

WEB APPENDIX

Are All Managers Created Equal?

Avi Goldfarb and Botao Yang

APPENDIX TABLE W1: LEVELS OF THINKING (# OF TYPES ALLOWED IN ESTIMATION)^A

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Up to Type-0	Up to Type-1	Up to Type-2	Up to Type-3	Up to Type-4	Up to Type-5	Up to Type-6
Correlates with strategic thinking parameter τ (γ)	constant (γ_0)		.2462** (.0280)	.3947** (.00135)	.6886** (.00334)	.7144** (.0489)	.5679** (.0494)	.5549** (.0135)
	ln(# of markets served)		-.1864** (.00822)	-.3867** (.00155)	.00575 (.00509)	-.0175 (.0129)	.000563 (.00369)	.000687 (.00301)
	ln(# ISPs in market)		.0238 (.0165)	.0933** (.000516)	.0407** (.00739)	.0445** (.0146)	.0403** (.0138)	.0303** (.00366)
	% population urban		1.2013** (.0477)	.5658** (.00196)	.3577** (.00618)	.3280** (.0342)	.2701** (.0431)	.2649** (.0211)
	% population college graduate		-6.1273** (.00925)	-4.6629** (.000861)	.8968** (.00772)	-.5735** (.0901)	.3950* (.1683)	.5982** (.0490)
Competitive incentives for adopting Rockwell's K56Flex (ψ^A)	# of ISP's on Rockwell		-.0416** (.00851)	-.0550** (.00160)	-4.7685** (.00989)	-3.9492** (.0945)	-5.6544** (.3094)	-9.3099** (.1579)
	# of ISP's on US Robotics		.0376** (.00872)	.0623** (.00255)	.1370** (.000872)	.1077** (.00300)	.5900** (.0568)	1.0175** (.0428)
	# of ISP's on both technologies		.00354** (.0000874)	-.00915** (.00118)	-.0654** (.000982)	.0114** (.000552)	-1.0862** (.14407)	-1.8378** (.1011)
Competitive incentives for adopting US Robotics' X2 (ψ^B)	# of ISP's on Rockwell		1.4720** (.00821)	1.1988** (.00596)	1.8447** (.0244)	1.4388* (.5700)	2.4819** (.3872)	4.2772** (.2901)
	# of ISP's on US Robotics		-1.4038** (.00794)	-1.6029** (.00617)	-4.6372** (.0299)	-3.9966** (.0885)	-5.6658** (.3085)	-9.2913** (.1752)
	# of ISP's on both technologies		-.0156** (.000362)	.5645** (.00396)	5.5753** (.0485)	2.9390** (.1348)	5.9635** (.3824)	9.6295** (.2692)
Controls: Non-strategic factors that affect adoption (β)	constant	.00662** (.000776)	-.1642** (.00000365)	-.1660** (.00000831)	-.0874** (.0000602)	-.0671** (.00493)	-.2487** (.00885)	-.0483** (.00805)
	ln(# ISPs in market)	.00117** (.000199)	.000137** (.00000135)	-.000223** (.00000279)	.0231** (.0000204)	.00277+ (.00166)	.0114** (.00309)	.0113** (.00213)
	ISP has digital connection	.000144 (.000161)	.000273** (.0000106)	.000133** (.0000174)	4.6722** (.00905)	3.8302** (.0925)	5.5712** (.3059)	9.1887** (.1640)
	missing	.000121 (.000179)	-.000102 (.0000199)	-.0000805 (.000103)	-.000315** (.0000237)	.000713** (.000183)	.0118** (.00310)	.0108** (.00203)
	ln(median household income)	.00152** (.0000538)	.0173** (.00000266)	.0175** (.0000366)	.00620** (.00000470)	.0118** (.0000966)	.0235** (.00153)	.00527** (.000907)
	# of business establishments per person	-.6510** (.00154)	-.4192** (.000592)	-.1879** (.000746)	.3304** (.00637)	-.1679* (.0768)	-1.1268** (.2290)	-1.1982** (.0789)
	% population college graduate	-.0255** (.000847)	-.1448** (.000351)	-.1742** (.0000321)	.4244** (.00455)	.7111** (.0242)	.5563** (.0967)	.5177** (.0653)
	% population urban	-.00305** (.000746)	.00626** (.0000795)	.00719** (.0000172)	-.0118** (.000866)	-.0657** (.00429)	-.0340** (.0102)	-.0332** (.00991)
	% county population in different county 5 yrs ago	-.0430** (.0000405)	-.00884** (.000528)	-.0160** (.000104)	-.4005** (.00138)	-.4141** (.0160)	-.1865** (.0663)	-.2003** (.0445)
	# of backbone providers	-.0000339** (.00000829)	-.0000142** (.00000509)	-.0000359** (.00000166)	-.00291** (.00000295)	-.00192** (.0000827)	-.00128** (.000169)	-.00109** (.0000879)
	log likelihood	-3034.6	-2744.7	-2735.4	-2712.3	-2664.7	-2644.7	-2641.8

