The Evolution of Scale Economies in U.S. Banking: Appendices A–E

David C. Wheelock Paul W. Wilson*

February 2017

*Wheelock: Research Department, Federal Reserve Bank of St. Louis, P.O. Box 442, St. Louis, MO 63166–0442; wheelock@stls.frb.org. Wilson: Department of Economics and School of Computing, Division of Computer Science, Clemson University, Clemson, South Carolina 29634–1309, USA; email pww@clemson.edu. This research was conducted while Wilson was a visiting scholar in the Research Department of the Federal Reserve Bank of St. Louis. We thank the Cyber Infrastructure Technology Integration group at Clemson University for operating the Palmetto cluster used for our computations. We thank Peter McCrory for research assistance. The views expressed in this paper do not necessarily reflect official positions of the Federal Reserve Bank of St. Louis or the Federal Reserve System. *JEL* classification nos.: G21, L11, C12, C13, C14. Keywords: banks, returns to scale, scale economies, non-parametric, regression.

Contents

List of Tables

List of Figures

A Interpretation of Scale Measures when (Net) Revenue or Profit is Negative

As noted in Section 2, either $\pi(\boldsymbol{y}_i, \boldsymbol{w}_i)$ or $\pi(\delta\boldsymbol{y}_i, \boldsymbol{w}_i)$—or $R(\boldsymbol{y}_i, \boldsymbol{w}_i)$ or $R(\delta\boldsymbol{y}_i, \boldsymbol{w}_i)$—might be negative, affecting how the magnitude of estimates of $\mathcal{E}_{\pi,i}$ and $\mathcal{E}_{R,i}$ are interpreted. Thus there are four cases to consider. In the discussion that follows, consider the scale measure $\mathcal{E}_{\pi,i}$ based on the profit function; similar reasoning applies to the scale measure $\mathcal{E}_{R,i}$ based on the revenue function.

In the most common scenario, $\pi(\boldsymbol{y}_i, \boldsymbol{w}_i) > 0$ and $\pi(\delta\boldsymbol{y}_i, \boldsymbol{w}_i) > 0$, and this case is discussed in Section 2. The other three cases are infrequent, and arise when $\pi(\boldsymbol{y}_i, \boldsymbol{w}_i) < 0$ or $\pi(\delta\boldsymbol{y}_i, \boldsymbol{w}_i) < 0$. We consider each of the three possible cases here.

1. $\pi(\boldsymbol{y}_i, \boldsymbol{w}_i) < 0$, $\pi(\delta\boldsymbol{y}_i, \boldsymbol{w}_i) > 0$.

   In this case, increasing output levels by a factor $\delta > 1$ increases profit. Also in this case, (2.6) can be written as $(1 - \mathcal{E}_{\pi,i})\delta\pi(\boldsymbol{y}_i, \boldsymbol{w}_i) = \pi(\delta\boldsymbol{y}_i, \boldsymbol{w}_i)$, implying $\mathcal{E}_{\pi,i} > 1$. Hence RTS are increasing in this case. If $\mathcal{E}_{\pi,i} = 1.05$ and $\delta = 1.1$, then increasing output levels by 10 percent leads to profits increasing by $100 + (1 - 1.05) \times 100 = 105$ percent from an initial negative value to a positive value. Alternatively, (2.6) can be rearranged to show the difference $\pi(\delta\boldsymbol{y}_i, \boldsymbol{w}_i) - \delta\pi(\boldsymbol{y}_i, \boldsymbol{w}_i) > 0$ equals $\mathcal{E}_{\pi,i}\delta|\pi(\boldsymbol{y}_i, \boldsymbol{w}_i|$; if $\mathcal{E}_{\pi,i} = 1.05$ and $\delta = 1.1$, then increasing output levels by 10 percent increases profit to a positive level equal to $(1 - 1.05) \times 1.1 = 0.55$ times the *magnitude* of the profits that were negative before the increase. Whether the increase is big or small in absolute terms depends on the starting point, i.e., the magnitude of $\pi(\boldsymbol{y}_i, \boldsymbol{w}_i)$.

2. $\pi(\boldsymbol{y}_i, \boldsymbol{w}_i) > 0$, $\pi(\delta\boldsymbol{y}_i, \boldsymbol{w}_i) < 0$.

   In this case, increasing output levels by a factor $\delta > 1$ decreases profit. Since $\pi(\boldsymbol{y}_i, \boldsymbol{w}_i) > 0$, (2.6) can again be rewritten as $(1 + \mathcal{E}_{\pi,i})\delta\pi(\boldsymbol{y}_i, \boldsymbol{w}_i) = \pi(\delta\boldsymbol{y}_i, \boldsymbol{w}_i)$. Clearly, $\mathcal{E}_{\pi,i} < -1$ since $\pi(\delta\boldsymbol{y}_i, \boldsymbol{w}_i) < 0$. Hence RTS are decreasing in this case. If $\mathcal{E}_{\pi,i} = -1.05$ and $\delta = 1.1$, then increasing output levels by 10 percent reduces profit by $100+(1+\mathcal{E}_{\pi,i})\delta\times100 = 105.5$ percent. As in the previous case, whether the absolute change in profit is big or small depends on the starting point.

3. $\pi(\boldsymbol{y}_i, \boldsymbol{w}_i) < 0$, $\pi(\delta\boldsymbol{y}_i, \boldsymbol{w}_i) < 0$.

   Using reasoning similar to that in footnote 2 in the paper, profit (increases, remains

unchanged, decreases) as $\mathcal{E}_{\pi,i}$ $(>,=,<)1-\delta^{-1} \approx 0.09091$ for $\delta = 1.1$. In this case we also have again $(1-\mathcal{E}_{\pi,i})\delta\pi(\boldsymbol{y}_i, \boldsymbol{w}_i) = \pi(\delta\boldsymbol{y}_i, \boldsymbol{w}_i)$. Since both profit terms are negative, $\mathcal{E}_{\pi,i} < 1$ and returns to scale are either increasing, constant, or decreasing depending on whether $\mathcal{E}_{\pi,i}$ is greater than, equal to, or less than 0. Increasing output levels by a factor δ causes profits to fall by a factor $(1-\mathcal{E}_{\pi,i})\delta$; for If $\mathcal{E}_{\pi,i} = 0.05$ and $\delta = 1.1$, a 10 percent increase in output levels results in profits that are still negative, but 4.5 percent greater than before the increase in output.

B Summary Statistics for Data Used for Estimation

As mentioned in the paper, we estimate several specifications in addition to the cost, revenue and profit models described in Section 3 of the paper. All together, we estimate 8 different models—2 cost functions, 2 revenue functions, and 4 profit functions. In subequent appendices, we number these models 1–8, with models 1, 3, and 5 corresponding to the cost, revenue and profit functions described in Section 3. In the tables that follow, we denote the dependent variables for these models as C_1, R_1, and π_1 respectively. In model 2, cost (C_2) is measured by total interest expense plus total non-interest expense. Similarly, in model 4 revenue (R_2) is measured by total interest income plus total non-interest income. In models 6–8, profit is measured by $\pi_2 = R_1 - C_2$, $\pi_3 = R_2 - C_1$ and $\pi_4 = R_2 - C_2$ (whereas in model 5 profit is measured by $\pi_1 = R_1 - C_1$). Results for estimated returns to scale given below in Appendix E are broadly qualitatively similar across the sets of specifications for cost, revenue and profit functions.

Table B.1 gives correlations for the dependent variables used in each of the 8 models described above. Table B.2–B.5 give summary statistics for left-hand and right-hand side variables used in Models 1–8 over the 4 quarters in which returns-to-scale are estimated (i.e., 1986.Q4, 1996.Q4, 2006.Q4, and 2015.Q4). Table B.6 gives similar summary statistics over the 117 quarters used for estimation (i.e., 1986.Q4–2015.Q4). All dollar amounts have been converted to constant 2015 dollars using the quarterly, seasonally adjusted, gross domestic product implicit price deflator.

Figure B.1 shows kernel density esitmates of log total assets for 1986.Q4, 1996.Q4, 2006.Q4 and 2015.Q4. The esimates displayed in Figure B.1 illustrate the evolution of bank sizes over the period covered by our sample; i.e., the distribution of bank sizes has shifted rightward over time.

Table B.1: Correlation Matrices for Dependent Variables, All Periods

	C_1/W_1	C_2/W_1	R_1	R_2	π_1	π_2	π_3	π_4
Homogeneity wrt prices not imposed on revenue, profit variables:								
C_1/W_1	1.0000							
C_2/W_1	0.9935	1.0000						
R_1	0.7106	0.6828	1.0000					
R_2	0.7031	0.6752	0.9944	1.0000				
π_1	0.7733	0.7518	0.9577	0.9399	1.0000			
π_2	0.6431	0.5990	0.7974	0.7585	0.8869	1.0000		
π_3	0.7571	0.7339	0.9678	0.9757	0.9687	0.8003	1.0000	
π_4	0.6950	0.6513	0.9092	0.9144	0.9265	0.8986	0.9481	1.0000

Table B.2: Quantiles and Means for Variables used in Estimation, 1986.Q4

	0.01	0.25	0.50	Mean	0.75	0.99
C_1/W_1	1.4285E+04	4.8580E+04	9.0857E+04	7.0159E+05	1.8405E+05	1.1684E+07
C_2/W_1	1.6762E+04	5.7208E+04	1.0817E+05	8.3290E+05	2.1925E+05	1.4208E+07
R_1	−3.2161E+03	2.6552E+03	5.3853E+03	4.7041E+04	1.1450E+04	7.2623E+05
R_2	8.2147E+02	3.3081E+03	6.3493E+03	5.1503E+04	1.2755E+04	7.8661E+05
π_1	−1.1057E+07	−1.7302E+05	−8.5864E+04	−6.5455E+05	−4.5699E+04	−1.3489E+04
π_2	−1.3692E+07	−2.0839E+05	−1.0242E+05	−7.8586E+05	−5.4381E+04	−1.5760E+04
π_3	−1.0964E+07	−1.7129E+05	−8.4585E+04	−6.5009E+05	−4.5199E+04	−1.3274E+04
π_4	−1.3650E+07	−2.0665E+05	−1.0157E+05	−7.8140E+05	−5.4012E+04	−1.5679E+04
Y_1	9.4970E+01	2.7478E+03	6.5611E+03	5.4197E+04	1.4842E+04	9.4352E+05
Y_2	6.0057E+02	5.6446E+03	1.1661E+04	1.7275E+05	2.5399E+04	2.4975E+06
Y_3	2.9062E+02	5.0820E+03	1.2893E+04	9.0136E+04	3.0702E+04	1.4840E+06
Y_4	3.8996E+03	1.5778E+04	3.1069E+04	1.9748E+05	6.4592E+04	2.8690E+06
Y_5	2.1739E+01	1.8319E+02	4.0705E+02	8.0615E+03	1.0033E+03	1.1912E+05
W_1	2.9941E−02	4.7824E−02	5.2315E−02	5.1871E−02	5.6474E−02	6.9519E−02
W_2	2.4148E+01	3.8039E+01	4.4386E+01	4.8134E+01	5.3449E+01	1.1244E+02
W_3	5.0803E−02	2.1430E−01	3.2525E−01	5.2831E−01	5.3877E−01	3.2728E+00
W_2/W_1	4.3850E+02	7.1662E+02	8.6105E+02	9.7204E+02	1.0762E+03	2.6353E+03
W_3/W_1	9.5988E−01	4.0663E+00	6.3178E+00	1.1330E+01	1.0651E+01	7.5292E+01
X_3	2.8957E+01	4.4644E+02	1.0862E+03	8.1347E+03	2.5143E+03	1.3590E+05
EQUITY	4.6844E+02	3.0110E+03	5.7012E+03	3.2222E+04	1.1211E+04	5.3531E+05
NPER	3.4032E−04	1.6663E−02	3.1966E−02	4.4983E−02	5.6878E−02	2.1259E−01
TIME	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
ASSETS	9.3010E+03	3.4814E+04	6.7352E+04	5.1436E+05	1.3537E+05	8.0312E+06

NOTE: Dollar figures are given in thousands of constant 2015 dollars.

Table B.3: Quantiles and Means for Variables used in Estimation, 1996.Q4

	0.01	0.25	0.50	Mean	0.75	0.99
C_1/W_1	1.9638E+04	6.8268E+04	1.3051E+05	1.2362E+06	2.7415E+05	1.2393E+07
C_2/W_1	2.4015E+04	8.1068E+04	1.5610E+05	1.5254E+06	3.3136E+05	1.5835E+07
R_1	7.4775E+02	3.5114E+03	6.9199E+03	7.2351E+04	1.4604E+04	7.1875E+05
R_2	8.7486E+02	3.6294E+03	7.1503E+03	7.4768E+04	1.5053E+04	7.3635E+05
π_1	−1.1712E+07	−2.6014E+05	−1.2354E+05	−1.1639E+06	−6.4618E+04	−1.8718E+04
π_2	−1.5166E+07	−3.1588E+05	−1.4894E+05	−1.4530E+06	−7.7339E+04	−2.3150E+04
π_3	−1.1658E+07	−2.5979E+05	−1.2339E+05	−1.1614E+06	−6.4476E+04	−1.8707E+04
π_4	−1.5151E+07	−3.1585E+05	−1.4849E+05	−1.4506E+06	−7.7178E+04	−2.3115E+04
Y_1	2.6258E+02	2.6478E+03	5.8175E+03	8.8979E+04	1.3725E+04	8.9102E+05
Y_2	5.0755E+02	6.0800E+03	1.2481E+04	1.9537E+05	2.5904E+04	1.4277E+06
Y_3	7.8824E+02	1.0595E+04	2.5656E+04	2.1970E+05	6.4027E+04	2.7739E+06
Y_4	4.1874E+03	1.7792E+04	3.3857E+04	3.1128E+05	7.0037E+04	3.0415E+06
Y_5	3.3334E+01	2.4517E+02	5.6283E+02	1.6617E+04	1.4214E+03	1.4524E+05
W_1	1.9594E−02	3.2982E−02	3.7037E−02	3.6638E−02	4.0576E−02	5.0377E−02
W_2	3.0004E+01	4.4822E+01	5.2365E+01	5.6208E+01	6.2693E+01	1.2609E+02
W_3	6.3216E−02	1.9908E−01	2.9122E−01	5.2205E−01	4.6896E−01	2.8226E+00
W_2/W_1	7.5975E+02	1.1952E+03	1.4391E+03	1.5908E+03	1.8106E+03	3.9926E+03
W_3/W_1	1.6388E+00	5.3958E+00	8.1142E+00	1.5264E+01	1.3369E+01	9.0522E+01
X_3	3.2687E+01	5.1065E+02	1.3453E+03	1.3182E+04	3.3807E+03	1.3020E+05
EQUITY	1.0588E+03	4.5069E+03	8.5316E+03	6.7811E+04	1.7396E+04	6.7885E+05
NPER	0.0000E+00	7.2233E−03	1.4046E−02	1.8648E−02	2.4139E−02	8.1476E−02
TIME	4.1000E+01	4.1000E+01	4.1000E+01	4.1000E+01	4.1000E+01	4.1000E+01
ASSETS	1.0925E+04	4.4322E+04	8.5241E+04	8.1747E+05	1.7826E+05	7.7399E+06

NOTE: Dollar figures are given in thousands of constant 2015 dollars.

Table B.4: Quantiles and Means for Variables used in Estimation, 2006.Q4

	0.01	0.25	0.50	Mean	0.75	0.99
C_1/W_1	2.7372E+04	1.0834E+05	2.1287E+05	2.8111E+06	4.7847E+05	1.9688E+07
C_2/W_1	3.4790E+04	1.3144E+05	2.5476E+05	3.3825E+06	5.7645E+05	2.4183E+07
R_1	7.5553E+02	4.1226E+03	8.7530E+03	1.5337E+05	2.0892E+04	8.8074E+05
R_2	8.7438E+02	4.3025E+03	9.1663E+03	1.5918E+05	2.1518E+04	9.0536E+05
π_1	−1.8792E+07	−4.5884E+05	−2.0425E+05	−2.6578E+06	−1.0416E+05	−2.6562E+04
π_2	−2.3032E+07	−5.5530E+05	−2.4635E+05	−3.2292E+06	−1.2709E+05	−3.3546E+04
π_3	−1.8769E+07	−4.5843E+05	−2.0379E+05	−2.6520E+06	−1.0410E+05	−2.6551E+04
π_4	−2.2999E+07	−5.5446E+05	−2.4571E+05	−3.2233E+06	−1.2677E+05	−3.3524E+04
Y_1	5.4270E+01	2.0337E+03	4.5317E+03	1.3393E+05	1.0605E+04	5.0776E+05
Y_2	6.8023E+02	7.9104E+03	1.7427E+04	3.0917E+05	4.0890E+04	1.8210E+06
Y_3	1.7185E+03	2.2155E+04	5.7937E+04	6.2418E+05	1.5227E+05	5.0291E+06
Y_4	3.7717E+03	1.9683E+04	3.8899E+04	8.8022E+05	8.4208E+04	4.1177E+06
Y_5	2.5222E+01	2.9465E+02	7.6319E+02	4.7674E+04	2.0922E+03	1.7041E+05
W_1	1.2300E−02	2.5134E−02	2.9807E−02	2.9760E−02	3.4539E−02	4.7022E−02
W_2	3.3580E+01	5.1988E+01	6.0842E+01	6.5241E+01	7.3959E+01	1.3351E+02
W_3	5.7326E−02	1.5976E−01	2.4101E−01	4.3295E−01	4.0730E−01	2.6102E+00
W_2/W_1	1.0786E+03	1.7139E+03	2.0858E+03	2.3338E+03	2.6522E+03	6.0090E+03
W_3/W_1	1.6144E+00	5.3063E+00	8.4496E+00	1.6224E+01	1.4996E+01	1.0431E+02
X_3	4.0038E+01	7.9625E+02	2.3097E+03	1.9033E+04	6.0625E+03	1.9300E+05
EQUITY	1.5462E+03	7.1660E+03	1.3890E+04	1.7695E+05	2.9155E+04	1.1112E+06
NPER	0.0000E+00	5.2085E−03	1.1642E−02	1.6275E−02	2.2149E−02	7.7390E−02
TIME	8.1000E+01	8.1000E+01	8.1000E+01	8.1000E+01	8.1000E+01	8.1000E+01
ASSETS	1.3424E+04	6.3182E+04	1.2914E+05	1.9531E+06	2.9528E+05	1.2084E+07

NOTE: Dollar figures are given in thousands of constant 2015 dollars.

