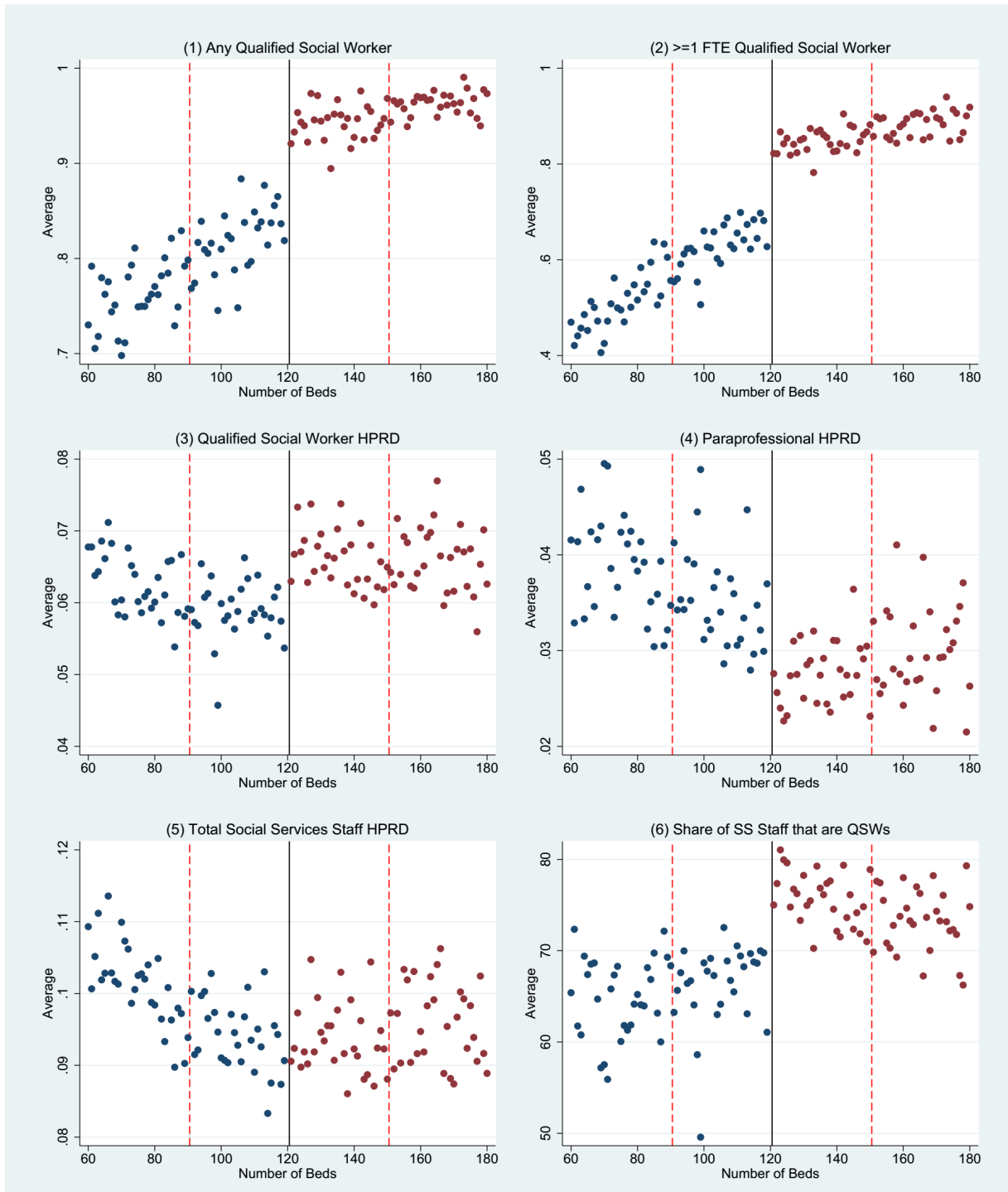


**Occupational Licensing of Social Services and Nursing Home Quality:
A Regression Discontinuity Approach**

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Supplemental Online Appendix

Figure A.1. Discontinuities in Social Worker Staffing: Raw Data



Notes: Each dot represents the average value of the dependent variable for facilities with a specific number of beds. Dashed vertical lines illustrate the maximum bandwidth used in main specifications. FTE, full-time equivalent; HPRD, hours per resident day; QSW, qualified social worker; SS, social services.