+significant at 90% confidence level. *significant at 95% confidence level. **significant at 99% confidence level.

^AAssumes symmetry between factors that drive adoption of technology A and technology B (aside from differentiation).

APPENDIX TABLE W2: ROBUSTNESS TO ALTERNATIVE (SYMMETRIC) SPECIFICATIONS

		(1)	(2)	(3)	(4) ^a	(5) ^b
		Basic model	Determinants of τ not estimated	Allow correlation between A & B errors	July Decisions Treated as Exogenous	Single-market ISP model
	constant (γ_0)	.5679** (.0494)	.9000** (.0150)	.5874** (.0543)	.7479** (.007)	.5451** (.0110)
Correlates with strategic thinking parameter τ (γ)	ln(# of markets served)	.000563 (.00369)		-.00991 (.00877)	-.012* (.0058)	N/A
	ln(# ISPs in market)	.0403** (.0138)		.0409** (.0147)	.057** (.0066)	.1145** (.00318)
	% population urban	.2701** (.0431)		.2225** (.0533)	.1253** (.0125)	-.0287** (.0144)
	% population college graduate	.3950* (.1683)		.7488** (.2849)	1.1289** (.0127)	-.0320** (.00631)
Competitive incentives for adopting Rockwell's K56Flex (ψ^A)	# of ISP's on Rockwell	-5.6544** (.3094)	-5.6572** (1.0501)	-5.6821** (.0831)	-2.6209** (.053)	-3.796** (.00532)
	# of ISP's on US Robotics	.5899** (.0568)	.1551** (.0288)	.6133** (.0527)	.1652** (.0093)	-.00807** (.000354)
	# of ISP's on both technologies	-1.0862** (.1441)	.00734** (.00248)	-1.0773** (.1515)	-.152** (.0268)	.0113** (.000241)
Competitive incentives for adopting US Robotics' X2 (ψ^B)	# of ISP's on Rockwell	2.4819** (.3872)	2.6414** (.9817)	2.5865** (.2583)	-.2315 (.172)	.2472** (.0156)
	# of ISP's on US Robotics	-5.6658** (.3085)	-5.7030** (1.0444)	-5.6954** (.0739)	-2.5025** (.0404)	-1.1694** (.0199)
	# of ISP's on both technologies	5.9635** (.3824)	3.9459** (.7064)	5.9614** (.0732)	.8055** (.083)	1.0465** (.0252)
Controls: Non-strategic factors that affect adoption (β)	constant	-.2487** (.00885)	-.0522** (.00204)	-.2801** (.0306)	.0315* (.0124)	.0544** (.0129)
	ln(# ISPs in market)	.0114** (.00309)	-.00465** (.000693)	.0107** (.00402)	-.0011 (.0033)	.3754** (.00252)
	ISP has digital connection	5.5712** (.3059)	5.5266** (1.0403)	5.5933** (.0719)	2.48** (.0207)	-.1928** (.0135)
	missing	.0118** (.00310)	.00177** (.000163)	.0114** (.00363)	.00001 (.0002)	-2.1305** (.0108)
	ln(median household income)	.0235** (.00153)	.0192** (.00128)	.0265** (.00258)	-.0044** (.0007)	-.000561 (.000653)
	# of business establishments per person	-1.1268** (.2290)	-3.4383** (.6078)	-.5293 (.4694)	-2.5307** (.0102)	-.00238 (.00563)
	% population college graduate	.5563** (.0967)	1.0594** (.1069)	.5043** (.155)	1.3298** (.07)	.00291 (.00507)
	% population urban	-.0340** (.0102)	-.0988** (.00953)	-.0359* (.0144)	-.0516** (.0104)	-.000445 (.000872)
	% county population in different county 5 yrs ago	-.1865** (.0663)	-.5118** (.0417)	-.2268* (.1012)	.026 (.079)	-.00169 (.00421)
	# of backbone providers	-.00128** (.000169)	-.000824** (.0000394)	-.00120** (.000279)	-.0017** (.0004)	.00203** (.0000371)
		ρ			-.4888** (.0148)	-.4825** (.0103)
	log likelihood	-2644.7	-2677.3	-2633.7	-2082.9	-225.705

