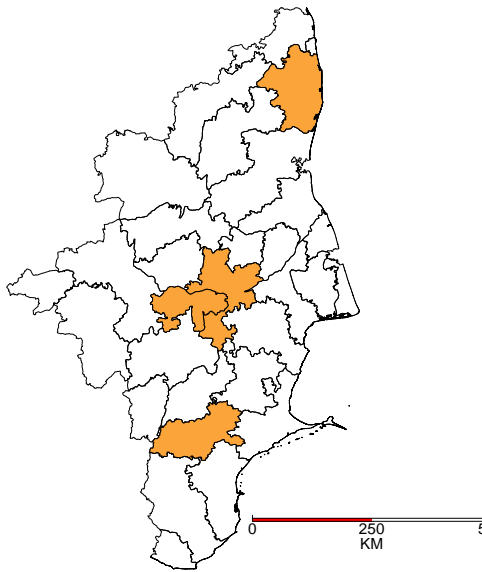


# A Online Appendix for “COVID-19 Learning loss and recovery: Panel data evidence from India” by Singh, Romero, and Muralidharan

## A.1 Additional tables and figures

Figure A.1: Map of sample districts in Tamil Nadu



*Note:* This figure shows the four sample districts included in the data collection.

Table A.1: Comparing the Baseline sample to National Family Health Survey (NFHS-V) - Household characteristics

	(1) NFHS-V sample	(2) Baseline sample	(3) Difference
<b>Panel A: Assets</b>			
Internet	0.59 (0.49)	0.47 (0.50)	-0.12*** (0.02)
Washing machine	0.14 (0.35)	0.09 (0.29)	-0.05*** (0.02)
Fridge	0.55 (0.50)	0.47 (0.50)	-0.08*** (0.02)
Computer	0.10 (0.30)	0.07 (0.26)	-0.03*** (0.01)
Television	0.94 (0.24)	0.93 (0.26)	-0.01** (0.01)
Fan	0.97 (0.16)	0.97 (0.17)	-0.00 (0.01)
Electricity	0.99 (0.08)	0.94 (0.24)	-0.06*** (0.01)
Car	0.05 (0.21)	0.05 (0.21)	0.00 (0.01)
Tractor	0.02 (0.14)	0.02 (0.15)	0.00 (0.00)
Bike	0.77 (0.42)	0.74 (0.44)	-0.03** (0.01)
Bicycle	0.46 (0.50)	0.35 (0.48)	-0.11*** (0.02)
N. of Obs.	3,419	18,457	
<b>Panel B: Other characteristics</b>			
Number of children (2-7 yrs old)	1.36 (0.56)	1.36 (0.54)	-0.00 (0.01)
Scheduled caste	0.36 (0.48)	0.33 (0.47)	-0.04* (0.02)
Owns land	0.30 (0.46)	0.23 (0.42)	-0.07*** (0.02)
N. of Obs.	3,419	18,457	
<b>Panel C: Parental education</b>			
Mother education: at least some primary	0.96 (0.20)	0.96 (0.20)	-0.00 (0.00)
Mother education: at least some secondary	0.87 (0.33)	0.93 (0.25)	0.06*** (0.01)
N. of Obs.	3,399	16,932	

Notes: This table presents the mean and the standard deviation (in parenthesis) for households in Tamil Nadu with children between 2-7 years old in the NFHS-V survey (Column 1) and households in our baseline sample (Column 2). Column 3 has the difference in means, and whether this difference is significant (clustering standard errors at the sampling cluster level for NFHS-V and at the village level in our sample). Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

Table A.2: Comparing attriters to non-attriters

	(1) Surveyed at follow-up	(2) Attrited	(3) Difference (overall)	(4) Difference (village FE)
Male	0.51 (0.50) [5,267]	0.50 (0.50) [19,152]	-0.00 (0.01) [24,419]	-0.00 (0.01) [24,419]
Mother Edu: < Gr. 9	0.32 (0.47) [5,267]	0.35 (0.48) [19,152]	0.03** (0.01) [24,419]	0.00 (0.01) [24,419]
Mother Edu: Gr. 9-11	0.31 (0.46) [5,267]	0.32 (0.47) [19,152]	0.01 (0.01) [24,419]	0.02** (0.01) [24,419]
Mother Edu: Gr. 12+	0.37 (0.48) [5,267]	0.33 (0.47) [19,152]	-0.04** (0.02) [24,419]	-0.03** (0.01) [24,419]
SES Decile	5.07 (3.00) [5,267]	4.96 (2.84) [19,152]	-0.11 (0.10) [24,419]	0.10 (0.07) [24,419]
Math (2019)	-0.01 (1.16) [5,267]	0.00 (1.09) [19,152]	0.01 (0.02) [24,419]	0.06*** (0.02) [24,419]
Tamil (2019)	-0.01 (0.67) [5,267]	0.00 (0.64) [19,152]	0.01 (0.01) [24,419]	0.03** (0.01) [24,419]
Age at baseline (months)	56.99 (20.08) [5,267]	55.82 (19.46) [19,152]	-1.17*** (0.35) [24,419]	-1.52*** (0.35) [24,419]

*Notes:* This table presents the mean and the standard deviation (in parenthesis) for children who were resurveyed from the baseline (Column 1) and those that were lost to attrition (Column 2). The number of observations appears in square brackets. Column 3 has the difference in means, as well as the standard error, clustered at the village level, of the difference (in parenthesis). Column 4 has the difference in means within village (i.e., after taking into account village fixed effects), as well as the standard error, clustered at the village level, of the difference (in parenthesis). Math and Tamil (2019) baseline scores correspond to the residuals after regressing the original scores on age brackets (in discrete years) and the age in months. The p-value of the joint F-statistic across variables is 0.002 without village fixed effects and < 0.001 with village fixed effects. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

Table A.3: Learning loss with age fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Math score (in SD)					Tamil score (in SD)				
Dec 21	-.65*** (.031)	-.66*** (.038)	-.68*** (.043)	-.68*** (.05)		-.31*** (.021)	-.3*** (.023)	-.33*** (.027)	-.34*** (.03)	
Male × Dec 21		.013 (.041)					-.013 (.022)			
Mother Edu: Gr. 9-11 × Dec 21			.0026 (.051)					-.0078 (.029)		
Mother Edu: Gr. 12+ × Dec 21			.08 (.049)					.054** (.025)		
SES Decile × Dec 21				.0052 (.0075)					.0064 (.004)	
4-5 years × Dec 21					-.41*** (.069)					-.18*** (.039)
5-6 years × Dec 21					-.6*** (.043)					-.22*** (.028)
6-7 years × Dec 21					-.71*** (.045)					-.36*** (.026)
7-8 years × Dec 21					-.76*** (.048)					-.43*** (.031)
N. of obs.	13,083	13,083	13,083	13,083	13,083	13,083	13,083	13,083	13,083	13,083
R-squared	.32	.32	.32	.32	.33	.3	.3	.3	.3	.3

*Notes:* This table presents estimates of learning loss following Equation 1, but with age fixed effects. The estimation sample is restricted to individuals tested in Aug 2019 (Wave 0) or December 2021 (Wave 1) who were aged between 55–95 months at the time of the test. All regressions include village and age (in years) fixed effects and control for gender, maternal education, and SES percentile. Test scores are normalized for age 60–72 months in 2019. Test scores are normalized for age 60–72 months in 2019. Standard errors are clustered at the village level. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

Table A.4: Recovery with age fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Math score (in SD)					Tamil score (in SD)				
Feb 22	.24***	.27***	.24***	.27***		.12***	.11***	.13***	.15***	
	(.043)	(.048)	(.057)	(.06)		(.024)	(.026)	(.031)	(.03)	
Apr 22	.47***	.49***	.5***	.55***		.19***	.19***	.21***	.23***	
	(.026)	(.031)	(.037)	(.042)		(.014)	(.016)	(.02)	(.02)	
<i>Interactions:</i>										
Male × Feb 22		-.052					.027			
		(.045)					(.023)			
Male × Apr 22		-.036					-.0024			
		(.033)					(.017)			
Mother Edu: Gr. 9-11 × Feb 22			.021					-.00033		
			(.056)					(.029)		
Mother Edu: Gr. 9-11 × Apr 22			.053					.016		
			(.045)					(.024)		
Mother Edu: Gr. 12+ × Feb 22			-.018					-.025		
			(.059)					(.03)		
Mother Edu: Gr. 12+ × Apr 22			-.15***					-.068***		
			(.042)					(.024)		
SES Decile × Feb 22				-.0055					-.0047	
				(.0086)					(.0042)	
SES Decile × Apr 22				-.017**					-.0083**	
				(.0068)					(.0034)	
4-5 years × Feb 22					.23***					.12**
					(.083)					(.048)
5-6 years × Feb 22					.23***					.097***
					(.062)					(.033)
6-7 years × Feb 22					.23***					.13***
					(.062)					(.033)
7-8 years × Feb 22					.29***					.15***
					(.054)					(.031)
8-9 years × Feb 22					.2***					.098***
					(.062)					(.034)
9-10 years × Feb 22					.23***					.13***
					(.073)					(.042)
10-11 years × Feb 22					.41***					.23***
					(.13)					(.071)
4-5 years × Apr 22					.36***					.21***
					(.063)					(.036)
5-6 years × Apr 22					.39***					.13***
					(.041)					(.022)
6-7 years × Apr 22					.47***					.2***
					(.04)					(.022)
7-8 years × Apr 22					.51***					.21***
					(.042)					(.023)
8-9 years × Apr 22					.53***					.21***
					(.046)					(.026)
9-10 years × Apr 22					.43***					.18***
					(.055)					(.028)
10-11 years × Apr 22					.67***					.33***
					(.091)					(.058)
N. of obs.	18,978	18,978	18,978	18,978	18,978	18,978	18,978	18,978	18,978	18,978
R-squared	.41	.41	.41	.41	.41	.45	.45	.46	.45	.46

*Notes:* This table presents estimates of the rate of recovery via regressions by comparing test scores in wave 1, 2 and 3. The estimation sample is restricted to individuals who were aged between 55–131 months at the time of the survey and tested in December 2021 (Wave 1), February 2022 (Wave 2), or April 2022 (Wave 3). All regressions include village and age (in years) fixed effects and control for test scores in 2019, gender, maternal education, and SES percentile. Test scores are normalized for age 60–72 months in 2019. Standard errors are clustered at the village level. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

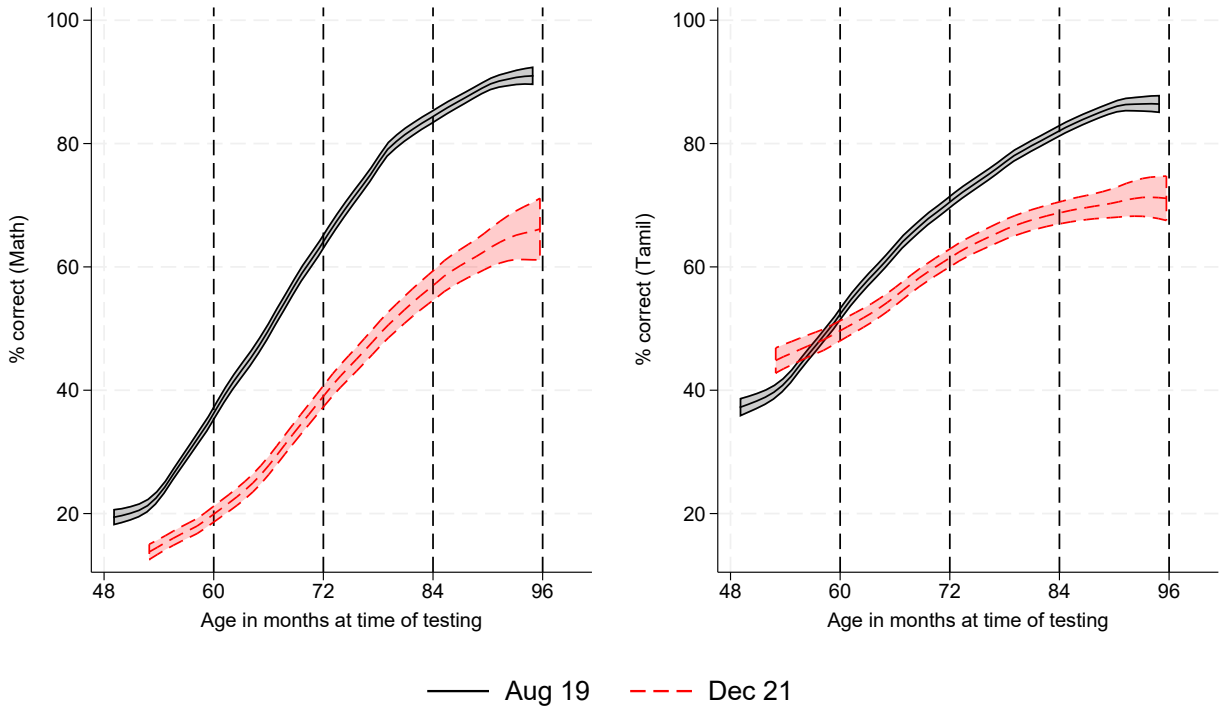
Table A.5: Learning loss and recovery restricting the sample to children 55–95 months old at the time of the survey