Table B.5: Quantiles and Means for Variables used in Estimation, 2015.Q4

	0.01	0.25	0.50	Mean	0.75	0.99
C_1/W_1	1.0626E+05	5.2067E+05	1.1119E+06	1.8666E+07	2.7318E+06	1.4240E+08
C_2/W_1	1.5534E+05	7.2978E+05	1.5695E+06	2.7335E+07	3.8389E+06	2.1414E+08
R_1	5.8014E+02	3.8511E+03	7.8937E+03	1.2840E+05	1.7659E+04	7.9773E+05
R_2	7.1519E+02	3.9455E+03	8.1673E+03	1.3408E+05	1.8168E+04	8.5243E+05
π_1	−1.4195E+08	−2.7055E+06	−1.1025E+06	−1.8538E+07	−5.1543E+05	−1.0493E+05
π_2	−2.1285E+08	−3.8207E+06	−1.5602E+06	−2.7206E+07	−7.2486E+05	−1.5328E+05
π_3	−1.4187E+08	−2.7056E+06	−1.1027E+06	−1.8532E+07	−5.1549E+05	−1.0491E+05
π_4	−2.1272E+08	−3.8207E+06	−1.5591E+06	−2.7201E+07	−7.2453E+05	−1.5328E+05
Y_1	4.9869E+00	1.4729E+03	3.4275E+03	1.9185E+05	8.1038E+03	6.7945E+05
Y_2	8.2713E+02	9.3589E+03	2.1943E+04	5.5048E+05	5.3645E+04	3.8193E+06
Y_3	2.5233E+03	3.2677E+04	8.0097E+04	7.3225E+05	1.9746E+05	7.1351E+06
Y_4	5.4605E+03	2.9490E+04	5.8854E+04	1.5083E+06	1.2884E+05	5.0939E+06
Y_5	3.5752E+01	3.5377E+02	9.8589E+02	5.0507E+04	2.8920E+03	2.2895E+05
W_1	7.0980E−04	2.6526E−03	3.9677E−03	4.3177E−03	5.6056E−03	1.1163E−02
W_2	3.9563E+01	5.9819E+01	7.0071E+01	7.4142E+01	8.4415E+01	1.3954E+02
W_3	5.9994E−02	1.5105E−01	2.2741E−01	4.4754E−01	3.9024E−01	3.7542E+00
W_2/W_1	5.9063E+03	1.2661E+04	1.8070E+04	2.4135E+04	2.7267E+04	1.1704E+05
W_3/W_1	9.7897E+00	3.5035E+01	6.2436E+01	1.4857E+02	1.2599E+02	1.5046E+03
X_3	3.5086E+01	8.9979E+02	2.7917E+03	2.2944E+04	7.0597E+03	2.4833E+05
EQUITY	1.8127E+03	9.7273E+03	1.9529E+04	3.4081E+05	4.1760E+04	2.0533E+06
NPER	0.0000E+00	5.9330E−03	1.2205E−02	1.8037E−02	2.2530E−02	1.1501E−01
TIME	1.1700E+02	1.1700E+02	1.1700E+02	1.1700E+02	1.1700E+02	1.1700E+02
ASSETS	1.8508E+04	8.8917E+04	1.7926E+05	2.9854E+06	3.9060E+05	1.8417E+07

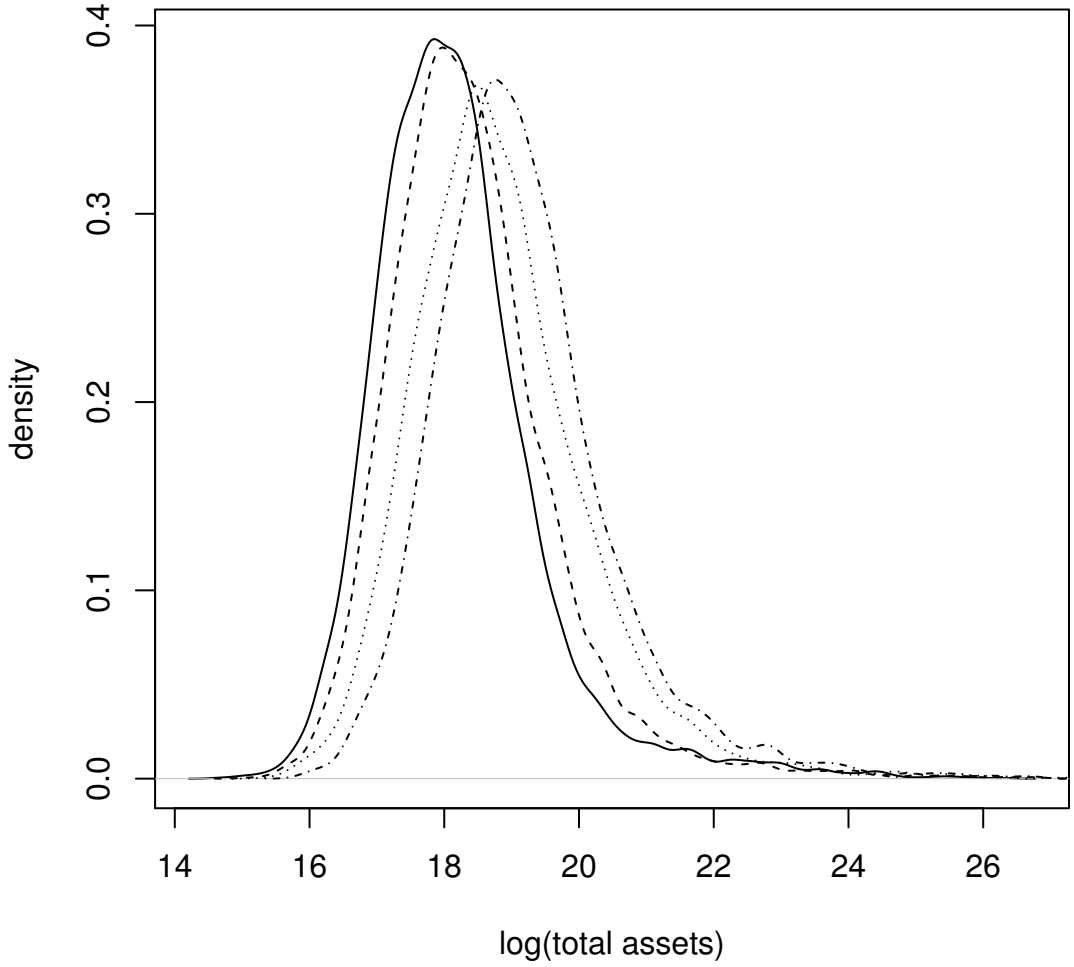
NOTE: Dollar figures are given in thousands of constant 2015 dollars.

Table B.6: Quantiles and Means for Variables used in Estimation, All Quarters

	0.01	0.25	0.50	Mean	0.75	0.99
C_1/W_1	1.7581E+04	7.7641E+04	1.7125E+05	3.4098E+06	4.4550E+05	2.3379E+07
C_2/W_1	2.0990E+04	9.3050E+04	2.0875E+05	4.8089E+06	5.6213E+05	3.0692E+07
R_1	5.5909E+02	3.4482E+03	6.9426E+03	8.5015E+04	1.5174E+04	7.2486E+05
R_2	8.0460E+02	3.6451E+03	7.2711E+03	9.1672E+04	1.5882E+04	7.7272E+05
π_1	−2.2596E+07	−4.2852E+05	−1.6297E+05	−3.3248E+06	−7.3402E+04	−1.6517E+04
π_2	−3.0026E+07	−5.4462E+05	−2.0024E+05	−4.7239E+06	−8.8673E+04	−1.9901E+04
π_3	−2.2542E+07	−4.2761E+05	−1.6260E+05	−3.3181E+06	−7.3203E+04	−1.6476E+04
π_4	−2.9967E+07	−5.4374E+05	−1.9993E+05	−4.7173E+06	−8.8490E+04	−1.9861E+04
Y_1	7.9818E+01	2.2160E+03	5.1518E+03	9.6592E+04	1.2025E+04	7.0749E+05
Y_2	5.6932E+02	6.3087E+03	1.3550E+04	2.4207E+05	3.1154E+04	1.8640E+06
Y_3	7.1851E+02	1.1362E+04	3.1410E+04	3.4505E+05	8.7623E+04	3.3477E+06
Y_4	4.1916E+03	1.8965E+04	3.7406E+04	5.6377E+05	8.0598E+04	3.6474E+06
Y_5	2.9044E+01	2.4066E+02	5.9222E+02	2.5616E+04	1.6037E+03	1.4839E+05
W_1	2.1543E−03	1.9285E−02	3.3102E−02	3.2665E−02	4.5244E−02	6.6601E−02
W_2	2.8801E+01	4.3852E+01	5.2515E+01	5.6152E+01	6.4042E+01	1.2041E+02
W_3	6.5227E−02	1.8211E−01	2.6997E−01	4.6718E−01	4.3943E−01	2.8289E+00
W_2/W_1	5.2789E+02	1.0499E+03	1.6292E+03	3.7772E+03	3.2204E+03	3.2890E+04
W_3/W_1	1.5785E+00	5.4754E+00	9.4494E+00	2.9362E+01	1.9831E+01	2.9017E+02
X_3	3.0665E+01	5.4687E+02	1.5438E+03	1.4450E+04	4.1485E+03	1.6133E+05
EQUITY	8.6404E+02	4.7176E+03	9.5730E+03	1.1172E+05	2.0518E+04	8.5412E+05
NPER	0.0000E+00	7.8813E−03	1.6633E−02	2.5232E−02	3.1354E−02	1.5069E−01
TIME	1.0000E+00	2.2000E+01	4.8000E+01	5.1908E+01	8.0000E+01	1.1600E+02
ASSETS	1.0983E+04	4.8178E+04	9.7835E+04	1.2465E+06	2.1775E+05	9.9231E+06

NOTE: Dollar figures are given in thousands of constant 2015 dollars.

Figure B.1: Density of (log) Total Assets of in 1986.Q4, 1996.Q4, 2006.Q4 and 2015.Q4



NOTE: Solid line shows density for 1986.Q4; dashed line shows density for 1996.Q4; dotted line shows density for 2006.Q4; and dash-dotted line shows density for 2015.Q4.

C Test of Translog Specifications

In order to provide a simple test of the translog specification for our cost, revenue, and profit equations, we divide our data for each of 117 quarters (1986.Q4–2015.Q4) into two mutually exclusive, collectively exhaustive subsamples containing (i) observations on banks with total assets up to the median of total assets, and (ii) observations on banks with total assets greater than the median of total assets (medians are over all banks within a given group). Thus for each quarter we have two subsamples. For each model $m \in \{1, \ldots, 8\}$, we specify a translog form for the conditional mean function after omitting the time (T) variable from the RHSs of the models. For each subsample in each quarter, we estimate via ordinary least squares (OLS) each of 8 models with translog specifications.

For a given quarter and a given model m, we obtain parameter estimates $\widehat{\boldsymbol{\beta}}_{mj}$ and corresponding covariance matrix estimates

$$\widehat{\Sigma}_{mj} = (\frac{n_{mj}}{n_{mj} - K_m})(\boldsymbol{X}'_{mj}\boldsymbol{X}_{mj})^{-1}\boldsymbol{X}'_{mj}\text{diag}(\widehat{\varepsilon}^2_{mji})\boldsymbol{X}_{mj}(\boldsymbol{X}'_{mj}\boldsymbol{X}_{mj})^{-1}, \tag{C.1}$$

where $j \in \{1, 2\}$, $\boldsymbol{X}_{mj}$ is the $(n_{mj} \times K_m)$ matrix of RHS variables (including interaction terms) used in the translog specification and the $\widehat{\varepsilon}_{mji}$ are the OLS residuals for model m, subset j. The factor $(\frac{n_{mj}}{n_{mj}-K_m})$ scales up the usual White (1980) heteroskedasticity-consistent covariance estimator as suggested by Davidson and MacKinnon (1993) to account for the fact that squared OLS-estimated residuals tend to underestimate squares of true residuals.

Finally, for a given quarter and model, we compute the Wald statistic

$$\widehat{W} = (\widehat{\boldsymbol{\beta}}_{m1} - \widehat{\boldsymbol{\beta}}_{m2})'(\widehat{\Sigma}_{m1} + \widehat{\Sigma}_{m2})^{-1}(\widehat{\boldsymbol{\beta}}_{m1} - \widehat{\boldsymbol{\beta}}_{m2}) \tag{C.2}$$

to test the null hypothesis $H_0\colon \boldsymbol{\beta}_{m1} = \boldsymbol{\beta}_{m2}$ versus the alternative hypothesis $H_1\colon \boldsymbol{\beta}_{m1} \neq \boldsymbol{\beta}_{m2}$. Rejection of the null provides evidence against the translog specification within a given group. Using the sample described in Section 3, we obtain p-values for the $117 \times 8 = 936$ Wald tests ranging from $10^{-85.456}$ to 0.0514. Only 1 out of 936 p-values are greater than 0.05, and only 4 are greater than 0.01. The median p-value is $10^{-13.723}$ (i.e., essentially zero). Splitting the data into $117 \times 2 = 234$ cells allows the translog parameters to vary across quarters as well as across bank-size. Even so, we find overwhelming evidence against the translog specification.

D Details of Non-parametric Estimation and Inference

D.1 Dimension reduction

Non-parametric regression methods typically suffer from the well-known curse of dimensionality, a phenomenon that causes rates of convergence to become slower, and estimation error to increase dramatically, as the number of continuous right-hand side variables increases (the presence of discrete dummy variables does not affect the convergence rate of our estimator). We use eigensystem analysis and principal components to help mitigate this problem. The idea is to sacrifice a relatively small amount of information in the data to permit a reduction in dimensionality that will have a large (and favorable) impact on estimation error.

We begin by applying marginal transformations to the continuous right-hand side RHS variables in each model. The marginal transformations are chosen to yield distributions that are approximately normal. For output quantities $Y_1,\ Y_2,\ Y_3$ and Y_5 we add 1 and then take the (natural) logarithm. For Y_4 we take the logarithm without adding 1. For the physical capital variable X_4 used in the first model, and for the normalized input price variables used in each of the cost models, we take logarithms. We similarly take logarithms of the input price variables (that are not normalized) in the revenue and profit models.

For an $(n \times 1)$ vector $\boldsymbol{V}$ define the function $\psi_1(\cdot)\colon \mathbb{R}^n \mapsto \mathbb{R}^n$ such that

$$\psi_1(\boldsymbol{V}) \equiv (\boldsymbol{V} - n^{-1}\boldsymbol{i}'\boldsymbol{V}) \left[n^{-1}\boldsymbol{V}'\boldsymbol{V} - n^{-2}\boldsymbol{V}'\boldsymbol{i}\boldsymbol{i}'\boldsymbol{V}\right]^{-1/2} \tag{D.1}$$

where $\boldsymbol{i}$ denotes an $(n \times 1)$ vector of ones. The function $\psi_1(\cdot)$ standardizes a variable by subtracting its sample mean and then dividing by its sample standard deviation. We apply this function to marginal transformations of the continuous RHS variables in each model.

For model $j \in \{1,\ \ldots,\ 8\}$, let K_j be the number of continuous RHS variables, and let $\boldsymbol{A}_j$ be the $(n \times K_j)$ matrix with columns containing the standardized, marginal transformations of the continuous RHS variables in the given model. Let $\boldsymbol{\Lambda}_j$ be the $(K_j \times K_j)$ matrix whose columns are the eigenvectors of the correlation matrix of Pearson correlation coefficients for pairs of columns of $\boldsymbol{A}_j$, and let λ_{jk} be the eigenvalue corresponding to the kth eigenvector in the kth column of $\boldsymbol{\Lambda}_j$, where the columns of $\boldsymbol{\Lambda}_j$, and their corresponding eigenvalues, have been sorted so that $\lambda_{j1} \geq \ldots \geq \lambda_{jK_j}$. Then let $\boldsymbol{P}_j = \boldsymbol{A}_j\boldsymbol{\Lambda}_j$. The matrix $\boldsymbol{P}_j$ has dimensions $(n \times K_j)$, and its columns are the principal components of $\boldsymbol{A}_j$. It is well-known that principal

components are orthogonal. Moreover, for each $k \in \{1,\ 2,\ \ldots,\ K_j\}$, the quantity

$$\phi_{jk} = \frac{\sum_{\ell=1}^{k} \lambda_{j\ell}}{\sum_{i=1}^{K} \lambda_{ji}} \tag{D.2}$$

represents the proportion of the independent linear information in $\boldsymbol{A}_j$ that is contained in the first k principal components, i.e., the first k columns of $\boldsymbol{P}_j$.

Using the dataset described in Section 3, for models $j \in \{1,\ 2\}$ and $k \in \{1,\ \ldots,\ 10\}$ we find $\phi_{j,k} = 0.4004706$, 0.6409254, 0.7411243, 0.8358076, 0.8875271, 0.9285652, 0.9551966, 0.9735527, 0.9886108 and 1.0000000. For the revenue and cost models ($j \in \{3,\ \ldots,\ 8\}$) and $k \in \{1,\ \ldots,\ 11\}$ we find $\phi_{j,k} = 0.3714919$, 0.5653879, 0.6641117, 0.7547991, 0.8381867, 0.8969946, 0.9292129, 0.9531239, 0.9751464, 0.9888575 and 1.0000000. As discussed in Section 3, we use the first 6 principal components in each case, omitting the last 4 in models 1–2, and the last 5 in models 3–8. In doing so, we sacrifice a relatively small amount of information, while retaining 89.7 to 93.2 percent of the independent linear information in the sample, in order to reduce the dimensionality of our estimation problem by 6 or 7 dimensions in the space of the continuous covariates. We regard this as a worthwhile trade-off given the curse of dimensionality.

Now write model j, $j \in \{1,\ \ldots,\ 8\}$ from the list of models given in Section 3 as

$$\mathcal{Y}_{ji} = m_j(\mathfrak{X}_{ji}) + \varepsilon_i \tag{D.3}$$

where $\mathcal{Y}_{ji}$ is the ith observation, $i = 1,\ \ldots,\ n$ on left-hand side (LHS) variable in model j and $\mathfrak{X}_{ji}$ is the vector of ith observations on K_j continuous RHS variables in model j. Let $\boldsymbol{\mathcal{Y}}_j = \begin{bmatrix}\mathcal{Y}_{ji} & \ldots & \mathcal{Y}_{jn}\end{bmatrix}'$. Define functions $\psi_2(\cdot)\colon \mathbb{R}^n \mapsto \mathbb{R}^n$ such that

$$\psi_2(\boldsymbol{V}) := \psi_1\left(\log(\boldsymbol{V} - \min(\boldsymbol{V}) + 1)\right) \tag{D.4}$$

and $\psi_3(\cdot)\colon \mathbb{R}^n \mapsto \mathbb{R}^n$ such that

$$\psi_3(\boldsymbol{V}) := \boldsymbol{V}/\mathrm{IQR}(\boldsymbol{V}) \tag{D.5}$$

where $\mathrm{IQR}(\boldsymbol{V})$ gives the inter-quartile range of the elements of $\boldsymbol{V}$.