+significant at 90% confidence level. *significant at 95% confidence level. **significant at 99% confidence level.

^a Here we treat the decisions made before July as exogenous. So, if an ISP had adopted one technology by July, this ISP only needed to consider whether to adopt the other technology or not in October. Of course, for those ISPs that had adopted both technologies by July, they had no technology adoption choice to make in October. Our previous structure is still applicable to those ISPs that had adopted neither technology by July. It is possible that earlier decisions by ISPs were observed by later adopters. In order to reflect the influence of these potentially observed decisions in July, we incorporate them into the expectation formation process of all ISPs and update their profit functions and choice probabilities accordingly. For example, if type k ISP j adopted technology A by July, its choice probabilities in October conditional on its type are:

$$\{\Pr(s_j = 0|k), \Pr(s_j = A|k), \Pr(s_j = B|k), \Pr(s_j = AB|k)\} = \{0, \Pr(\pi_j^{AB} < \pi_j^A | k), 0, 1 - \Pr(\pi_j^{AB} < \pi_j^A | k)\}$$

where $\Pr(\pi_j^{AB} < \pi_j^A | k) = \Pr(\sum_i E[\pi_{ij}^B | k] + v_j^B + \Gamma < 0) = \Phi(-\sum_i E[\pi_{ij}^B | k] - \Gamma)$.

^b The single market ISP model treats each local branch of a multi-market ISP as an independent decision-maker, which means that local branches of the same ISP make independent decisions and that these decisions can be different from each other. In the multi-market ISP model presented in the main paper, we have the constraint that all branches of a multi-market ISP must make the same choice.

