The Effect of Home Computer Use on Children's Cognitive and Non-Cognitive Skills

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Outline

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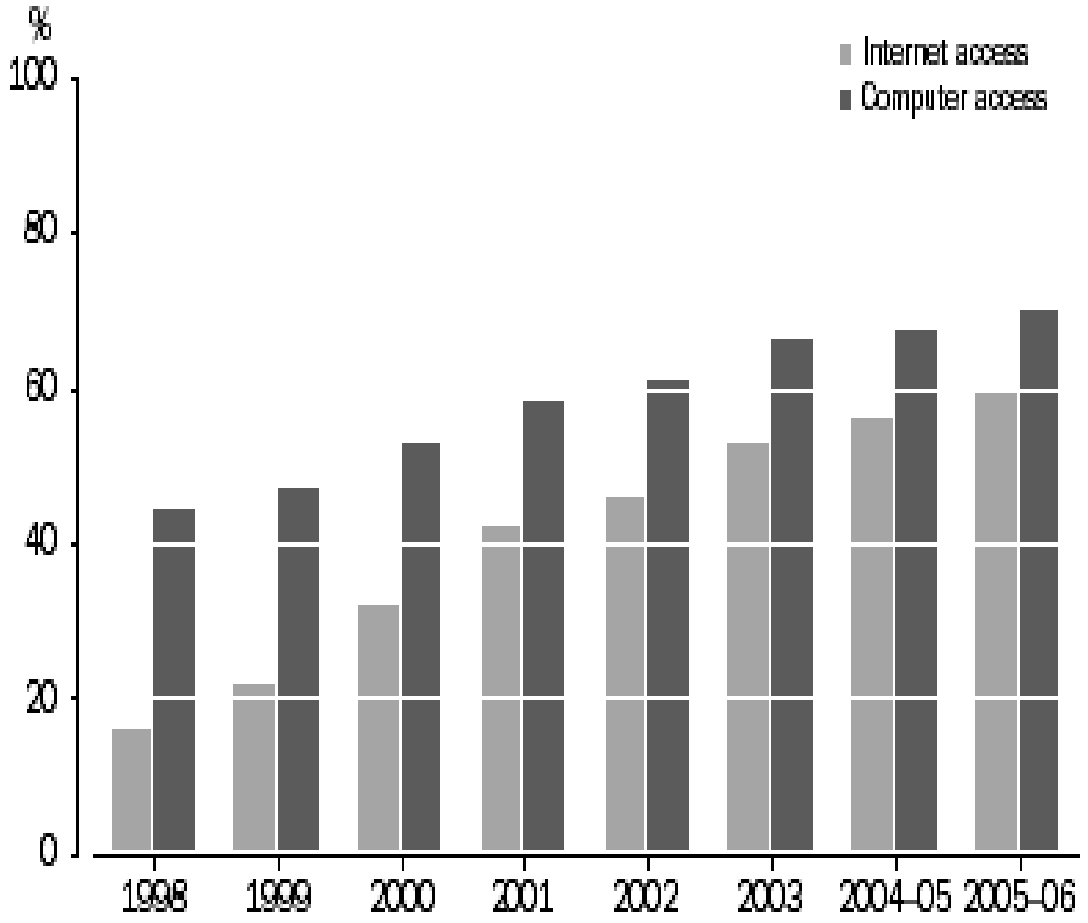
Motivation

- Economists have found that educational choices and lifetime income are largely pre-determined by age 16.
- Cognitive and Non-Cognitive skills drive most outcomes.
- Gaps in these skills across individuals and across socioeconomic groups open up at early ages and deficits need to be addressed at very early ages. (James Heckman - Nobel Prize Economics 2000)
- Recent focus on the determinants of these skills: Childcare, Parental Time, etc.
- I look at the effect of home computers for children in the LSAC K-cohort (wave 2).

Household Home Internet or Computer Access. (Source: ABS)



Are Computers Important?

- Kevin Rudd: "I want to turn every secondary school in Australia into a digital school".
- Use of computers might improve cognitive skills. Educational Software, Internet, Games (?)
- Use of computers might affect non-cognitive skills. Social and Emotional.

Effect of Computers in Schools

- Rouse et al. 2004: educational software and reading skill. 8-12 years old (US). No significant improvements in language acquisition or reading skills.
- Banerjee et al. 2007: computer-assisted learning program. 8-10 years old (India). Find that the program was very effective increasing math scores by 0.36 sd's the first year, and by 0.54 sd's the second year.