Instead of estimating (D.3) directly, we estimate the model

$$\mathcal{Y}_{ji}^{+} = m_j^{+}(\mathfrak{X}_{ji}^{+}) + \xi_i \tag{D.6}$$

where $E(\xi_i) = 0$, $\text{VAR}(\xi_i) = \sigma^2(\mathfrak{X}_{ji}^+)$, $\mathcal{Y}_{ji}^+$ is the ith element of the $(n \times 1)$ vector $\boldsymbol{\mathcal{Y}}_j^+ = \psi_2(\boldsymbol{\mathcal{Y}}_{ji})$ for the cost models ($j \in \{1,\ 2\}$) or $\boldsymbol{\mathcal{Y}}_j^+ = \psi_3(\boldsymbol{\mathcal{Y}}_{ji})$ for the revenue and profit models ($j \in \{3,\ \ldots,\ 8\}$), $\mathfrak{X}_{ij}^+$ is the row vector containing the ith observations on $\psi_4(\boldsymbol{P}_{j,\cdot 1}),\ \ldots, \psi_4(\boldsymbol{P}_{j,\cdot 6})$, with $\boldsymbol{P}_{j,\cdot k}$ denoting the kth column of the principal component matrix $\boldsymbol{P}_j$ and $\psi_4(\cdot)\colon \mathbb{R}^n \mapsto \mathbb{R}^n$ such that

$$\psi_4(\boldsymbol{P}_{j,\cdot k}) := \boldsymbol{P}_{j,\cdot k} \left[n^{-1} \boldsymbol{P}_{j,\cdot k}' \boldsymbol{P}_{j,\cdot k} - n^{-2} \boldsymbol{P}_{j,\cdot k}' \boldsymbol{i}\boldsymbol{i}' \boldsymbol{P}_{j,\cdot k} \right]^{-1/2}. \tag{D.7}$$

The transformation $\psi_4(\boldsymbol{P}_{j,\cdot k})$ of $\boldsymbol{P}_{j,\cdot k}$ has (constant) unit variance. Moreover, all of the transformations that have been introduced can be inverted. Hence, given estimated values $\widehat{\boldsymbol{M}}^+ = \left[\widehat{m}_j^+(\mathfrak{X}_{j1}^+) \quad \ldots \quad \widehat{m}_j^+(\mathfrak{X}_{jn}^+ \right]'$, straightforward algebra yields estimated or predicted values

$$\widehat{\boldsymbol{\mathcal{Y}}}_{ji} = \left[\widehat{\mathcal{Y}}_{j1} \quad \ldots \quad \widehat{\mathcal{Y}}_{jn} \right]' = \psi_2^{-1} \left(\widehat{\boldsymbol{M}}^+ \right). \tag{D.8}$$

As discussed below, we use a local linear estimator to estimate $m_j^+(\mathfrak{X}_{ji}^+)$. Although this estimator is weakly consistent, it is asymptotically biased. Moreover, even if $\widehat{m}_j^+(\mathfrak{X}_{ji}^+)$ were *unbiased*, use of the nonlinear transformation in (D.8) means that $\widehat{\mathcal{Y}}_{ji}$ obtained from (D.8) would not, in general, be unbiased because of the linearity of the expectations operator. Furthermore, even if an unbiased estimator of $\widehat{\mathcal{Y}}_{ji}$ were available, plugging such an estimator into the returns-to-scale measures $\mathcal{E}_{C,i}$, $\mathcal{E}_{R,i}$, and $\mathcal{E}_{\pi,i}$ defined in Section 2 to obtain estimators $\widehat{\mathcal{E}}_{C,i}$, $\widehat{\mathcal{E}}_{R,i}$, and $\widehat{\mathcal{E}}_{\pi,i}$ involves additional nonlinear transformations. Fortunately, any bias in the resulting estimates $\widehat{\mathcal{E}}_{C,i}$, $\widehat{\mathcal{E}}_{R,i}$, and $\widehat{\mathcal{E}}_{\pi,i}$ can be corrected while making inference about returns to scale; as discussed below in Section D.3, we employ a bias-corrected bootstrap method when estimating confidence intervals for our returns-to-scale measures.

D.2 Non-parametric estimation of conditional mean functions

Local polynomial estimators are discussed by Fan and Gijbels (1996), and are a generalization of the Nadaraya-Watson (Nadaraya, 1964; Watson, 1964) kernel estimator which amounts to fitting locally a polynomial of order $p = 0$. The local-linear estimator that we employ has less bias, but no more variance than the Nadaraya-Watson estimator; see Fan and Gijbels for explanation.

We specify the kernel function $\mathcal{K}(\cdot)\colon \mathbb{R}^\ell \mapsto \mathbb{R}_+^1$ needed by the local linear estimator as an

ℓ-variate, spherically symmetric Epanechnikov kernel with a single, scalar bandwidth h_0; i.e.,

$$\mathcal{K}(\boldsymbol{t}) = \frac{\ell(\ell+2)}{2S_\ell}(1 - \boldsymbol{t}\boldsymbol{t}')\mathbb{1}(\boldsymbol{t}\boldsymbol{t}' \leq 1) \tag{D.9}$$

where $\mathbb{1}(\cdot)$ again represents the indicator function, $S_\ell = 2\pi^{\ell/2}/\Gamma(\ell/2)$, and $\Gamma(\cdot)$ denotes the gamma function (recall that for each of the transformed models represented by (D.6), $\ell = 6$). The spherically symmetric Epanechnikov kernel is optimal in terms of asymptotic minimax risk; see Fan et al. (1997) for details and a proof.

Note that the principal components transformation pre-whitens the data; in addition, the principal components are orthogonal. These two facts allow us to work with a single bandwidth rather than a vector or matrix of bandwidths. Moreover, we use an is an adaptive, scalar-valued bandwidth $h(\mathfrak{X}_0^+)$ that depends on the point $(\mathfrak{X}_0^+)$ in the space of the continuous, transformed RHS variables where the conditional mean function is to be evaluated as explained below.

D.3 Practical issues for implementation

To implement our estimator, optimize the bandwidth $h(\mathfrak{X}_0^+)$. All of the right-hand side variables $\mathfrak{X}_0^+$ are continuous, but the sparseness of the data varies. Hence we use an adaptive, nearest-neighbor bandwidth. We define $h(\mathfrak{X}_0^+)$ for any particular point $\mathfrak{X}_0^+ \in \mathbb{R}^\ell$ as the maximum Euclidean distance between $\mathfrak{X}_0^+$ and the κ nearest points in the observed sample $\{\mathfrak{X}_{ji}^+\}_{i=1}^n$, $\kappa \in \{2,\ 3,\ 4,\ \ldots\}$. Thus, given the data and the point $\mathfrak{X}_0^+$, the bandwidth $h(\mathfrak{X}_0^+)$ is determined by κ, and varies depending on the density of the continuous explanatory variables locally around the point $\mathfrak{X}_0^+ \in \mathbb{R}^\ell$ at which the conditional mean function is estimated. This results in a bandwidth that is increasing with decreasing density of the data around the point of interest, $\mathfrak{X}_0^+$. More smoothing is required where data are sparse than where data are dense; our nearest-neighbor bandwidth adapts automatically to the density of the data.

Note that we use a nearest-neighbor *bandwidth* rather than a nearest-neighbor *estimator*. The bandwidth is used inside a kernel function, and the kernel function integrates to unity. Loftsgaarden and Quesenberry (1965) use this approach in the density estimation context to avoid nearest-neighbor density estimates (as opposed to bandwidths) that do not integrate to unity (see Pagan and Ullah, 1999, pp. 11-12 for additional discussion). Fan and Gijbels (1994; 1996, pp. 151–152) discuss nearest-neighbor bandwidths in the regression context.

As a practical matter, for models $j \in \{1, \ldots, 8\}$ we optimize κ_j by minimizing a least-squares cross-validation function; i.e., we select

$$\kappa_j = \underset{\kappa_j}{\operatorname{argmin}} \sum_{i=1}^{n} \left[\mathcal{Y}_{ji}^{+} - \widehat{m}_{j,-i}^{+}(\mathfrak{X}_{ji}^{+})\right]^2, \tag{D.10}$$

where $\widehat{m}_{j,-i}^{+}(\mathfrak{X}_{ji}^{+})$ is computed the same way as $\widehat{m}_{j}^{+}j(\mathfrak{X}_{ji}^{+})$, except that the ith observation is omitted. The least-squares cross validation function approximates the part of mean integrated square error that depends on the bandwidths.[1]

Once appropriate values of the bandwidth parameters have been selected, the conditional mean function can be estimated at any point $\mathfrak{X}_0^{+} \in \mathbb{R}^{\ell}$. We then estimate the returns-to-scale measures defined in the text by replacing the cost terms with estimates obtained from the relation (D.8). To make inferences about returns to scale, we use the wild bootstrap proposed by Härdle (1990) and Härdle and Mammen (1993).[2] After B replications, we obtain a set bootstrap estimates $\left\{\widehat{m}_{j,b}^{*}(\cdot)\right\}_{b=1}^{B}$, which we substitute into the definitions of the returns-to-scale measures given in the text. Letting $\mathcal{S}$ denote the relevant returns-to-scale measure, we have the original estimate $\widehat{\mathcal{S}}$ and the bootstrap estimates $\left\{\widehat{\mathcal{S}}_b\right\}_{b=1}^{B}$. to obtain bootstrap values $\widehat{\mathcal{S}}_b^{*}$ and $\widehat{\mathcal{E}}_b^{*}$ for particular values of $\mathfrak{X}^{+}$, with $b = 1, \ldots, B$.

To make inference about $\mathcal{S}$, we use the bias-correction method described by Efron and Tibshirani (1993). In particular, we estimate $(1-\alpha) \times 100$-percent confidence intervals by $\left(\widehat{\mathcal{S}}^{*(\alpha_1)}, \widehat{\mathcal{S}}^{*(\alpha_2)}\right)$, where $\widehat{\mathcal{S}}^{*(\alpha)}$ denotes the α-quantile of the bootstrap values $\widehat{\mathcal{S}}_b^{*}$, $b = 1, \ldots, B$, and

$$\alpha_1 = \Phi\left(\widehat{\varphi}_0 + \frac{\widehat{\varphi}_0 + \varphi^{(\alpha/2)}}{1 - \widehat{\varphi}_0 + \varphi^{(\alpha/2)}}\right), \tag{D.11}$$

$$\alpha_2 = \Phi\left(\widehat{\varphi}_0 + \frac{\widehat{\varphi}_0 + \varphi^{(1-\alpha/2)}}{1 - \widehat{\varphi}_0 + \varphi^{(1-\alpha/2)}}\right), \tag{D.12}$$

[1] Choice of κ by cross validation has been proposed by Fan and Gijbels (1996) and has been used by Wheelock and Wilson (2001, 2001, 2011, and 2012), Wilson and Carey (2004), and others. Time required to compute the cross validation function *once* is of order $O(n^2)$, and it must be computed many times in order to find optimal values of the bandwidths. With almost one million observations, this presents a formidable computational burden. However, the problem is trivially parallel; using n_p CPUs, the computation time required for each evaluation of the cross-validation function is only slightly more than $1/n_p$ times the time that would be required on a single processor. We performed all computations on the Palmetto cluster operated by Clemson University's Cyber Infrastructure Technology Integration (CITI) group.

[2] Ordinary bootstrap methods are inconsistent in our context due to the asymptotic bias of the estimator; see Mammen (1992) for additional discussion.

$\Phi(\cdot)$ denotes the standard normal distribution function, $\varphi^{(\alpha)}$ is the $(\alpha \times 100)$-th percentile of the standard normal distribution, and

$$\widehat{\varphi}_0 = \Phi^{-1}\left(\frac{\#\{\widehat{\mathcal{S}}_b^* < \widehat{\mathcal{S}}\}}{B}\right), \tag{D.13}$$

with $\Phi^{-1}(\cdot)$ denoting the standard normal quantile function (e.g., $\Phi^{-1}(0.95) \approx 1.6449$).

E Additional Results

Tables E.1–E.24 show additional results not appearing in the paper. To facilitate comparison, Tables E.4 and E.14 are included here, even though the same tables appear as Tables 1 and 4 in the paper.

Tables E.1 gives percentiles and means for estimates of the returns to scale indices $\mathcal{E}_{C,i}$, $\mathcal{E}_{R,i}$ and $\mathcal{E}_{\pi,i}$ for quarters 1986.Q4, 1996.Q4, 2006.Q4 and 2015.Q4. Table E.2 gives counts of institutions facing IRS, CRS, or DRS in each of the four quarters examined. Results are given for .1, .05 and .01 significance; counts of institutions facing CRS include those for which CRS could not be rejected in favor of either IRS or DRS. Tables E.3–E.5 give counts at .1, .05 and .01 significance similar to those in Table E.2, but broken into quartiles of institutions' sizes as measured by their total assets.

Tables E.6–E.9 give estimates of the pseudo-elasticities given by $(1-\mathcal{E}_{C,i})\delta$, $(1+\mathcal{E}_{R,i})\delta$ and $(1+\mathcal{E}_{\pi,i})\delta$ for the 100 largest banks in each quarter 1986.Q4, 1996.Q4, 2006.Q4 and 2015.Q4 instead of only the 10 largest banks as in in Tables 2–3 of the paper.

Tables E.10–E.11 give the estimates of the RTS statistics $\mathcal{E}_{C,i}$, $\mathcal{E}_{R,i}$ and $\mathcal{E}_{\pi,i}$ or the 10 largest institutions in each of the four quarters examined. These estimates correspond to the estimates of the pseudo-elasticities given by $(1-\mathcal{E}_{C,i})\delta$, $(1+\mathcal{E}_{R,i})\delta$ and $(1+\mathcal{E}_{\pi,i})\delta$ displayed in Tables 2–3 of the paper.

Table E.12 gives, for significance levels .1, .05 and .01, counts of institutions appearing in both 2006.Q3 and 2015.Q4 and which have a statistically significant change in their estimated RTS. These counts are broken down by direction, i.e., whether institutions increased or decreased their RTS. Tables E.13–E.15 give similar information for the 10 largest institutions (in terms of total assets) for significance levels .1, .05 and .01.

Tables E.16–E.24 show transition matrices for each of the 8 models estimated and giving the numbers of institutions facing IRS, CRS, or DRS in 2006.Q4 versus 2015.Q4.

Table E.1: Quantiles and Means for Estimates of Returns to Scale Indices

Model	LHS	Period	0.01	0.25	0.50	Mean	0.75	0.99
1	C_1/W_1	1986.Q4	−0.0482	−0.0059	0.0060	0.0062	0.0180	0.0626
		1996.Q4	−0.0842	−0.0160	0.0054	0.0047	0.0262	0.0895
		2006.Q4	−0.0866	−0.0154	0.0059	0.0060	0.0273	0.0917
		2015.Q4	−0.1026	−0.0156	0.0117	0.0106	0.0388	0.1140
2	C_2/W_1	1986.Q4	−0.0505	−0.0069	0.0065	0.0066	0.0198	0.0667
		1996.Q4	−0.0945	−0.0193	0.0046	0.0036	0.0275	0.0973
		2006.Q4	−0.0960	−0.0172	0.0067	0.0059	0.0293	0.0966
		2015.Q4	−0.1089	−0.0155	0.0135	0.0120	0.0419	0.1181
3	R_1	1986.Q4	−0.1210	−0.0186	−0.0055	0.0050	0.0086	0.2587
		1996.Q4	−0.0930	−0.0152	−0.0036	0.0058	0.0080	0.0820
		2006.Q4	−0.1029	−0.0190	−0.0041	−0.0047	0.0097	0.0892
		2015.Q4	−0.0933	−0.0217	−0.0064	−0.0058	0.0088	0.0893
4	R_2	1986.Q4	−0.1023	−0.0182	−0.0049	0.0018	0.0082	0.1343
		1996.Q4	−0.1003	−0.0171	−0.0032	−0.0028	0.0108	0.0867
		2006.Q4	−0.1073	−0.0212	−0.0043	−0.0021	0.0127	0.1011
		2015.Q4	−0.1016	−0.0225	−0.0053	−0.0028	0.0114	0.1201
5	π_1	1986.Q4	−0.7191	−0.0357	−0.0011	0.0771	0.0405	1.0819
		1996.Q4	−0.1329	−0.0193	0.0009	0.0163	0.0236	0.3351
		2006.Q4	−0.1731	−0.0228	0.0028	0.0306	0.0301	0.5844
		2015.Q4	−0.1144	−0.0244	−0.0039	−0.0011	0.0170	0.1303
6	π_2	1986.Q4	−0.7718	−0.0365	0.0034	0.0456	0.0562	1.8145
		1996.Q4	−0.1862	−0.0197	0.0047	0.0407	0.0314	0.7837
		2006.Q4	−0.2652	−0.0220	0.0072	0.0764	0.0431	1.1727
		2015.Q4	−0.1420	−0.0212	0.0048	0.0158	0.0309	0.5001
7	π_3	1986.Q4	−0.1529	−0.0256	−0.0017	−0.0245	0.0246	0.3762
		1996.Q4	−0.1117	−0.0198	0.0019	0.0134	0.0254	0.2419
		2006.Q4	−0.1326	−0.0217	0.0044	0.0205	0.0324	0.3601
		2015.Q4	−0.1219	−0.0244	−0.0030	0.0002	0.0204	0.1666
8	π_4	1986.Q4	−0.2791	−0.0229	0.0026	0.0539	0.0346	1.0055
		1996.Q4	−0.1232	−0.0141	0.0059	0.0547	0.0278	0.6802
		2006.Q4	−0.1442	−0.0144	0.0089	0.0800	0.0366	0.9155
		2015.Q4	−0.1240	−0.0178	0.0056	0.0341	0.0313	0.4635

Table E.2: Counts of Institutions Facing IRS, CRS, and DRS

			.1 signif.			.05 signif.			.01 signif.		
Model	LHS	Period	IRS	CRS	DRS	IRS	CRS	DRS	IRS	CRS	DRS
1	C_1/W_1	1986.Q4	4774	5477	74	3830	6445	50	2278	8019	28
		1996.Q4	3076	4313	202	2465	4987	139	1453	6053	85
		2006.Q4	2697	3432	153	2209	3952	121	1406	4794	82
		2015.Q4	2371	2275	192	2088	2590	160	1542	3183	113
2	C_2/W_1	1986.Q4	4680	5567	78	3733	6539	53	2136	8157	32
		1996.Q4	2929	4455	207	2302	5136	153	1307	6195	89
		2006.Q4	2657	3465	160	2184	3983	115	1377	4821	84
		2015.Q4	2442	2215	181	2136	2558	144	1576	3170	92
3	R_1	1986.Q4	2065	7462	798	1419	8240	666	672	9113	540
		1996.Q4	1725	5408	458	1197	6028	366	560	6757	274
		2006.Q4	1474	4231	577	1030	4781	471	517	5401	364
		2015.Q4	1195	2635	1008	957	2968	913	577	3475	786
4	R_2	1986.Q4	2120	7380	825	1466	8177	682	720	9057	548
		1996.Q4	1811	5389	391	1300	5975	316	607	6745	239
		2006.Q4	1584	4213	485	1164	4707	411	551	5404	327
		2015.Q4	1286	2688	864	1038	3026	774	653	3507	678
5	π_1	1986.Q4	2852	7198	275	1933	8160	232	817	9319	189
		1996.Q4	2354	4990	247	1727	5663	201	780	6649	162
		2006.Q4	2102	3941	239	1609	4476	197	814	5318	150
		2015.Q4	1396	2785	657	1103	3147	588	643	3703	492
6	π_2	1986.Q4	3371	6643	311	2504	7557	264	1248	8861	216
		1996.Q4	2838	4385	368	2177	5102	312	1220	6120	251
		2006.Q4	2552	3446	284	2061	3982	239	1293	4785	204
		2015.Q4	1956	2326	556	1615	2721	502	1039	3359	440
7	π_3	1986.Q4	2789	7119	417	1980	7989	356	930	9121	274
		1996.Q4	2473	4895	223	1823	5584	184	872	6568	151
		2006.Q4	2257	3790	235	1736	4346	200	878	5246	158
		2015.Q4	1524	2738	576	1230	3096	512	759	3628	451
8	π_4	1986.Q4	3452	6390	483	2609	7302	414	1429	8552	344
		1996.Q4	3076	4170	345	2422	4873	296	1402	5938	251
		2006.Q4	2834	3149	299	2352	3665	265	1498	4561	223
		2015.Q4	2110	2188	540	1803	2554	481	1216	3192	430

Table E.3: Counts of Institutions Facing IRS, CRS, and DRS by Size Quartile (.1 signif.)