TABLE W3: BETTER-RESPOND RATHER THAN BEST-RESPOND

		(1)	(2)
		97% accuracy of what lower types should do	85% accuracy of what lower types should do
	constant (γ_0)	.6832** (.0476)	.7344** (.042)
Correlates with strategic thinking parameter τ (γ)	ln(# of markets served)	-.014** (.0053)	-.0338** (.0035)
	ln(# ISPs in market)	.0412* (.0166)	.0495** (.013)
	% population urban	.2029** (.0673)	.2542** (.0441)
	% population college graduate	.7775** (.0818)	1.4826** (.197)
Competitive incentives for adopting Rockwell's K56Flex (ψ^A)	# of ISP's on Rockwell	-3.2773** (.175)	-3.5464** (.3267)
	# of ISP's on US Robotics	1.1942** (.079)	1.0159** (.0865)
	# of ISP's on both technologies	-2.8131** (.192)	-2.6232** (.2287)
Competitive incentives for adopting US Robotics' X2 (ψ^B)	# of ISP's on Rockwell	.2797** (.0598)	.5351** (.0505)
	# of ISP's on US Robotics	-1.1876** (.1787)	-3.9845** (.3165)
	# of ISP's on both technologies	2.0056** (.297)	8.8276** (.7267)
Controls: Non- strategic factors that affect adopting Rockwell's K56Flex (β^A)	constant	-2.136** (.0047)	-4.9438** (.2324)
	ln(# ISPs in market)	.3817** (.002)	.7244** (.0742)
	ISP has digital connection	2.8437** (.1815)	3.2915** (.3206)
	missing	-.8048** (.0092)	-1.0363** (.1031)
	ln(median household income)	.2292** (.0021)	.4797** (.0246)
	# of business establishments per person	3.3227** (.6973)	-15.0931** (4.1787)
	% population college graduate	-1.7764** (.2589)	3.4961** (1.5167)
	% population urban	.322** (.0522)	.6561* (.2616)
	% county population in different county 5 yrs ago	-.3869 (.2872)	-.6729 (.5935)
	# of backbone providers	-.0414** (.0003)	-.0728** (.007)
	Controls: Non- strategic factors that affect adopting US Robotics' X2 (β^B)	constant	-8.8489** (.1782)
ln(# ISPs in market)		.0249 (.0195)	-.0173+ (.0091)
ISP has digital connection		1.1319** (.167)	3.6686** (.2961)
missing		.0215 (.0301)	.2385** (.0212)
ln(median household income)		.8171** (.0154)	1.8279** (.19)
# of business establishments per person		.3058 (.5631)	4.6567* (2.3319)
% population college graduate		1.2688** (.1553)	2.3056** (.5884)
% population urban		-.5674** (.0985)	-.2524+ (.1403)
% county population in different county 5 yrs ago		.3201** (.1171)	-.8019** (.1086)
# of backbone providers		.0343** (.0042)	.0499** (.0062)
ρ		-.2177 (.3388)	-.2329 (.5547)
log likelihood	-2617.3	-2601.7	

+significant at 90% confidence level. *significant at 95% confidence level. **significant at 99% confidence level.

TABLE W4: ROBUSTNESS TO SYMMETRIC, SINGLE MARKET SPECIFICATIONS WITH UNOBSERVED HETEROGENEITY

		(1) ^a	(2) ^a	(3) ^a	(4) ^a
		500 markets, with heterogeneity	500 markets, no heterogeneity	1000 markets, with heterogeneity	1000 markets, no heterogeneity
	constant (γ_0)	.3273** (.0997)	.3259** (.0932)	.3760** (.0954)	.3757* (.1778)
Correlates with strategic thinking parameter τ (γ)	ln(# of markets served)	N/A	N/A	N/A	N/A
	ln(# ISPs in market)	.1699** (.0288)	.1705** (.0262)	.1499** (.0295)	.1499** (.046)
	% population urban	.0704 (.0529)	.0692 (.0513)	-.0561 (.0394)	-.0561 (.0417)
	% population college graduate	-.1191 (.3224)	-.1225 (.3059)	-.2411 (.5678)	-.2407 (.3442)
Competitive incentives for adopting Rockwell's K56Flex (ψ^A)	# of ISP's on Rockwell	-.8652** (.0543)	-.844** (.0644)	-.7219** (.1433)	-.7222** (.1305)
	# of ISP's on US Robotics	-.0371** (.0068)	-.0378** (.0062)	-.3609+ (.2082)	-.361+ (.1934)
	# of ISP's on both technologies	.1448** (.0076)	.1389** (.0154)	.58** (.2245)	.5801** (.1771)
Competitive incentives for adopting US Robotics' X2 (ψ^B)	# of ISP's on Rockwell	.053 (.1942)	.1371 (.2026)	.9428** (.0357)	.9435** (.0282)
	# of ISP's on US Robotics	-1.9824** (.3237)	-1.9904** (.2161)	-.8353** (.0312)	-.8361** (.0227)
	# of ISP's on both technologies	2.4442** (.5052)	2.5732** (.3565)	-1.1263** (.0228)	-1.1262** (.014)
	constant (β_0)	.6289** (.0796)	.5269 (.3863)	-.1822** (.0633)	-.1815** (.0302)
	ln(# ISPs in market)	.3012** (.027)	.3204** (.0413)	-.0966** (.0249)	-.0968** (.0228)
	ISP has digital connection	-.3477** (.0998)	-.3681** (.0888)	.6612** (.0328)	.6612** (.0222)
	missing	-2.2373** (.1288)	-2.2417** (.1342)	-.2298** (.0305)	-.2297** (.0242)
Controls: Non-strategic factors that affect adoption (β)	ln(median household income)	.0084 (.0109)	.0137 (.036)	.0147 (.0111)	.0147* (.0072)
	# of business establishments per person	-6.052** (.8402)	-6.0143** (1.7908)	-.6304 (.5024)	-.6402 (1.8129)
	% population college graduate	.0102 (.0547)	-.012 (.216)	-.0726 (.1601)	-.0719 (.1986)
	% population urban	-.0431** (.0073)	-.0418 (.0371)	.0059 (.0257)	.0058 (.0264)
	% county population in different county 5 yrs ago	-.1354 (.1212)	-.1353 (.093)	-.1422 (.2004)	-.1426 (.1871)
	# of backbone providers	-.0027** (.0008)	-.0026* (.0011)	-.0047** (.0006)	-.0047** (.0006)
	constant (σ_0)	.0188 (.0117)		.0013 (.0286)	
	log likelihood	-6071.5	-6072.1	-25,825.0	-25,825.0