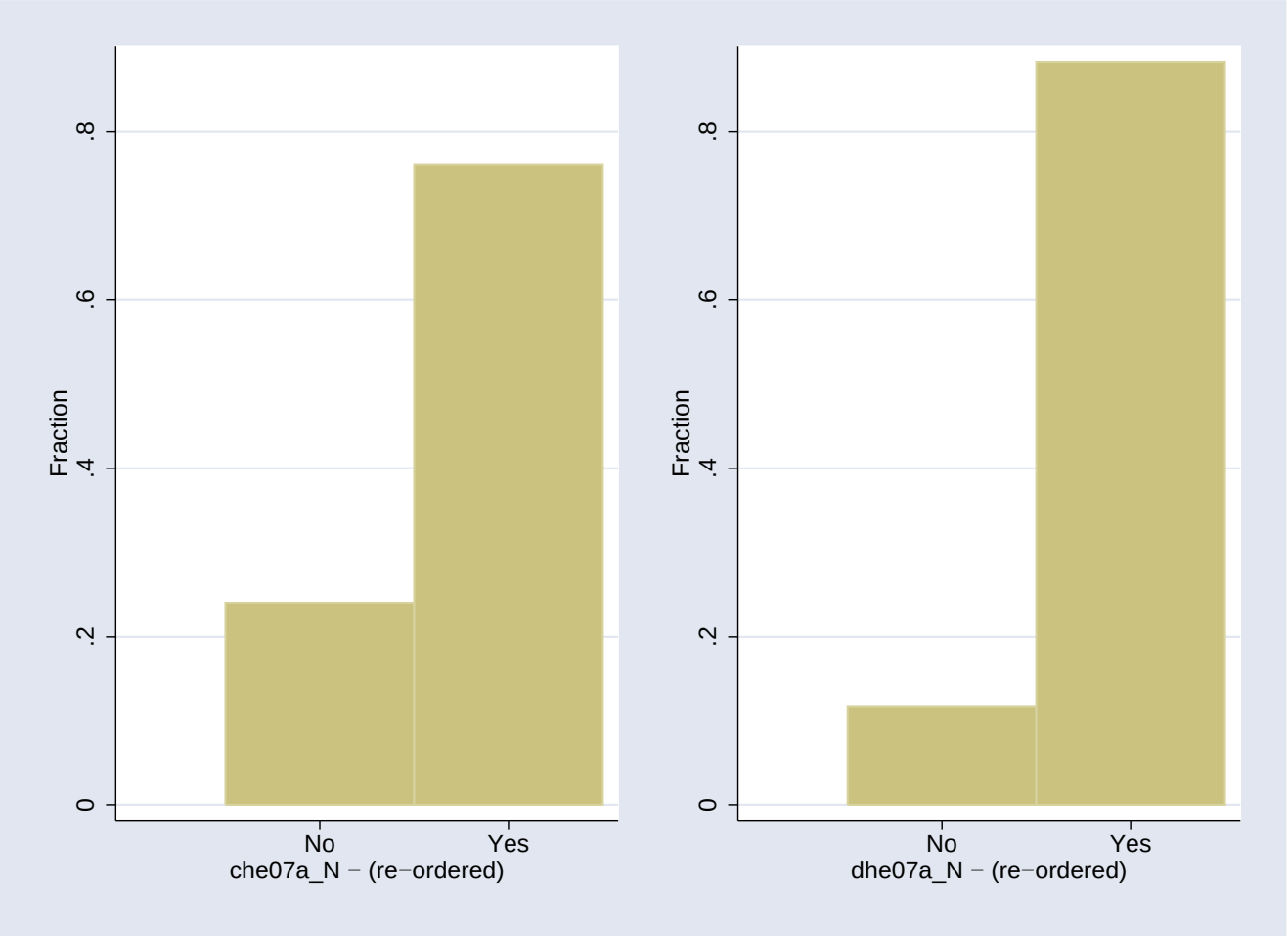
Effect of Computers at Home

- Schmitt et al. 2006: home pc and secondary education (UK). Find positive association between Home PC and qualifications obtained at age 16-18.
- Beltran et al. 2007: home pc and secondary education (US). Home pc associated with a 6-8 percentage point higher probability of graduating from high school.