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Panel A: Learning loss in regression form</b>								
	Math score (in SD)				Tamil score (in SD)			
Wave 1 (Dec 2021)	-.73***	-.74***	-.76***	-.75***	-.35***	-.35***	-.37***	-.38***
	(.031)	(.038)	(.042)	(.049)	(.02)	(.023)	(.027)	(.029)
Male × Dec 21		.023				-.0074		
		(.041)				(.022)		
Mother Edu: Gr. 9-11 × Dec 21			.019				.0015	
			(.053)				(.03)	
Mother Edu: Gr. 12+ × Dec 21			.09*				.06**	
			(.049)				(.025)	
SES Decile × Dec 21				.0046				.0061
				(.0075)				(.0039)
N. of obs.	13,083	13,083	13,083	13,083	13,083	13,083	13,083	13,083
R-squared	.33	.33	.33	.33	.31	.31	.31	.31
<b>Panel B: Recovery in regression form</b>								
	Math score (in SD)				Tamil score (in SD)			
Wave 2 (Feb 2022)	.25***	.28***	.22***	.26***	.13***	.12***	.15***	.18***
	(.043)	(.052)	(.064)	(.066)	(.024)	(.028)	(.034)	(.032)
Wave 3 (April 2022)	.44***	.49***	.47***	.51***	.18***	.19***	.21***	.22***
	(.027)	(.035)	(.042)	(.046)	(.014)	(.018)	(.021)	(.022)
<i>Interactions:</i>								
Male × Feb 22		-.064				.023		
		(.055)				(.027)		
Male × Apr 22		-.081*				-.018		
		(.043)				(.021)		
Mother Edu: Gr. 9-11 × Feb 22			.078				-.0031	
			(.069)				(.038)	
Mother Edu: Gr. 9-11 × Apr 22			.082				.016	
			(.057)				(.03)	
Mother Edu: Gr. 12+ × Feb 22			.011				-.055	
			(.069)				(.037)	
Mother Edu: Gr. 12+ × Apr 22			-.14***				-.076**	
			(.052)				(.029)	
SES Decile × Feb 22				-.00092				-.0096*
				(.0096)				(.0049)
SES Decile × Apr 22				-.013				-.0079*
				(.0081)				(.0041)
N. of obs.	11,971	11,971	11,971	11,971	11,971	11,971	11,971	11,971
R-squared	.35	.35	.35	.35	.32	.32	.32	.32

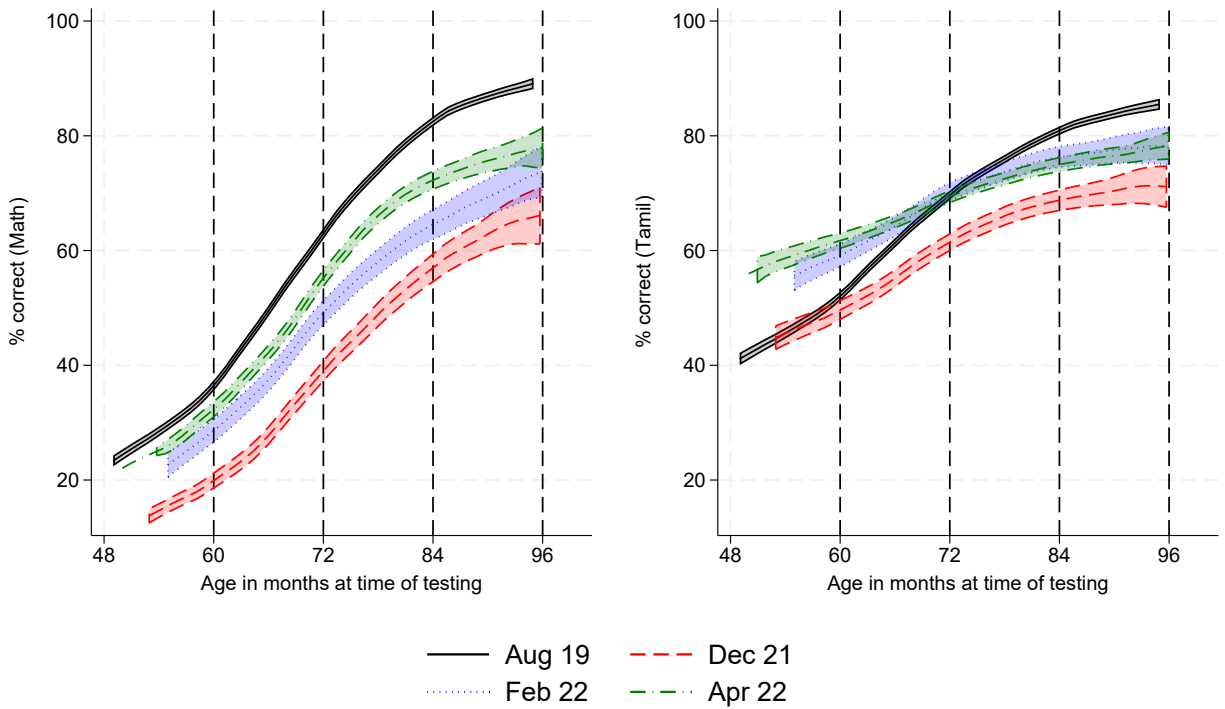
*Notes:* Panel A estimates the learning loss following Equation 1, but with age fixed effects. The estimation sample is restricted to individuals tested in Aug 2019 (Wave 0) or December 2021 (Wave 1) who were aged between 55–95 months at the time of the test. All regressions include village and age (in years) fixed effects and control for gender, maternal education, and SES percentile. Test scores are normalized for age 60–72 months in 2019. Panel B estimates the rate of recovery via regressions by comparing test scores in wave 1, 2 and 3. The estimation sample is restricted to individuals who were aged between 55–95 months at the time of the survey and tested in December 2021 (Wave 1), February 2022 (Wave 2), or April 2022 (Wave 3). All regressions include village and age (in years) fixed effects and control for gender, maternal education, and SES percentile. Panel B also controls for test scores in 2019. Test scores are normalized for age 60–72 months in 2019. Standard errors are clustered at the village level. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

Figure A.2: Learning loss and recovery in test scores across survey waves: % of correct answers

(a) Learning loss in December 2021



(b) Recovery between December 2021 and May 2022



Note: These figures present local polynomial regressions with respect to age at the time of test-taking across the four survey waves in the data. At any age, the decline in scores from Aug 2019 to Dec 2021 measures learning loss. The shift from December 2021 to the two subsequent survey waves measures the degree of recovery for children of a particular age at the time of testing (horizontal axis). The outcome is the percentage of correct answers over the common items across rounds.

Table A.6: Recovery from learning loss in different domains

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<b>Panel A: Tamil</b>									
	Oral comprehension			Letter identification					
Age (in months)	60	72	84	60	72	84			
% correct (Aug 2019)	52.09	69.82	81.00	43.60	68.77	85.63			
% correct (Dec 2021)	49.64	61.45	68.76	29.83	53.53	70.95			
% correct (Feb 2022)	59.16	70.22	76.32	34.92	57.99	75.55			
% correct (Apr 2022)	61.73	69.39	74.99	35.79	60.73	79.67			
Absolute loss (in percentage points)	-2.44	-8.37	-12.24	-13.77	-15.23	-14.67			
Absolute recovery (in percentage points) by Feb 22	9.51	8.77	7.57	5.08	4.46	4.60			
Absolute recovery (in percentage points) by Apr 22	12.08	7.94	6.23	5.96	7.20	8.71			
<b>Panel B: Math</b>									
	Quantitative comparison			Number identification			Counting		
Age (in months)	60	72	84	60	72	84	60	72	84
% correct (Aug 2019)	67.30	84.24	92.67	31.43	59.38	80.76	50.61	74.70	88.97
% correct (Dec 2021)	61.43	77.39	86.01	13.67	33.44	59.13	44.49	68.78	84.25
% correct (Feb 2022)	68.22	81.50	88.55	22.71	44.90	66.83	54.86	75.13	86.47
% correct (Apr 2022)	73.40	85.33	92.45	24.81	50.34	74.45	61.55	79.82	91.37
Absolute loss (in percentage points)	-5.87	-6.85	-6.66	-17.76	-25.94	-21.63	-6.13	-5.92	-4.71
Absolute recovery (in percentage points) by Feb 22	6.79	4.11	2.54	9.04	11.46	7.70	10.38	6.35	2.22
Absolute recovery (in percentage points) by Apr 22	11.97	7.94	6.43	11.14	16.90	15.32	17.06	11.03	7.12

*Notes:* This table presents, for children of different ages, the raw percentage in wave 1 (Dec 2021), wave 2 (Feb 2022), and wave 3 (Apr 2022), as well as the difference between the wave 2 and 3 with wave 1 (the absolute recovery in percentage points) for competences in language and math that were tested in 2019 and 2021/22. Oral comprehension refers to questions related to a story read to the child. Letter and number identification refers to the ability of children to identify different letters and numbers. We restrict attention to common items that were administered both pre- and post-pandemic.



Table A.7: Difference in resources, inputs and child activities by maternal education

	(1) Primary or less	(2) Incomplete secondary	(3) Grade 12 or more	(4) (3)-(1)	(5) Math value added	(6) Tamil value added
Video classes	0.08 (0.27)	0.12 (0.32)	0.22 (0.41)	0.136*** (0.41)	.2*** (.048)	.081*** (.024)
Audio classes	0.04 (0.20)	0.08 (0.27)	0.12 (0.32)	0.069*** (0.32)	.052 (.057)	.0032 (.031)
In-person classes	0.08 (0.28)	0.08 (0.27)	0.04 (0.21)	-0.039*** (0.21)	.028 (.045)	.0052 (.034)
School sent homework	0.13 (0.33)	0.19 (0.40)	0.27 (0.44)	0.125*** (0.44)	.15*** (.046)	.045** (.019)
HH member teaches child	0.62 (0.48)	0.77 (0.42)	0.83 (0.37)	0.192*** (0.37)	.095** (.038)	.08*** (.019)
Private tutoring	0.17 (0.38)	0.16 (0.37)	0.12 (0.33)	-0.065*** (0.33)	.15*** (.038)	.048** (.02)
Child can access TV	0.78 (0.41)	0.81 (0.39)	0.80 (0.40)	0.002 (0.40)	.097** (.045)	.062*** (.022)
Child can access smartphone	0.50 (0.50)	0.62 (0.48)	0.76 (0.43)	0.248*** (0.43)	.011 (.038)	-.0051 (.021)
Child can access phone internet	0.21 (0.41)	0.28 (0.45)	0.37 (0.48)	0.135*** (0.48)	-.025 (.042)	-.0086 (.02)
Child can access computer	0.01 (0.12)	0.02 (0.13)	0.06 (0.24)	0.052*** (0.24)	.13 (.083)	.039 (.043)
Child can access WiFi	0.00 (0.04)	0.01 (0.07)	0.03 (0.17)	0.029*** (0.17)	.094 (.13)	.0027 (.059)
Used YouTube for edu content	0.28 (0.45)	0.45 (0.50)	0.56 (0.50)	0.246*** (0.50)	.088** (.036)	.056** (.022)
Used Educational TV	0.52 (0.50)	0.55 (0.50)	0.50 (0.50)	-0.047** (0.50)	.11*** (.029)	.064*** (.017)
Used books from school	0.75 (0.43)	0.76 (0.43)	0.77 (0.42)	0.019 (0.42)	.12*** (.045)	.055** (.022)
Used books from home	0.40 (0.49)	0.46 (0.50)	0.52 (0.50)	0.086*** (0.50)	.045 (.033)	.048*** (.017)
Used other internet resources	0.03 (0.17)	0.04 (0.21)	0.07 (0.26)	0.047*** (0.26)	-.065 (.054)	-.0024 (.033)
No. of Obs.	1,782	1,633	1,696	3,478	5,111	5,111

*Notes:* This table presents the mean and the standard deviation (in parenthesis) for children with mothers who have completed primary or less (Column 1), incomplete secondary (Column 2), and completed secondary or more (Column 3). Column 4 presents the difference in means, as well as the standard error, clustered at the village level, of the difference (in parenthesis) between children with mothers with secondary education or more and children with mothers with primary education or less. Column 5 and 6 present the value added of each input on test-scores in Math and Tamil, estimated with a regression that controls for village fixed effects, gender, baseline test scores, parental education, SES, and age. The sample for all the estimations in this table is restricted to wave 1. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

Table A.8: Difference in resources, inputs and child activities by SES tercile

	(1) Tercile 1	(2) Tercile 2	(3) Tercile 3	(4) Tercile 3-Tercile 1 (3)-(1)	(5) Math value added	(6) Tamil value added
Video classes	0.08 (0.26)	0.12 (0.33)	0.22 (0.42)	0.144*** (0.42)	.2*** (.048)	.081*** (.024)
Audio classes	0.05 (0.21)	0.08 (0.27)	0.11 (0.32)	0.059*** (0.32)	.052 (.057)	.0032 (.031)
In-person classes	0.09 (0.28)	0.07 (0.26)	0.05 (0.22)	-0.037*** (0.22)	.028 (.045)	.0052 (.034)
School sent homework	0.13 (0.33)	0.19 (0.39)	0.28 (0.45)	0.129*** (0.45)	.15*** (.046)	.045** (.019)
HH member teaches child	0.69 (0.46)	0.74 (0.44)	0.79 (0.41)	0.090*** (0.41)	.095** (.038)	.08*** (.019)
Private tutoring	0.14 (0.35)	0.15 (0.35)	0.16 (0.37)	0.002 (0.37)	.15*** (.038)	.048** (.02)
Child can access TV	0.76 (0.43)	0.80 (0.40)	0.83 (0.37)	0.051*** (0.37)	.097** (.045)	.062*** (.022)
Child can access smartphone	0.48 (0.50)	0.64 (0.48)	0.77 (0.42)	0.270*** (0.42)	.011 (.038)	-.0051 (.021)
Child can access phone internet	0.20 (0.40)	0.28 (0.45)	0.38 (0.49)	0.147*** (0.49)	-.025 (.042)	-.0086 (.02)
Child can access computer	0.01 (0.11)	0.02 (0.15)	0.06 (0.24)	0.047*** (0.24)	.13 (.083)	.039 (.043)
Child can access WiFi	0.00 (0.07)	0.01 (0.09)	0.03 (0.16)	0.019*** (0.16)	.094 (.13)	.0027 (.059)
Used YouTube for edu content	0.31 (0.46)	0.43 (0.49)	0.56 (0.50)	0.226*** (0.50)	.088** (.036)	.056** (.022)
Used Educational TV	0.51 (0.50)	0.54 (0.50)	0.50 (0.50)	-0.046** (0.50)	.11*** (.029)	.064*** (.017)
Used books from school	0.74 (0.44)	0.75 (0.43)	0.79 (0.41)	0.039** (0.41)	.12*** (.045)	.055** (.022)
Used books from home	0.42 (0.49)	0.46 (0.50)	0.48 (0.50)	0.036** (0.50)	.045 (.033)	.048*** (.017)
Used other internet resources	0.03 (0.17)	0.05 (0.23)	0.06 (0.25)	0.030*** (0.25)	-.065 (.054)	-.0024 (.033)
No. of Obs.	1,792	1,702	1,642	3,434	5,111	5,111

