

# **Why Are (Some) Consumers (Finally) Writing Fewer Checks? The Role of Payment Characteristics**

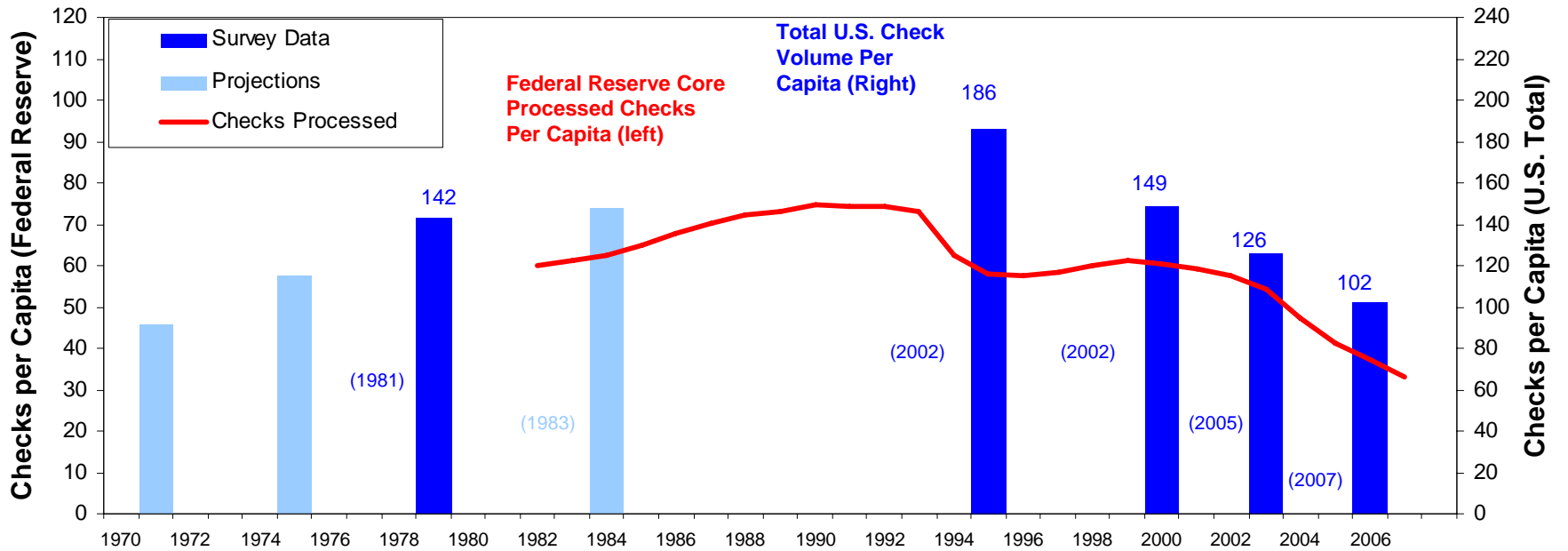
Scott Schuh and Joanna Stavins  
Federal Reserve Bank of Boston