			1st quartile			2nd quartile			3rd quartile			4th quartile		
Model	LHS	Period	IRS	CRS	DRS	IRS	CRS	DRS	IRS	CRS	DRS	IRS	CRS	DRS
1	C_1/W_1	1986.Q4	1376	1196	10	988	1579	14	1028	1534	19	1382	1168	31
		1996.Q4	817	1054	27	695	1175	28	670	1174	53	894	910	94
		2006.Q4	759	797	15	672	876	22	573	971	26	693	788	90
		2015.Q4	616	569	25	563	607	39	537	623	49	655	476	79
2	C_2/W_1	1986.Q4	1432	1144	6	1005	1563	13	1004	1558	19	1239	1302	40
		1996.Q4	824	1048	26	689	1173	36	634	1218	45	782	1016	100
		2006.Q4	767	787	17	658	890	22	560	979	31	672	809	90
		2015.Q4	622	558	30	595	580	34	571	597	41	654	480	76
3	R_1	1986.Q4	423	1969	190	517	1970	94	582	1910	89	543	1613	425
		1996.Q4	334	1433	131	443	1403	52	460	1382	55	488	1190	220
		2006.Q4	290	1105	176	359	1115	96	389	1120	61	436	891	244
		2015.Q4	262	736	212	295	702	212	366	698	145	272	499	439
4	R_2	1986.Q4	456	1914	212	524	1942	115	563	1908	110	577	1616	388
		1996.Q4	379	1412	107	457	1387	54	465	1383	49	510	1207	181
		2006.Q4	309	1112	150	401	1103	66	435	1079	56	439	919	213
		2015.Q4	297	742	171	319	726	164	374	697	138	296	523	391
5	π_1	1986.Q4	884	1662	36	706	1854	21	702	1853	26	560	1829	192
		1996.Q4	787	1078	33	611	1275	12	540	1335	22	416	1302	180
		2006.Q4	658	890	23	569	981	20	464	1082	24	411	988	172
		2015.Q4	402	736	72	365	743	101	371	755	83	258	551	401
6	π_2	1986.Q4	1286	1274	22	989	1578	14	686	1870	25	410	1921	250
		1996.Q4	1093	779	26	839	1049	10	582	1290	25	324	1267	307
		2006.Q4	944	614	13	754	812	4	540	1008	22	314	1012	245
		2015.Q4	715	469	26	574	593	42	478	668	63	189	596	425
7	π_3	1986.Q4	822	1706	54	682	1863	36	657	1869	55	628	1681	272
		1996.Q4	757	1110	31	647	1236	15	565	1312	20	504	1237	157
		2006.Q4	642	905	24	608	940	22	549	996	25	458	949	164
		2015.Q4	436	708	66	388	733	88	405	724	80	295	573	342
8	π_4	1986.Q4	1264	1286	32	964	1593	24	704	1829	48	520	1682	379
		1996.Q4	1117	749	32	874	1010	14	674	1196	27	411	1215	272
		2006.Q4	960	593	18	866	695	9	626	927	17	382	934	255
		2015.Q4	739	449	22	618	551	40	532	616	61	221	572	417

Table E.4: Counts of Institutions Facing IRS, CRS, and DRS by Size Quartile (.05 signif.)

			1st quartile			2nd quartile			3rd quartile			4th quartile		
Model	LHS	Period	IRS	CRS	DRS	IRS	CRS	DRS	IRS	CRS	DRS	IRS	CRS	DRS
1	C_1/W_1	1986.Q4	1138	1439	5	734	1837	10	808	1761	12	1150	1408	23
		1996.Q4	669	1211	18	524	1356	18	513	1353	31	759	1067	72
		2006.Q4	630	932	9	526	1030	14	446	1106	18	607	884	80
		2015.Q4	528	662	20	481	696	32	469	704	36	610	528	72
2	C_2/W_1	1986.Q4	1189	1390	3	757	1816	8	764	1805	12	1023	1528	30
		1996.Q4	644	1233	21	529	1350	19	475	1390	32	654	1163	81
		2006.Q4	637	925	9	533	1020	17	450	1105	15	564	933	74
		2015.Q4	544	645	21	509	677	23	487	691	31	596	545	69
3	R_1	1986.Q4	287	2142	153	333	2170	78	398	2121	62	401	1807	373
		1996.Q4	245	1549	104	291	1572	35	299	1560	38	362	1347	189
		2006.Q4	201	1226	144	249	1253	68	263	1265	42	317	1037	217
		2015.Q4	204	822	184	229	796	184	289	795	125	235	555	420
4	R_2	1986.Q4	318	2095	169	344	2149	88	364	2136	81	440	1797	344
		1996.Q4	270	1546	82	320	1548	30	319	1543	35	391	1338	169
		2006.Q4	227	1220	124	292	1224	54	307	1218	45	338	1045	188
		2015.Q4	235	830	145	260	810	139	299	790	120	244	596	370
5	π_1	1986.Q4	637	1914	31	463	2103	15	444	2119	18	389	2024	168
		1996.Q4	620	1252	26	444	1443	11	358	1527	12	305	1441	152
		2006.Q4	528	1024	19	416	1142	12	352	1199	19	313	1111	147
		2015.Q4	327	827	56	269	855	85	301	839	69	206	626	378
6	π_2	1986.Q4	1032	1530	20	720	1848	13	469	2093	19	283	2086	212
		1996.Q4	919	958	21	635	1255	8	387	1495	15	236	1394	268
		2006.Q4	815	745	11	620	947	3	408	1150	12	218	1140	213
		2015.Q4	609	582	19	476	701	32	379	779	51	151	659	400
7	π_3	1986.Q4	591	1947	44	474	2074	33	444	2095	42	471	1873	237
		1996.Q4	583	1285	30	469	1418	11	396	1492	9	375	1389	134
		2006.Q4	496	1053	22	473	1083	14	397	1156	17	370	1054	147
		2015.Q4	356	803	51	302	837	70	328	817	64	244	639	327
8	π_4	1986.Q4	1020	1534	28	712	1849	20	490	2060	31	387	1859	335
		1996.Q4	956	916	26	674	1216	8	486	1393	18	306	1348	244
		2006.Q4	836	719	16	728	838	4	490	1065	15	298	1043	230
		2015.Q4	655	537	18	536	640	33	443	724	42	169	653	388

Table E.5: Counts of Institutions Facing IRS, CRS, and DRS by Size Quartile (.01 signif.)

			1st quartile			2nd quartile			3rd quartile			4th quartile		
Model	LHS	Period	IRS	CRS	DRS	IRS	CRS	DRS	IRS	CRS	DRS	IRS	CRS	DRS
1	C_1/W_1	1986.Q4	712	1868	2	375	2202	4	411	2164	6	780	1785	16
		1996.Q4	381	1508	9	273	1619	6	282	1599	16	517	1327	54
		2006.Q4	411	1154	6	326	1238	6	243	1319	8	426	1083	62
		2015.Q4	372	827	11	340	848	21	333	852	24	497	656	57
2	C_2/W_1	1986.Q4	754	1825	3	349	2230	2	363	2214	4	670	1888	23
		1996.Q4	364	1523	11	258	1632	8	260	1616	21	425	1424	49
		2006.Q4	424	1143	4	328	1234	8	249	1313	8	376	1131	64
		2015.Q4	387	811	12	366	829	14	342	852	15	481	678	51
3	R_1	1986.Q4	148	2314	120	145	2378	58	169	2372	40	210	2049	322
		1996.Q4	106	1721	71	129	1747	22	125	1752	20	200	1537	161
		2006.Q4	98	1367	106	112	1413	45	127	1416	27	180	1205	186
		2015.Q4	128	937	145	109	954	146	174	939	96	166	645	399
4	R_2	1986.Q4	169	2288	125	149	2368	64	173	2351	57	229	2050	302
		1996.Q4	117	1718	63	135	1746	17	143	1732	22	212	1549	137
		2006.Q4	102	1374	95	123	1409	38	140	1398	32	186	1223	162
		2015.Q4	151	938	121	140	950	119	181	936	92	181	683	346
5	π_1	1986.Q4	297	2264	21	187	2380	14	153	2417	11	180	2258	143
		1996.Q4	303	1573	22	198	1690	10	144	1746	7	135	1640	123
		2006.Q4	309	1246	16	196	1370	4	163	1395	12	146	1307	118
		2015.Q4	213	964	33	133	1021	55	163	993	53	134	725	351
6	π_2	1986.Q4	623	1945	14	324	2247	10	180	2394	7	121	2275	185
		1996.Q4	617	1264	17	343	1550	5	158	1733	6	102	1573	223
		2006.Q4	570	993	8	378	1189	3	245	1315	10	100	1288	183
		2015.Q4	429	766	15	296	888	25	224	952	33	90	753	367
7	π_3	1986.Q4	291	2259	32	196	2364	21	201	2356	24	242	2142	197
		1996.Q4	312	1561	25	191	1698	9	172	1719	6	197	1590	111
		2006.Q4	272	1282	17	231	1330	9	175	1383	12	200	1251	120
		2015.Q4	244	928	38	165	994	50	193	961	55	157	745	308
8	π_4	1986.Q4	623	1936	23	367	2197	17	236	2331	14	203	2088	290
		1996.Q4	648	1228	22	394	1497	7	209	1681	7	151	1532	215
		2006.Q4	614	948	9	461	1107	2	284	1276	10	139	1230	202
		2015.Q4	477	720	13	361	820	28	276	899	34	102	753	355