*Notes:* This table presents the mean and the standard deviation (in parenthesis) for children in different terciles of the SES distribution (Columns 1–3). Column 4 presents the difference in means, as well as the standard error, clustered at the village level, of the difference (in parenthesis) between the top and the bottom tercile. Column 5 and 6 presents the value added of each input on test-scores in Math and Tamil, estimated with a regression that controls for village fixed effects, gender, baseline test scores, parental education, SES, and age. The sample for all the estimations in this table is restricted to wave 1. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

Table A.9: Difference in resources, inputs and child activities, by *Illam Thedi Kalvi (ITK)* attendance

	Overall			Public			Private		
	(1) Does not attend ITK	(2) Attend ITK	(3) Difference (village FE)	(4) Does not attend ITK	(5) Attend ITK	(6) Difference (village FE)	(7) Does not attend ITK	(7) Attend ITK	(9) Difference (village FE)
<b>Panel A: Resources for remote instruction</b>									
Video classes	0.23 (0.42)	0.06 (0.24)	-0.15*** (0.01)	0.04 (0.19)	0.04 (0.19)	0.01 (0.01)	0.45 (0.50)	0.20 (0.40)	-0.24*** (0.03)
Audio classes	0.09 (0.29)	0.06 (0.24)	-0.02*** (0.01)	0.04 (0.20)	0.06 (0.23)	0.02 (0.01)	0.16 (0.37)	0.12 (0.33)	-0.03 (0.02)
In-person classes	0.04 (0.19)	0.09 (0.29)	0.06*** (0.01)	0.06 (0.24)	0.10 (0.31)	0.05*** (0.01)	0.02 (0.15)	0.06 (0.23)	0.03*** (0.01)
School sent homework	0.37 (0.48)	0.27 (0.44)	-0.07*** (0.01)	0.26 (0.44)	0.27 (0.44)	0.02 (0.02)	0.58 (0.49)	0.43 (0.49)	-0.12*** (0.03)
HH member teaches child	0.86 (0.34)	0.87 (0.33)	0.01 (0.01)	0.82 (0.38)	0.87 (0.34)	0.03* (0.02)	0.93 (0.26)	0.93 (0.25)	0.02 (0.01)
Private tutoring	0.14 (0.35)	0.10 (0.30)	-0.01 (0.01)	0.13 (0.34)	0.11 (0.31)	-0.01 (0.01)	0.19 (0.39)	0.14 (0.35)	-0.00 (0.02)
N. of Obs.	3,830	5,136	8,966	1,149	3,633	4,781	1,802	795	2,585
<b>Panel B: Compensatory inputs from parents and schools</b>									
<i>Child can access...</i>									
TV	0.92 (0.26)	0.94 (0.24)	0.02*** (0.01)	0.90 (0.30)	0.94 (0.24)	0.05*** (0.01)	0.95 (0.21)	0.96 (0.20)	0.01 (0.01)
Smartphone	0.78 (0.42)	0.71 (0.45)	-0.06*** (0.01)	0.64 (0.48)	0.69 (0.46)	0.03 (0.02)	0.90 (0.30)	0.87 (0.33)	-0.03* (0.02)
Phone internet	0.52 (0.50)	0.48 (0.50)	-0.04*** (0.01)	0.42 (0.49)	0.46 (0.50)	0.03 (0.02)	0.63 (0.48)	0.62 (0.49)	-0.01 (0.02)
Computer	0.03 (0.17)	0.02 (0.14)	-0.01 (0.00)	0.01 (0.11)	0.02 (0.13)	0.01* (0.00)	0.05 (0.21)	0.04 (0.18)	-0.01 (0.01)
WiFi	0.02 (0.14)	0.01 (0.12)	-0.00 (0.00)	0.01 (0.11)	0.01 (0.11)	-0.00 (0.00)	0.03 (0.18)	0.03 (0.18)	0.00 (0.01)
N. of Obs.	3,829	5,136	8,965	1,149	3,633	4,781	1,802	795	2,585
<b>Panel C: Child educational activities</b>									
YouTube for edu content	0.56 (0.50)	0.47 (0.50)	-0.07*** (0.01)	0.41 (0.49)	0.44 (0.50)	0.03 (0.02)	0.71 (0.45)	0.66 (0.48)	-0.05** (0.02)
Educational TV	0.44 (0.50)	0.65 (0.48)	0.22*** (0.01)	0.59 (0.49)	0.70 (0.46)	0.11*** (0.02)	0.42 (0.49)	0.58 (0.49)	0.17*** (0.02)
Books from school	0.86 (0.35)	0.95 (0.22)	0.11*** (0.01)	0.92 (0.26)	0.96 (0.19)	0.04*** (0.01)	0.96 (0.19)	0.97 (0.17)	0.02** (0.01)
Books from home	0.61 (0.49)	0.57 (0.49)	-0.04** (0.01)	0.57 (0.50)	0.56 (0.50)	-0.03 (0.02)	0.65 (0.48)	0.64 (0.48)	0.01 (0.03)
Other internet resources	0.07 (0.25)	0.05 (0.22)	-0.01 (0.01)	0.04 (0.20)	0.05 (0.21)	0.01 (0.01)	0.10 (0.30)	0.10 (0.30)	-0.00 (0.01)
N. of Obs.	3,829	5,136	8,965	1,149	3,633	4,781	1,802	795	2,585

Notes: This table presents the mean and the standard deviation (in parenthesis) for children who do not attend ITK (Columns 1, 4, and 7) and those who attend (Columns 2, 5, and 8). The number of observations appears in square brackets. Columns 3, 6, and 9 have the difference in means within village (i.e., after taking into account village fixed effects), as well as the standard error, clustered at the village level, of the difference (in parenthesis). Columns 1-3 use the full sample, while Columns 4-6 restrict the sample to children enrolled in public schools and Columns 7-9 restrict the sample to children enrolled in private schools. The sample for all the estimations in this table is restricted to wave 3 and to individuals who were aged between 55–131 months at the time of the survey. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

Table A.10: Assessing effect of *Illam Thedi Kalvi (ITK)* with age fixed effects

	Naive	VAM	Augmented		
	(1)	(2)	(3)	(4)	(5)
ITK effect on math test scores	.065**	.17***	.17***	.18***	.16***
	(.027)	(.026)	(.026)	(.026)	(.025)
N. of obs.	8,966	8,902	8,901	8,901	8,901
R-squared	.32	.38	.39	.39	.39
ITK effect on Tamil test scores	.077***	.099***	.095***	.098***	.088***
	(.015)	(.015)	(.015)	(.015)	(.015)
N. of obs.	8,966	8,902	8,901	8,901	8,901
R-squared	.39	.45	.45	.45	.46
Child demographic characteristics	Yes	Yes	Yes	Yes	Yes
Household characteristics	No	Yes	Yes	Yes	Yes
Lagged achievement	No	Yes	Yes	Yes	Yes
Enrollment type	No	Yes	Yes	Yes	Yes
Resources for remote instruction	No	No	Yes	Yes	Yes
Compensatory inputs from parents and schools	No	No	No	Yes	Yes
Child educational activities	No	No	No	No	Yes

*Notes:* The estimation sample is restricted to individuals tested during wave 3 (March-May of 2022) who were aged between 55–131 months at the time of the test. Column 1 has a naive specification that only controls for children’s demographic characteristics (age and gender). Column 2 has the standard value-added model (VAM) specification, which controls for children’s demographic characteristics, for household characteristics (maternal education and SES percentile), for lagged tests scores (in math and Tamil) allowing the effect of the lagged score to vary by age, and for enrollment type (private, public or out of school). Columns 3-5 have augmented specifications that also control for resources during remote instruction, compensatory inputs from parents and schools, and child educational activities. Table A.9 presents mean values for these inputs and Table A.12 presents the full list of estimated coefficients. Panel A presents results for math test scores, while Panel B presents results for Tamil test scores. Standard errors are clustered at the village level. All regressions include village fixed effects. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

Table A.11: Assessing effect of *Illam Thedi Kalvi (ITK)* restricting the sample to children 55–95 at the time of the survey

	Naive	VAM	Augmented		
	(1)	(2)	(3)	(4)	(5)
ITK effect on math test scores	.085***	.18***	.18***	.18***	.17***
	(.031)	(.031)	(.031)	(.031)	(.031)
N. of obs.	5,328	5,284	5,284	5,284	5,284
R-squared	.27	.34	.34	.35	.35
ITK effect on Tamil test scores	.079***	.1***	.099***	.1***	.092***
	(.018)	(.018)	(.018)	(.018)	(.018)
N. of obs.	5,328	5,284	5,284	5,284	5,284
R-squared	.27	.32	.32	.32	.33
Child demographic characteristics	Yes	Yes	Yes	Yes	Yes
Household characteristics	No	Yes	Yes	Yes	Yes
Lagged achievement	No	Yes	Yes	Yes	Yes
Enrollment type	No	Yes	Yes	Yes	Yes
Resources for remote instruction	No	No	Yes	Yes	Yes
Compensatory inputs from parents and schools	No	No	No	Yes	Yes
Child educational activities	No	No	No	No	Yes

*Notes:* The estimation sample is restricted to individuals tested during wave 3 (March-May of 2022) who were aged between 55–95 months at the time of the test. Column 1 has a naive specification that only controls for children’s demographic characteristics (age and gender). Column 2 has the standard value-added model (VAM) specification, which controls for children’s demographic characteristics, for household characteristics (maternal education and SES percentile), for lagged tests scores (in math and Tamil) allowing the effect of the lagged score to vary by age, and for enrollment type (private, public or out of school). Columns 3-5 have augmented specifications that also control for resources during remote instruction, compensatory inputs from parents and schools, and child educational activities. Table A.9 presents mean values for these inputs and Table A.12 presents the full list of estimated coefficients. Panel A presents results for math test scores, while Panel B presents results for Tamil test scores. Standard errors are clustered at the village level. All regressions include village fixed effects. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

Table A.12: Sensitivity of *Illam Thedi Kalvi* estimates to including further inputs

	Math				Tamil			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
If child attends ITK	.17*** (.026)	.16*** (.026)	.17*** (.025)	.16*** (.025)	.093*** (.015)	.09*** (.015)	.092*** (.015)	.083*** (.014)
Age at endline (months)	.018*** (.0012)	.018*** (.0012)	.018*** (.0012)	.017*** (.0012)	.015*** (.00069)	.015*** (.00069)	.014*** (.00068)	.014*** (.00068)
Male	-.12*** (.019)	-.12*** (.019)	-.12*** (.019)	-.11*** (.019)	-.094*** (.011)	-.096*** (.011)	-.095*** (.011)	-.089*** (.011)
Mother Edu: Gr. 9-11	.14*** (.029)	.13*** (.029)	.12*** (.029)	.11*** (.029)	.066*** (.016)	.058*** (.016)	.053*** (.016)	.05*** (.016)
Mother Edu: Gr. 12+	.18*** (.03)	.16*** (.03)	.14*** (.03)	.13*** (.03)	.1*** (.017)	.087*** (.017)	.081*** (.017)	.078*** (.017)
SES Decile	.016*** (.0042)	.01** (.0042)	.008* (.0042)	.0073* (.0041)	.0055** (.0021)	.0029 (.0021)	.0018 (.0021)	.0015 (.0021)
Government school (2021-22)	.59*** (.055)	.6*** (.054)	.58*** (.053)	.49*** (.056)	.31*** (.028)	.31*** (.028)	.3*** (.028)	.24*** (.032)
Private school (2021-22)	.9*** (.058)	.88*** (.058)	.79*** (.058)	.7*** (.061)	.37*** (.032)	.36*** (.032)	.32*** (.032)	.27*** (.036)
<i>Resources for remote instruction:</i>								
TV		.14*** (.042)	.14*** (.041)	.096** (.043)		.062** (.024)	.06** (.024)	.022 (.025)
Smartphone		.17*** (.035)	.14*** (.035)	.11*** (.039)		.088*** (.02)	.078*** (.02)	.062*** (.021)
Phone internet		-.05 (.039)	-.05 (.038)	-.073* (.037)		-.025 (.022)	-.026 (.022)	-.04* (.021)
Computer		.15** (.067)	.13** (.066)	.1 (.066)		.11*** (.036)	.1** (.036)	.082** (.037)
WiFi		.11 (.099)	.11 (.099)	.044 (.096)		.022 (.056)	.019 (.057)	-.029 (.055)
<i>Compensatory inputs from parents and schools:</i>								
Video classes			.21*** (.041)	.2** (.041)			.084*** (.023)	.082*** (.023)
Audio classes			-.046 (.053)	-.064 (.053)			.011 (.028)	-.0042 (.027)
In-person classes			-.011 (.044)	-.021 (.044)			.022 (.022)	.014 (.022)
School sent homework			.055* (.029)	.044 (.029)			.016 (.017)	.009 (.017)
HH member teaches child			.056 (.036)	.037 (.036)			.034* (.018)	.019 (.018)
Private tutoring			.073** (.037)	.064* (.036)			.055*** (.018)	.048*** (.018)
<i>Child educational activities:</i>								
YouTube for edu content				.069** (.03)				.027* (.015)
Educational TV				.071*** (.025)				.072*** (.014)
Books from school				.15*** (.047)				.097*** (.027)
Books from home				.028 (.03)				.03** (.015)
Other internet resources				.16*** (.052)				.1*** (.03)
Constant	-1.9*** (.12)	-2*** (.13)	-2.1*** (.13)	-2.1*** (.13)	-1.1*** (.07)	-1.2*** (.073)	-1.2*** (.074)	-1.2*** (.074)
N. of obs.	8,902	8,901	8,901	8,901	8,902	8,901	8,901	8,901
R-squared	.38	.39	.39	.39	.45	.45	.46	.46

Notes: Standard errors are clustered at the village level. All regressions include village fixed effects and control for lagged tests scores (in math and Tamil) allowing the effect of the lagged score to vary by age. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

Table A.13: Recovery from learning loss by ITK enrollment

	(1)	(2)	(3)	(4)	(5)	(6)
	Math score (in SD)			Tamil score (in SD)		
Wave 3	.46*** (.026)	.49*** (.025)	.38*** (.027)	.19*** (.013)	.2*** (.014)	.15*** (.015)
Wave 3 $\times$ ITK			.21*** (.025)			.1*** (.014)
N. of obs.	15,016	15,016	15,016	15,016	15,016	15,016
R-squared	.41	.44	.44	.47	.49	.49