November 15, 2008

Research Conference on Payment Systems  
Norges Bank, Oslo, Norway

# FACT #1: Paper check use is (finally!) declining...

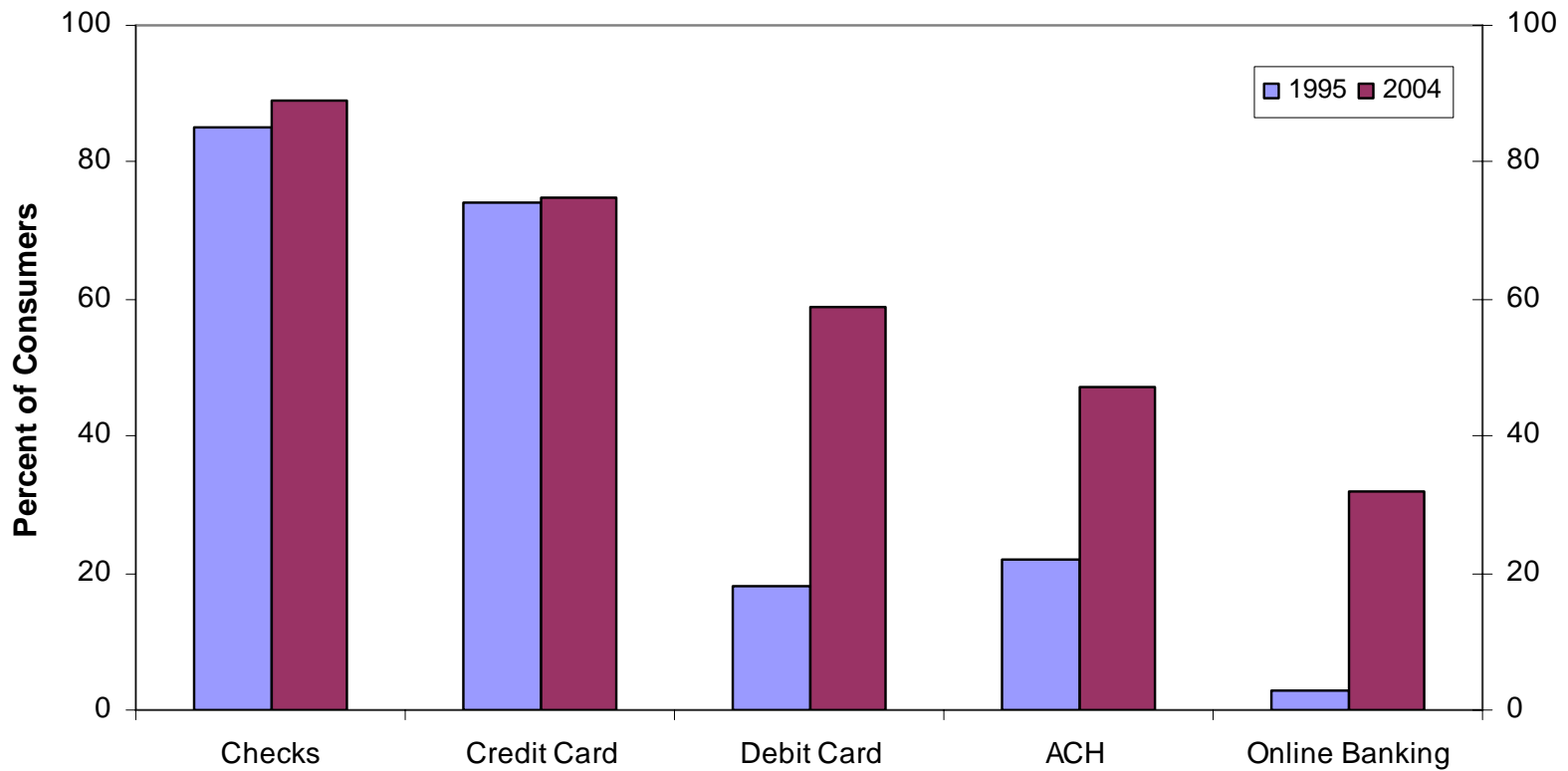
## Figure 1: U.S. Checks Per Capita



...and adoption of newer payments is increasing...

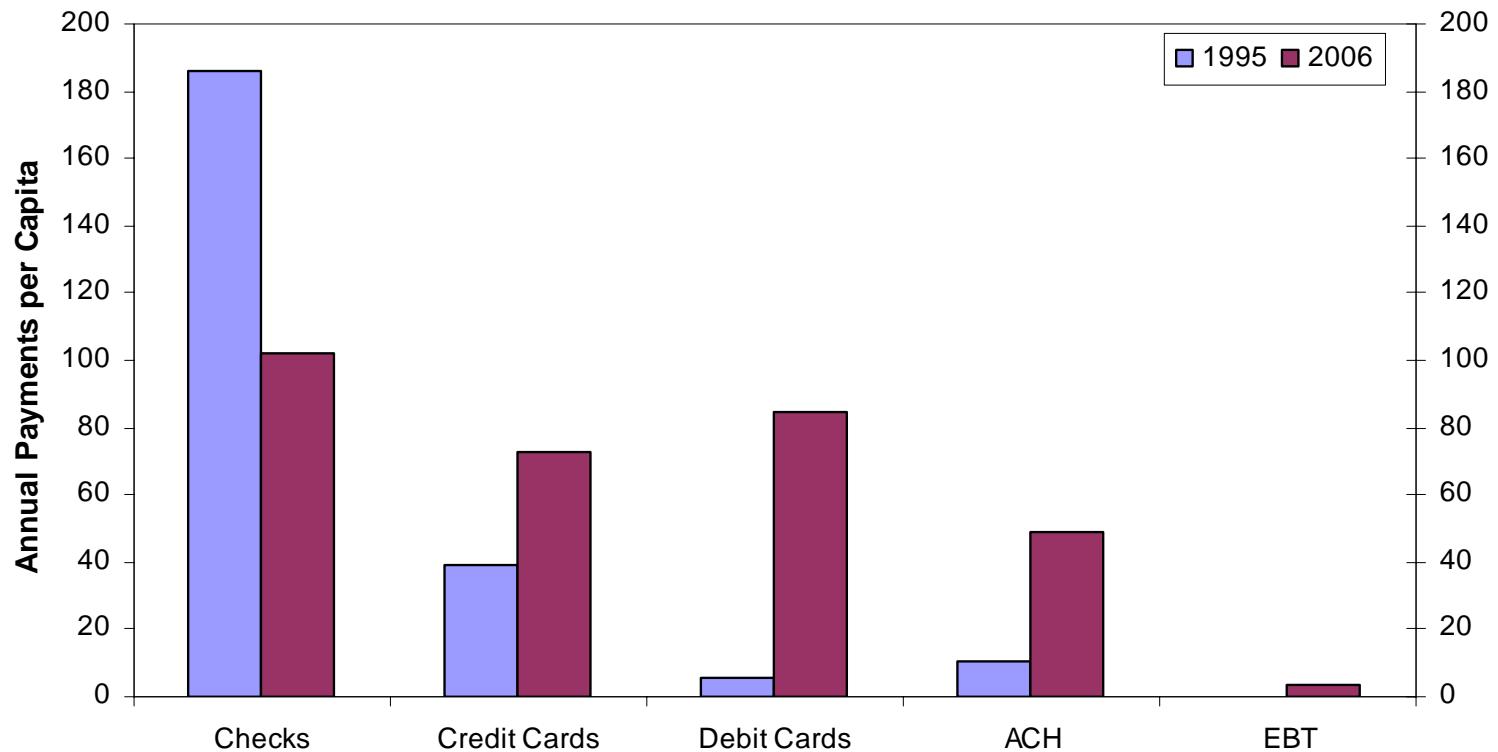
Figure 3

U.S. Payment Adoption Rates (Consumers Only)



...and use of new payments also is increasing...