Table E.6: Returns to Scale for 100 Largest Banks by Total Assets, 1986.Q4

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
CITIBANK	275	1.0371^{***}	1.0405^{***}	1.0147^{***}	1.0253^{***}	0.9834^{***}	0.9760^{***}	1.0205^{***}	0.9982^{***}
BK OF AMER	204	1.0928^{**}	1.0956	1.0558^{***}	1.0481^{***}	1.1622	$1.2975^{(3)}$	1.0466^{***}	1.0319^{***}
CHASE MHTN BK	150	1.0618^{***}	1.0595^{***}	1.0820	1.0892	1.0616	1.0513	1.1124	1.0779^{***}
MANU. HAN	139	1.0855^{***}	1.0870^{**}	1.0686^{***}	1.0570^{***}	1.1819	1.1124	1.0611^{***}	1.0459^{***}
MORGAN GNTY TC	130	1.0306^{***}	1.0269^{***}	1.0381^{***}	1.0598^{***}	1.0603	1.0498	1.0904	1.0347^{***}
SECURITY PACIFIC	113	1.0982	1.1006	1.0593^{***}	1.0542^{***}	1.0774	1.0697	1.0376^{***}	1.0315^{***}
CHEMICAL NY	109	1.0923^{***}	1.0927^{**}	1.0574^{***}	1.0613^{***}	1.0995	1.1203	1.0577^{***}	1.0587^{***}
BANKERS TR NY	100	1.0461^{***}	1.0422^{***}	1.0354^{***}	1.0409^{***}	1.0542^{***}	1.0433	1.0609^{***}	1.0436^{***}
FIRST INTRST BC	100	1.0883^{*}	1.0904	1.0705^{***}	1.0675^{***}	1.0586	0.9843	1.0484^{***}	1.0084^{***}
WELLS FARGO & CO	81	1.0897	1.0920	1.0488^{***}	1.0463^{***}	1.0622	1.0662	1.0405^{***}	1.0417^{***}
FIRST	74	1.0796^{***}	1.0809^{***}	1.0415^{***}	1.0392^{***}	1.0946	1.0494	1.0825^{***}	1.0619^{***}
BK OF BOSTON	62	1.0662^{***}	1.0716^{***}	1.0799^{***}	1.0870^{***}	1.1007	0.9894	1.1076	1.0370^{***}
CONTINENTAL IL NB&TC C	56	1.0571^{***}	1.0505^{***}	1.0637	1.0755	1.2408	1.0085	1.2889^{***}	1.0601^{***}
FIRST BK SYS	51	1.0815^{***}	1.0892^{**}	1.0862^{***}	1.0963^{***}	1.1041	1.0630	1.1129	1.0593^{***}
NCNB	49	1.1071	1.1153	1.0742^{***}	1.0748^{***}	1.0461^{***}	1.0072^{***}	1.0422^{***}	1.0334^{***}
MELLON BK	46	1.0816^{***}	1.0847^{***}	1.0475^{***}	1.0715^{***}	1.0663	0.9056	1.0985	1.0517^{***}
FIRST UNION	45	1.0827	1.0924	1.0372^{***}	1.0409^{***}	1.0872	1.0282^{*}	1.1041	1.0622^{***}
PNC FNCL	45	1.0948	1.1085	1.0401^{***}	1.0472^{***}	1.0750	1.0318^{***}	1.0950^{***}	1.0529^{***}
IRVING BK	44	1.0803^{***}	1.0806^{***}	1.0604^{***}	1.0731^{***}	1.1016	0.9862^{***}	1.1295	1.0295^{***}
SUNTRUST BANKS	43	1.0743^{***}	1.0676^{***}	1.0309^{***}	1.0333^{***}	1.0701	1.0484	1.0821^{***}	1.0644^{***}
MCORP	41	1.0528^{***}	1.0730^{**}	1.0037^{***}	1.0507^{***}	$0.7969^{(3)}$	$1.0856^{(3)}$	1.0764	1.0227^{***}
MARINE MIDLAND BANK	41	1.0776^{***}	1.0731^{***}	1.0908^{***}	1.0834^{***}	1.1785^{*}	1.2700	1.0843^{***}	1.0449^{***}
REPUBLICBANK ORATION	40	1.0587^{***}	1.0521^{***}	1.0979	1.0943	1.2439	$-1.4827^{(2)}$	1.0936	1.0142^{***}
BK OF NEW ENGLAND	40	1.1036	1.1157	1.0779^{***}	1.0856^{***}	1.0540^{***}	1.0217^{***}	1.0707^{***}	1.0447^{***}
NBD BANCORP INC	39	1.1078	1.1115	1.0698^{***}	1.0832^{***}	1.0736^{***}	1.0307^{***}	1.1072	1.0675^{***}
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.6: Returns to Scale for 100 Largest Banks by Total Assets, 1986.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
NORWEST	38	1.0749^{***}	1.0690^{***}	1.0698^{***}	1.0766^{***}	1.1433	0.9912	1.1069	1.0477^{***}
BK OF NY CO	37	1.0645^{***}	1.0699^{***}	1.0690^{***}	1.0745^{***}	1.0751	1.0300	1.0962	1.0402^{***}
TEXAS CMRC BSHRS	36	1.0747^{***}	1.0819^{***}	1.0405^{***}	1.0696^{***}	0.8976	$1.0006^{(3)}$	1.0976	0.9913^{***}
CITIZENS & SOUTHERN	34	1.0849^{***}	1.0875^{***}	1.0587^{***}	1.0639^{***}	1.0486^{***}	1.0024^{***}	1.0763^{*}	1.0384^{***}
BARNETT BK OF FL	34	1.1076	1.1138	0.9950^{***}	0.9931^{***}	0.9930^{***}	0.9904^{***}	0.9955^{***}	0.9929^{***}
INTERFIRST ORATION	34	1.0770^{***}	1.0793^{***}	1.0427^{***}	1.0708^{***}	$1.1122^{(3)}$	$1.1306^{**(3)}$	1.1232	1.0354^{***}
FIRST WACHOVIA	34	1.0929^{***}	1.0892^{***}	1.0517^{***}	1.0560^{***}	1.0262^{***}	0.9892^{***}	1.0162^{***}	1.0084^{***}
REPUBLIC NB OF NY	31	1.0339^{***}	1.0343^{***}	1.0242^{***}	1.0478^{***}	1.0062^{***}	0.9667^{***}	1.0710^{***}	0.9689^{***}
FIRST FIDELITY BC	27	1.1232	1.1284	1.0663^{***}	1.0623^{***}	1.0387^{***}	0.9965^{***}	1.0357^{***}	1.0112^{***}
SOVRAN	27	1.0748^{***}	1.0731^{***}	1.0679^{***}	1.0778^{***}	1.0252^{***}	1.0317^{***}	1.0326^{**}	1.0633^{***}
BANC ONE	27	1.0919^{**}	1.0868^{***}	1.0417^{***}	1.0507^{***}	1.0789	0.9947	1.0912	1.0265^{***}
MIDLANTIC BK	27	1.0949	1.0852^{***}	1.0537^{***}	1.0622^{***}	1.0799^{***}	1.0633	1.0860^{***}	1.0486^{***}
FIRST CITY BANCORPORATION OF T	26	1.0856^{***}	1.0929^{*}	1.0689^{***}	1.0801^{***}	$1.2113^{**(3)}$	$1.1510^{***(3)}$	1.0833^{***}	1.0042^{***}
NATIONAL CITY	25	1.0643^{***}	1.0640^{***}	1.0723^{***}	1.0799^{***}	1.0581^{***}	0.9925^{***}	1.0604^{***}	1.0244^{***}
CORESTATES FNCL	25	1.0876^{**}	1.0875^{**}	1.0444^{***}	1.0487^{***}	1.0761	1.0690	1.0817^{***}	1.0591^{***}
HARTFORD T	23	1.1024	1.1081	0.9883^{***}	0.9968^{***}	0.9855^{***}	0.9859^{***}	0.9824^{***}	0.9932^{***}
BOATMENS BSHRS	23	1.0888^{**}	1.0857^{***}	1.0450^{***}	1.0464^{***}	1.0617^{***}	1.0567	1.0623^{***}	1.0447^{***}
SOUTHEAST BKG	22	1.1248	1.1283	1.0602^{***}	1.0770^{***}	1.0618^{***}	0.9751^{***}	1.0955	1.0190^{***}
FLEET FNCL GROUP	21	1.0865^{***}	1.0913^{**}	1.1303^{***}	1.1107^{***}	1.1098	1.0303	1.0816	1.0473^{***}
NATIONAL WESTMINSTER BANK USA	20	1.0296^{***}	1.0321^{***}	1.0268^{***}	1.0564^{***}	0.9417^{***}	0.8855^{***}	0.9859^{***}	0.9714^{***}
VALLEY T	20	1.0593^{***}	1.0559^{***}	1.0886	1.1051	1.0491	0.7828	1.0801	1.0355^{***}
FIDELCOR	19	1.0455^{***}	1.0466^{***}	1.0195^{***}	1.0179^{***}	1.0079^{***}	1.0199^{***}	0.9941^{***}	1.0057^{***}
AMERITRUST	19	1.0732^{***}	1.0764^{***}	1.0914	1.1084	1.1137	1.0848	1.1539^{***}	1.0756
SHAWMUT	19	1.0909^{**}	1.0911^{*}	1.0632^{***}	1.0440^{***}	1.0988	1.0603	1.0877	1.0833
ALLIED BANCSHARES	18	1.0767^{***}	1.0679^{***}	1.0791	1.0957	0.6345	$1.0846^{(3)}$	1.0877	0.9945^{***}
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.6: Returns to Scale for 100 Largest Banks by Total Assets, 1986.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
COMERICA INC	18	1.1068	1.1031	1.0791^{**}	1.0926	1.0817	1.0242^{*}	1.1204^{***}	1.0575^{*}
CITIBANK SOUTH DAKOTA	18	1.0483^{***}	1.0616^{***}	0.9883^{***}	0.9934^{***}	0.9216^{***}	0.7459	0.9728^{***}	0.9396^{***}
SIGNET BKG	17	1.0617^{***}	1.0561^{***}	1.0714^{***}	1.0693^{**}	1.0713	1.0268	1.0962	1.0613
UNION BK	17	1.0836^{***}	1.0961^{**}	1.0666^{**}	1.0855	1.0227	0.9265^{**}	1.0967	1.0296^{***}
U S BC	17	1.0971^{*}	1.0944^{**}	1.0978	1.1129^{***}	1.0392	1.0934	1.0451^{***}	1.0954
MARYLAND T	17	1.0848	1.0913	1.0940^{***}	1.0925	1.1256	1.0916	1.1227^{**}	1.0970
SOCIETY	17	1.1082	1.1086	1.0754^{***}	1.0800	1.0937	0.9958^{***}	1.1167^{**}	1.0236^{***}
UNITED VA BSHRS	17	1.0766^{***}	1.0727^{***}	1.0801^{***}	1.0771^{***}	1.0461^{***}	0.9581^{***}	1.0441^{***}	0.9883^{***}
NORTHERN TR	16	1.0464^{***}	1.0424^{***}	1.0452^{***}	1.0526^{***}	1.0593^{***}	1.0461^{***}	1.0799	1.0600
KEYCORP	16	1.1305	1.1304	1.0640^{***}	1.0685^{***}	1.0840	1.0206^{***}	1.0724^{***}	1.0072^{***}
HARRIS T&SB	15	1.0396^{***}	1.0596^{***}	1.0319^{***}	1.0401^{***}	1.0281^{***}	1.0007^{***}	1.0407^{***}	1.0225^{***}
RAINIER NB	15	1.0796^{***}	1.0854^{***}	1.1013	1.1062	1.1474^{*}	1.1653	1.1295^{***}	1.1049
MICHIGAN T	15	1.0730^{***}	1.0930^{*}	1.1082	1.1015	1.1296^{*}	1.0590	1.1408^{***}	1.0646^{***}
MANUFACTURERS TIONAL .	14	1.0356^{***}	1.0405^{***}	1.0674^{***}	1.0757^{***}	1.0707	1.0685	1.0863	1.0840
BAYBANKS	14	1.1452	1.1440^{**}	1.0588^{***}	1.0577^{***}	1.0948	1.0295^{***}	1.0974	1.0142^{***}
HUNTINGTON BSHRS	14	1.0789^{***}	1.0917^{*}	1.0734^{***}	1.0803	1.0682	1.0530	1.0783	1.0643^{***}
UNITED JERSEY BANKS	13	1.0697^{***}	1.0841^{***}	1.0686^{***}	1.0729^{**}	1.1179	1.1069	1.1110	1.0803^{***}
FLORIDA NB OF FL	13	1.0585^{***}	1.0673^{***}	1.0419^{***}	1.0462^{***}	1.0013^{***}	0.3775^{***}	1.0200^{***}	0.9844^{***}
EUROPEAN AMER BC	13	1.1112	1.1222	1.0487^{***}	1.0397^{***}	0.7176^{*}	$0.4463^{(3)}$	0.8906^{***}	0.9517^{***}
STATE STREET BOSTON	12	1.0399^{***}	1.0449^{***}	1.0602^{***}	1.0631^{***}	1.0539^{***}	1.0382^{***}	1.0407^{***}	1.0445^{***}
MERIDIAN BC	12	1.0936^{**}	1.0993	1.0006^{***}	1.0119^{***}	1.0144^{***}	0.9963^{***}	1.0210^{***}	0.9996^{***}
MERCANTILE BANCORPORATION	12	1.0757^{***}	1.0753^{***}	1.0909	1.0768^{***}	1.0513	0.9414	1.0399^{***}	1.0354^{***}
TEXAS AMERICAN BANCSHARES INC.	11	1.0974	1.1450	1.0612^{***}	1.0703^{***}	0.7144	$1.0556^{(3)}$	1.0301^{***}	$0.4288^{(3)}$
RIGGS T	11	1.0830^{***}	1.0789^{***}	1.0438^{***}	1.0653^{***}	1.0490^{***}	1.0229^{***}	1.0809	1.0323^{***}
BK OF TOKYO TC	11	1.0468^{***}	1.0455^{***}	1.0919	1.0352^{***}	1.2171^{***}	1.0423^{***}	1.1024	1.0539^{***}
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.6: Returns to Scale for 100 Largest Banks by Total Assets, 1986.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
CALIFORNIA FIRST BK	11	1.1202	1.1141	1.0490^{***}	1.0784^{***}	0.9597^{*}	$-6.7887^{*(3)}$	1.0795	1.0463^{***}
FIRST PENNSYLVANIA ORATION	11	1.0597^{***}	1.0662^{***}	1.0476^{***}	1.0663^{***}	1.0203^{***}	1.0146	1.0462^{***}	1.0379^{***}
AMSOUTH BC	11	1.0859^{***}	1.1002	1.0416^{***}	1.0256^{***}	1.0316^{***}	1.0298^{***}	1.0844^{***}	1.0165^{***}
DOMINION BSHRS	11	1.1229	1.1320	1.0849	1.0860	1.0537^{**}	1.0646	1.0753^{***}	1.0719
FIRST AMER	11	1.1165	1.1067	0.9547^{***}	0.9566^{***}	0.7152^{***}	0.6274^{***}	0.7540^{***}	0.7951^{***}
FIRST TENNESSEE T	10	1.0705^{***}	1.0696^{***}	1.0599^{***}	1.0489^{***}	1.0343	1.0820	1.0469^{*}	1.0975
MARSHALL & ILSLEY	10	1.0454^{***}	1.0342^{***}	1.0505^{***}	1.0647	1.0680	1.0599	1.0892	1.0679
OLD KENT	10	1.0589^{***}	1.0651^{***}	1.0484^{***}	1.0515^{***}	1.0481^{***}	1.0367^{***}	1.0580^{***}	1.0296^{***}
CENTERRE BANCORPORATION	10	1.0596^{***}	1.0519^{***}	1.0872	1.0944	1.0836	0.8734	1.1269	1.0068^{***}
CITIBANK NY ST	10	1.0951	1.1031	1.0676^{***}	1.0774^{***}	1.0316^{***}	0.6968	1.0846	1.0232^{***}
CONTINENTAL BC	10	1.0472^{***}	1.0222^{***}	1.0800	1.0660^{***}	1.2140^{**}	17.3225	1.0814	1.1284
MELLON BK EAST	10	1.1097	1.1146	1.0315^{***}	1.0430^{***}	1.0513^{***}	1.0139	1.0113^{***}	1.0182^{***}
COMMERCE BSHRS	10	1.1100	1.1122	1.0643^{***}	1.0658^{***}	0.9994^{***}	0.8238^{***}	1.0363^{***}	0.9707^{***}
BANCORP HI	9	1.0885^{**}	1.0875^{***}	1.1024	1.1084^{**}	1.0684^{***}	1.0636	1.0811^{***}	1.0545^{***}
FIRST SCTY	9	1.0883^{**}	1.0961	1.0812	1.0891	0.7777^{**}	$0.9886^{(3)}$	1.0653	0.9081^{***}
CHASE MHTN BK USA	9	1.1003	1.1202^{***}	1.0237^{***}	1.0199^{***}	1.0016^{***}	0.9696^{***}	1.0146^{***}	0.9975^{***}
INB FNCL	9	1.0782^{***}	1.0818^{**}	1.0825^{***}	1.0865	1.0688	1.0697	1.0663^{***}	1.0524^{***}
SOUTHTRUST	9	1.1294	1.1306^{**}	1.0612^{***}	1.0670^{***}	1.0343^{***}	0.9937^{***}	1.0396^{***}	1.0104^{***}
FIRST KENTUCKY T	9	1.0466^{***}	1.0505^{***}	1.0653^{***}	1.0563^{***}	1.0867	1.0813	1.0438^{***}	1.0597
SANWA BK CALIFORNIA	9	1.1011	1.1004	1.0781^{***}	1.0882^{***}	1.0444	$0.1225^{(3)}$	1.1099	1.0470^{***}
UNITED BK OF CO	9	1.0630^{***}	1.0615^{***}	1.0591^{***}	1.0798	0.9726^{**}	$0.6716^{*(3)}$	1.0271^{***}	1.0244^{***}
LOUISIANA BSHRS	9	1.0958^{***}	1.0954^{**}	1.0315^{***}	1.0239^{***}	1.0839	$1.1230^{(3)}$	1.0375^{***}	1.0258
FIRST NB OF MD	9	1.0522^{***}	1.0452^{***}	1.0581^{***}	1.0550^{***}	1.0327^{***}	1.0232^{***}	1.0379^{***}	1.0376^{***}
FIRST FLORIDA BK	9	1.1070	1.1080	1.0603^{***}	1.0652^{***}	1.0377^{***}	1.0218^{***}	1.0548^{***}	1.0234^{***}
SOUTH CAROLINA T	9	1.0722^{***}	1.0613^{***}	1.0748^{**}	1.0865	1.0418	1.1222	1.0395^{***}	1.0766
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.7: Returns to Scale for 100 Largest Banks by Total Assets, 1996.Q4

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
CHASE MHTN	469	1.0557***	1.0480***	1.0334***	1.0328***	1.0401***	1.0521***	1.0308***	1.0448***
CITICORP	394	1.0368***	1.0364***	1.0376***	1.0309***	1.0426***	1.0698***	1.0293***	1.0496***
BK OF AMER	352	1.0412***	1.0435***	1.0469***	1.0446***	1.0485***	1.0641***	1.0379***	1.0533***
NATIONSBANK	266	1.0773***	1.0621***	1.0442***	1.0589***	1.0395***	1.0446***	1.0616***	1.0460***
MORGAN GNTY TC	245	1.0539***	1.0475***	1.0126***	1.0144***	0.9942***	0.9881***	1.0025***	0.9975***
FIRST UNION	195	1.0907**	1.0930**	1.0201***	1.0209***	0.9906***	0.9925***	0.9875***	0.9982***
WELLS FARGO & CO	155	1.0630***	1.0523***	1.0839***	1.0821***	1.1083	1.0766***	1.0910	1.0549***
FIRST NBD	150	1.0663***	1.0627***	1.0392***	1.0423***	1.0440***	1.0150***	1.0431***	1.0138***
BANC ONE	143	1.0653***	1.0725***	1.0594***	1.0593***	1.0600***	1.0476***	1.0377***	1.0454***
FLEET FNCL GROUP	123	1.0587***	1.0589**	1.0817***	1.0917***	1.0781***	1.0720***	1.0836	1.0657***
NORWEST	113	1.0324***	1.0235***	1.0782***	1.0868***	1.0637***	1.0637***	1.0838***	1.0698***
PNC BC	102	1.0965	1.1134	1.0939***	1.1092	1.0830	1.0913***	1.1039	1.1016
KEYCORP	95	1.0792***	1.0929*	1.0896***	1.0965	1.0830***	1.0623***	1.0985	1.0708***
BK OF BOSTON	88	1.0736***	1.0872***	1.0817***	1.0942	1.1079	1.0929	1.0925	1.1013***
BK OF NY CO	77	1.0763***	1.0935**	1.0378***	1.0742***	1.0461***	1.0176***	1.0993	1.0169***
SUNTRUST BK	73	1.0717***	1.0816***	1.1247***	1.1264***	1.1271**	1.0957	1.1428***	1.1054
NATIONAL CITY	72	1.0866**	1.0827**	1.1089*	1.1247***	1.0825***	1.0429***	1.1209	1.0575***
WACHOVIA	67	1.0700***	1.0713***	1.1018	1.0922	1.1066	1.0295***	1.1008	1.0531***
REPUBLIC NB OF NY	66	1.0206***	1.0236***	1.0505***	1.0440***	1.0391***	1.0347***	1.0324***	1.0355***
CORESTATES FNCL	65	1.0630***	1.0630***	1.1132***	1.1124***	1.0988	1.0579***	1.1007	1.0725***
MELLON BC	61	1.1136	1.1066	1.1049	1.1134***	1.0801***	1.0496***	1.0916	1.0657***
BARNETT BK	59	1.1191	1.1246	1.0804***	1.0802**	1.1014	1.0185***	1.0993	1.0333***
BOATMENS BSHRS	58	1.0419***	1.0410***	1.0814***	1.0835	1.0974	1.0197***	1.0991	1.0427***
FIRST BK SYSTEM	52	1.0942	1.1156	1.0775***	1.0857	1.0813	1.0447***	1.0890	1.0639***
COMERICA	49	1.0441***	1.0436***	1.0612***	1.0658***	1.0648*	1.0325***	1.0711	1.0500***
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.7: Returns to Scale for 100 Largest Banks by Total Assets, 1996.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
U S BC	48	1.0608***	1.1188	1.0698***	1.0743***	1.0695	1.0331***	1.0720*	1.0496***
STATE STREET BOSTON	43	1.0901**	1.0969	1.0131***	1.0225***	1.0214***	1.0239***	1.0297***	1.0258***
UNION BK OF CA	41	1.1224	1.1501	1.0647***	1.0638***	1.0345***	1.0157***	1.0401***	1.0363***
SOUTHTRUST	36	1.1074	1.1343	1.0445***	1.0582***	1.0731	0.9546***	1.1141	0.9742***
MARINE MIDLAND BK	32	1.1156	1.1351*	1.0658***	1.0729	1.0891	1.0302***	1.0937	1.0503***
FIRST OF AMER BK	31	1.0675***	1.1199	1.0788***	1.0683***	1.1018	0.9796***	1.0503***	0.9962***
NORTHERN TR	31	1.0883**	1.0691***	1.0528***	1.1001***	1.0801***	1.0390***	1.1459**	1.0408***
SOUTHERN T	30	1.0883*	1.0790*	1.0513***	1.0370***	1.0513***	1.0299***	1.0510**	1.0341***
HUNTINGTON BSHRS	29	1.0556***	1.0624***	1.0741***	1.0785***	1.0374***	0.9915***	1.0446***	1.0070***
FIFTH THIRD BC	29	1.0380***	1.1143	1.0699***	1.0811	1.0579**	0.9947***	1.0473***	1.0070***
FIRSTAR	28	1.0672***	1.1079	1.0640***	1.0740***	1.0858	1.0405***	1.0878	1.0488***
SUMMIT BK	28	1.0782***	1.0970	1.0864***	1.0887	1.0820***	1.0679***	1.0907	1.0770***
REGIONS	27	1.0476***	1.0535***	1.0721***	1.0721***	1.0361***	0.9940***	1.0407***	1.0070***
MERCANTILE BANCORPORATION	27	1.0719***	1.0566***	1.0653***	1.0502***	1.0752	1.0037***	1.0544***	1.0133***
CRESTAR	26	1.0596***	1.0650***	1.0767***	1.0878***	1.0391***	0.9762***	1.0476***	1.0005***
AMSOUTH BC	26	1.0771***	1.1050	1.0591***	1.0810***	1.0735	1.0627***	1.0842	1.0643***
BANPONCE	24	1.0725***	1.0507***	1.0834***	1.0870***	1.0372***	0.9807***	1.0524***	1.0033***
MBNA	23	1.1125*	1.1174***	0.9745***	0.9744***	0.9454***	0.9556***	0.9474***	0.9672***
HARRIS T&SB	21	1.0964	1.1181	1.0938	1.1222*	1.1361***	1.0410***	1.1861***	1.0556***
MARSHALL & ILSLEY	21	1.0819***	1.1059	1.0738***	1.0680***	1.0916	1.0542***	1.0904***	1.0592***
FIRST SCTY	20	1.0686***	1.0705***	1.0637***	1.0629***	1.0471***	1.0174***	1.0622***	1.0270***
BANCORP HI	20	1.0862**	1.0985	1.0033***	1.0137***	0.9928***	0.9931***	1.0120***	0.9875***
UNION PLANTERS	19	1.0634***	1.0861*	1.0762***	1.0790	1.1253	1.0670	1.0848	1.0924***
FIRST TENNESSEE T	18	1.1080	1.1283	1.0816***	1.0849***	1.0956***	1.0626***	1.0980	1.0652***
LASALLE NB	18	1.0639***	1.0905***	1.0695***	1.0826	1.0662	1.0234***	1.0702	1.0424***
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.7: Returns to Scale for 100 Largest Banks by Total Assets, 1996.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
FIRST EMPIRE ST	18	1.0921*	1.0856**	1.0878***	1.0794**	1.1155*	1.0841***	1.1017	1.0716***
OLD KENT	18	1.1079	1.0876*	1.0702***	1.0757***	1.0873***	1.0611***	1.0973	1.0615***
COMPASS BSHRS	17	1.0749***	1.0785***	1.0601***	1.0640***	1.0619***	1.0454***	1.0603***	1.0531***
SIGNET BKG	17	1.0920**	1.1051	1.0945***	1.1131*	1.1270***	1.0624***	1.1321***	1.0641***
CENTRAL FIDELITY BK	15	1.0562***	1.0590***	1.0518***	1.0599***	1.1233*	1.0762***	1.1643***	1.0929
FIRST AMER	15	1.0699**	1.0780*	1.0884***	1.0901	1.1117*	1.0846***	1.1090*	1.0812***
STAR BC	14	1.0844**	1.0922*	1.0753***	1.0764***	1.1025	1.0400***	1.0998	1.0510***
COMMERCE BSHRS	14	1.0692***	1.0672***	1.0658***	1.0596***	1.0574***	1.0330***	1.0622***	1.0421***
EUROPEAN AMER BK	13	1.0752***	1.1045	1.0381***	1.0458***	1.0450***	1.0310***	1.0488***	1.0458***
MICHIGAN NB	13	1.1290***	1.1345***	1.1288**	1.1644***	1.0979	1.0891	1.1250***	1.1051
FIRST CMRC	13	1.0562***	1.0561***	1.0661***	1.0695**	1.1214	1.0663***	1.1173*	1.0705***
FIRST NB OF MD	13	1.0172***	1.0303***	1.0516***	1.0419***	1.0462***	1.0508***	1.0361***	1.0630***
HIBERNIA	13	1.0763***	1.0799	1.0517***	1.0473***	1.0723*	1.0632***	1.0830	1.0758***
FIRST VA BK	12	1.0655***	1.0672***	1.0616***	1.0597***	1.0738***	1.0470***	1.0752***	1.0402***
FIRST HAWAIIAN	12	1.0324**	1.0843	0.9718***	0.9724***	0.9001***	0.9371***	0.9004***	0.9421***
FIRST CITIZENS BSHRS	11	1.1013	1.1142	1.0779***	1.0762***	1.0649**	1.0284***	1.0538***	1.0338***
SANWA BK CA	11	1.0871**	1.1072	1.0570***	1.1008	1.0736	1.0156***	1.1214*	1.0359***
PROVIDENT BC	10	1.0604***	1.0668***	1.0398***	1.0217***	1.0607***	1.0501***	1.0463***	1.0576***
FIRST T OF NE	9	1.0422***	1.0722***	1.0587***	1.0629***	1.0521***	0.9889***	1.0853	1.0486***
ZIONS BC	9	1.0888	1.0923	1.0804	1.0751	1.0539**	1.0284***	1.0546***	1.0402***
MERCANTILE BSHRS	9	1.1198	1.1355	1.1100*	1.1043	1.0781***	1.0128***	1.0669	1.0236***
DEPOSIT GUARANTY	9	1.1329	1.1329	1.0802***	1.0984	1.0601***	1.0410***	1.0849	1.0525***
UMB	9	1.0730***	1.0769***	1.1009	1.1127**	1.1092**	1.1024	1.1352***	1.1120
CENTURA BANKS	9	0.9353***	0.9620***	1.0683***	1.0921***	1.0709*	1.0432***	1.1055	1.0637***
DAUPHIN DEPOSIT	8	1.1190	1.1337*	1.0880	1.0958	1.1055*	1.0956	1.1122**	1.1150
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.7: Returns to Scale for 100 Largest Banks by Total Assets, 1996.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WILMINGTON TR	8	1.0626^{***}	1.0486^{***}	1.0578^{***}	1.0676^{***}	1.1062	1.0344^{***}	1.1037	1.0478^{***}
MAGNA GROUP	8	1.0794^{***}	1.1044	1.0956	1.0957	1.1013	1.0740^{**}	1.1019	1.0861
FIRST COMMERCIAL	8	1.0964^{*}	1.1197	1.0912	1.0940	1.0766	1.0382^{***}	1.0668^{**}	1.0430^{***}
ONBANCORP	8	1.0492^{***}	1.0699^{***}	1.0705^{**}	1.0611^{***}	1.0870	1.0319^{***}	1.0642^{**}	1.0266^{***}
FIRSTMERIT	8	1.1015	1.0942	1.0989	1.1131^{*}	1.1081^{**}	1.0949	1.1203^{***}	1.1180
CCB	7	1.0628^{***}	1.0933^{**}	1.0749^{***}	1.0799^{***}	1.0505^{***}	1.0237^{***}	1.0592^{***}	1.0298^{***}
OLD T BC	7	1.0782^{***}	1.0982^{*}	1.0574^{***}	1.0663^{**}	1.0262^{***}	1.0341^{***}	1.0399^{***}	1.0434^{***}
KEYSTONE FNCL	7	1.1217	1.1351	1.0995	1.0896	1.1296^{***}	1.0851	1.1518^{***}	1.1139
TRUSTMARK	7	1.1264^{***}	1.1407^{***}	1.1340^{***}	1.1143^{**}	1.1414^{***}	1.1054	1.1276^{***}	1.1317^{**}
INDUSTRIAL BK OF JAPAN TC	7	1.0935^{**}	1.0851^{***}	1.0131^{***}	1.0161^{***}	1.0100^{***}	1.0064^{***}	1.0178^{***}	1.0126^{***}
BK OF THE WEST	7	1.0837	1.0821	1.0634^{***}	1.0688^{***}	1.0373^{***}	1.0284^{***}	1.0404^{***}	1.0340^{***}
SUMITOMO BK OF CA	7	0.9845^{***}	0.9875^{***}	1.0722^{*}	1.0504^{***}	1.1051	1.0660^{***}	1.0804	1.0685^{***}
PEOPLES HERITAGE FNCL GROUP	7	1.0459^{***}	1.0583^{***}	1.0913	1.0820	1.0917	1.0606	1.0819	1.0767
RIGGS T	7	1.1231	1.1208^{***}	1.0028^{***}	1.0107^{***}	0.9959^{***}	0.9944^{***}	1.0116^{***}	1.0142^{***}
NORTH FORK BC	7	1.0872^{***}	1.0846^{***}	0.9898^{***}	0.9943^{***}	0.9886^{***}	0.9790^{***}	0.9969^{***}	0.9773^{***}
COLONIAL BANCGROUP	7	1.1659	1.1826	1.0812	1.0858	1.1077^{*}	1.1076	1.1096	1.1031
CULLEN/FROST BKR	7	1.0819^{**}	1.1038	1.0905	1.0956	1.0836	1.0560^{***}	1.0879	1.0661^{***}
VALLEY NBC	7	1.1583^{***}	1.1467^{***}	1.0573^{***}	1.0545^{***}	1.0596^{**}	1.0362^{***}	1.0263^{***}	1.0288^{***}
BOK	6	1.0716^{**}	1.0777^{*}	1.0816^{***}	1.0890	1.0871^{***}	1.0181^{***}	1.0949	1.0352^{***}
UNITED CAROLINA BSHRS	6	1.1212^{***}	1.1355^{***}	1.1051	1.0998	1.1126	1.0706^{***}	1.1106^{*}	1.0794^{***}
ASSOCIATED BANC-CORP	6	1.1046	1.1010	1.0786^{**}	1.0750^{***}	1.0584^{***}	1.0378^{***}	1.0460^{***}	1.0499^{***}
ONE VALLEY BC	6	1.0672^{***}	1.0665^{***}	1.0765^{***}	1.0814^{***}	1.0520^{***}	1.0178^{***}	1.0528^{***}	1.0283^{***}
CITIZENS BC	6	1.0303^{**}	0.9903^{***}	1.0220^{***}	1.0360^{***}	1.0130^{***}	1.0262^{***}	1.0318^{**}	1.0324^{***}
CITY T	6	1.0507^{***}	1.0708^{***}	1.0341^{***}	1.0338^{***}	1.0738	1.0425^{***}	1.0559^{***}	1.0381^{***}
CNB BSHRS	6	1.1011	1.1152	1.0675^{***}	1.0654^{***}	1.1095	1.0405^{***}	1.1167^{*}	1.0503^{***}
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.8: Returns to Scale for 100 Largest Banks by Total Assets, 2006.Q4