*Notes:* This table presents estimates of the rate of recovery via regressions by comparing test scores in waves 1 and 3 (without wave 2). The estimation sample is restricted to individuals who were aged between 55–131 months at the time of the survey and tested in December 2021 (Wave 1) or April 2022 (Wave 3). The estimates in Column 1 and 4 are equivalent to those in Columns 1 and 5 of Panel B in Table 3. Columns 2 and 5 add information about the type of schools the child is enrolled in 2022. Columns 3 and 6 add information about whether students were attending ITK by wave 3 (wave 3  $\times$  ITK). The interaction can be interpreted as the additional effect of ITK attendance on the pace of recovery. Note ITK did not exist before Wave 2, so ITK attendance is zero for these observations. While ITK had already begun by Wave 2, we did not collect ITK attendance data at this point, thus excluding these observations from the estimation. Standard errors are clustered at the village level. All regressions include village fixed effects and control for age, gender, maternal education, and SES percentile. Test scores are normalized for age 60–72 months in 2019. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

Table A.14: Sensitivity of *Illam Thedi Kalvi (ITK)* estimates for children enrolled in public schools to omitted variable bias

$R_{max}^2 = \bar{R}^2 + 0.1(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 0.3(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 0.5(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 0.7(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 0.9(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 1(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 1.1(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 1.3(\bar{R}^2 - \hat{R}^2)$	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
<b>Panel A: Math</b>								
$\beta^*$	0.184	0.179	0.174	0.169	0.164	0.161	0.159	0.153
$\hat{\beta}$	0.211	0.211	0.211	0.211	0.211	0.211	0.211	0.211
$\tilde{\beta}$	0.186	0.186	0.186	0.186	0.186	0.186	0.186	0.186
$\hat{R}^2$	0.281	0.281	0.281	0.281	0.281	0.281	0.281	0.281
$\bar{R}^2$	0.327	0.327	0.327	0.327	0.327	0.327	0.327	0.327
<b>Panel B: Tamil</b>								
$\beta^*$	0.107	0.105	0.104	0.102	0.101	0.100	0.099	0.097
$\hat{\beta}$	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115
$\tilde{\beta}$	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108
$\hat{R}^2$	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381
$\bar{R}^2$	0.430	0.430	0.430	0.430	0.430	0.430	0.430	0.430

Notes: This table presents bias-adjusted treatment effects ( $\beta^*$ ), following Oster (2019) using the “robomit” package in R (Schaub, 2020). The estimator of the treatment effect of ITK in a regression without controls (except for village fixed-effects and student’s age) is  $\hat{\beta}$ , and  $\hat{R}^2$  is the R-squared of this regression. The estimator of the treatment effect of ITK in a regression with controls is  $\tilde{\beta}$ , and  $\bar{R}^2$  is the R-squared of this regression. As long as the selection on un-observables is at most as large as the selection on observables (i.e.,  $\delta = 1$  in Oster (2019)) and the  $R^2$  from controlling by un-observables is  $R_{max}^2$ , then the treatment effect is bounded between  $\tilde{\beta}$  and  $\beta^*$ . Different columns vary the value of  $R_{max}^2$ , as a function of the growth in  $R^2$  from adding controls (after including village fixed effects and age). Oster (2019) suggests  $R_{max}^2$  is unlikely to be above a 30% increase over  $\bar{R}^2$ .



Table A.15: Sensitivity of *Illam Thedi Kalvi (ITK)* estimates for children enrolled in private schools to omitted variable bias

$R_{max}^2 = \bar{R}^2 + 0.1(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 0.3(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 0.5(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 0.7(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 0.9(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 1(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 1.1(\bar{R}^2 - \hat{R}^2)$	$\bar{R}^2 + 1.3(\bar{R}^2 - \hat{R}^2)$	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
<b>Panel A: Math</b>								
$\beta^*$	-0.012	-0.006	-0.001	0.005	0.011	0.014	0.017	0.023
$\hat{\beta}$	-0.043	-0.043	-0.043	-0.043	-0.043	-0.043	-0.043	-0.043
$\tilde{\beta}$	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015	-0.015
$\hat{R}^2$	0.331	0.331	0.331	0.331	0.331	0.331	0.331	0.331
$\bar{R}^2$	0.364	0.364	0.364	0.364	0.364	0.364	0.364	0.364
<b>Panel B: Tamil</b>								
$\beta^*$	-0.009	-0.007	-0.004	-0.002	0.000	0.001	0.002	0.005
$\hat{\beta}$	-0.021	-0.021	-0.021	-0.021	-0.021	-0.021	-0.021	-0.021
$\tilde{\beta}$	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
$\hat{R}^2$	0.388	0.388	0.388	0.388	0.388	0.388	0.388	0.388
$\bar{R}^2$	0.412	0.412	0.412	0.412	0.412	0.412	0.412	0.412

Notes: This table presents bias-adjusted treatment effects ( $\beta^*$ ), following Oster (2019) using the “robomit” package in R (Schaub, 2020). The estimator of the treatment effect of ITK in a regression without controls (except for village fixed-effects and student’s age) is  $\hat{\beta}$ , and  $\hat{R}^2$  is the R-squared of this regression. The estimator of the treatment effect of ITK in a regression with controls is  $\tilde{\beta}$ , and  $\bar{R}^2$  is the R-squared of this regression. As long as the selection on un-observables is at most as large as the selection on observables (i.e.,  $\delta = 1$  in Oster (2019)) and the  $R^2$  from controlling by un-observables is  $R_{max}^2$ , then the treatment effect is bounded between  $\tilde{\beta}$  and  $\beta^*$ . Different columns vary the value of  $R_{max}^2$ , as a function of the growth in  $R^2$  from adding controls (after including village fixed effects and age). Oster (2019) suggests  $R_{max}^2$  is unlikely to be above a 30% increase over  $\bar{R}^2$ .

Table A.16: Assessing effect of *Illam Thedi Kalvi* (ITK) in different competencies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Panel A: 4-6 years old</b>							
	Tamil			Math			
	Oral comprehension	Letter identification	Quantitative comparison	Counting	Number identification	Addition	Subtraction
ITK effect	2.9** (1.2)	7.8*** (1.6)	5.7*** (1.1)	6.5*** (1.7)	8.1*** (1.8)	6.8*** (1.8)	7.3*** (1.9)
N. of obs.	3,265	3,438	3,265	3,453	3,438	3,438	3,458
Control mean	68	47	82	74	44	76	63
R-squared	.2	.3	.22	.22	.3	.21	.21
<b>Panel B: 7-9 years old</b>							
	Tamil		Math				
	Letter identification	Matching word to picture	Addition	Subtraction			
ITK effect	3.4*** (1.2)	2.1*** (.8)	3.7*** (1.1)	3.6*** (1.3)			
N. of obs.	4,291	4,726	4,291	4,291			
Control mean	71	91	83	72			
R-squared	.28	.15	.18	.18			

*Notes:* The estimation sample is restricted to individuals tested during wave 3 (March-May of 2022). All estimations are standard value-added model (VAM) specification, which controls for children's demographic characteristics, for household characteristics (maternal education and SES percentile), for lagged tests scores (in math and Tamil) allowing the effect of the lagged score to vary by age, and for enrollment type (private, public or out of school). Panel A presents results for children who were between 48 and 83 months of age at the time of the test, while Panel B presents results for children who were over 72 and 119 months old at the time of the test. Standard errors are clustered at the village level. All regressions include village fixed effects. Statistical significance at the 1, 5, 10% levels is indicated by \*\*\*, \*\*, and \*.

## A.2 Student achievement tests

This appendix describes the tests used to assess student achievement in the August 2019 round and the three waves in 2021-22.

### A.2.1 Test content

Our baseline assessments were adopted from those used by [Ganimian et al. \(in press\)](#) for a complementary RCT aiming to improve preschool instruction in the same districts (in different villages, from 2016 to 2018). Tests were administered one-on-one in Tamil by enumerators during home visits.

Since this round was designed as a baseline for a preschool (kindergarten) intervention, the emphasis was on ensuring that the test was well-suited for measuring achievement in the 3–6 years of age range. Tests in language focused on oral comprehension and letter recognition. Tests in math focused on comparing quantities, number recognition, and simple addition and subtraction. All students were administered the same tests.

In 2021–22, reflecting our purpose of studying learning loss and recovery over a much longer age range, we added several dimensions to the test. To keep test length manageable, both for respondents and for survey logistics, we used overlapping booklets that were specific for each discrete age category. Each age group had overlapping items with other ages and also with the baseline assessment. This allows us to test a broader range of skills and also avoid floor and ceiling effects at the ends of the age distribution. In math, the test retained the initial items and the focus on arithmetic skills but was broadened to incorporate more difficult items such as multiplication and word problems. In total, we added 31 questions in 2021-2022 to the math assessments, although, as mentioned above, not every student had to answer all 31 questions since we had different booklets for each age group with overlapping questions. In Tamil, we added a total of 30 questions.

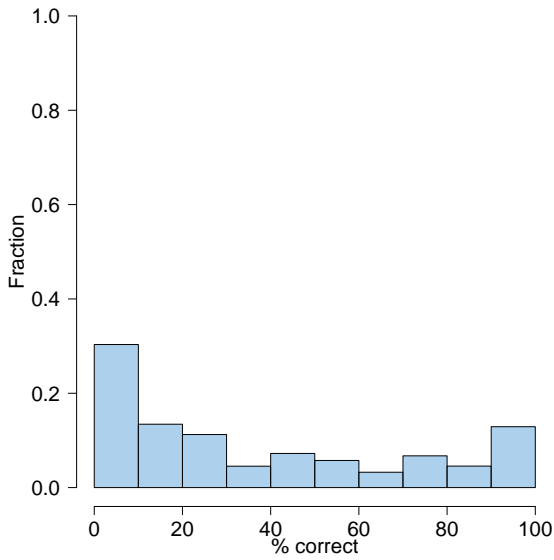
In both rounds, and for all test booklets, [Cronbach \(1951\)](#)'s alpha is above 0.85.

## A.2.2 Test score distributions

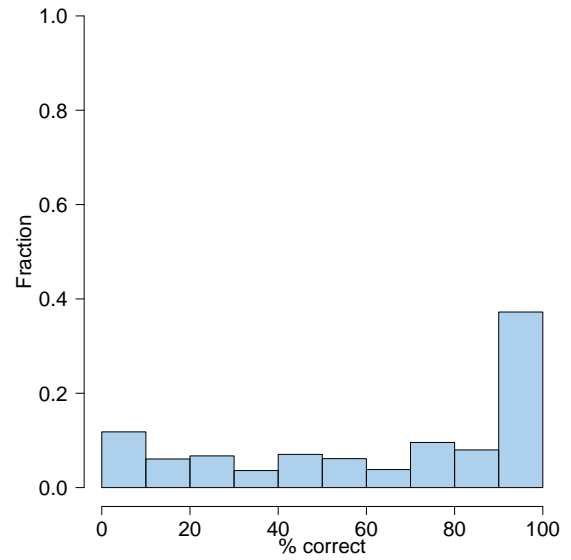
Reflecting the short — and undifferentiated by age — assessments in 2019, we face issues of ceiling effects in the percentage of correct answers for older age groups in the baseline (see Figures A.3-A.4).

This problem is much less severe in 2021 (see Figures A.5-A.6).

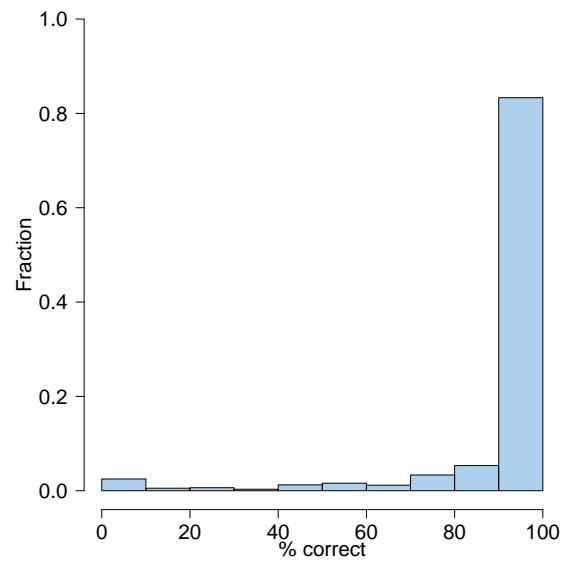
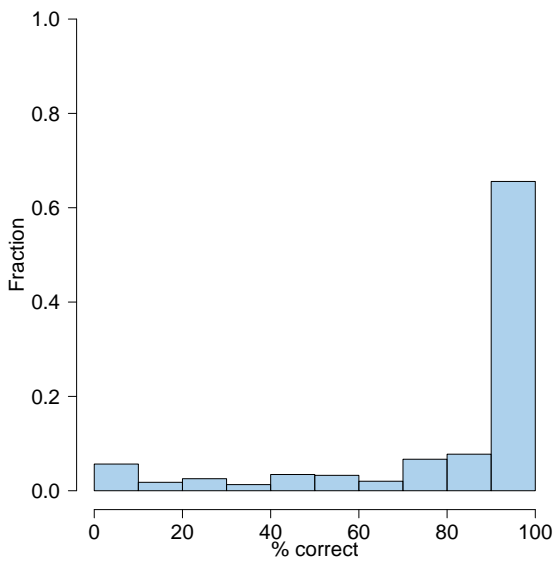
Figure A.3: Distribution of correct answers (%) in math in 2019 by age  
 (a) 4 year-olds (b) 5 year-olds