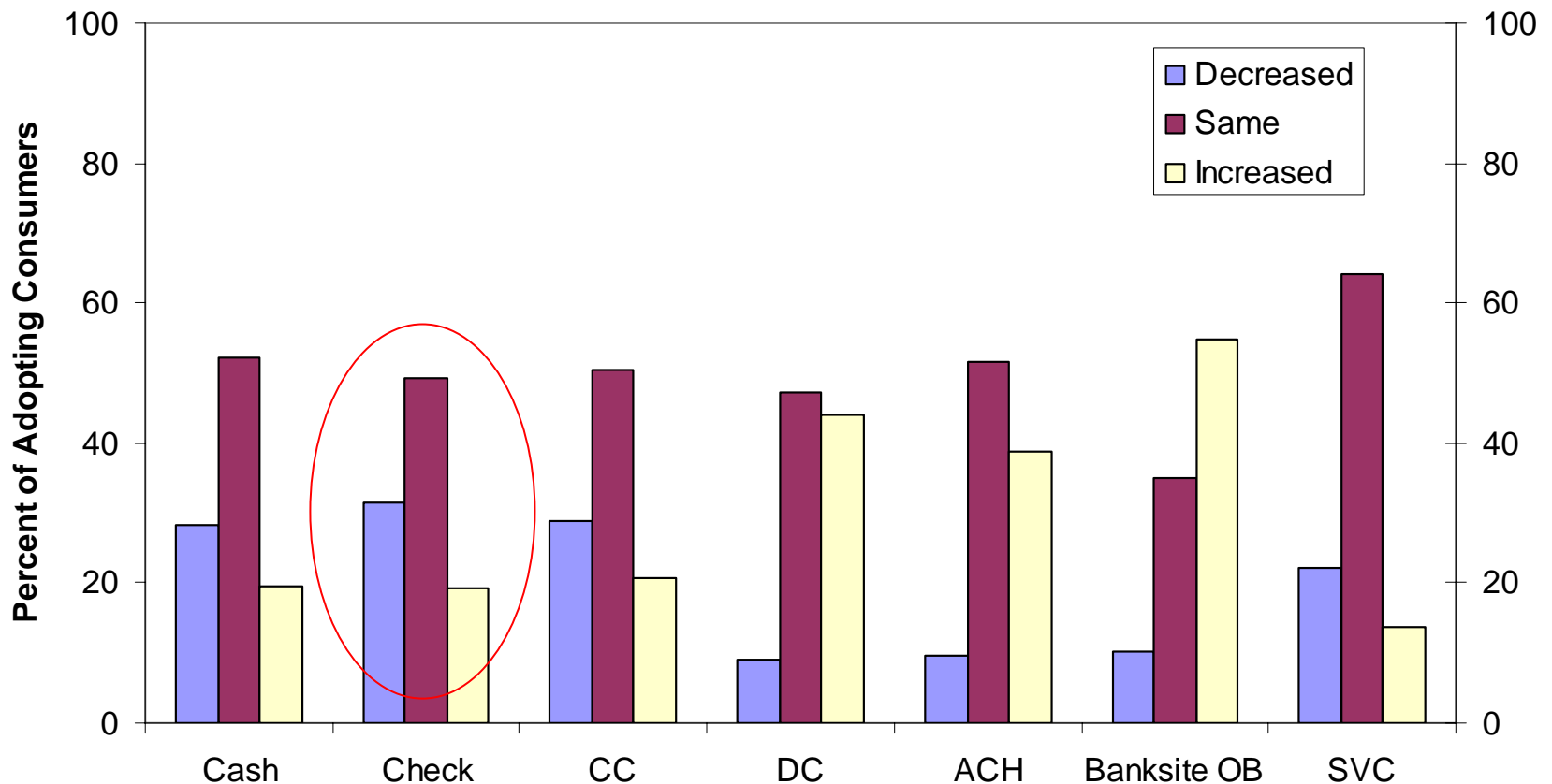
### U.S. Payment Use (All Payments)



# FACT #2: (Some) Consumers are writing fewer checks...

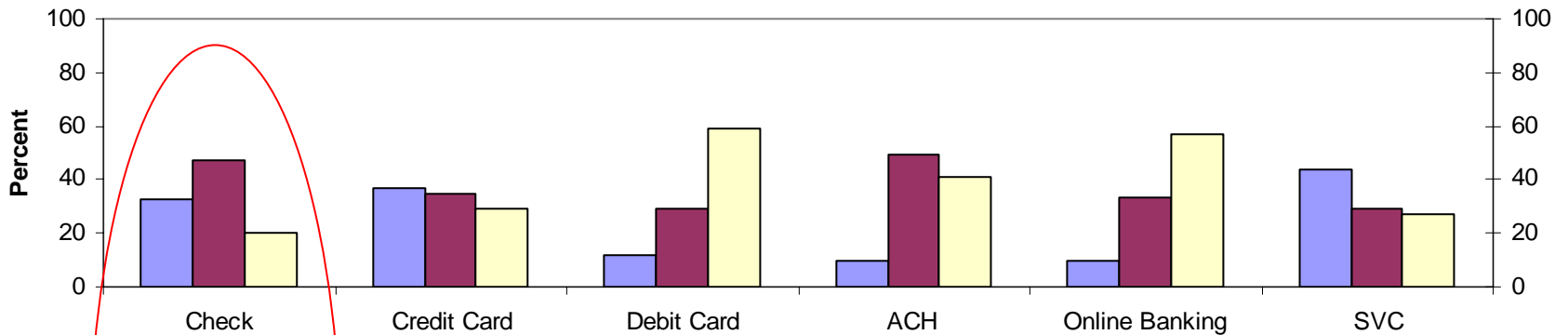
Figure 2

Change in Consumer Payment Use, 2003-2006

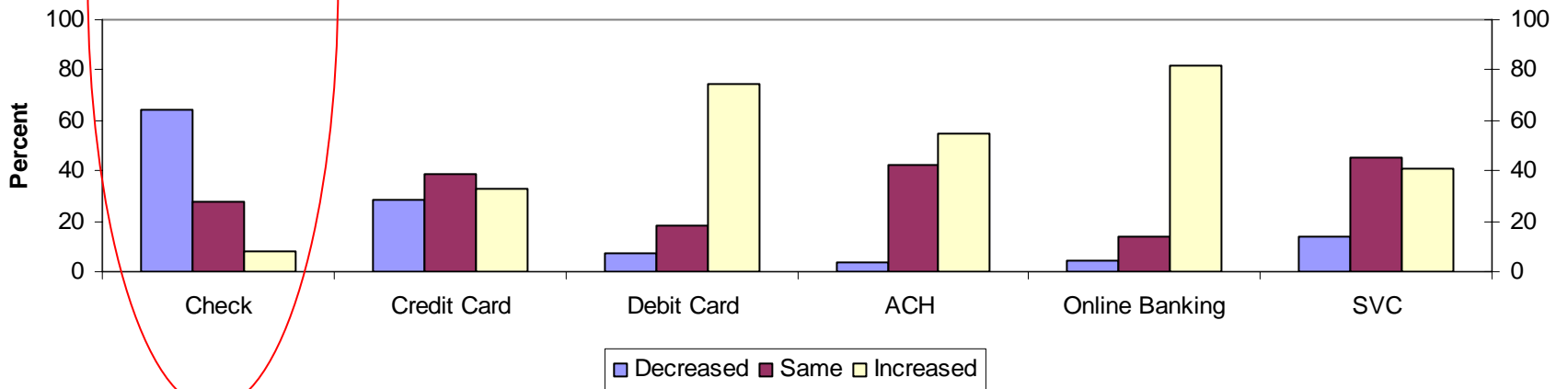


...and sophisticated consumers reduced check use more

**Change in Payment Use, 2003-2006: AARP Survey**



**Change in Payment Use, 2001-2004: Fed Survey**



SOURCES: 2004 Boston Fed Consumer Payment Survey, 2006 Boston Fed/AARP Consumer Payment Survey

# Some unanswered questions

- Why did checks decline in mid-1990s?
- Why did they decline as much as they did?
- Why did only some consumers reduce check use?
- Why did consumers choose the alternative payment instruments they chose?
- Why don't we have answers...?