Table A.1. Effect of OBRA 1987 Staffing Provision on Other Inputs and Occupancy

<i>Variables</i>	(1) <i>Housekeeping HPRD</i>	(2) <i>Dieticians and food service workers HPRD</i>	(3) <i>Mental health staff HPRD</i>	(4) <i>Facility has special care unit other than for dementia</i>	(5) <i>Facility occupancy rate</i>	(6) <i>Facility occupancy rate: including 120-bed facilities</i>
Panel A: Bandwidth of 10 beds						
121+ Bed facility	-0.0198 (0.0275)	-0.0230 (0.0314)	-0.00331 (0.00416)	-0.0127 (0.0140)	2.734** (0.959)	0.425 (0.649)
Observations	24,128	24,128	24,128	24,128	24,037	43,401
Panel B: Bandwidth of 20 beds						
121+ Bed facility	-0.0185 (0.0209)	0.00149 (0.0202)	-0.00256 (0.00263)	-0.00368 (0.00824)	2.200*** (0.586)	0.822 (0.589)
Observations	48,134	48,134	48,134	48,134	47,945	67,304
Panel C: Bandwidth of 30 beds						
121+ Bed facility	-0.00561 (0.0163)	0.0101 (0.0167)	-0.00239 (0.00228)	-0.00216 (0.00665)	1.539*** (0.511)	0.428 (0.546)
Observations	81,188	81,188	81,188	81,188	80,879	100,238

Notes: Estimates are based on local linear regression as described in the Empirical Framework section. All regressions include state and year fixed effects. Additional controls in all regressions are ADL index score, % of patients with dementia or Alzheimer's, % with intellectual disabilities, % Medicare paid, % Medicaid paid, RN HPRD, RN/LPN/CNA Total HPRD, and indicators for whether the facility is government-owned, for-profit, part of a chain, part of a continuing care retirement community, and whether the facility has a dementia special care unit. 120-bed facilities are excluded unless otherwise specified (column (6)). Standard errors (in parentheses) are clustered at the level of the running variable, facility size. ADL, activities for daily living; HPRD, hours per resident day; OBRA, Omnibus Budget Reconciliation Act; RN, registered nurse; LPN, licensed practical nurse; CNA, certified nurse aide.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A.2. Broad Categorization of Nursing Home Regulations and Corresponding Deficiencies

<i>Regulation number</i>	<i>Regulation</i>	<i>Corresponding F-tags</i>	<i>Broad categorization</i>
§483.10	Resident rights	F150–F177	Quality of life
§483.12	Admission, transfer, and discharge rights	F201–F208	Quality of life
§483.13	Resident behavior and facility practices	F221–F226	Quality of life
§483.15	Quality of life	F240–F258	Quality of life
§483.20	Resident assessment	F271–F287	Quality of care
§483.25	Quality of care	F309–F334	Quality of care
§483.30	Nursing services	F353–F356	Quality of care
§483.35	Dietary services	F360–F373	Quality of care
§483.40	Physician services	F385–F390	Quality of care
§483.45	Specialized rehabilitative services	F406–F407	Quality of care
§483.55	Dental services	F411–F412	Quality of care
§483.60	Pharmacy services	F425–F431	Quality of care
§483.65	Infection control	F441–F445	Quality of care
§483.70	Physical environment	F454–F469	Quality of life
§483.75	Administration	F490–F524	Administration

Notes: As of 2016, the Interpretive Guidelines of the *States Operations Manual* identifies 15 regulatory areas that may result in a deficiency citation. Each deficiency citation is identified by a corresponding F-tag (CMS 2016a). These 15 regulatory areas can be broadly classified as related to quality of life, quality of care, and other areas (Harrington et al. 2000). Although the area each regulation addresses has not changed over the study period, the corresponding F-tags and how they are interpreted have changed from 1998 to 2016. The F-tags reported correspond to those codified at the start of 2016.