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
CITIGROUP	2082	1.1011	1.0925*	1.0808***	1.0773***	1.1355***	1.1124	1.1105**	1.0648***
BK OF AMER	1672	1.0391***	1.0396***	1.0930***	1.1136	1.1519***	1.1721***	1.1498***	1.1089
JPMORGAN CHASE & CO	1543	1.1025	1.1001	1.0982	1.0958	1.2066***	1.1376	1.1774***	1.0789***
WACHOVIA	726	1.0459***	1.1073	1.0229***	1.0660*	1.0663	1.0825	1.1272	1.0402***
WELLS FARGO & CO	554	1.0193***	1.0256***	0.9996***	1.0377***	1.0134***	1.0480	1.0245***	1.0271***
U S BC	250	1.0585***	1.0554***	1.0493***	1.0566***	1.0656***	1.0701***	1.0707***	1.0656***
COUNTRYWIDE	225	1.1009	1.1131	1.0013***	1.0023***	0.9950***	0.9910***	1.0002***	0.9958***
SUNTRUST BK	210	1.0734***	1.0731***	1.0757***	1.0777***	1.0865	1.0560***	1.0902	1.0472***
HSBC BK USA	191	1.0456***	1.0436***	1.0096***	1.0161***	0.9928***	0.9851***	1.0234***	1.0027***
NATIONAL CITY	160	1.0697***	1.0657***	1.0178***	1.0273***	0.9778***	1.0039***	0.9907***	1.0138***
CAPITAL ONE	140	1.0599***	1.0491***	1.0958	1.0712***	1.1368**	1.0991	1.0892	1.0555***
BB&T	138	1.0653***	1.0628***	1.0384***	1.0406***	1.0414***	1.0242***	1.0668***	1.0294***
REGIONS	132	1.0712***	1.0608***	1.0212***	1.0026***	0.9968***	1.0274***	0.9693***	1.0243***
STATE STREET	126	1.1016	1.1009	1.0012***	1.0003***	0.9959***	0.9993***	0.9946***	0.9980***
BK OF NY CO	121	1.0536***	1.0496***	0.9897***	0.9956***	0.9861***	0.9735***	0.9979***	0.9926***
FIFTH THIRD BC	118	1.0883***	1.0862***	1.0400***	1.0522***	1.0266***	1.0240***	1.0490***	1.0250***
PNC FNCL SVC GROUP	115	1.0660***	1.0778***	1.0402***	1.0571***	1.0377***	1.0126***	1.0891	1.0178***
KEYCORP	108	1.0104***	1.0161***	1.0566***	1.0646***	1.0711***	1.0577***	1.0878***	1.0608***
LASALLE BK	83	1.0681***	1.0594***	1.0061***	1.0359***	1.0051***	1.0023***	1.0555***	1.0211***
COMERICA	68	1.0480***	1.0416***	1.0460***	1.0454***	1.0432***	1.0491***	1.0533***	1.0482***
NORTHERN TR	66	1.0372***	1.0323***	1.0207***	1.0024***	1.0271***	1.0377***	1.0005***	1.0453***
BK OF THE WEST	64	1.1092***	1.1023	1.0919***	1.1058	1.1235	1.0560***	1.1442***	1.0646***
MANUFACTURERS & TRADERS TC	64	1.0691***	1.0661***	1.0855***	1.0898*	1.0958	1.0900	1.1017	1.0962***
MARSHALL & ILSLEY	64	1.0586***	1.0513***	1.0483***	1.0683***	1.0543***	1.0425***	1.0965	1.0462***
UNION BK OF CA	59	0.9759***	0.9673***	1.0263***	1.0168***	1.0209***	1.0469***	1.0068***	1.0438***
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.8: Returns to Scale for 100 Largest Banks by Total Assets, 2006.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
POPULAR	54	1.0894***	1.0875**	1.0795***	1.0876***	1.0801	1.0113***	1.0861	1.0321***
ZIONS BC	53	1.0919**	1.0921***	1.0545***	1.0503***	1.0653***	1.0628***	1.0682***	1.0614***
CHARTER ONE BK	53	1.1178	1.1083	1.1241***	1.1227***	1.1989***	1.1201	1.1751***	1.1376*
COMMERCE BC	51	1.0732***	1.0740***	1.0357***	1.0361***	1.0449***	1.0552***	1.0546***	1.0638***
HARRIS	47	1.1334***	1.1337***	1.0342***	1.0396***	1.0133***	1.0373***	0.9955***	1.0290***
TD BANKNORTH	46	1.1111***	1.1007	1.1715***	1.1966***	1.2452***	1.2089***	1.2963***	1.2148***
FIRST HORIZON T	45	1.0543***	1.0443***	1.0583***	1.0779	1.0618*	1.0631***	1.1190	1.0524***
HUNTINGTON BSHRS	41	1.1154**	1.1144	1.0424***	1.0473***	1.0332***	1.0475***	1.0310***	1.0532***
CITIZENS BK OF MA	41	1.0523***	1.0272***	1.1014	1.1726**	1.1086	1.0514***	1.1550	1.0582***
COMPASS BSHRS	39	1.1033	1.0938**	1.0316***	1.0256***	1.0421***	1.0378***	1.0485***	1.0449***
SYNOVUS	36	1.0882***	1.0865***	1.0951	1.1007	1.1051	1.0945	1.1165	1.0884
NEW YORK CMNTY BC	33	1.0449***	1.0463***	1.0355***	1.0201***	1.0402***	1.0574	1.0323***	1.0633
MELLON BK	31	1.1076	1.0839***	1.0441***	1.0444***	1.0730***	1.0746***	1.0739***	1.0749***
COLONIAL BANCGROUP	26	1.0923***	1.0968	1.0199***	1.0042***	1.0834	1.0457*	1.0693	1.0549***
RBC CENTURA BK	25	1.1032	1.1144**	1.0632***	1.0680***	1.1125	1.1441	1.1259	1.1120
ASSOCIATED BANC	24	1.0809***	1.0859**	1.0496***	1.0430***	1.0672*	1.0954	1.0796	1.1077
BOK	20	1.0456***	1.0532***	1.0631***	1.0405***	1.1000	1.0865	1.0765	1.0752***
MERCANTILE BSHRS	20	1.0557***	1.0356***	1.0980***	1.1373*	1.1237	1.0917	1.1513**	1.0944***
WEBSTER FNCL	20	1.0748***	1.0792***	1.0084***	0.9925***	1.0517**	1.0339***	1.0303***	1.0345***
CITIZENS BK	19	1.1007	1.1035	1.1647***	1.1917***	1.3255***	1.2915***	1.3400***	1.2613***
SKY FNCL GROUP	19	1.0631***	1.0622***	1.0967	1.0957	1.1108**	1.1074*	1.1062*	1.1010
FIRST CITIZENS BSHRS	18	1.1289***	1.1551***	1.0659***	1.0713***	1.0603***	1.0542***	1.0700***	1.0661***
COMMERCE BSHRS	17	1.1478***	1.1735***	1.0676**	1.0901	1.0888	1.0935	1.1123**	1.1058***
FULTON FNCL	17	1.0992	1.0988	1.0628**	1.0480***	1.1104*	1.0758	1.1058**	1.0880***
CITY T	17	1.2171***	1.2179***	1.1080	1.0977	1.1356**	1.0924	1.1202**	1.0885***
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.8: Returns to Scale for 100 Largest Banks by Total Assets, 2006.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
TCF	17	1.0986	1.1015	1.1417*	1.1735***	1.1410**	1.1257	1.1621***	1.1172
SOUTH FNCL GROUP	16	1.1092	1.1054	1.0031***	1.0212***	1.0477***	1.0602***	1.0725	1.0504***
CITIZENS BK RI	16	1.0626***	1.0171***	1.0337***	1.0336***	1.0267***	1.0282***	1.0345***	1.0331***
FBOP	16	1.0591***	1.0642***	0.9747***	0.9718***	0.9554***	0.9700***	0.9852***	0.9999***
CULLEN/FROST BKR	14	1.0775***	1.0775***	1.0274***	1.0015***	1.0774	1.0642**	1.0478***	1.0494***
VALLEY T BC	14	1.1521***	1.1609***	1.0634***	1.0722***	1.0947	1.0720***	1.1184***	1.0780***
BANCORPSOUTH	14	1.1461***	1.1630***	1.0544***	1.0485***	1.0527***	1.0536***	1.0590***	1.0567***
FIRST HAWAIIAN BK	14	1.1066	1.1032	1.0837***	1.0771***	1.0623***	1.0167***	1.0618***	1.0374***
INVESTORS FNCL SVC	13	1.0873**	1.0866**	1.0102***	1.0051***	1.0086***	1.0062***	1.0084***	1.0060***
WILMINGTON TR	13	1.0806**	1.0800**	1.0912	1.1011	1.1523***	1.0925	1.1393***	1.0931***
CITIZENS BKG	12	1.1025	1.1056	1.1381***	1.2009***	1.1398***	1.1285	1.1796***	1.1314
EAST W BC	12	1.0456***	1.0579***	1.0271***	1.0343***	1.0253***	0.9688***	1.0210***	0.9717***
INTERNATIONAL BSHRS	12	1.1174	1.1318	1.0751***	1.0760***	1.0385***	1.0056***	1.0371***	1.0065***
BK OF HI	12	1.0758***	1.0636***	1.0612***	1.0548***	1.1015	1.0844***	1.1026	1.0837***
FIRSTMERIT	12	1.1206	1.1195	1.0825	1.0880	1.1185*	1.1436**	1.1140	1.1010
WHITNEY HC	12	1.0893	1.0770	1.0652***	1.0659***	1.0724***	1.0774***	1.0752	1.0585***
CORUS BSHRS	11	1.0535***	1.0542***	0.9804***	0.9377***	0.9794***	0.9732***	0.9598***	0.9811***
FIRST BKS	11	1.0951	1.0945	0.9958***	0.9649***	1.0182***	1.0686	0.9993***	1.0602***
WINTRUST	11	1.0813***	1.0851***	0.9872***	0.9903***	0.9841***	1.0649	1.0087***	1.0654***
STERLING	11	1.1576***	1.1652***	1.0776***	1.0788***	1.1071	1.0499***	1.1141*	1.0497***
UCBH HOLD	11	1.0609***	1.0541***	1.0229***	1.0213***	0.9872***	0.9424***	0.9863***	0.9489***
ISRAEL DISCOUNT BK OF NY	10	1.1099	1.1150	1.0525***	1.0551***	1.1083	1.0117***	1.0922	1.0335***
TRUSTMARK	10	1.1242	1.1340	1.0808***	1.0826***	1.0745	1.0809***	1.0910	1.0870***
ARVEST BK GRP	10	1.1360***	1.1371***	1.0438***	1.0542***	1.0404***	1.0533***	1.0637***	1.0635***
FIRST MIDWEST BC	10	1.1208	1.1168	1.0651***	1.0624***	1.0657	1.0637***	1.0470***	1.0622***
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.8: Returns to Scale for 100 Largest Banks by Total Assets, 2006.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
UMB	10	1.1228	1.1142	1.1489***	1.2149***	1.1477***	1.1286	1.2258***	1.1335
SUSQUEHANNA BSHRS	9	1.1567***	1.1657***	1.0468***	1.0468***	1.0741	1.0874	1.0595***	1.0863***
OLD T BC	9	1.1288	1.1243	1.0670***	1.0556***	1.1009	1.0682***	1.0793	1.0561***
MB FNCL	9	1.0239***	1.0272***	1.0228***	1.0140***	1.0238***	0.9586***	1.0030***	0.9771***
CATHAY GEN BC	9	1.0437***	1.0588***	1.0750***	1.0589***	1.0428*	1.0279***	1.0148***	1.0291***
FIRSTBANK HC	9	1.0874**	1.0762***	1.0361***	1.0262***	1.0273***	1.0088***	1.0225***	1.0138***
GREATER BAY BC	8	1.1129	1.1216	1.0732***	1.0857	1.0961	1.0504***	1.1424***	1.0669***
PACIFIC CAP BC	8	1.0978	1.1091	1.0244***	1.0027***	1.0582***	1.0967	1.0436***	1.0876
UMPQUA HC	8	1.0712***	1.0774***	1.0275***	1.0359***	0.9837***	0.9746***	0.9838***	0.9783***
ALABAMA NBC	8	1.0644***	1.0677***	1.0360***	1.0243***	1.0418***	1.0128***	1.0240***	1.0030***
CENTRAL BANCOMPANY	8	1.0999	1.1123	1.0642***	1.0725*	1.0465***	1.0315***	1.0455***	1.0344***
UNITED CMNTY BK	8	1.0808***	1.0862**	1.0410***	1.0528***	1.0497***	1.0532***	1.0683***	1.0550***
UNITED BSHRS	8	1.1273	1.1202	1.0741***	1.0608***	1.0692	1.0715	1.0535	1.0839
CHITTENDEN	8	1.0248***	1.0090***	1.0457***	1.0392***	1.0498***	1.0424**	1.0566	1.0525***
PROVIDENT BSHRS	7	1.1409*	1.1530**	1.0554***	1.0505***	1.1066	1.0582***	1.0872	1.0462***
IRWIN	7	1.1007	1.1108	1.0700***	1.0766***	1.1196**	1.1185	1.1235***	1.0781
HANCOCK HC	7	1.1547***	1.1716***	1.0853***	1.0717***	1.0628**	1.0287***	1.0631***	1.0385***
FIRST COMMONWEALTH FNCL	7	1.1495***	1.1825	1.1228***	1.1231**	1.1440***	1.1030	1.1405***	1.1053
FNB	7	1.1405***	1.1641*	1.1062*	1.1043	1.1095*	1.1209*	1.0773	1.1210**
CVB	7	1.0655***	1.0788***	1.0378***	1.0506***	0.9898***	0.9552***	1.0176***	0.9407***
OCEAN BSHRS	7	1.0386***	1.0407***	1.0767	1.0967	1.0471***	0.9931***	1.0551***	1.0035***
FIRST CITIZENS BC	7	1.1342*	1.1446***	1.0345***	1.0377***	1.0242***	1.0236***	1.0315***	1.0221***
BANK LEUMI USA	7	1.0395***	1.0341***	1.0494***	1.0398***	1.0092***	0.9887***	1.0078***	1.0154***
CENTRAL PACIFIC FNCL	6	1.1350*	1.1244	1.0808***	1.1355**	1.0603***	1.0103***	1.0870	1.0022***
PARK T	6	1.0987	1.0990	1.0807	1.0703	1.0684	1.0719**	1.0501**	1.0641***
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.9: Returns to Scale for 100 Largest Banks by Total Assets, 2015.Q4