# Because...

- There is little research (theoretical or empirical) on consumer payment demand
  - Schreft (2006); Philly Fed “Consumer Payments Bibliography”; Benton et al (2007)
- There is little data (publicly) available on consumer payment choice
  - Carten et al (2007), 2006 Boston Fed conference

# Literature Overview

- Money demand models w/ income and characteristics:
  - E.g., Barnett, Fisher, and Serletis (1992); Rotemberg, Driscoll, and Poterba (1995); Whitesell (1989); He, Huang, and Wright (2006)
- Payments models with DEM and/or Y only:
  - E.g., Stavins (2001), Bertaut & Haliassos (2005), Mester (2003, 2006), Hayashi & Klee (2003), Anguelov et al (2004), Kim et al (2005), Fusaro (2008), Rysman (2006), Zinman (2008)
  - Limitations in scope (# of instruments, types of choice, explanatory variables, etc.)
- Payments models w/characteristics:
  - E.g., Carrow & Staten (1999), Jonker (2005), Klee (2006b), Borzekowski & Kiser (2008), Ching & Hayashi (2006), Borzekowski, Kiser & Ahmed (2007)

# Schuh-Stavins Overview

- Estimate reduced-form models of consumer demand for payment instruments
  - Adoption and use (Heckman selection model)
  - 3-year change in use (ordered logit)
- Use rich new data source: 2006 Survey of Consumer Payment Choice
  - 7 instruments (CS, CK, CC, DC, ACH, OB, SVC)
    - $M1 = (CS + SVC) + DD$  [other instruments access DD]
  - Broad list of consumer demographics & income
  - Unique list of payment characteristics
- Conclusion – characteristics are important!
  - Esp. convenience, cost, recordkeeping, and timing

# Payment Instrument Choice Variables

Adoption:  $A_{ijt} = \begin{cases} 1 & \text{if consumer } i \text{ has adopted payment } j \\ 0 & \text{otherwise} \end{cases}$

Use:  $U_{ijt} = \left( \frac{n_{ijt}}{N_{it}} \right)$  where  $N_{it} = \sum_j n_{ijt}$

Change in use:  $CU_{ijt} \equiv \begin{cases} 1 & \text{if use increased} \\ 0 & \text{if use stayed the same} \\ -1 & \text{if use decreased} \end{cases}$

# Heckman (1976) Selection Model

1<sup>st</sup>-stage probit (all):

$$A_{ijt} = A(DEM_{it}, Y_{it}, NET_{it}) + \varepsilon_{ijt}^A$$

2<sup>nd</sup>-stage OLS (adopters only):

$$U_{ijt} = U(\overline{RCHAR}_{ijt}, DEM_{it}, Y_{it}, J_{it}, MR_{it} - 1) + \varepsilon_{ijt}^U$$

(See Table 1 and text for variable definitions)

**Table 1: Regression Variable Definitions**

<b>Class</b>	<b>Variable</b>	<b>Definition</b>
<i>CHAR</i>	<i>COST</i>	Cost or fees (1-10)
	<i>CONV</i>	Convenience (1-10)
	<i>SAFE</i>	Safety (1-10)
	<i>PRIV</i>	Privacy (1-10)
	<i>ACC</i>	Accuracy (1-10)
	<i>TIME</i>	Payment timing (1-10)
	<i>REC</i>	Record keeping (1-10)
<i>DEM</i>	<i>AGE</i>	25–34; 35–44; 45–54; 55–64; 65+
	<i>GEN</i>	Male; female
	<i>RACE</i>	White; black; Latino; Asian; American Indian; other
	<i>EDU</i>	Less than HS; high school; less than college; college; some post-graduate or more
	<i>MS</i>	Married; divorced; widowed; single
	<i>HH</i>	Size; children (under 18)
<i>Y</i>	<i>INC</i>	Less than \$25,000; \$25,000–50,000; \$50,000–75,000; \$75,000–100,000; \$100,000 or more
	<i>INT</i>	Does your checking account earn interest? (Yes=1)
	<i>LFS</i>	Labor force status: employed, not employed, retired
	<i>FR</i>	Financial responsibility: shared=1; most=2; all=3
<i>MISC</i>	<i>J</i>	Number of payment methods used in a typical month
	<i>NET</i>	Internet use: None=0; less than monthly=1; less than weekly=2; less than daily=3; daily or more=4

# Econometric Concerns w/Characteristics

**Reported vs. actual:**

$$CHAR_{ijt} = C_{ijt}^* + \eta_{ijt}$$

**Potential problems:**

$C_{ijt}^*$  is endogenous for some  $j$

$Y_{ijt}$ ,  $C_{ijt}^*$  are simultaneously determined

$E(\eta_{ijt} \varepsilon_{ijt}) \neq 0$  for several potential reasons:

$\eta_{ijt}$  may include errors (limited information, or measurement) and misperceptions

**SOLUTION:** Instrumental variables estimation (19 instruments)

# Consumer Payments Data

- Surveys of Consumer Payment Choice
  - 2003, 2004 SCPC: Fed employees (Boston Fed)
  - 2006 SCPC: U.S. consumers (AARP & Boston Fed)
  - 2008, 2009: U.S. consumers (Boston Fed, RAND ALP)
- Sample
  - 1,500 consumers age 25+
  - Have all or shared financial responsibility in HH
  - Telephone survey (standard list-assisted RDD)
  - Post-stratified weighting on 4 demographics to match Census
  - Over-sampling of older consumers (for AARP purposes)
- Representation
  - Not perfect, but about as good as anything else...