Table A.3. CMS Nursing Home Severity and Scope of Deficiencies: Point Weightings

<i>Severity</i>	<i>Scope</i>		
	<i>Isolated</i>	<i>Pattern</i>	<i>Widespread</i>
Immediate jeopardy to resident health or safety	J 50/75 points	K 100/125 points	L 150/175 points
Actual harm that is not immediate jeopardy	G 20 points	H 35/40 points	I 45/50 points
No actual harm with potential for more than minimal harm that is not immediate jeopardy	D 4 points	E 8 points	F 16/20 points
No actual harm with potential for minimal harm	A 0 points	B 0 points	C 0 points

Source: Centers for Medicare and Medicaid Services (2016b).

Notes: Each deficiency is assigned a severity and scope that results in a corresponding letter assignment. This letter assignment corresponds to a number of points used by CMS to determine the number of stars a nursing home (or skilled nursing facility) receives on the Nursing Home Compare website. For severity and scope combinations with two points, the higher point weighting is utilized if the deficiency falls under one of the following regulations: §483.13 resident behavior and nursing home practices, §483.15 quality of life, or §483.25 quality of care. All other deficiencies are weighted by the lower point amount.

Table A.4. The Effect of OBRA 1987 Staffing Provision on Deficiency Scores

<i>Variables</i>	(1) <i>Total deficiency points</i>	(2) <i>Quality of life deficiency points</i>	(3) <i>Provision of social services (F250) deficiency points</i>	(4) <i>Provision of social services (F250) deficiency</i>	(5) <i>QSW staffing at 121+ beds (F251) deficiency points</i>	(6) <i>QSW staffing at 121+ beds (F251) deficiency</i>
Panel A: Bandwidth of 10 beds						
121+ Bed facility	-1.123 (1.865)	0.264 (0.710)	0.0221 (0.0700)	0.00812** (0.00344)	0.0163** (0.00632)	0.00555*** (0.000661)
Observations	23,723	23,723	23,723	23,723	23,723	23,723
Panel B: Bandwidth of 20 beds						
121+ Bed facility	-0.0493 (1.078)	-0.0720 (0.383)	0.0443 (0.0473)	0.00510 (0.00313)	0.0207*** (0.00539)	0.00574*** (0.000607)
Observations	47,197	47,197	47,197	47,197	47,197	47,197
Panel C: Bandwidth of 30 beds						
121+ Bed facility	-1.095 (0.909)	-0.424 (0.367)	0.0340 (0.0347)	0.00664** (0.00287)	0.0194*** (0.00454)	0.00482*** (0.000599)
Observations	79,581	79,581	79,581	79,581	79,581	79,581

Notes: Estimates are based on local linear regression as described in the Empirical Framework section. All regressions include state and year fixed effects. Additional controls in all regressions are ADL index score, % of patients with dementia or Alzheimer's, % with intellectual disabilities, % Medicare paid, % Medicaid paid, RN HPRD, RN/LPN/CNA Total HPRD, and indicators for whether the facility is government-owned, for-profit, part of a chain, part of a continuing care retirement community, and whether the facility has a dementia special care unit. Standard errors (in parentheses) are clustered at the level of the running variable, facility size. ADL, activities for daily living; HPRD, hours per resident day; OBRA, Omnibus Budget Reconciliation Act; QSW, qualified social worker; RN, registered nurse; LPN, licensed practical nurse; CNA, certified nurse aide.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A.5. IV Estimates of the Impact of the Substitution toward QSWs on Deficiency Scores: No Additional Controls