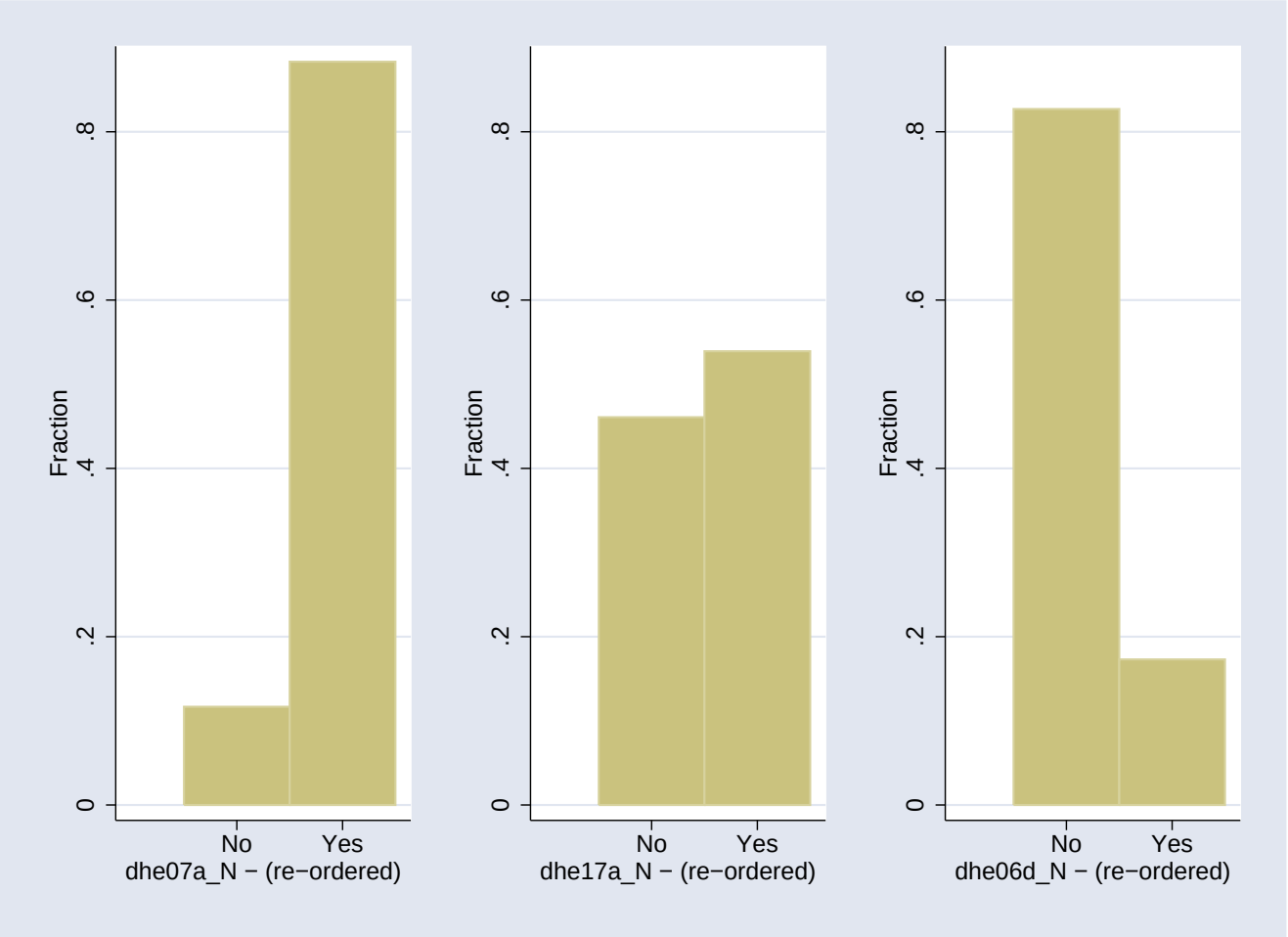
LSAC data

- Little is known about the effect of using a home computer for very young children.
- LSAC data include information on:
  - Cognitive and non-cognitive skills.
  - Computer Use at Home and in School.
  - Information about parental background, family composition, etc.