# Figure 4 Adoption and Use of Payment Instruments by U.S. Consumers

## Rates of Adoption (All Consumers)

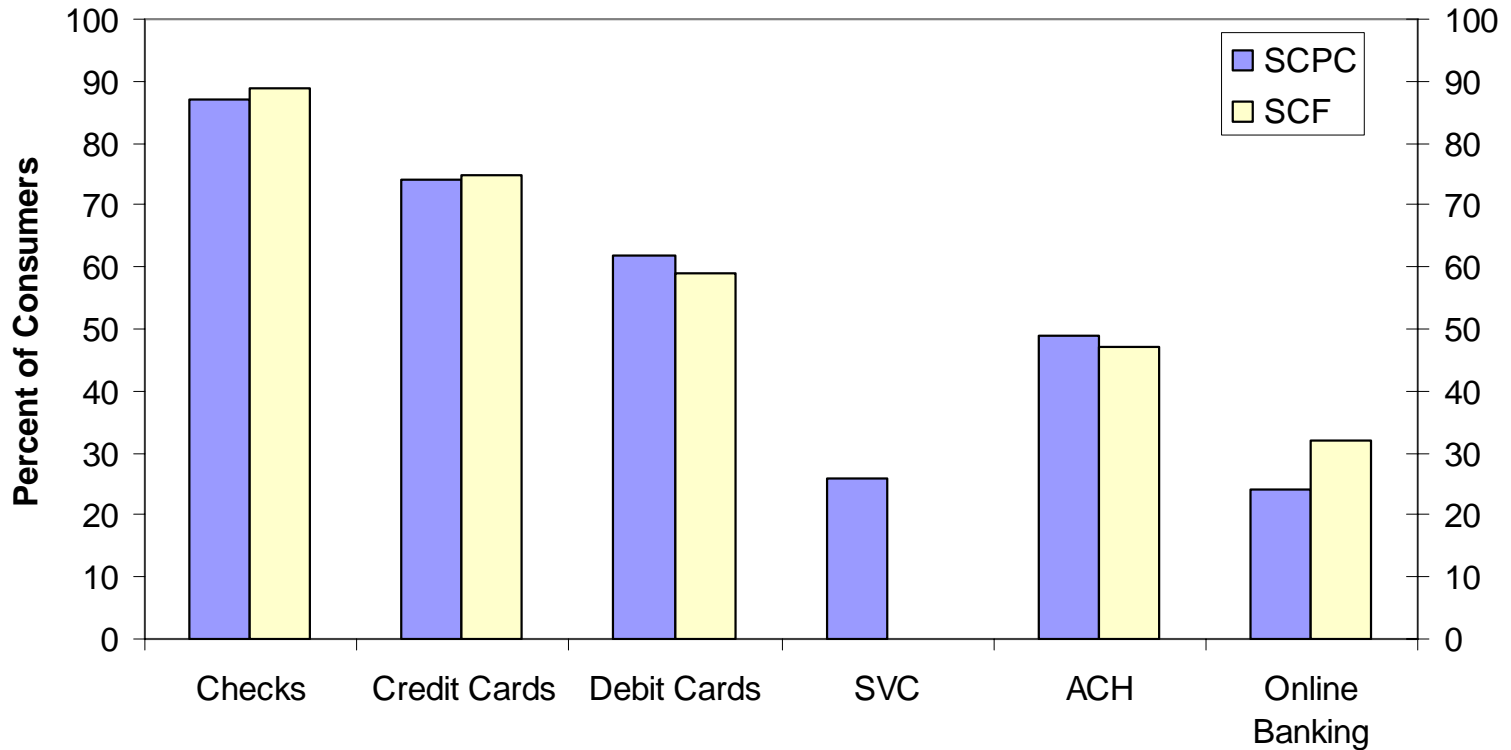
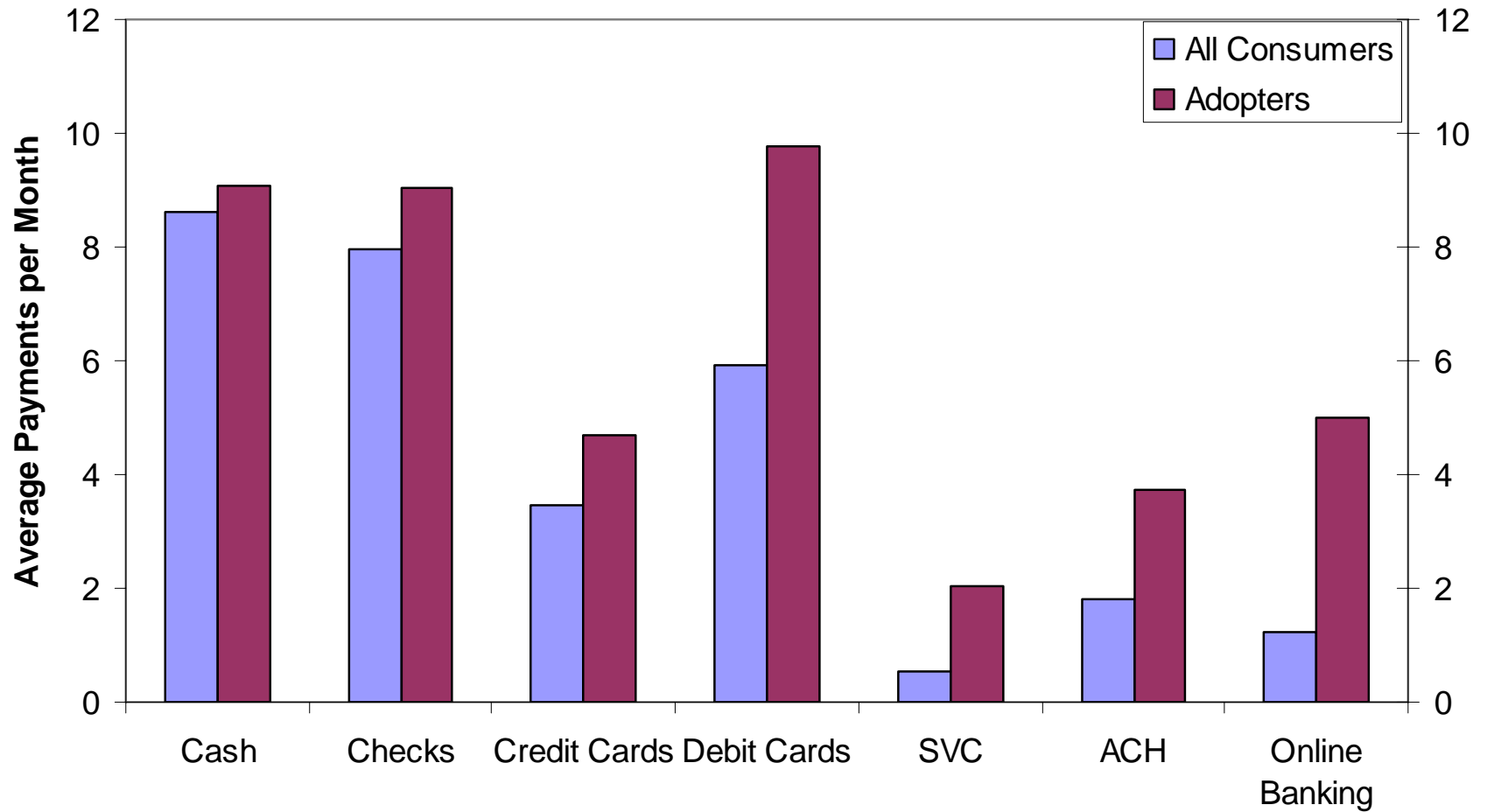