<i>Variables</i>	(1)	(2)	(3)	(4)	(5)	(6)
	<i>Total deficiency points</i>	<i>Quality of life deficiency points</i>	<i>Provision of social services (F250) deficiency points</i>	<i>Provision of social services (F250) deficiency</i>	<i>QSW staffing at 121+ beds (F251) deficiency points</i>	<i>QSW staffing at 121+ beds (F251) deficiency</i>
Panel A: Bandwidth of 10 beds						
Share QSWs (0–100)	–0.211 (0.364)	0.000483 (0.108)	0.00192 (0.0106)	0.000901 (0.000876)	0.00190* (0.000994)	0.000698*** (0.000259)
Observations	23,723	23,723	23,723	23,723	23,723	23,723
Panel B: Bandwidth of 20 beds						
Share QSWs (0–100)	0.0263 (0.165)	–0.0112 (0.0551)	0.00653 (0.00759)	0.000757 (0.000464)	0.00296*** (0.000775)	0.000827*** (0.000148)
Observations	47,197	47,197	47,197	47,197	47,197	47,197
Panel C: Bandwidth of 30 beds						
Share QSWs (0–100)	–0.191 (0.152)	–0.0760 (0.0562)	0.00509 (0.00586)	0.00101** (0.000506)	0.00300*** (0.000719)	0.000749*** (0.000125)
Observations	79,581	79,581	79,581	79,581	79,581	79,581

Notes: Estimates are based on local linear regression as described in the Empirical Framework section. The first-stage F -statistic for the bandwidths of 10, 20, and 30 beds are 12.2, 31.9, and 43.9, respectively. All regressions include state and year fixed effects. Standard errors (in parentheses) are clustered at the level of the running variable, facility size. IV, instrumental variables; QSW, qualified social worker.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A.6. IV Estimates of the Impact of the Substitution toward QSWs on Deficiency Scores: Including 120-Bed Facilities

<i>Variables</i>	(1) <i>Total deficiency points</i>	(2) <i>Quality of life deficiency points</i>	(3) <i>Provision of social services (F250) deficiency points</i>	(4) <i>Provision of social services (F250) deficiency</i>	(5) <i>QSW staffing at 121+ beds (F251) deficiency points</i>	(6) <i>QSW staffing at 121+ beds (F251) deficiency</i>
Panel A: Bandwidth of 10 beds						
Share QSWs (0–100)	0.111 (0.321)	–0.0373 (0.0921)	0.00890 (0.00779)	0.000842 (0.000837)	0.00254* (0.00140)	0.000902*** (0.000324)
Observations	42,832	42,832	42,832	42,832	42,832	42,832
Panel B: Bandwidth of 20 beds						
Share QSWs (0–100)	0.107 (0.123)	–0.0453 (0.0377)	0.00658 (0.00493)	0.000604* (0.000312)	0.00347*** (0.000945)	0.000951*** (0.000120)
Observations	66,306	66,306	66,306	66,306	66,306	66,306
Panel C: Bandwidth of 30 beds						
Share QSWs (0–100)	–0.0417 (0.116)	–0.0512 (0.0375)	0.00606 (0.00421)	0.000844*** (0.000326)	0.00332*** (0.000781)	0.000816*** (0.000109)
Observations	98,690	98,690	98,690	98,690	98,690	98,690