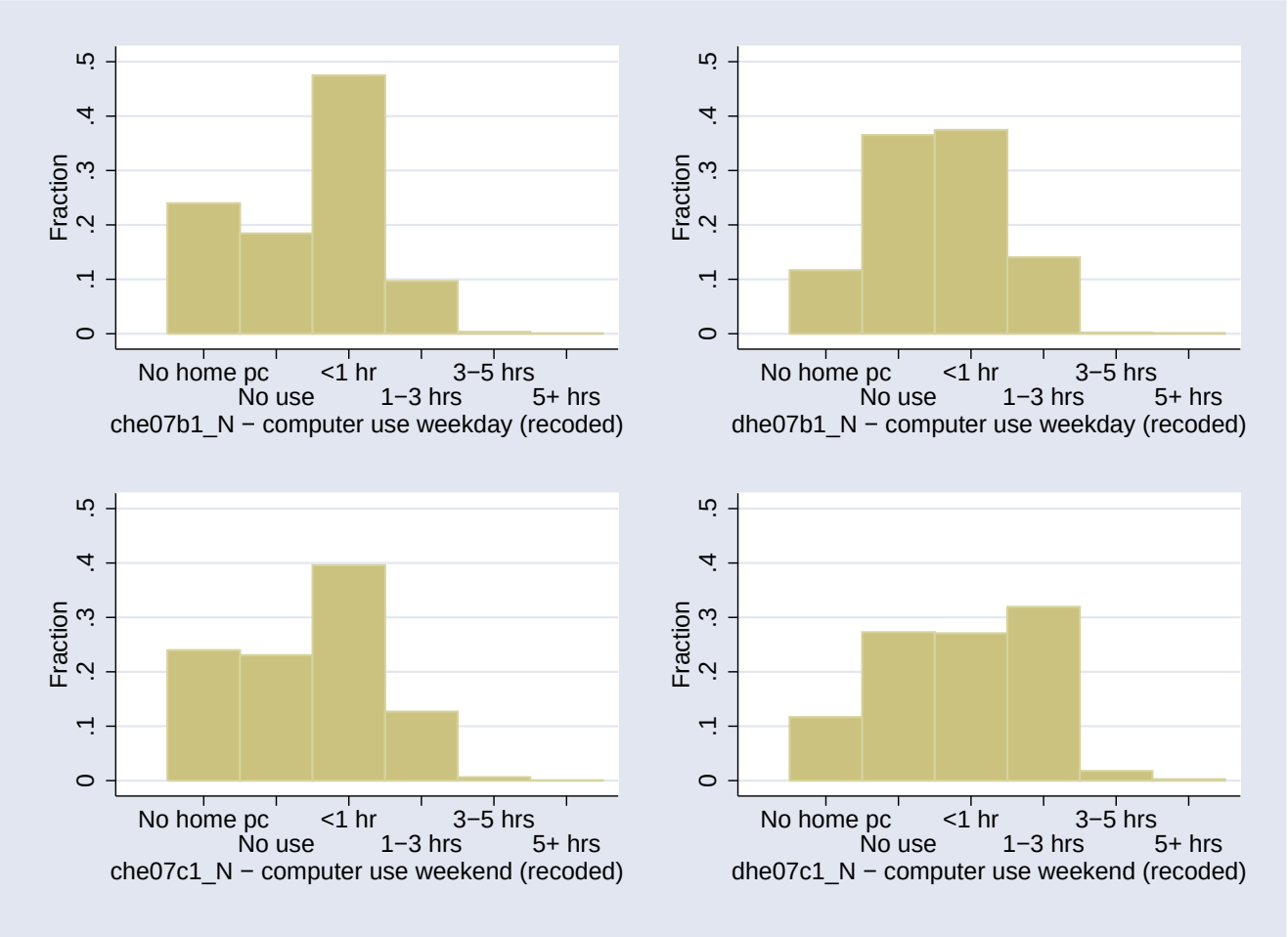
SC has Computer Access at home - Waves 1 and 2



SC has Computer, Video Games and TV (bedrm) - Wave 2



SC Computer Use during Weekday/Weekend - Waves 1 and 2



Cognitive and Non-Cognitive Skills in LSAC

- Cognitive:
  - Peabody Picture Vocabulary Test (PPVT) - knowledge of the meaning of spoken words. (Wave 1-2)
  - Matrix Reasoning - numerical test. (Wave 2)
- Non-Cognitive:
  - SDQ Prosocial, SDQ Peer problems - Prosocial (Wave 1-2)
  - SDQ Emotional symptoms - Internalising (Wave 1-2)
  - SDQ Hyperactivity, SDQ Conduct - Externalising (Wave 1-2)

Identification Problem

$$T_{ia} = \beta_0 + \beta_1 C_{ia} + \rho v_{ia} + \gamma_a \mu_i + \epsilon_{ia}$$

- We are interested in β_1.
- C_{ia} is endogenous.
  - Smarter kids might use pc more often.
  - Less social kids might use pc more often.
  - More educated (richer) parents might buy educational software, internet connection, and also invest more in their children.
  - $T_{ia} = \beta_0 + \beta_1 C_{ia} + \varepsilon_{ia}; \Rightarrow \widehat{\beta}_1 \neq \beta_1$
- Ideally, use randomized experiments to identify the effect of home computer on skills. But not available.