+significant at 90% confidence level. *significant at 95% confidence level. **significant at 99% confidence level.

^aMarket-level unobserved heterogeneity is captured by the random intercept $C: C \sim N(\beta_0, \sigma_0)$. The markets were randomly selected. For 500 markets, after omitting markets with 1 or 2 ISPs, we get a sample of 290 markets. For 1000 markets, after omitting markets with 1 or 2 ISPs, we get a sample of 694 markets. These estimates use the single market ISP model in Appendix Table W2 column 5 because unobserved heterogeneity is not identified in the multi-market model.

TABLE W5: OPERATIONAL SOPHISTICATION, SURVIVAL, AND STRATEGIC THINKING

	Dependent Variable			
	τ^a	Survival ^b	Survival ^b	Survival ^b
Have a networking maintenance business	.0798** (.0219)	-.0678 (.0980)	-.0840 (.0985)	-.0505 (.0905)
Have a web design business	.0377* (.0187)	.0799 (.0837)	.0719 (.0838)	
τ			.205 (.129)	.212+ (.128)
Constant	2.61** (.0105)	.315** (.0467)	-.220 (.338)	-.219 (.338)
Log likelihood	N/A	-799.4	-798.2	-798.5
R ²	.022	N/A	N/A	N/A
# of observations	1213	1213	1213	1213

+significant at 90% confidence level. *significant at 95% confidence level. **significant at 99% confidence level.

^aOLS Regression; ^bProbit Regression

Notes: Uses the 1213 ISPs for which we have data on other activities that proxy for operational sophistication.

TABLE W6: NUMBER OF ISPS ADOPTING FOR DIFFERENT SIMULATED LEVELS OF STRATEGIC THINKING

	Adopt neither	Adopt Rockwell Semiconductor's Technology (A)	Adopt US Robotics' Technology (B)	Adopt both
Everyone is type-0	12.5	282.4	29.1	1909.0
$\tau = 1$	157.7	111.5	1258.5	705.3
$\tau = 2$	1238.4	127.2	599.8	267.6
$\tau =$ estimated from the data (the average is 2.62 though it varies across firms)	1106.9	521.0	453.2	151.8
$\tau = 3$	1242.6	511.6	371.0	107.9
$\tau = 4$	1544.7	397.4	242.1	48.8
$\tau = 5$	1723.6	296.7	187.4	25.3
Everyone is type-1	96.9	10.6	2122.0	3.5

Notes: Simulations based on table 2 column 2 and 2,233 total ISPs in the data. This table was used to generate figures 1 and 2