Figure 4 (continued)

Monthly Use



**Table 4a: Average Absolute Ratings of Payment Characteristics**

Payment Method	Characteristic							
	Cost	Convenience	Safety	Privacy	Accuracy	Timing	Record Keeping	Average
Cash	8.0	7.5	6.1	8.2	8.0	7.1	5.3	7.2
Checks	7.3	8.0	7.6	6.7	8.7	7.6	8.9	7.8
Credit Cards	5.6	8.8	6.6	6.4	8.1	8.0	8.2	7.4
Debit Cards	7.4	9.1	7.3	7.1	8.5	8.6	7.8	8.0
ACH	8.5	9.1	8.3	7.9	8.9	8.9	8.5	8.6
SVC	7.9	8.2	7.7	8.3	8.2	8.3	6.0	7.8
Bank Site Online Banking	8.2	9.0	8.0	7.9	8.9	8.7	8.9	8.5
Average	7.6	8.5	7.4	7.5	8.5	8.2	7.7	7.9

All characteristics are “above average” (5)?

Check characteristics are about average (7.8)

Table 4b: Logged Characteristic Ratings Relative to Checks

Payment Method	Characteristic							
	Cost	Convenience	Safety	Privacy	Accuracy	Timing	Record Keeping	Average
Cash	8	-10	-39	26	-17	-16	-81	-18
Checks	0	0	0	0	0	0	0	0
Credit Cards	-38	14	-19	-7	-9	8	-12	-9
Debit Cards	6	25	2	16	-1	24	-16	8
ACH	19	21	13	23	3	24	-7	14
SVC	11	5	-1	35	-13	10	-59	-2
Bank Site Online Banking	26	41	22	34	6	31	3	23
Average	5	14	-3	18	-4	11	-25	2

$$RCHAR_{kit}(j, j') \equiv 100 \times \log \left( \frac{CHAR_{kijt}}{CHAR_{kijt'}} \right) \quad \text{(Table above)}$$

$$\overline{RCHAR}_{kit}(j) \equiv \frac{1}{J_{it}} \sum_{j' \neq j} RCHAR_{kit}(j, j') \quad \text{(Regressions)}$$

**Table 5: Adoption Model Regressions (1st Stage of Heckman: Probit)**

<b>Explanatory Variables</b>	<b>Cash</b>	<b>Checks</b>	<b>Credit Cards</b>	<b>Debit Cards</b>	<b>ACH</b>	<b>Bank Site Online Banking</b>	<b>SVC</b>
<b>Age:</b>							
<b>25-34</b>	-.06	.06	.02	.18	.29 *	.46 ***	-.11
<b>35-44</b>							
<b>45-54</b>	-.22	-.12	.36 **	-.50 ***	-.22	-.35 **	.00
<b>55-64</b>	-.21	.37	.57 ***	-.40 **	-.29 *	-.46 ***	.22
<b>&gt;65</b>	-.87 **	.30	.75 ***	-.92 ***	-.15	-.67 ***	.16
<b>Education:</b>							
<b>Some High School</b>	-.64	-.85 ***	-.22	-.28	-.22	-.41	-.09
<b>High School</b>	.19	-.24	-.04	-.08	-.05	-.44 ***	.02
<b>Some College/Assoc. Degree</b>	.33	.21	.01	.20	.12	.06	.03
<b>College Degree</b>							
<b>At Least Some Post Grad.</b>	.71 *	-.05	.19	-.08	.23	.15	.18
<b>Marital Status:</b>							
<b>Divorced</b>	.25	-.13	-.15	.25	.02	.13	-.25
<b>Widowed</b>	-.07	.02	.02	.28	.04	-.05	.19
<b>Single</b>	.84 *	-.39 *	.10	.05	-.22	-.25	.27
<b>Household Composition:</b>							
<b>Size</b>	-.05	-.06	.00	.00	-.06	-.04	.09
<b>Children</b>	.23	-.10	-.44 **	.00	.08	.14	-.03
<b>Race:</b>							
<b>Latino</b>	-.68 **	-.41	.47 *	.31	-.26	-.04	.03
<b>Black</b>	.30	-.74 ***	-.43 **	.18	-.04	.05	-.60 ***
<b>Asian</b>	4.91	-1.28 ***	.28	.22	-.14	-.41	-.61
<b>American Indian</b>	4.63	-.53	-.92 **	.76	.28	-.12	.28
<b>Other</b>	-.04	.38	-.62	-.30	-.61 *	.22	-.66
<b>Gender: Male</b>	-.13	-.28 *	-.30 **	-.05	-.10	-.02	-.39 ***
<b>Income:</b>							
<b>&lt;\$25,000</b>	.05	-.68 ***	-1.33 ***	-.40 **	-.40 ***	-.71 ***	-.11
<b>\$25,000-\$49,999</b>	-.08	-.22	-.27 *	-.10	-.23 *	-.23	.24 *
<b>\$50,000-\$74,999</b>							
<b>\$75,000-\$99,999</b>	.77	.49	.20	-.07	.05	.07	.27
<b>&gt;\$100,000</b>	-.28	.54	.59 **	.31 *	.31 **	.57 ***	.02
<b>Retired</b>	.09	.15	.21	.15	.24 *	.05	-.45 ***
<b>Not Employed</b>	-.53 *	-.45 **	-.11	-.16	-.12	-.29	-.21
<b>Financial Responsibility</b>	-.11	-.01	-.07	-.11 *	.02	.05	-.05
<b>Internet Use</b>	.08	.12 **	.23 ***	.17 ***	.12 ***		.11 ***
<b>Number of Observations</b>	663	922	914	848	986	1055	990
<b>Pseudo R-squared</b>	.19	.32	.30	.16	.09	.19	.09