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
JPMORGAN CHASE & CO	2378	1.0151***	0.9958***	1.1007	1.0938	1.1249***	1.1612***	1.1441***	1.1346
BK OF AMER	2145	1.0140***	0.9952***	1.1030	1.0911	1.1592***	1.3029***	1.1918***	1.2063**
CITIGROUP	1765	1.0375***	1.0108***	1.1337***	1.1070	1.1842***	1.3036***	1.1868***	1.1687**
WELLS FARGO & CO	1764	1.0347***	1.0256***	1.1170**	1.1055**	1.1180***	1.1174	1.1513***	1.1049
U S BC	418	0.9654***	0.9725***	1.0091***	0.9877***	1.0181***	1.0356***	1.0044***	1.0249***
BK OF NY MELLON	384	1.0697***	1.0649***	1.0451***	1.0538***	1.0348***	1.0550***	1.0507***	1.0497***
PNC FNCL SVC GROUP	359	0.9639***	0.9709***	1.0168***	0.9874***	1.0283***	1.0441***	1.0066***	1.0370***
STATE STREET	246	1.1568	1.1575	1.0042***	0.9979***	1.0117***	1.0876	1.0064***	1.0825
T D BK	243	1.0527***	1.0123***	1.0666**	1.0684***	1.0717	1.0922	1.0793***	1.0917***
BB&T	209	1.0483***	1.0123***	1.0795	1.0563***	1.1012	1.0938	1.0586***	1.0819***
SUNTRUST BK	189	1.0487***	1.1008*	1.0608***	1.0746***	1.0849***	1.0855***	1.0941	1.0791***
FIFTH THIRD BK	139	1.0880**	1.1568	1.0770***	1.1024	1.0921***	1.0756***	1.1322***	1.0971***
CITIZENS FNCL GRP	137	1.0338***	1.0987	1.0067***	0.9961***	1.0483***	1.0727	1.0184***	1.0671***
REGIONS	125	1.1139	1.1520	1.0995***	1.1151**	1.1289*	1.1166	1.1638***	1.1583
NORTHERN TR	118	1.0297***	1.0526***	1.0467***	1.0485***	1.0436***	1.0604***	1.0487***	1.0671***
M&T BK	110	1.1969***	1.1955***	1.0434***	1.0804***	1.0455***	1.0855	1.0918***	1.1145
BMO HARRIS BK	105	1.1009	1.0281	1.0630***	1.1413	1.0834***	1.0843	1.1647**	1.1316
KEYCORP	95	1.0487***	1.0359***	1.0561***	1.0534***	1.0572***	1.0611***	1.0545***	1.0763***
SANTANDER BK	90	1.1466***	1.1412***	1.0288***	1.0429***	1.0230***	1.0334***	1.0504***	1.0665***
COMPASS BK	85	1.1107	1.1030	1.1101	1.1203*	1.1244	1.1195	1.1466***	1.1485
BK OF THE WEST	75	1.0391***	1.0390***	1.1282*	1.1392***	1.1274	1.1496**	1.1392***	1.1768***
COMERICA	71	0.9915***	1.0179***	1.0318***	1.0321***	1.0328***	1.0358***	1.0383***	1.0427***
HUNTINGTON BSHRS	70	1.0837***	1.0564***	1.0438***	1.0450***	1.0398***	1.0339***	1.0427***	1.0373***
CIT BK	44	1.0211***	1.0620***	0.9483***	0.9541***	0.9416***	0.9561***	0.9573***	0.9683***
FIRST NIAGARA FNCL GROUP	40	1.1823***	1.1482	1.0592***	1.0663***	1.0646***	1.1079	1.0663***	1.1047
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.9: Returns to Scale for 100 Largest Banks by Total Assets, 2015.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
PEOPLES UNITED FNCL INC	38	1.1334***	1.1154	1.0496***	1.0493***	1.0563***	1.0343***	1.0489***	1.0297***
POPULAR	36	1.0997	1.0107	1.0478***	1.0801***	1.0232***	1.0675	1.0619***	1.0763
EAST WEST BC	32	1.0334***	1.0372***	1.0350***	1.0293***	1.0203***	1.0379***	0.9997***	1.0361***
FIRST CITIZENS BSHRS	31	1.2064***	1.2111***	1.0512***	1.0586***	1.0461***	1.0253***	1.0492***	1.0337***
BOK	31	1.1142	1.1215	1.0292***	1.0279***	1.0249***	1.0330***	1.0240***	1.0332***
CULLEN/FROST BKR	28	1.1812***	1.1352	1.0424***	1.0448***	1.0324***	1.0038***	1.0345***	1.0082***
SYNOVUS	28	1.1381	1.1565	1.0378***	1.0422***	1.0400***	1.0191***	1.0418***	1.0222***
ASSOCIATED BANC-CORP	28	1.0712***	1.0516***	1.0348***	1.0294***	1.0394***	1.0358***	1.0364***	1.0358***
FIRST HORIZON T	26	1.1276	1.1358	1.0304***	1.0290***	1.0143***	1.0441***	1.0021***	1.0413***
FIRSTMERIT	25	1.2250***	1.2220***	1.0311***	1.0307***	1.0345***	1.1115	1.0342***	1.1031
WEBSTER FNCL	24	1.1596	1.1715	1.0301***	1.0254***	1.0267***	1.0402***	1.0306***	1.0426***
COMMERCE BSHRS	24	1.1767***	1.1908***	1.0553***	1.0596***	1.0496***	1.0330***	1.0555***	1.0388***
UMPQUA HC	23	1.0683***	1.0712***	1.0263***	1.0273***	1.0291***	1.0961	1.0332***	1.0863
BANKUNITED	23	1.0605***	1.0617***	1.0451***	1.0394***	1.0319***	1.0628	1.0236***	1.0454
WINTRUST	22	1.1496***	1.1395	1.0669***	1.0694***	1.0515***	1.0123***	1.0601***	1.0247***
HANCOCK HC	22	1.1404	1.1689***	1.0629***	1.0752***	1.0590***	1.0275***	1.0757***	1.0401***
PROSPERITY BSHRS	22	1.0660***	1.0616***	1.0260***	1.0304***	1.0167***	0.9989***	1.0161***	0.9988***
VALLEY T BC	21	1.1443***	1.1336*	1.0896***	1.0863***	1.0983	1.0773***	1.1320*	1.0884***
TCF	20	1.2352***	1.2725***	1.0538***	1.0761***	1.0513***	1.0814	1.0682***	1.0846
IBERIABANK	19	1.1017	1.1342***	1.0354***	1.0327***	1.0163***	1.0024***	1.0063***	1.0020***
FIRST HAWAIIAN BK	19	1.2051***	1.2039***	1.0468***	1.0408***	1.0322***	0.9977***	1.0344***	1.0010***
PACIFIC WESTERN BK	19	1.0838	1.0521***	1.0292***	1.0237***	1.0152***	1.0407***	1.0131***	1.0278***
UMB	19	1.0690	1.0734	1.0492***	1.0416***	1.0446***	1.0584***	1.0405***	1.0494***
TEXAS CAP BK	19	1.1784***	1.1638***	1.0406***	1.0342***	1.0179***	1.0015***	1.0267***	1.0062***
FIRST NB OF OMAHA	18	1.2206***	1.2119***	1.0709***	1.0732***	1.0640***	1.0321***	1.0788***	1.0452***
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.9: Returns to Scale for 100 Largest Banks by Total Assets, 2015.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
FULTON FNCL	18	1.0416***	1.0331***	1.0577***	1.0657***	1.0553***	1.0339***	1.0652***	1.0351***
FNB	17	1.1844***	1.2047***	1.0596***	1.0557***	1.0430***	1.0689	1.0352***	1.0639***
ARVEST BK GRP	16	1.1408***	1.1565***	1.0704***	1.0754***	1.0680***	1.0299***	1.0648***	1.0369***
BK OF HI	15	1.1899***	1.2479***	1.0642***	1.0662***	1.0627***	1.0468***	1.0660***	1.0499***
FIRSTBANK HC	15	0.9954***	1.0139***	1.0136***	1.0045***	1.0039***	0.9827***	1.0021***	0.9781***
RAYMOND JAMES BK	15	1.3002***	1.2036***	1.0469***	1.0170***	1.0250***	1.0389	1.0215***	1.0402
MB FNCL	15	1.0448***	1.0404***	1.0400***	1.0348***	1.0046***	1.0078***	0.9874***	1.0056***
RABOBANK	15	1.0949	1.0924	1.0548***	1.0669***	1.0821	1.1396	1.1080	1.1555
WASHINGTON FED INC	15	1.0982	1.1108	1.0144***	1.0224***	1.0158***	0.9978***	1.0323***	1.0064***
WESTERN ALLI BC	14	1.0242***	1.0006**	1.0648***	1.0085***	1.0555**	1.0634	1.0055***	1.0701
BANCORPSOUTH	14	1.0460***	1.0510***	1.0445***	1.0444***	1.0220***	0.9883***	1.0168***	0.9937***
CATHAY GEN BC	13	1.0718***	1.0875	1.0265***	1.0598***	1.0021***	0.9792	1.0525***	0.9924
UNITED BSHRS	13	1.1734***	1.1753***	1.0502***	1.0567***	1.0330***	1.0298***	1.0302***	1.0300***
TRUSTMARK	12	1.0396**	1.0198*	1.0466***	1.0457***	1.0367***	1.0193***	1.0383***	1.0267***
OLD T BC	12	1.1921***	1.2112***	1.0884***	1.1030	1.0805***	1.0548***	1.0933***	1.0673***
INTERNATIONAL BSHRS	12	1.0767***	1.0710***	1.0448***	1.0451***	1.0191***	0.9923***	1.0178***	0.9887***
CENTRAL BANCOMPANY INC	12	1.1054	1.1121	1.0706***	1.0800***	1.0528***	1.0113***	1.0537***	1.0140***
STERLING BC	12	1.1057	1.0889*	1.0564***	1.0629	1.0302***	1.0702	1.0409***	1.0733
BREMER BK	10	1.1821***	1.1706**	1.0535***	1.0506***	1.0336***	0.9664***	1.0323***	0.9635***
GREAT WESTERN BC	10	1.0876*	1.0765***	1.0566***	1.0628***	1.0287***	1.0029***	1.0255***	1.0035***
FIRST MW BC	10	1.1090	1.1100	1.0698***	1.0917***	1.0474***	0.9810***	1.0603***	0.9799***
BK OF THE OZARKS	10	1.1063	1.0945*	0.9926***	0.9808***	0.9693***	0.9626***	0.9534***	0.9680***
ISRAEL DISCOUNT BK OF NY	10	1.0679***	1.0421***	1.0981	1.0729	1.1023	1.0574***	1.0792	1.0519***
EASTERN BK	10	1.1816***	1.1334	1.0490***	1.0456***	1.0416***	1.0156***	1.0143***	1.0110***
NATIONAL PENN BSHRS	10	1.0719	1.0586**	1.0679***	1.0932***	1.0540***	1.0183***	1.0699***	1.0216***
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.9: Returns to Scale for 100 Largest Banks by Total Assets, 2015.Q4 (continued)

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
UNITED CMNTY BK	9	1.1072	1.1065	1.0663***	1.0779***	1.0282***	1.0197***	1.0270***	1.0239***
CHEMICAL	9	1.0103***	1.0022***	1.0933***	1.1146	1.0621***	1.0175***	1.0685***	1.0118***
PINNACLE BC	9	1.0612***	1.0724**	1.0270***	1.0094***	0.9977***	0.9800***	0.9902***	0.9715***
GLACIER BC	9	1.0388***	1.0514***	1.0330***	1.0092***	1.0065***	0.9666***	0.9942***	0.9626***
HOME BSHRS	9	1.0770***	1.0573***	1.0204***	1.0101***	1.0012***	0.9646***	0.9887***	0.9530***
COLUMBIA BKG SYS	9	1.4461***	1.4280***	1.0280***	1.0112***	1.0270***	1.0079***	1.0171***	1.0106***
FIRST INTRST BANCSYSTEM	9	1.0354***	1.0622**	1.0876***	1.1070*	1.0498***	1.0205***	1.0439***	1.0264***
PINNACLE FNCL PTNR	9	1.0744***	1.0879**	1.0286***	1.0102***	0.9966***	0.9980***	0.9822***	1.0141***
PLAINSCAPITAL BK	9	1.1097	1.0749*	1.0534***	1.0623***	1.0484***	1.0531***	1.0555***	1.0571***
CADENCE BC LLC	9	1.0690***	1.0719**	1.0785***	1.0550***	1.0751***	1.1326	1.0267***	1.1198
SOUTH ST	9	1.1581**	1.1357	1.0442***	1.0274***	1.0199***	1.0071***	1.0081***	1.0123***
WESBANCO	8	1.1274	1.1166	1.0615***	1.0415***	1.0440***	1.0021***	1.0296***	0.9978***
COMMUNITY BK SYS	8	0.9961***	0.9918***	1.0563***	1.0592***	1.0379***	1.0082***	1.0412***	1.0062***
NBT BC	8	1.0229***	1.0133***	1.0719***	1.0679***	1.0553***	1.0406***	1.0504***	1.0355***
MERCANTIL COMMERCEBANK	8	1.0158***	0.9840***	1.0157***	0.9944***	0.9840***	0.9959	0.9445***	1.0049
FIRST FNCL BC	8	1.0441***	1.0352***	1.0624***	1.0513***	1.0649***	1.0080***	1.0602***	1.0059***
CUSTOMERS BC	8	1.0300***	1.0309***	1.0681***	1.0968	1.0335***	1.1102	1.0637	1.1112
RENASANT	8	1.0637**	1.0709*	1.0548***	1.0576***	1.0240***	0.9672***	1.0232***	0.9629***
BERKSHIRE HILLS BC	8	1.0685**	1.0756**	1.1069	1.1604***	1.1113	1.0199***	1.1484***	1.0217***
BBCN BC	8	1.1027	1.1048	1.0780	1.1245**	1.0356***	1.0595	1.0595	1.0650
BANC OF CA	8	1.0444***	1.0347***	1.0832***	1.1359	1.0683***	1.0755	1.0909	1.0870
UNION BSHRS	8	1.1024	1.0827**	1.0361***	1.0343***	1.0173***	1.0014***	1.0195***	1.0005***
CVB	8	1.3245***	1.2981***	1.0377***	1.0308***	0.9938***	0.9635***	1.0176***	0.9763***
SIMMONS FIRST T	8	1.0951**	1.1105	1.0370***	1.0266***	0.9982***	0.9556***	0.9880***	0.9656***
BANNER	8	1.1028	1.1034	1.0767	1.0191***	1.0451***	1.0573	1.0080***	1.0651
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $(1 - \mathcal{E}_{C,i})\delta$ are reported ($\delta = 1.1$). For Models 3–4 and Models 5–8, estimates of $(1 + \mathcal{E}_{R,i})\delta$ and $(1 + \mathcal{E}_{\pi,i})\delta$ are given. For Models 1–2, values *less than* 1.1 indicate increasing returns to scale, while for Models 3–8, values *greater than* 1.1 indicate increasing returns to scale. Statistical significance (difference from 1.1) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.10: Returns to Scale for Largest Banks by Total Assets, 1986.Q4 and 1996.Q4

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
—1986.Q4—									
CITIBANK	275	0.0572***	0.0541***	−0.0775***	−0.0679***	−0.1060***	−0.1128***	−0.0722***	−0.0926***
BK OF AMER	204	0.0065**	0.0040	−0.0402***	−0.0472***	0.0566	0.1795(3)	−0.0486***	−0.0619***
CHASE MHTN BK	150	0.0348***	0.0368***	−0.0163	−0.0099	−0.0349	−0.0442	0.0112	−0.0201***
MANU. HAN	139	0.0132***	0.0118**	−0.0286***	−0.0391***	0.0744	0.0113	−0.0354***	−0.0491***
MORGAN GNTY TC	130	0.0631***	0.0664***	−0.0563***	−0.0366***	−0.0361	−0.0457	−0.0087	−0.0594***
SECURITY PACIFIC	113	0.0016	−0.0006	−0.0370***	−0.0417***	−0.0206	−0.0275	−0.0567***	−0.0623***
CHEMICAL NY	109	0.0070***	0.0067**	−0.0387***	−0.0352***	−0.0004	0.0185	−0.0385***	−0.0376***
BANKERS TR NY	100	0.0490***	0.0525***	−0.0588***	−0.0538***	−0.0416***	−0.0516	−0.0356***	−0.0513***
FIRST INTRST BC	100	0.0106*	0.0087	−0.0269***	−0.0295***	−0.0376	−0.1052	−0.0469***	−0.0832***
WELLS FARGO & CO	81	0.0093	0.0072	−0.0465***	−0.0488***	−0.0343	−0.0307	−0.0541***	−0.0530***
—1996.Q4—									
CHASE MHTN	469	0.0403***	0.0473***	−0.0605***	−0.0611***	−0.0545***	−0.0435***	−0.0629***	−0.0502***
CITICORP	394	0.0575***	0.0578***	−0.0567***	−0.0628***	−0.0522***	−0.0274***	−0.0643***	−0.0458***
BK OF AMER	352	0.0535***	0.0514***	−0.0483***	−0.0504***	−0.0468***	−0.0327***	−0.0564***	−0.0425***
NATIONSBANK	266	0.0207***	0.0344***	−0.0507***	−0.0374***	−0.0550***	−0.0503***	−0.0349***	−0.0491***
MORGAN GNTY TC	245	0.0419***	0.0477***	−0.0794***	−0.0778***	−0.0962***	−0.1018***	−0.0886***	−0.0932***
FIRST UNION	195	0.0085**	0.0064**	−0.0726***	−0.0719***	−0.0994***	−0.0977***	−0.1023***	−0.0925***
WELLS FARGO & CO	155	0.0337***	0.0434***	−0.0146***	−0.0163***	0.0075	−0.0212***	−0.0082	−0.0410***
FIRST NBD	150	0.0307***	0.0339***	−0.0553***	−0.0525***	−0.0509***	−0.0772***	−0.0517***	−0.0783***
BANC ONE	143	0.0316***	0.0250***	−0.0369***	−0.0370***	−0.0364***	−0.0477***	−0.0566***	−0.0496***
FLEET FNCL GROUP	123	0.0376***	0.0374**	−0.0166***	−0.0076***	−0.0200***	−0.0254***	−0.0149	−0.0312***
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	π_1	π_2	π_3	π_4
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $\mathcal{E}_{C,i})$ are reported. For Models 3–4 and Models 5–8, estimates of $\mathcal{E}_{R,i})$ and $\mathcal{E}_{\pi,i})$ are given. In all cases, values greater than (equal to, less than) 0 indicate increasing (constant, decreasing) returns to scale. Statistical significance (difference from 0) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.11: Returns to Scale for Largest Banks by Total Assets, 2006.Q4 and 2015.Q4