Notes: Estimates are based on local linear regression as described in the Empirical Framework section. The first-stage F -statistic for the bandwidths of 10, 20, and 30 beds are 16.2, 65.6, and 91.4, respectively. All regressions include state and year fixed effects. Additional controls in all regressions are ADL index score, % of patients with dementia or Alzheimer's, % with intellectual disabilities, % Medicare paid, % Medicaid paid, RN HPRD, RN/LPN/CNA Total HPRD, and indicators for whether the facility is government-owned, for-profit, part of a chain, part of a continuing care retirement community, and whether the facility has a dementia special care unit. Standard errors (in parentheses) are clustered at the level of the running variable, facility size. ADL, activities for daily living; HPRD, hours per resident day; IV, instrumental variables; QSW, qualified social worker; RN, registered nurse; LPN, licensed practical nurse; CNA, certified nurse aide.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A.7. IV Estimates of the Impact of the Substitution toward QSWs on Deficiency Scores: With State-Specific Linear Time Trends

<i>Variables</i>	(1) <i>Total deficiency points</i>	(2) <i>Quality of life deficiency points</i>	(3) <i>Provision of social services (F250) deficiency points</i>	(4) <i>Provision of social services (F250) deficiency</i>	(5) <i>QSW staffing at 121+ beds (F251) deficiency points</i>	(6) <i>QSW staffing at 121+ beds (F251) deficiency</i>
Panel A: Bandwidth of 10 beds						
Share QSWs (0-100)	-0.143 (0.351)	0.0168 (0.104)	0.00240 (0.0107)	0.000854 (0.000863)	0.00215** (0.00109)	0.000734*** (0.000268)
Observations	23,723	23,723	23,723	23,723	23,723	23,723
Panel B: Bandwidth of 20 beds						
Share QSWs (0-100)	-0.0440 (0.159)	-0.0266 (0.0589)	0.00632 (0.00765)	0.000732 (0.000501)	0.00306*** (0.000758)	0.000840*** (0.000138)
Observations	47,197	47,197	47,197	47,197	47,197	47,197
Panel C: Bandwidth of 30 beds						
Share QSWs (0-100)	-0.185 (0.142)	-0.0739 (0.0572)	0.00472 (0.00596)	0.000974* (0.000514)	0.00301*** (0.000718)	0.000746*** (0.000120)
Observations	79,581	79,581	79,581	79,581	79,581	79,581

Notes: Estimates are based on local linear regression as described in the Empirical Framework section. The first-stage F -statistic for the bandwidths of 10, 20, and 30 beds are 12.5, 36.7, and 48.5, respectively. All regressions include state and year fixed effects and state-specific linear time trends. Additional controls in all regressions are ADL index score, % of patients with dementia or Alzheimer's, % with intellectual disabilities, % Medicare paid, % Medicaid paid, RN HPRD, RN/LPN/CNA Total HPRD, and indicators for whether the facility is government-owned, for-profit, part of a chain, part of a continuing care retirement community, and whether the facility has a dementia special care unit. Standard errors (in parentheses) are clustered at the level of the running variable, facility size. ADL, activities for daily living; HPRD, hours per resident day; IV, instrumental variables; QSW, qualified social worker; RN, registered nurse; LPN, licensed practical nurse; CNA, certified nurse aide.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A.8. IV Estimates of the Impact of the Substitution toward QSWs on Deficiency Scores: States with License Requirements

<i>Variables</i>	(1) <i>Total deficiency points</i>	(2) <i>Quality of life deficiency points</i>	(3) <i>Provision of social services (F250) deficiency points</i>	(4) <i>Provision of social services (F250) deficiency</i>	(5) <i>QSW staffing at 121+ beds (F251) deficiency points</i>	(6) <i>QSW staffing at 121+ beds (F251) deficiency</i>
Panel A: Bandwidth of 10 beds						
Share QSWs (0–100)	–0.206 (0.641)	0.122 (0.196)	0.0266* (0.0158)	0.00213 (0.00174)	0.00417 (0.00299)	0.00128* (0.000749)
Observations	9,937	9,937	9,937	9,937	9,937	9,937
Panel B: Bandwidth of 20 beds						
Share QSWs (0–100)	–0.110 (0.510)	–0.00108 (0.173)	0.0203* (0.0113)	0.00151 (0.00154)	0.00683** (0.00275)	0.00202*** (0.000558)
Observations	19,934	19,934	19,934	19,934	19,934	19,934
Panel C: Bandwidth of 30 beds						
Share QSWs (0–100)	–0.285 (0.383)	–0.0885 (0.136)	0.00877 (0.00826)	0.000901 (0.00111)	0.00580*** (0.00195)	0.00152*** (0.000356)
Observations	37,118	37,118	37,118	37,118	37,118	37,118