(c) 6 year-olds

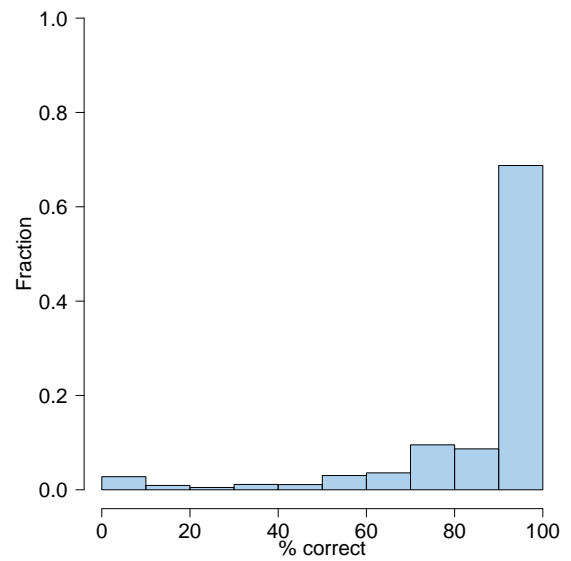
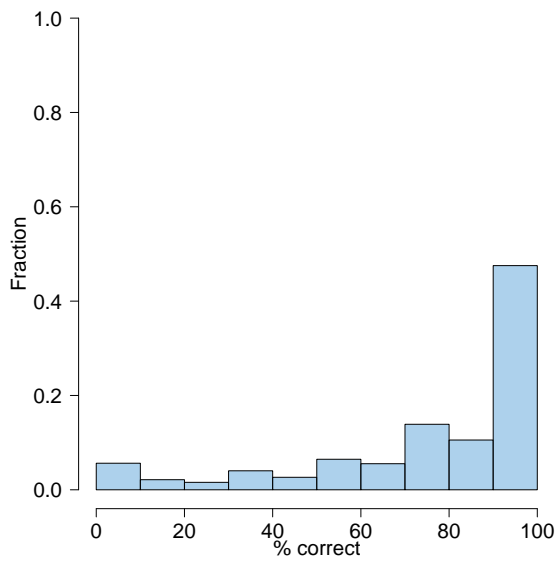
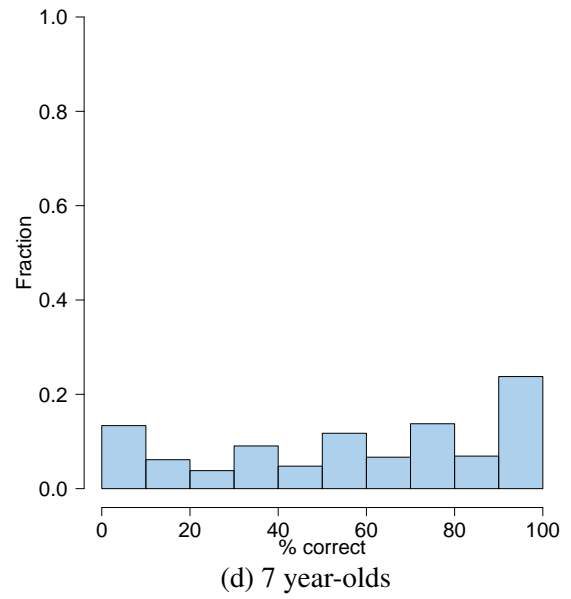
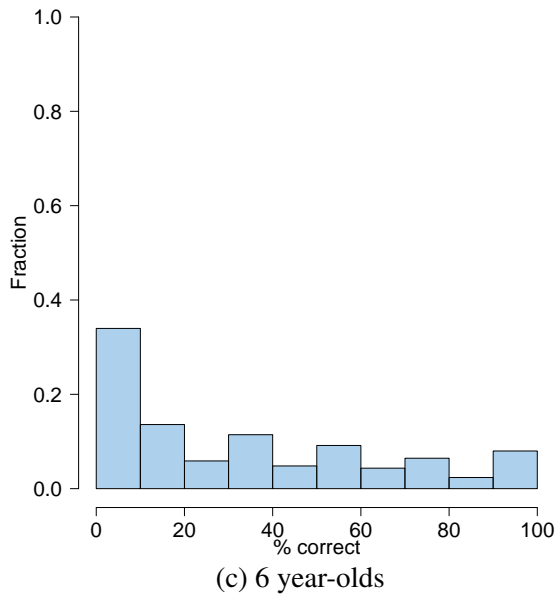


(d) 7 year-olds



Note: This figure presents the percentage of correct responses to the math assessment in 2019 for children of different ages.

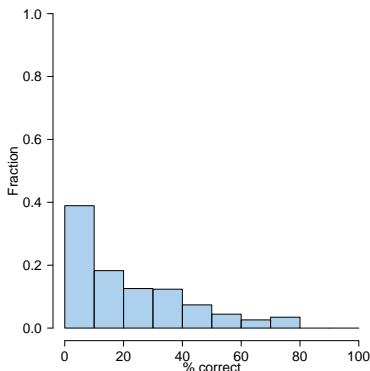
Figure A.4: Distribution of correct answers (%) in Tamil in 2019 by age  
 (a) 4 year-olds (b) 5 year-olds



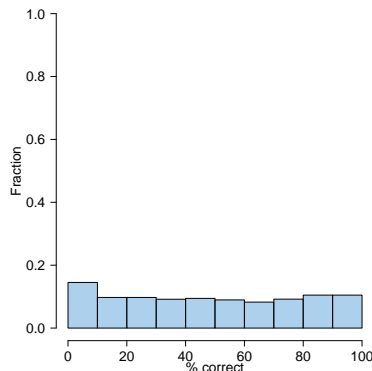
Note: This figure presents the percentage of correct responses to the Tamil assessment in 2019 for children of different ages.

Figure A.5: Distribution of correct answers (%) in math in 2021 by age

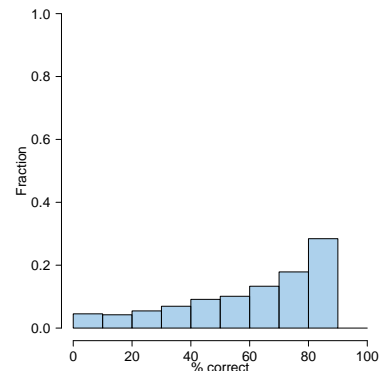
(a) 4 year-olds



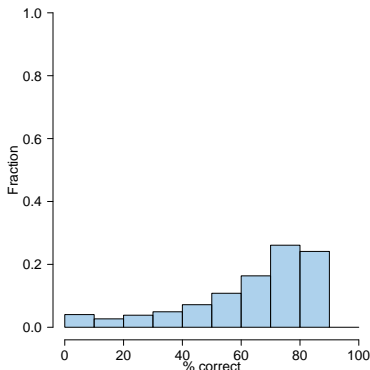
(b) 5 year-olds



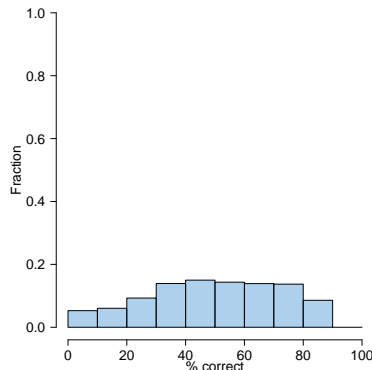
(c) 6 year-olds



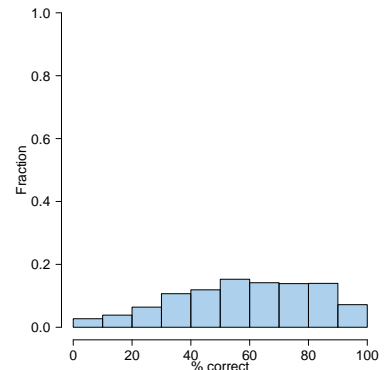
(d) 7 year-olds



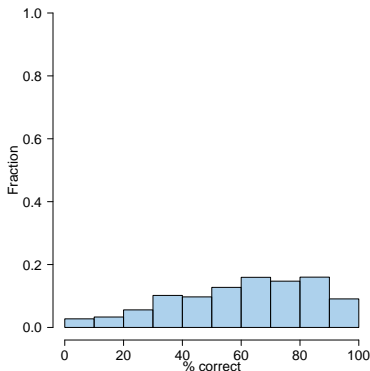
(e) 8 year-olds



(f) 9 year-olds



(g) 10 year-olds



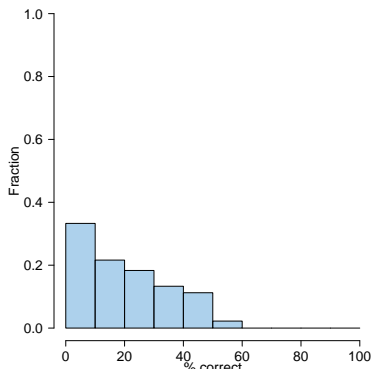
*Note: This figure presents the percentage of correct responses to the math assessment in 2021-2022 for children of different ages.*

Figure A.6: Distribution of correct answers (%) in Tamil in 2021 by age

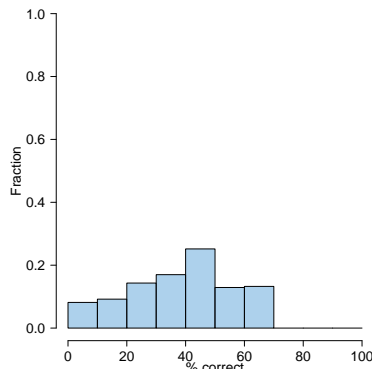
(a) 4 year-olds

(b) 5 year-olds

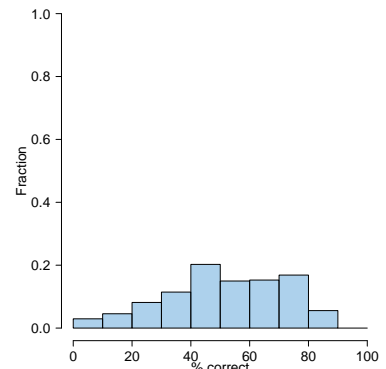
(c) 6 year-olds



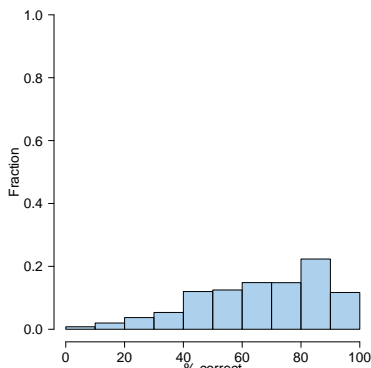
(d) 7 year-olds



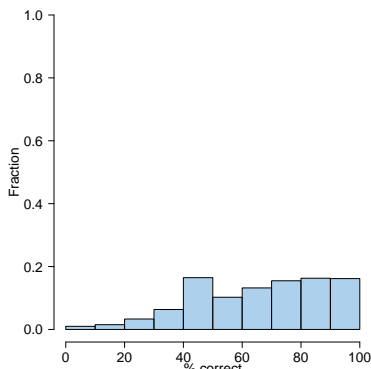
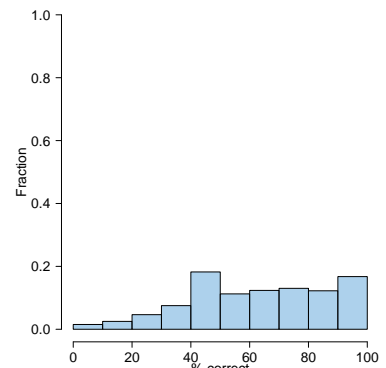
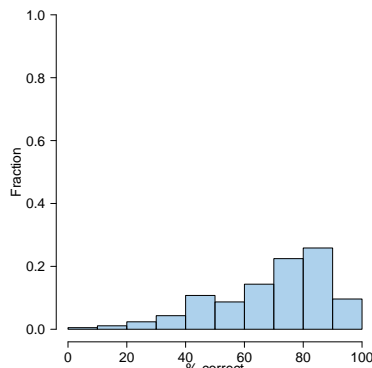
(e) 8 year-olds



(f) 9 year-olds



(g) 10 year-olds



*Note: This figure presents the percentage of correct responses to the Tamil assessment in 2021-2022 for children of different ages.*

Thus, although our estimates of learning loss may be sensitive to floor and ceiling effects, especially at the ends of the age distribution, we see similar estimates if we restrict the analysis

to common items across rounds. Further, our estimates of the pace of the recovery or of the effects of the ITK program are unlikely to be affected.

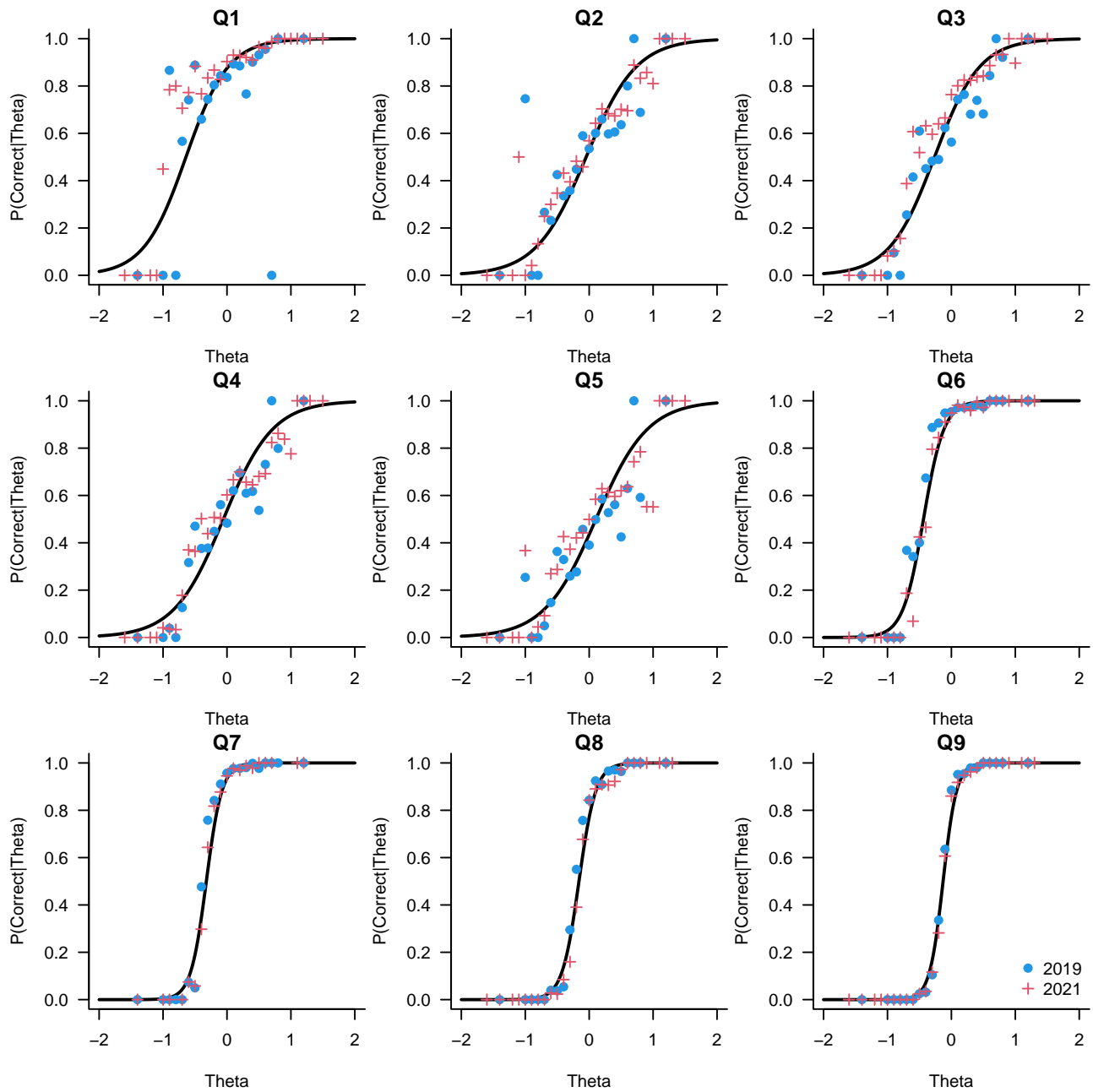
### **A.2.3 Linking using Item Response Theory**

We generate comparable test scores that are linked across ages and across the baseline (2019) and the follow-ups (2021–22) by pooling all test observations and estimating Item Response Theory scores. All questions were scored as correct or incorrect (dichotomous response). We use a 2-parameter logistic model (reflecting that most of our items were open-ended) for estimating the scores using the mirt package in R (Chalmers, 2012).