Name	Assets	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
—2006.Q4—									
CITIGROUP	2082	−0.0010	0.0068*	−0.0175***	−0.0206***	0.0323***	0.0113	0.0095**	−0.0320***
BK OF AMER	1672	0.0553***	0.0549***	−0.0064***	0.0124	0.0472***	0.0656***	0.0453***	0.0081
JPMORGAN CHASE & CO	1543	−0.0023	−0.0001	−0.0016	−0.0038	0.0969***	0.0342	0.0704***	−0.0192***
WACHOVIA	726	0.0492***	−0.0066	−0.0701***	−0.0309*	−0.0306	−0.0159	0.0247	−0.0544***
WELLS FARGO & CO	554	0.0734***	0.0676***	−0.0913***	−0.0566***	−0.0787***	−0.0472	−0.0687***	−0.0663***
U S BC	250	0.0378***	0.0405***	−0.0461***	−0.0394***	−0.0313***	−0.0272***	−0.0267***	−0.0313***
COUNTRYWIDE	225	−0.0008	−0.0119	−0.0897***	−0.0888***	−0.0955***	−0.0990***	−0.0907***	−0.0948***
SUNTRUST BK	210	0.0241***	0.0245***	−0.0221***	−0.0202***	−0.0123	−0.0400***	−0.0089	−0.0480***
HSBC BK USA	191	0.0495***	0.0513***	−0.0821***	−0.0763***	−0.0975***	−0.1045***	−0.0696***	−0.0885***
NATIONAL CITY	160	0.0276***	0.0312***	−0.0748***	−0.0661***	−0.1111***	−0.0873***	−0.0994***	−0.0784***
—2015.Q4—									
JPMORGAN CHASE & CO	2378	0.0772***	0.0948***	0.0007	−0.0056	0.0226***	0.0556***	0.0401***	0.0315
BK OF AMER	2145	0.0782***	0.0953***	0.0027	−0.0081	0.0539***	0.1844***	0.0835***	0.0966**
CITIGROUP	1765	0.0568***	0.0811***	0.0306***	0.0064	0.0765***	0.1851***	0.0789***	0.0624**
WELLS FARGO & CO	1764	0.0594***	0.0677***	0.0154**	0.0050**	0.0163***	0.0158	0.0466***	0.0044
U S BC	418	0.1224***	0.1159***	−0.0827***	−0.1021***	−0.0744***	−0.0585***	−0.0869***	−0.0683***
BK OF NY MELLON	384	0.0275***	0.0319***	−0.0499***	−0.0420***	−0.0592***	−0.0409***	−0.0448***	−0.0457***
PNC FNCL SVC GROUP	359	0.1237***	0.1173***	−0.0756***	−0.1024***	−0.0652***	−0.0508***	−0.0849***	−0.0573***
STATE STREET	246	−0.0516	−0.0522	−0.0871***	−0.0928***	−0.0803***	−0.0113	−0.0851***	−0.0159
T D BK	243	0.0430***	0.0797***	−0.0304**	−0.0287***	−0.0257	−0.0071	−0.0188***	−0.0076***
BB&T	209	0.0470***	0.0797***	−0.0187	−0.0398***	0.0011	−0.0057	−0.0377***	−0.0164***
Dep. Var.		C_1/W_1	C_2/W_1	R_1	R_2	π_1	π_2	π_3	π_4
RHS Vars.		$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: For Models 1–2, estimates of $\mathcal{E}_{C,i})$ are reported. For Models 3–4 and Models 5–8, estimates of $\mathcal{E}_{R,i})$ and $\mathcal{E}_{\pi,i})$ are given. In all cases, values greater than (equal to, less than) 0 indicate increasing (constant, decreasing) returns to scale. Statistical significance (difference from 0) at the ten, five, or one percent levels is denoted by one, two, or three asterisks, respectively. Assets are given in millions of constant 2015 dollars.

Table E.12: Numbers of Significant Changes in RTS Elasticities from 2006.Q4 to 2015.Q4

	.1 signif.			.05 signif.			.01 signif.		
Model	Change	RTS↑	RTS↓	Change	RTS↑	RTS↓	Change	RTS↑	RTS↓
1	3228	1765	1463	3064	1686	1378	2791	1552	1239
2	3195	1784	1411	3031	1704	1327	2702	1538	1164
3	2444	1162	1282	2194	1033	1161	1805	841	964
4	2653	1260	1393	2448	1155	1293	2123	1001	1122
5	1427	589	838	1210	493	717	896	364	532
6	1483	702	781	1260	594	666	935	431	504
7	2260	956	1304	2004	849	1155	1593	656	937
8	2108	995	1113	1843	860	983	1485	690	795

NOTE: For each level of significance, "Change" gives the number of cases among 4148 banks in 2015.Q4 that also appear in 2006.Q4 and for which the estimated elasticities in Table 3 significantly differ between 2006.Q4 and 2015.Q4. Columns labelled "RTS↑" and "RTS↓" give counts of banks where returns to scale improve and worsen, respectively.

Table E.13: Significant Changes in RTS from 2006.Q4 to 2015.Q4 for 10 Largest Banks in 2015.Q4 (.1 Significance)

	Model							
Bank	1	2	3	4	5	6	7	8
JPMORGAN CHASE & CO	↑	↑	—	—	↓	—	—	—
BK OF AMER	↑	↑	—	↓	—	—	↑	↑
CITIGROUP	↑	↑	↑	↑	↑	↑	↑	↑
WELLS FARGO & CO	—	—	↑	↑	↑	↑	↑	↑
U S BC	↑	↑	↓	↓	↓	↓	↓	↓
PNC FNCL SVC GROUP	↑	↑	↓	↓	—	—	↓	↑
STATE STREET	↓	↓	↑	↑	↑	↑	↑	↑
T D BK	↑	↑	↓	↓	—	↓	↓	—
BB&T	↑	↑	↑	—	—	—	—	↑
SUNTRUST BK	—	↓	—	—	—	—	—	—
Dep. Var.	C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: Upward arrows indicate a significant increase in RTS pseudo-elasticity from 2006.Q4 to 2015.Q4. Downward arrows indicate significant decrease in RTS pseueo-elasticity from 2006.Q4 to 2015.Q4. Horizontal dashes indicate no significant change.

Table E.14: Significant Changes in RTS from 2006.Q4 to 2015.Q4 for 10 Largest Banks in 2015.Q4 (.05 Significance)

	Model							
Bank	1	2	3	4	5	6	7	8
JPMORGAN CHASE & CO	↑	↑	—	—	—	—	—	—
BK OF AMER	↑	↑	—	↓	—	—	↑	↑
CITIGROUP	↑	↑	↑	↑	↑	↑	↑	↑
WELLS FARGO & CO	—	—	↑	↑	↑	↑	↑	↑
U S BC	↑	↑	↓	↓	↓	—	↓	↓
PNC FNCL SVC GROUP	↑	↑	—	↓	—	—	↓	↑
STATE STREET	↓	↓	↑	↑	↑	↑	↑	↑
T D BK	↑	↑	↓	↓	—	—	↓	—
BB&T	↑	↑	↑	—	—	—	—	↑
SUNTRUST BK	—	↓	—	—	—	—	—	—
Dep. Var.	C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: Upward arrows indicate a significant increase in RTS pseudo-elasticity from 2006.Q4 to 2015.Q4. Downward arrows indicate significant decrease in RTS pseueo-elasticity from 2006.Q4 to 2015.Q4. Horizontal dashes indicate no significant change.

Table E.15: Significant Changes in RTS from 2006.Q4 to 2015.Q4 for 10 Largest Banks in 2015.Q4 (.01 Significance)

	Model							
Bank	1	2	3	4	5	6	7	8
JPMORGAN CHASE & CO	↑	↑	—	—	—	—	—	—
BK OF AMER	↑	↑	—	↓	—	—	—	↑
CITIGROUP	↑	↑	↑	↑	↑	↑	↑	↑
WELLS FARGO & CO	—	—	↑	↑	↑	↑	↑	↑
U S BC	↑	↑	↓	↓	↓	—	↓	↓
PNC FNCL SVC GROUP	↑	↑	—	↓	—	—	↓	↑
STATE STREET	↓	↓	↑	↑	↑	↑	↑	↑
T D BK	↑	↑	↓	↓	—	—	↓	—
BB&T	—	↑	↑	—	—	—	—	—
SUNTRUST BK	—	—	—	—	—	—	—	—
Dep. Var.	C_1/W_1	C_2/W_1	R_1	R_2	$R_1 - C_1$	$R_1 - C_2$	$R_2 - C_1$	$R_2 - C_2$
RHS Vars.	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_1)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$	$(\boldsymbol{y}, \boldsymbol{w}_2)$

NOTE: Upward arrows indicate a significant increase in RTS pseudo-elasticity from 2006.Q4 to 2015.Q4. Downward arrows indicate significant decrease in RTS pseueo-elasticity from 2006.Q4 to 2015.Q4. Horizontal dashes indicate no significant change.

Table E.16: Transition Matrices, 2006.Q4 to 2015.Q4, Cost Models, .1 Significance

Model 1 (dep. var. C_1):

	IRS	CRS	DRS	Total
IRS	866	803	47	1716
CRS	1085	1143	96	2324
DRS	52	45	11	108
Total	2003	1991	154	4148

Model 2 (dep. var. C_2):

	IRS	CRS	DRS	Total
IRS	883	752	49	1684
CRS	1130	1138	88	2356
DRS	51	45	12	108
Total	2064	1935	149	4148

NOTE: For each transition matrix, rows correspond to RTS in 2006.Q4 and columns correspond to RTS in 2015.Q4.

Table E.17: Transition Matrices, 2006.Q4 to 2015.Q4, Revenue Models, .1 Significance

Model 3 (dep. var. R_1):

	IRS	CRS	DRS	Total
IRS	295	536	182	1013
CRS	714	1601	485	2800
DRS	53	143	139	335
Total	1062	2280	806	4148

Model 4 (dep. var. R_2):

	IRS	CRS	DRS	Total
IRS	327	611	145	1083
CRS	761	1607	426	2794
DRS	44	114	113	271
Total	1132	2332	684	4148

NOTE: For each transition matrix, rows correspond to RTS in 2006.Q4 and columns correspond to RTS in 2015.Q4.

Table E.18: Transition Matrices, 2006.Q4 to 2015.Q4, Profit Models, .1 Significance)

Model 5 (dep. var. π_1):

	IRS	CRS	DRS	Total
IRS	441	793	145	1379
CRS	783	1566	296	2645
DRS	16	38	70	124
Total	1240	2397	511	4148

Model 6 (dep. var. π_2):

	IRS	CRS	DRS	Total
IRS	787	767	106	1660
CRS	963	1144	213	2320
DRS	15	51	102	168
Total	1765	1962	421	4148

Model 7 (dep. var. π_3):

	IRS	CRS	DRS	Total
IRS	524	877	131	1532
CRS	799	1441	252	2492
DRS	19	33	72	124
Total	1342	2351	455	4148

Model 8 (dep. var. π_4):

	IRS	CRS	DRS	Total
IRS	943	806	111	1860
CRS	927	1002	198	2127
DRS	16	43	102	161
Total	1886	1851	411	4148

NOTE: For each transition matrix, rows correspond to RTS in 2006.Q4 and columns correspond to RTS in 2015.Q4.

Table E.19: Transition Matrices, 2006.Q4 to 2015.Q4, Cost Models, .05 Significance

Model 1 (dep. var. C_1):

	IRS	CRS	DRS	Total
IRS	640	716	30	1386
CRS	1073	1514	88	2675
DRS	41	37	9	87
Total	1754	2267	127	4148

Model 2 (dep. var. C_2):

	IRS	CRS	DRS	Total
IRS	645	690	28	1363
CRS	1124	1500	82	2706
DRS	35	38	6	79
Total	1804	2228	116	4148

NOTE: For each transition matrix, rows correspond to RTS in 2006.Q4 and columns correspond to RTS in 2015.Q4.

Table E.20: Transition Matrices, 2006.Q4 to 2015.Q4, Revenue Models, .05 Significance

Model 3 (dep. var. R_1):

	IRS	CRS	DRS	Total
IRS	167	427	112	706
CRS	645	2032	494	3171
DRS	33	120	118	271
Total	845	2579	724	4148

Model 4 (dep. var. R_2):

	IRS	CRS	DRS	Total
IRS	197	509	92	798
CRS	692	2004	426	3122
DRS	30	103	95	228
Total	919	2616	613	4148

NOTE: For each transition matrix, rows correspond to RTS in 2006.Q4 and columns correspond to RTS in 2015.Q4.

Table E.21: Transition Matrices, 2006.Q4 to 2015.Q4, Profit Models, .05 Significance

Model 5 (dep. var. π_1):

	IRS	CRS	DRS	Total
IRS	266	688	93	1047
CRS	709	1994	296	2999
DRS	11	31	60	102
Total	986	2713	449	4148

Model 6 (dep. var. π_2):

	IRS	CRS	DRS	Total
IRS	531	723	72	1326
CRS	918	1545	217	2680
DRS	7	44	91	142
Total	1456	2312	380	4148

Model 7 (dep. var. π_3):

	IRS	CRS	DRS	Total
IRS	319	753	88	1160
CRS	756	1878	249	2883
DRS	10	29	66	105
Total	1085	2660	403	4148

Model 8 (dep. var. π_4):

	IRS	CRS	DRS	Total
IRS	681	798	73	1552
CRS	923	1329	198	2450
DRS	10	40	96	146
Total	1614	2167	367	4148

NOTE: For each transition matrix, rows correspond to RTS in 2006.Q4 and columns correspond to RTS in 2015.Q4.

Table E.22: Transition Matrices, 2006.Q4 to 2015.Q4, Cost Models, .01 Significance

Model 1 (dep. var. C_1):

	IRS	CRS	DRS	Total
IRS	311	526	13	850
CRS	952	2215	73	3240
DRS	22	28	8	58
Total	1285	2769	94	4148

Model 2 (dep. var. C_2):

	IRS	CRS	DRS	Total
IRS	313	507	11	831
CRS	975	2226	58	3259
DRS	19	34	5	58
Total	1307	2767	74	4148

NOTE: For each transition matrix, rows correspond to RTS in 2006.Q4 and columns correspond to RTS in 2015.Q4.

Table E.23: Transition Matrices, 2006.Q4 to 2015.Q4, Revenue Models, .01 Significance

Model 3 (dep. var. R_1):

	IRS	CRS	DRS	Total
IRS	52	234	52	338
CRS	449	2693	458	3600
DRS	7	100	103	210
Total	508	3027	613	4148

Model 4 (dep. var. R_2):

	IRS	CRS	DRS	Total
IRS	63	259	46	368
CRS	498	2697	406	3601
DRS	11	86	82	179
Total	572	3042	534	4148

NOTE: For each transition matrix, rows correspond to RTS in 2006.Q4 and columns correspond to RTS in 2015.Q4.

Table E.24: Transition Matrices, 2006.Q4 to 2015.Q4, Profit Models, .01 Significance

Model 5 (dep. var. π_1):

	IRS	CRS	DRS	Total
IRS	84	396	43	523
CRS	480	2793	276	3549
DRS	4	19	53	76
Total	568	3208	372	4148

Model 6 (dep. var. π_2):

	IRS	CRS	DRS	Total
IRS	232	546	36	814
CRS	705	2291	219	3215
DRS	1	38	80	119
Total	938	2875	335	4148

Model 7 (dep. var. π_3):

	IRS	CRS	DRS	Total
IRS	110	417	44	571
CRS	554	2692	247	3493
DRS	4	21	59	84
Total	668	3130	350	4148

Model 8 (dep. var. π_4):

	IRS	CRS	DRS	Total
IRS	318	607	40	965
CRS	777	2077	202	3056
DRS	5	36	86	127
Total	1100	2720	328	4148

NOTE: For each transition matrix, rows correspond to RTS in 2006.Q4 and columns correspond to RTS in 2015.Q4.

References

Davidson, R. and J. MacKinnon (1993), *Estimation and Inference in Econometrics*, New York: Oxford University Press.

Efron, B. and R. J. Tibshirani (1993), *An Introduction to the Bootstrap*, London: Chapman and Hall.

Fan, J. and I. Gijbels (1994), Censored regression: Local linear regression smoothers, *Journal of the American Statistical Association* 89, 560–570.

— (1996), *Local Polynomial Modelling and Its Applications*, London: Chapman and Hall.

Fan, J., M. B. T. Gasser, I. Gijbels, and J. Engel (1997), Local polynomial regression: Optimal kernels and asymptotic minimax efficiency, *Annals of the Institute for Statistical Mathematics* 49, 79–99.

Härdle, W. (1990), *Applied Nonparametric Regression*, Cambridge: Cambridge University Press.

Härdle, W. and E. Mammen (1993), Comparing nonparametric versus parametric regression fits, *Annals of Statistics* 21, 1926–1947.

Loftsgaarden, D. O. and C. P. Quesenberry (1965), A nonparametric estimate of a multivariate density function, *Annals of Mathematical Statistics* 36, 1049–1051.

Mammen, E. (1992), *When Does Bootstrap Work? Asymptotic Results and Simulations*, Berlin: Springer-Verlag.

Nadaraya, E. A. (1964), On estimating regression, *Theory of Probability and its Applications* 10, 186–190.

Pagan, A. and A. Ullah (1999), *Nonparametric Econometrics*, Cambridge: Cambridge University Press.

Watson, G. (1964), Smooth regression analysis, *Sankhya Series A* 26, 359–372.

Wheelock, D. C. and P. W. Wilson (2001), New evidence on returns to scale and product mix among U.S. commercial banks, *Journal of Monetary Economics* 47, 653–674.

— (2011), Are credit unions too small?, *Review of Economics and Statistics* 93, 1343–1359.

— (2012), Do large banks have lower costs? new estimates of returns to scale for U.S. banks, *Journal of Money, Credit, and Banking* 44, 171–199.

White, H. (1980), A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity, *Econometrica* 48, 817–838.

Wilson, P. W. and K. Carey (2004), Nonparametric analysis of returns to scale and product mix among US hospitals, *Journal of Applied Econometrics* 19, 505–524.