Notes: Estimates are based on local linear regression as described in the Empirical Framework section. The first-stage F -statistic for the bandwidths of 10, 20, and 30 beds are 4.3, 15.0, and 22.5, respectively. Sample is limited to observations in states that require QSWs to be licensed. All regressions include state and year fixed effects. Additional controls in all regressions are ADL index score, % of patients with dementia or Alzheimer's, % with intellectual disabilities, % Medicare paid, % Medicaid paid, RN HPRD, RN/LPN/CNA Total HPRD, and indicators for whether the facility is government-owned, for-profit, part of a chain, part of a continuing care retirement community, and whether the facility has a dementia special care unit. Standard errors (in parentheses) are clustered at the level of the running variable, facility size. ADL, activities for daily living; HPRD, hours per resident day; IV, instrumental variables; QSW, qualified social worker; RN, registered nurse; LPN, licensed practical nurse; CNA, certified nurse aide. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A.9. IV Estimates of the Impact of the Substitution toward QSWs on Deficiency Scores: States without License Requirements

<i>Variables</i>	(1) <i>Total deficiency points</i>	(2) <i>Quality of life deficiency points</i>	(3) <i>Provision of social services (F250) deficiency points</i>	(4) <i>Provision of social services (F250) deficiency</i>	(5) <i>QSW staffing at 121+ beds (F251) deficiency points</i>	(6) <i>QSW staffing at 121+ beds (F251) deficiency</i>
Panel A: Bandwidth of 10 beds						
Share QSWs (0–100)	–0.137 (0.428)	–0.0248 (0.131)	–0.0116 (0.0170)	0.000421 (0.00104)	0.00103 (0.000717)	0.000436** (0.000205)
Observations	13,786	13,786	13,786	13,786	13,786	13,786
Panel B: Bandwidth of 20 beds						
Share QSWs (0–100)	0.0292 (0.198)	–0.0136 (0.0579)	0.00129 (0.0102)	0.000425 (0.000435)	0.00167** (0.000821)	0.000417*** (0.000130)
Observations	27,263	27,263	27,263	27,263	27,263	27,263
Panel C: Bandwidth of 30 beds						
Share QSWs (0–100)	–0.101 (0.166)	–0.0549 (0.0544)	0.00367 (0.00889)	0.00123** (0.000573)	0.00178* (0.000936)	0.000410*** (0.000138)
Observations	42,463	42,463	42,463	42,463	42,463	42,463

Notes: Estimates are based on local linear regression as described in the Empirical Framework section. The first-stage F -statistic for the bandwidths of 10, 20, and 30 beds are 7.9, 19.5, and 20.4, respectively. Sample is limited to observations in states that do not require QSWs to be licensed. All regressions include state and year fixed effects. Additional controls in all regressions are ADL index score, % of patients with dementia or Alzheimer's, % with intellectual disabilities, % Medicare paid, % Medicaid paid, RN HPRD, RN/LPN/CNA Total HPRD, and indicators for whether the facility is government-owned, for-profit, part of a chain, part of a continuing care retirement community, and whether the facility has a dementia special care unit. Standard errors (in parentheses) are clustered at the level of the running variable, facility size. ADL, activities for daily living; HPRD, hours per resident day; IV, instrumental variables; QSW, qualified social worker; RN, registered nurse; LPN, licensed practical nurse; CNA, certified nurse aide. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.