Table 6: Use Model Regressions (2nd Stage of Heckman)

Explanatory Variables	Cash	Checks	Credit Cards	Debit Cards	ACH	Bank Site Online Banking	SVC
<b>Characteristics:</b>							
Cost	.00	.04 ***	.06 ***	-.01	.03 *	.03	.00
Convenience	.05 ***	.08 ***	.10 ***	-.02	.00	.07	.06 *
Safety	.01	.01	.02	.06 **	.01	.02	.00
Privacy	.00	.02	-.04 ***	.01	.01	.02	-.03
Accuracy	.03	.02	-.05 **	.02	.01	.00	-.05
Timing	.02	.01	.05 **	.08 *	.01	.01	.02
Record Keeping	.05 ***	.00	.02	.04	-.03	.02	.03 *
<b>Age:</b>							
25-34	-.02	-.06 **	-.04	.07 *	.00	.20	-.02
35-44							
45-54	-.01	.04	.00	-.05	.01	-.08	-.04
55-64	-.01	.02	.01	-.11 **	.03	-.12	-.02
>65	.02	.02	.04	-.07	.04	-.23	.00
<b>Education:</b>							
Some High School	.08	-.01	-.02	.05	.05	-.04	.12 *
High School	.00	.01	-.03	.02	.01	-.10	-.01
Some College/Assoc. Degree	.00	.00	-.03 *	.00	-.02	.07	.02
College Degree							
At Least Some Post Grad.	.06 *	.01	.02	-.04	-.04	.04	-.01
<b>Marital Status:</b>							
Divorced	.02	-.04	-.02	-.03	.01	.05	.03
Widowed	-.01	-.04	.01	-.07	.04 *	-.05	.03
Single	-.02	-.03	.00	.02	.02	-.10	-.02
<b>Household Composition:</b>							
Size	.01	.01	-.01	.01	.00	-.04	.01
Children	-.02	.00	-.01	-.02	.00	.12	-.05
<b>Race:</b>							
Latino	-.03	.09 **	-.01	-.03	.08 **	-.01	.07
Black	-.04	.04	-.02	.01	.11 ***	.02	.07
Asian	.07	.06	-.02	-.15	.01	-.19	-.05
American Indian	.09	-.10	-.01	.08	-.05	-.04	-.06
Other	.00	-.13 *	.05	.01	.12	.22	.09
<b>Gender: Male</b>							
	.04 **	.00	.01	-.04	.02	.00	.00
<b>Income:</b>							
<\$25,000	.08 **	.08 ***	-.02	-.06	.01	-.33	.03
\$25,000-\$49,999	.01	.05 **	-.02	-.03	.00	-.09	.00
\$50,000-\$74,999							
\$75,000-\$99,999	-.02	.01	.01	-.03	.00	.10	-.04
>\$100,000	-.02	.00	.02	-.04	-.03	.26	.00
Check Interest	-.03	.00	-.02	.03	.00	.03	-.01
Retired	-.02	-.03	.02	.04	-.01	-.05	.02
Not Employed	.01	.01	.07 **	.02	.03	-.12	.07 *
Financial Responsibility	.01	-.01	.00	.02	.00	.03	.01
Total Payment Methods	.01 *	-.11 ***	.01 **	.04 ***	-.05 ***	-.05 ***	.00
Inverse Mills Ratio	-.12	-.15 *	-.01	.07	-.13 **	.61	-.05
Number of Observations	618	837	663	456	491	216	204
R-squared	.18	.45	.19	.17	.24	.36	.18
Without CHAR	.06	.41	.08	.12	.23	.31	.15
Without CHAR and Total Payment Methods	.06	.11	.08	.09	.09	.18	.14

Table 7: Comparison of Heckman 2nd Stage Results and IV Regression Results for Checks