We show empirical fit to the estimated Item Characteristic Curve (ICC) for each round in Figures A.7-A.16. Overall, questions are able to discriminate between students with different achievement levels (i.e., the ICC monotonically increases, meaning higher ability students are more likely to answer the question correctly), and there is no differential item functioning across rounds (i.e., students do not have an advantage in answering the question given by the timing of the survey round, and thus the likelihood of answering the question correctly depends on the ability and not the timing of the survey).

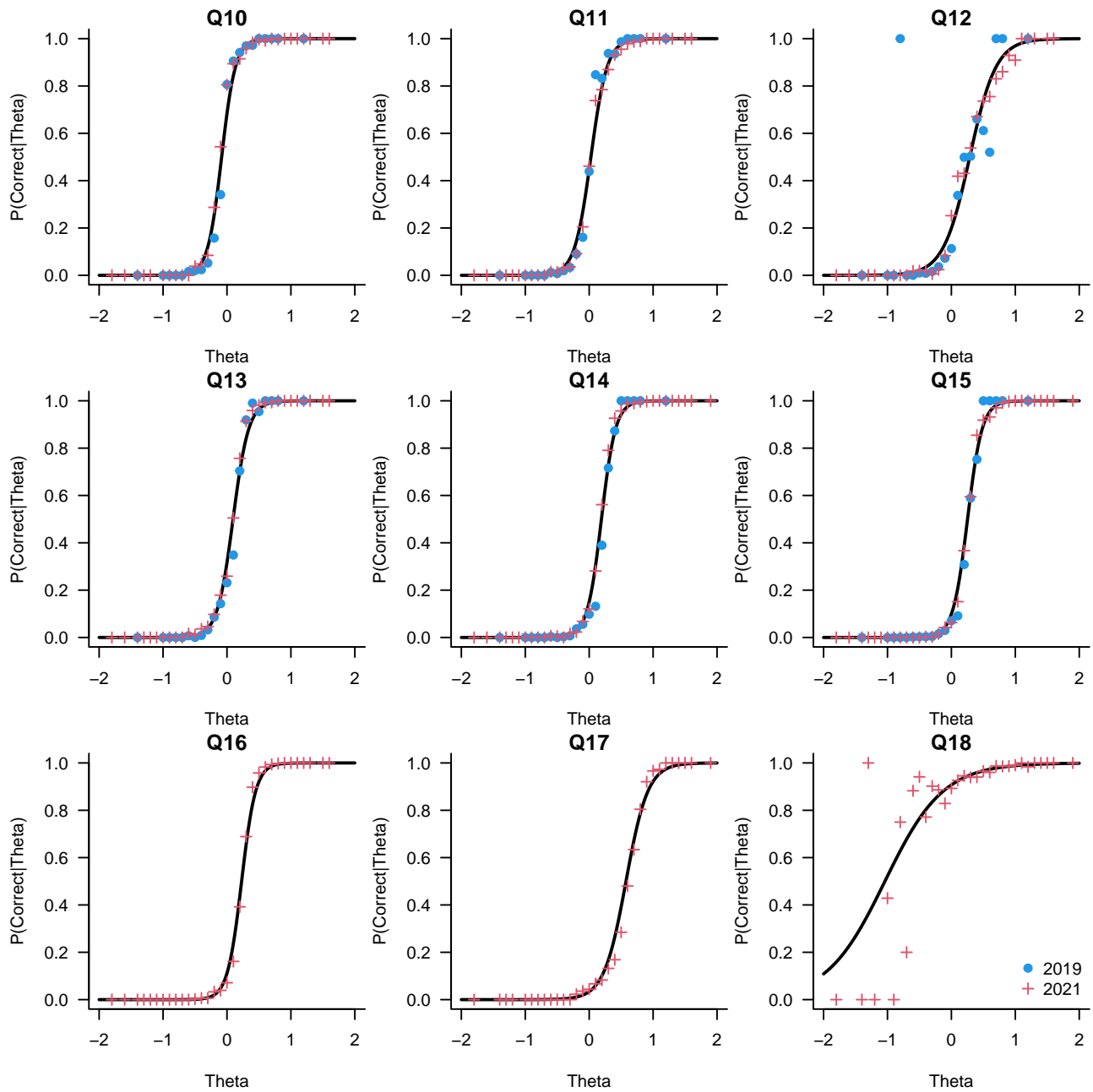


Figure A.7: Empirical fit to the estimated item characteristic curve (ICC) for Tamil questions 1-9



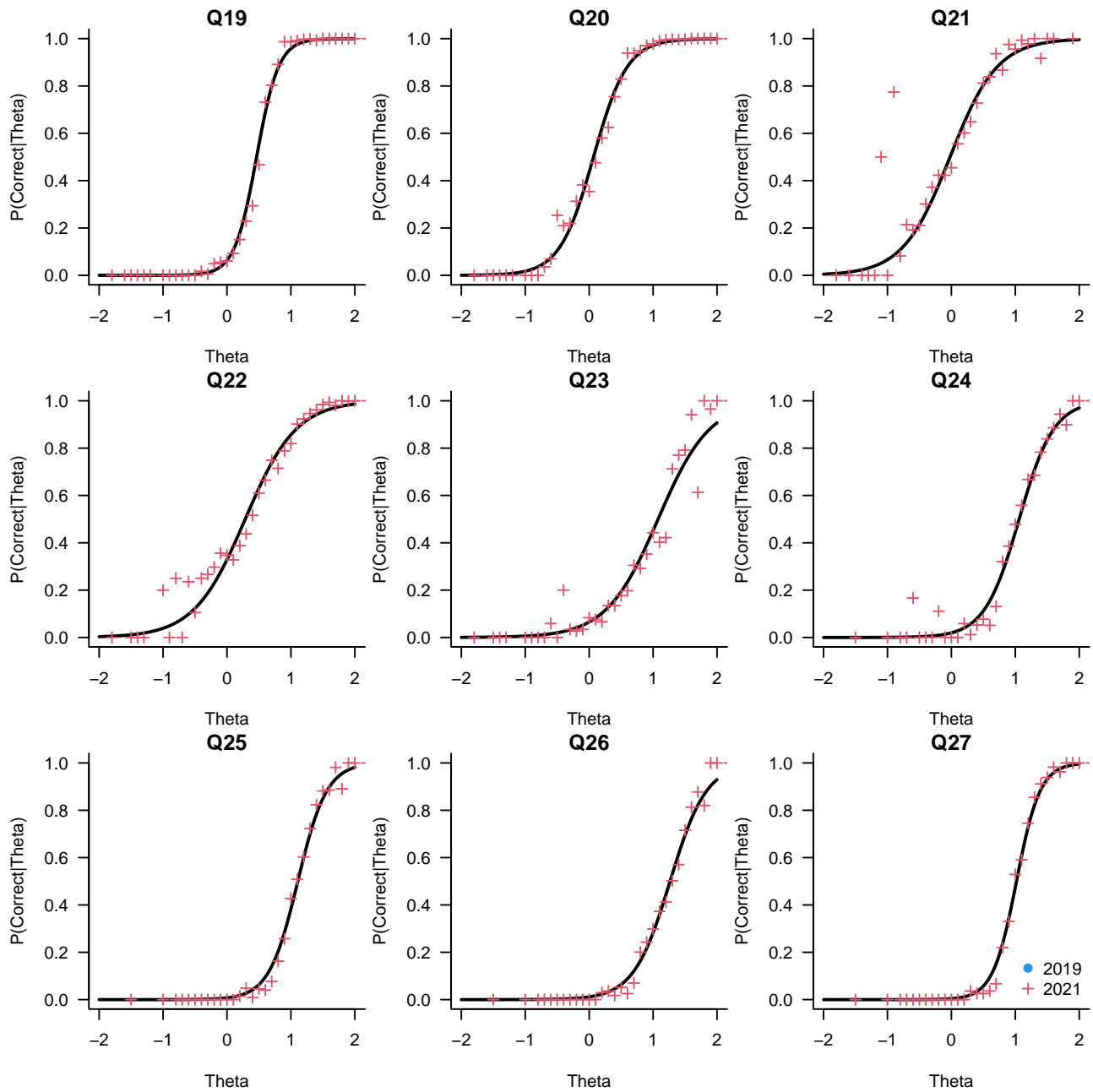
*Note: This figure presents the likelihood that students with different IRT scores answer different questions correctly, as well as the item characteristic curve for each question.*

Figure A.8: Empirical fit to the estimated item characteristic curve (ICC) for Tamil questions 10-18



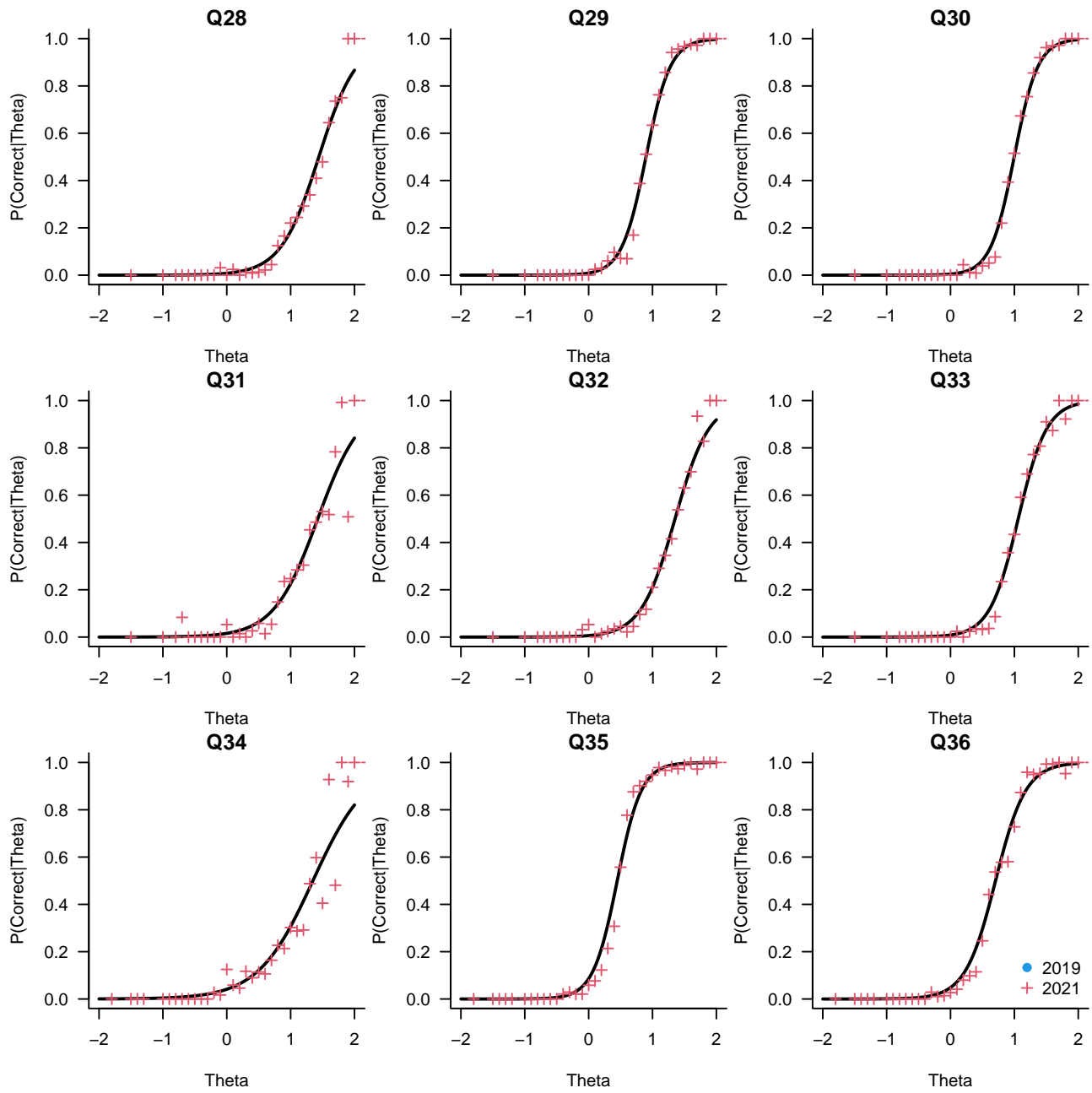
*Note: This figure presents the likelihood that students with different IRT scores answer different questions correctly, as well as the item characteristic curve for each question.*

Figure A.9: Empirical fit to the estimated item characteristic curve (ICC) for Tamil questions 19-27