Solutions to Identification Problem

- Include many "control variables". (OLS)
  $T_{ia} = \beta_0 + \beta_1 C_{ia} + \boldsymbol{X}\alpha + \varepsilon_{ia}$
- Use lagged skills measures. (Added Value Model)
  $T_{ia} = \beta_0 + \beta_1 C_{ia} + \delta T_{i(a-1)} + \varepsilon_{ia}$
- Use Instrumental Variables (IV). IVs have to be correlated with C_{ia} but not directly with T_{ia}. (Hard to find!)

Causal Effect of Home Computer Use - Boys

	OLS 1	OLS 2	OLS 3	Add Value	N
PPVT	.00044	.00037	.00029	.00042	2248
	(.00029)	(.00028)	(.00028)	(.00026)	
Matrix	.00125***	.00114***	.00112***	——	2244
	(.00030)	(.00030)	(.00030)	(——)	
Pro-sociality	-.00041	-.00049	-.00044	-.00021	2222
	(.00030)	(.00030)	(.00031)	(.00026)	
Hyperactivity	-2.0e-05	-3.5e-06	-4.0e-05	-.00035	2221
	(.00030)	(.00030)	(.00030)	(.00024)	
Emotional Sympt	5.8e-05	9.4e-05	.00013	-5.6e-05	2221
	(.00030)	(.00030)	(.00030)	(.00027)	
Peer problems	.001***	.00111***	.00104***	.00069***	2220
	(.00030)	(.00030)	(.00030)	(.00026)	
Conduct problems	.0004	.00044	.00045	.00026	2222
	(.00030)	(.00030)	(.00030)	(.00026)	

Causal Effect of Home Computer Use - Girls

	OLS 1	OLS 2	OLS 3	Add Value	N
PPVT	6.8e-05	.00015	.00017	1.7e-05	2161
	(.00035)	(.00035)	(.00035)	(.00031)	
Matrix	.00056	.00066*	.00068*	——	2158
	(.00036)	(.00036)	(.00036)	(——)	
Pro-sociality	5.4e-06	-1.2e-06	1.5e-05	.0001	2120
	(.00036)	(.00036)	(.00036)	(.00032)	
Hyperactivity	.00049	.00036	.00038	.00047	2120
	(.00035)	(.00035)	(.00035)	(.00029)	
Emotional Sympt	4.3e-05	4.6e-05	3.5e-05	9.2e-06	2120
	(.00036)	(.00036)	(.00036)	(.00032)	
Peer problems	.0011***	.00101***	.00101***	.00081**	2121
	(.00035)	(.00035)	(.00035)	(.00033)	
Conduct problems	-1.1e-05	-.00013	-.00012	-.00026	2119
	(.00035)	(.00035)	(.00035)	(.00031)	

Weekday vs Weekend Use - Boys

	OLS3			
	Weekday	Weekend	V. Games (WD)	V. Games (WE)
PPVT	-.00014	.00079*	-.00189***	-.00071*
Matrix	-.00051	.00223***	-.00069	8.1e-05
Pro-sociality	-.00123	.00028	.00065	-.00016
Hyperactivity	5.4e-05	.00046	-2.2e-05	.00019
Emotional Sympt	.00097	-.00062	.00038	-.00047
Peer problems	.00023	.00126***	.00141*	.00016
Conduct problems	.00095	-.00029	-5.1e-05	7.8e-05

Weekday vs Weekend Use - Girls

	OLS3			
	Weekday	Weekend	V. Games (WD)	V. Games (WE)
PPVT	.00061	.00022	-.00341*	-.00189**
Matrix	-.00043	.00171***	-.00271	.00073
Pro-sociality	.00019	7.2e-05	-.0008	.00079
Hyperactivity	-9.5e-05	.00033	.00142	-.00087
Emotional Sympt	-.00058	.0004	-.00148	.0004
Peer problems	.00163**	.00057	-.00257	-3.4e-05
Conduct problems	-7.7e-05	-.00053	.00235	-.00076

Conclusions and Future Work

- Home Computer use has an effect on numerical skills and on social (peer) skills.
- These effects are robust to a rich set of control variables and to lagged skills measures (for peer skills).
- The effect is mainly due to use during the weekend. Video Game use does not show the same results.
- Further Robustness checks needed: include more (different) controls or try IVs.
- Even if there is an effect there is not much information about how computers are used: educational software, homework, internet, video games.
- Investigate the effect of computers in school.