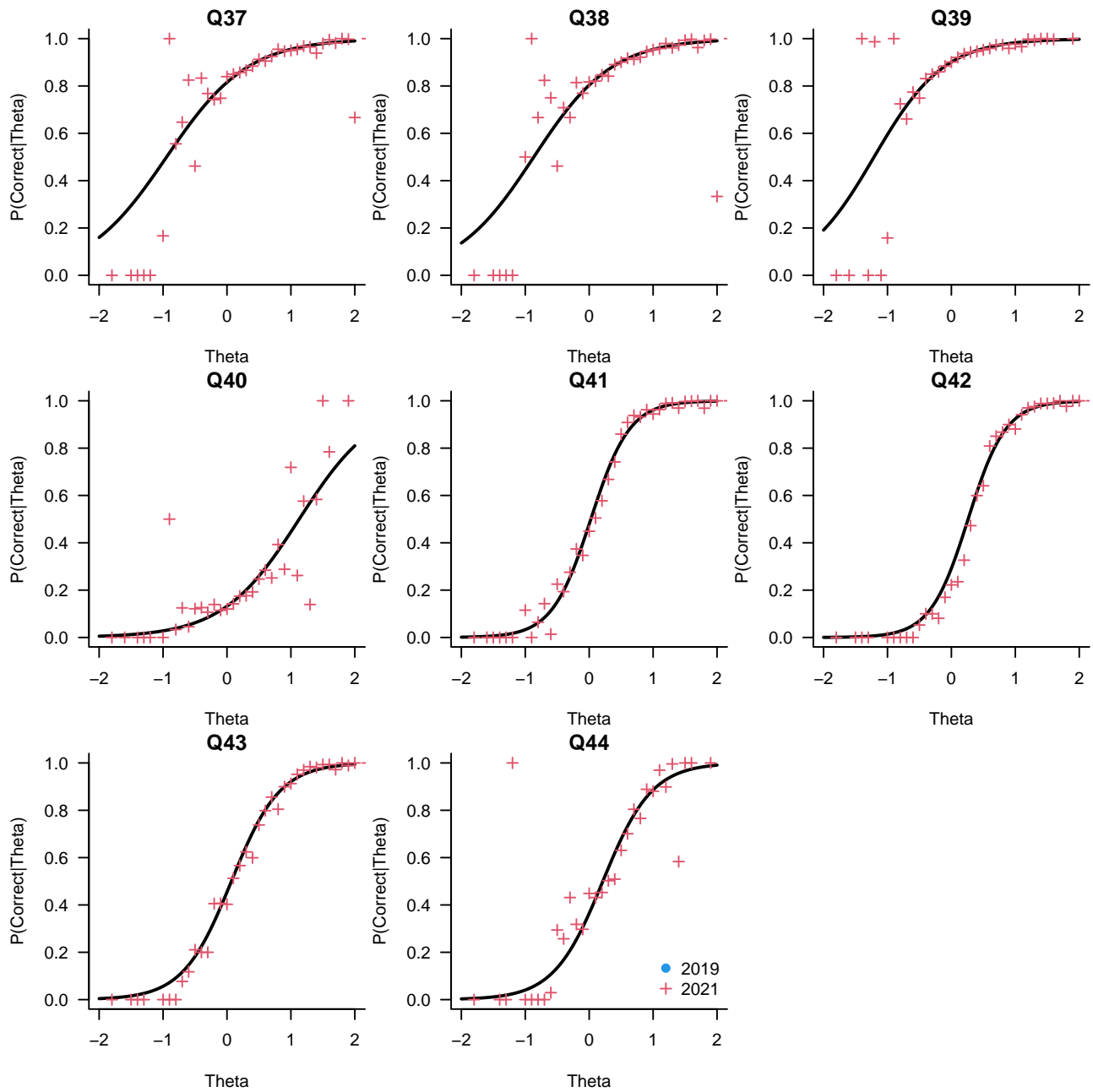
*Note: This figure presents the likelihood that students with different IRT scores answer different questions correctly, as well as the item characteristic curve for each question.*

Figure A.10: Empirical fit to the estimated item characteristic curve (ICC) for Tamil questions 28-36



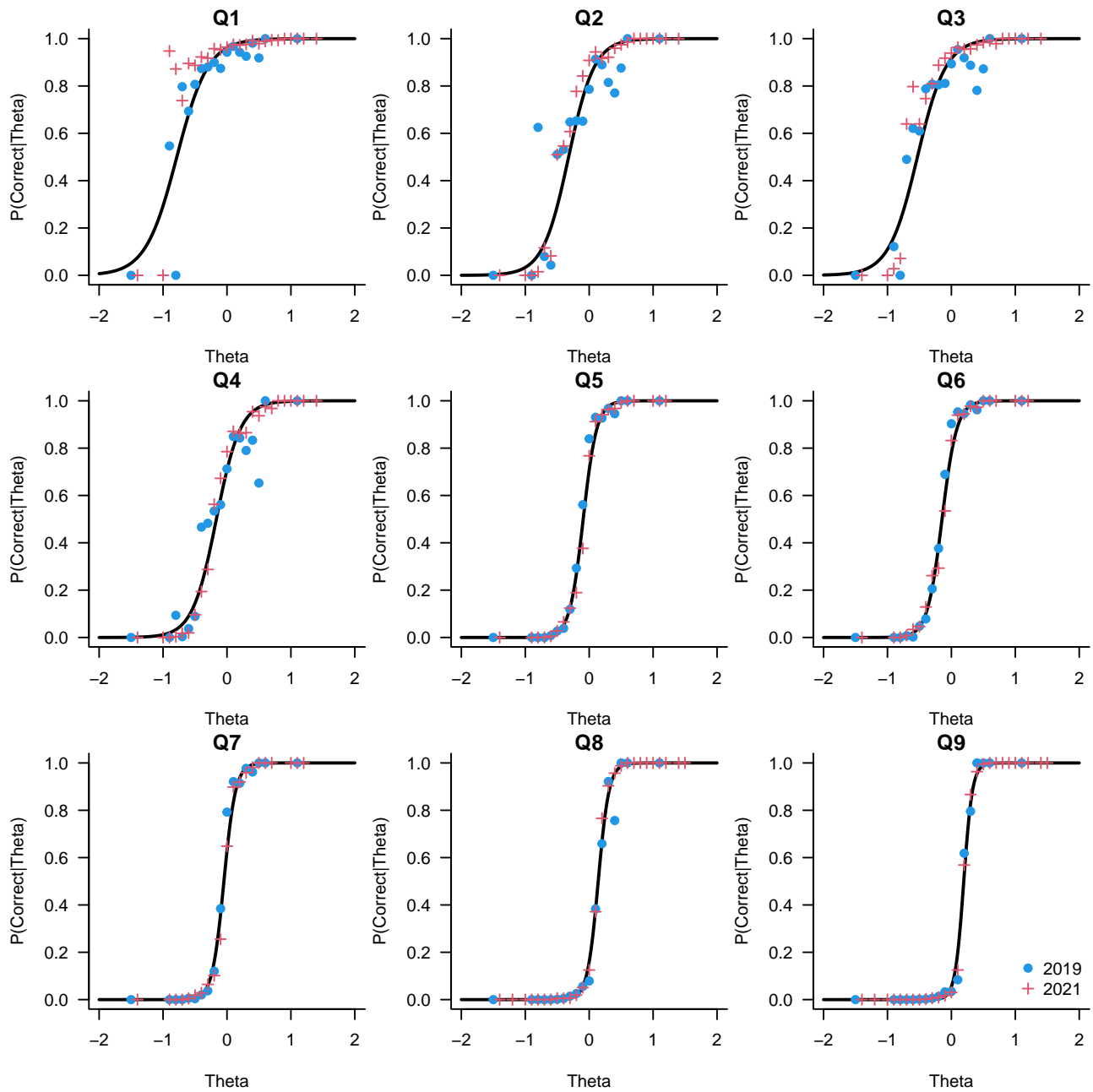
*Note: This figure presents the likelihood that students with different IRT scores answer different questions correctly, as well as the item characteristic curve for each question.*

Figure A.11: Empirical fit to the estimated item characteristic curve (ICC) for Tamil questions 37-44



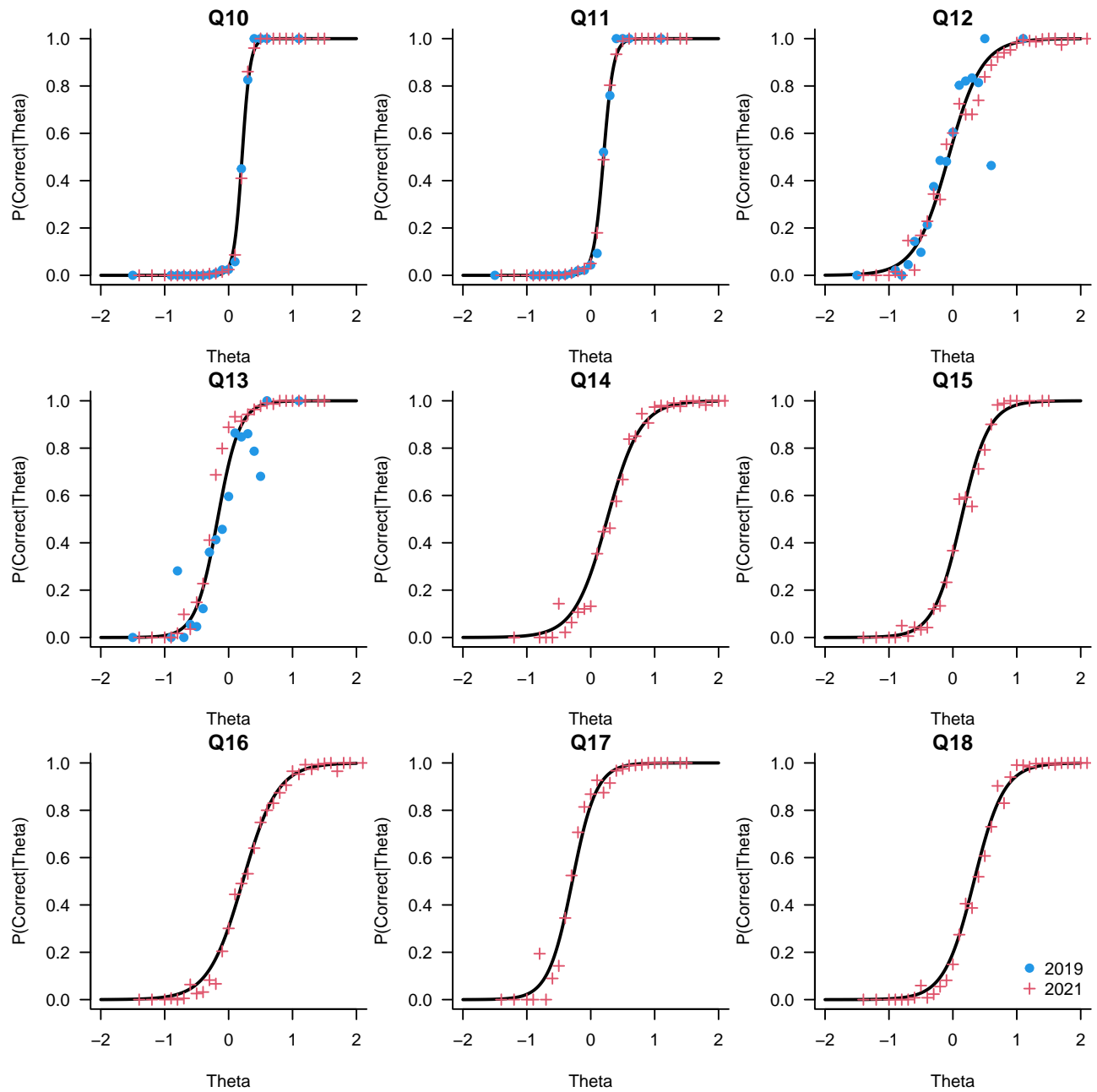
*Note: This figure presents the likelihood that students with different IRT scores answer different questions correctly, as well as the item characteristic curve for each question.*

Figure A.12: Empirical fit to the estimated item characteristic curve (ICC) for math questions 1-9



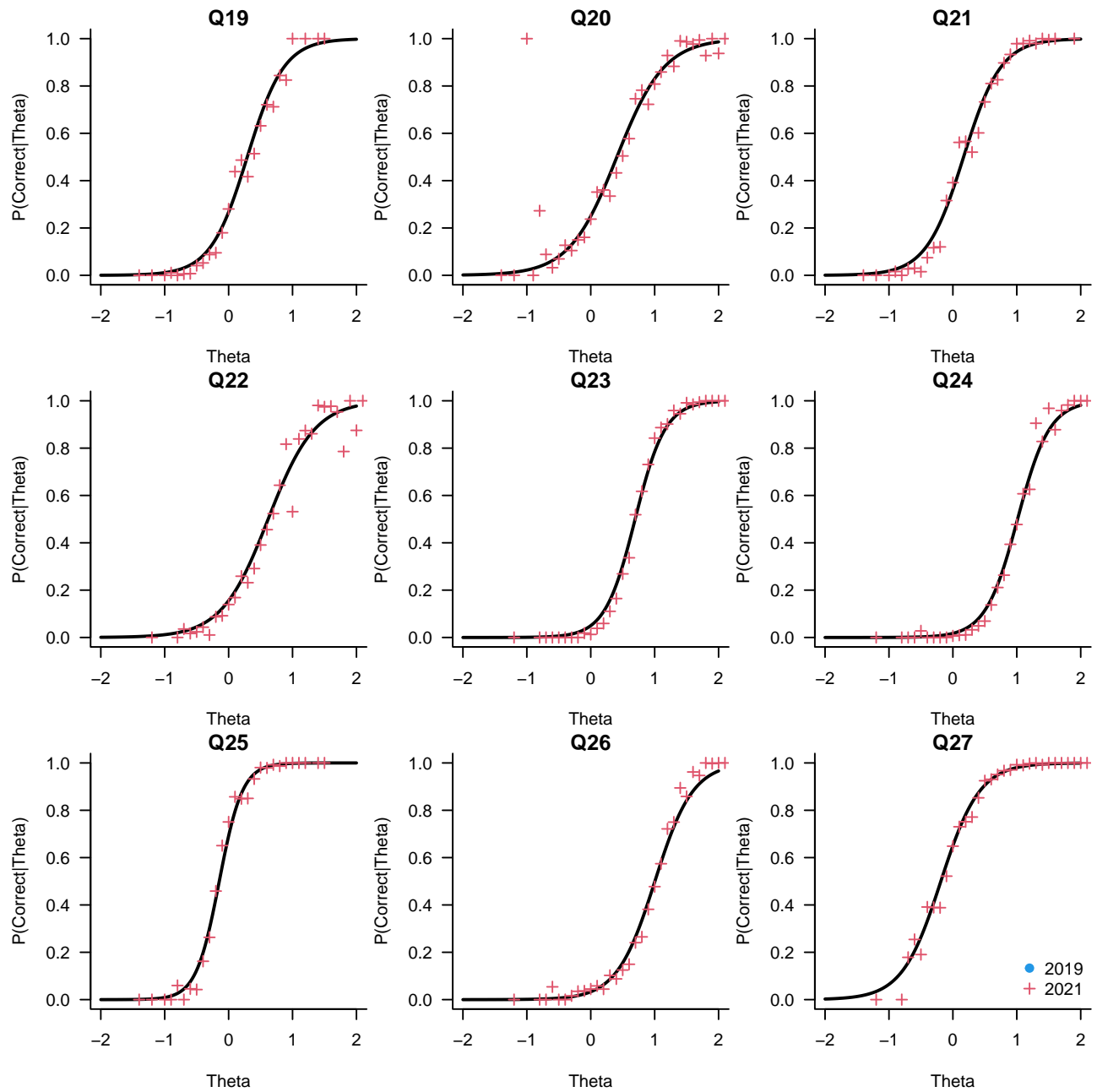
*Note: This figure presents the likelihood that students with different IRT scores answer different questions correctly, as well as the item characteristic curve for each question.*

Figure A.13: Empirical fit to the estimated item characteristic curve (ICC) for math questions 10-18



*Note: This figure presents the likelihood that students with different IRT scores answer different questions correctly, as well as the item characteristic curve for each question.*

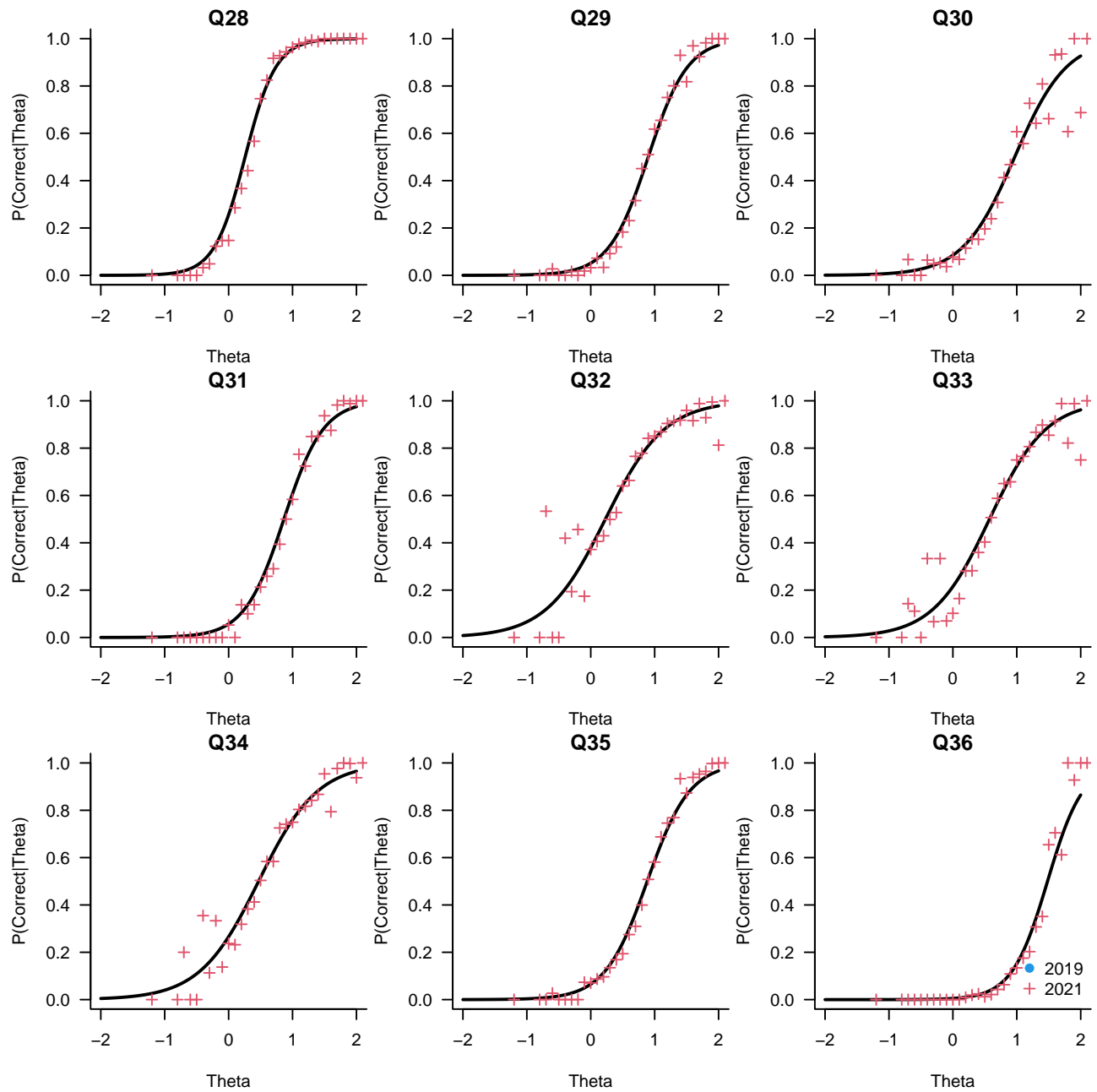
Figure A.14: Empirical fit to the estimated item characteristic curve (ICC) for math questions 19-27



*Note: This figure presents the likelihood students with different IRT scores answer different questions correctly, as well as the item characteristic curve for each question.*

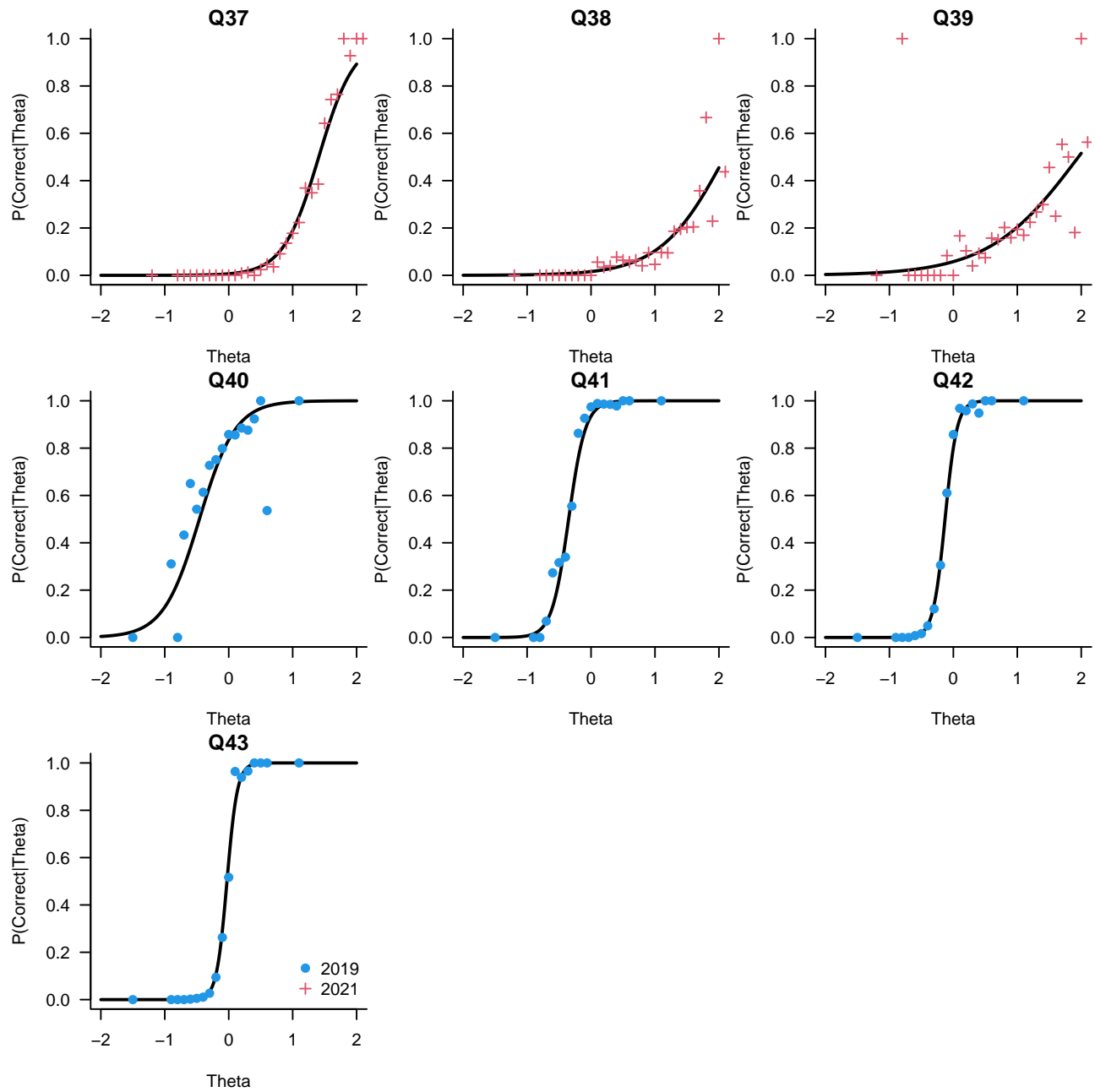


Figure A.15: Empirical fit to the estimated item characteristic curve (ICC) for math questions 28-36



*Note: This figure presents the likelihood that students with different IRT scores answer different questions correctly, as well as the item characteristic curve for each question.*

Figure A.16: Empirical fit to the estimated item characteristic curve (ICC) for math questions 37-43



*Note: This figure presents the likelihood that students with different IRT scores answer different questions correctly, as well as the item characteristic curve for each question.*

### **A.3 The *Illam Thedi Kalvi* (Education at Doorstep) Program**

This appendix provides further details about the *Illam Thedi Kalvi* (ITK) program, based on program documents and information shared by the Government of Tamil Nadu.

#### **A.3.1 Program objectives and rollout**

The ITK program was conceived by the Government of Tamil Nadu as an emergency response to the lack of structured education after March 2020, caused by the pandemic-induced school closures. The program targeted students in Grades 1-8. Although open for all students in local communities, it gave special emphasis to remediation for public school students.

The program was rolled out in a staggered manner. It was launched by the Chief Minister of Tamil Nadu on October 26, 2021. Phase 1 of the program started on December 1, 2021 in 12 districts of the state. After receiving positive reports on the implementation and program reception in the first month, the program was then extended to the remaining districts of Tamil Nadu from January 3, 2022.

#### **A.3.2 Volunteer selection and training**

The program had an extensive volunteer selection protocol and had a secondary objective of empowering local educated women, who were given explicit preference in recruitment. Volunteers were required to have graduated from Grade 12 (the end of high school) to be eligible to teach students in Grades 1-5 (primary school), and to have completed a Bachelors' degree to teach students in Grades 6-8 (middle school). The program intended to match one volunteer to 20 students. Volunteers were not paid a salary but were provided a monthly stipend of INR 1,000 for teaching and learning materials (TLM) and incidental expenses.

Volunteer recruitment included three stages. First, individuals interested in volunteering were required to register their interest on a dedicated program website maintained by the Department of Education. Second, candidates who met the basic eligibility criteria were then visited by members of the School Management Committee (SMC) of the local school, which included parent representatives, who validated their educational qualifications and assessed their acceptability as teachers in the local community. The SMC members then classified each candidate as

“not recommended”/“recommended”/“strongly recommended”. Third, volunteers were given a computer-based psychometric aptitude test, administered in a central location, which tested their cognitive ability, personality, and behavior towards children. This was followed by a Focus Group Discussion, conducted in the presence of a Headmaster, the Block Education Officer and a representative from a local civil society organization, to assess the commitment and interest of volunteers at a more individual level. ~746,000 individuals registered to participate in the program as volunteers, of whom ~200,000 volunteers were selected.

Volunteers received two days of training focused on program design, expectations, curriculum and other essential information, followed by a one-day visit to the local school. Since the program focused much more on the reach of this remediation program for government school students, this was seen as an essential part of building the bridge between the ITK volunteers and the local public school. Refresher trainings were provided monthly.

### **A.3.3 Program outreach**

Community mobilization was central to the program. This happened at multiple stages. Approximately 5000 folk artists were hired to perform street plays and folk performances to raise awareness about the program in ~84,000 habitations. In addition, the program also received considerable coverage in the local media. Qualitative reports from officials indicate this was important in raising interest in volunteering for the program.

In addition, there was considerable within-village mobilization to ensure student participation. This included active outreach by teachers and head-teachers of local government schools, as well as members of School Management Committees (which include representatives of parents and local elected officials). It also included the distribution of posters, flyers, and banners, as well as the organization of local activities.

### **A.3.4 Program content and delivery**

**Program delivery** The program provided up to 90 minutes of instruction to students between 5:00-6:30 pm, five days per week. This instruction was typically provided in a local community

space such as a school, a community hall, or a public preschool center.

**Curriculum** The program, focused on re-introducing students to education and remediating learning loss, introduced a play-based curriculum that focused on basic literacy and numeracy. The curriculum was designed by the State Council for Educational Research and Training, the body responsible for curriculum design in the public schooling system. Volunteers were provided an easy-to-transact manual covering the curriculum in detail, including specific teaching and learning materials (TLMs) mapped to activities. Volunteers were also encouraged to develop their own TLMs for leading children in activity-based learning.

Quarterly assessments were provided through an app for ITK volunteers to administer to students. These were intended to inform the remediation attempts in the ITK centers.

**Program reporting** The program was monitored through a dedicated app through which volunteers registered students, provided feedback and also administered assessments for students. This provided the core data for the central monitoring of the implementation of the scheme. In addition, Telegram groups were set up which allowed for communication between the ITK volunteers and state education bureaucracy.

**Coordination with the schooling system** The program was set up to be closely coordinated with (and complementary to) the public school system, starting from the selection of volunteers and the encouragement to students to attend. ITK volunteers also joined meetings of School Management Committees to report on the performance of the program and to receive feedback on how to remediate learning losses. This alignment between ITK centers and public schools was an important design component of the program.