	Heckman Full Model	IV Full Model	Heckman Restricted	IV Restricted No Demog	IV Restricted with Demog
<b>Characteristics:</b>					
Cost	.04 ***	.10	.04 ***	.09	.10
Convenience	.08 ***	.12	.08 ***	.15	.17
Safety	.01	.17	.01	.26	.04
Privacy	.02	.05	.02	-.03	.06
Accuracy	.02	-.04	.02	-.12	-.05
Timing	.01	.14	.01	.16	.14
Record Keeping	.00	.23	.00	.18	.17
<b>Age:</b>					
25-34	-.06 **	-.01	-.07 **	.00	-.02
35-44					
45-54	.04	.08	.03	.08	.05
55-64	.02	-.03	.00	-.02	-.04
>65	.02	.00	.01	.01	-.02
<b>Education:</b>					
Some High School	-.01	.10			
High School	.01	.01			
Some College/Assoc. Degree	.00	.02			
College Degree					
At Least Some Post Grad.	.01	-.03			
<b>Marital Status:</b>					
Divorced	-.04	-.02	-.05 **	-.02	-.03
Widowed	-.04	-.06	-.05 *	-.07	-.07 *
Single	-.03	-.05	-.05 *	-.05	-.07 *
<b>Household Composition:</b>					
Size	.01	.00			
Children	.00	.01			
<b>Race:</b>					
Latino	.09 **	.12	.09 **	.11	.13 **
Black	.04	.08	.04	.06	.05
Asian	.06	.16	.07	.11	.12
American Indian	-.10	-.19 *	-.10	-.19 *	-.17 *
Other	-.13 *	-.15	-.13 *	-.18 *	-.18 *
<b>Gender: Male</b>					
	.00	.01			
<b>Income:</b>					
<\$25,000	.08 ***	.05	.09 ***	.03	.05
\$25,000-\$49,999	.05 **	.03	.05 **	.03	.03
\$50,000-\$74,999					
\$75,000-\$99,999	.01	.00	.01	-.02	.01
>\$100,000	.00	.01	.00	.00	.00
Check Interest	.00	-.01	.00	-.02	-.02
Retired	-.03	-.01	-.03	-.01	-.01
Not Employed	.01	.06	.01	.05	.04
Financial Responsibility	-.01	-.02	-.01	-.02	-.01
Total Payment Methods	-.11 ***	-.08 ***	-.11 ***	-.08 ***	-.09 ***
Inverse Mills Ratio	-.15 *	-.32 *	-.15 **	-.25 **	-.21 **
Number of Observations	837	754	837	754	754
R-squared	.45		.45		
Sargan p-value		.54		.60	.62
Basmann p-value		.58		.64	.67

p-value = .105

Table 8: Change in Use Model Regressions (Ordered Logit)

Explanatory Variables	Cash	Checks	Credit Cards	Debit Cards	ACH	Bank Site Online Banking	SVC
<b>Characteristics:</b>							
<b>Cost</b>	.88	.97	1.36 ***	1.43	1.61 *	2.70 **	1.27
<b>Convenience</b>	1.71 ***	2.96 ***	2.65 ***	.78	1.10	3.27 *	1.03
<b>Safety</b>	1.02	1.01	1.21	1.68 **	.76	1.09	1.06
<b>Privacy</b>	.88	1.41 **	.91	1.04	.96	.62	.66
<b>Accuracy</b>	1.02	.81	1.14	1.75	.92	.75	1.05
<b>Timing</b>	1.08	1.37 *	.92	3.20 ***	2.51 ***	2.20	.89
<b>Record Keeping</b>	1.59 ***	.69 **	1.24	.93	2.26 ***	2.21	1.39 **
<b>Age:</b>							
<b>25-34</b>	.71	1.27	.74	2.10 **	3.09 ***	.91	.55 *
<b>35-44</b>							
<b>45-54</b>	1.41	1.51 *	1.11	.66	1.11	.87	1.25
<b>55-64</b>	1.25	1.98 ***	.86	.88	1.00	2.80 *	1.19
<b>&gt;65</b>	1.10	2.08 **	.94	.91	1.04	3.77	1.77
<b>Education:</b>							
<b>Some High School</b>	3.31 **	1.92 *	.86	.51	.46	.41	1.06
<b>High School</b>	2.45 ***	2.04 ***	1.31	.43 ***	.77	2.41	.54 *
<b>Some College/Assoc. Degree</b>	1.34	1.18	.84	.57 *	1.12	.71	.69
<b>College Degree</b>							
<b>At Least Some Post Grad.</b>	1.08	.91	1.43	.49 **	1.07	1.29	.83
<b>Marital Status:</b>							
<b>Divorced</b>	1.94 **	.93	1.34	1.26	1.05	1.53	1.10
<b>Widowed</b>	2.07 **	1.19	1.53	.98	.80	1.27	1.03
<b>Single</b>	1.36	1.29	1.65 *	.92	.73	3.00 *	.95
<b>Household Composition:</b>							
<b>Size</b>	1.05	1.03	.96	1.19	.98	1.14	1.21 *
<b>Children</b>	1.58 *	1.56 *	1.11	.73	1.23	1.26	.55 *
<b>Race:</b>							
<b>Latino</b>	1.55	1.80 *	.81	.74	.57	3.20	.46
<b>Black</b>	1.16	1.11	.47 **	1.69	.72	1.17	.89
<b>Asian</b>	2.95	3.55 *	.72	.86	.50	.35	1.23
<b>American Indian</b>	1.10	.25 *	3.10	5.23	.36	2.92	8.31
<b>Other</b>	2.29	.49	3.91 *	.73	1.79	2.77	.05 **
<b>Gender: Male</b>	1.08	1.54 ***	1.09	.70 *	1.09	.69	.85
<b>Income:</b>							
<b>&lt;\$25,000</b>	1.44	1.34	.50 **	.52 *	1.06	.72	.72
<b>\$25,000-\$49,999</b>	1.18	1.09	.71	.96	1.21	.98	.73
<b>\$50,000-\$74,999</b>							
<b>\$75,000-\$99,999</b>	1.20	1.05	.86	.72	1.08	1.37	.90
<b>&gt;\$100,000</b>	1.31	.75	.97	.63	1.67 *	1.63	1.34
<b>Check Interest</b>	1.51 **	.94	.72 **	1.54 **	1.24	1.59	1.59 **
<b>Retired</b>	1.27	.71 *	1.65 **	.67	.85	.29 **	.56
<b>Not Employed</b>	.53 **	.52 **	1.54	.56	1.11	.88	1.86
<b>Financial Responsibility</b>	.89	.99	1.00	1.05	1.30 **	1.06	1.00
<b>Number of Observations</b>	633	863	713	495	533	216	391
<b>Pseudo R-squared</b>	.10	.09	.06	.13	.10	.13	.07
<b>Pseudo R-squared without characteristics (same sample)</b>	.06	.05	.03	.07	.05	.05	.06

# 4 explanations for check decline

- More payment instruments per consumer?
  - Lower payment use shares, *ceteris paribus*
  - But why more instruments?...
- Payment characteristics changed?
  - Relative convenience, cost of checks declined?
  - Relative timing, recordkeeping of other instruments declined?
- Proportion of poor consumers increased?
  - Not likely a big effect
- Demographics changed?
  - Such changes likely too small, slow to explain the decline

TO BE COMPLETED: Counterfactual simulations with models

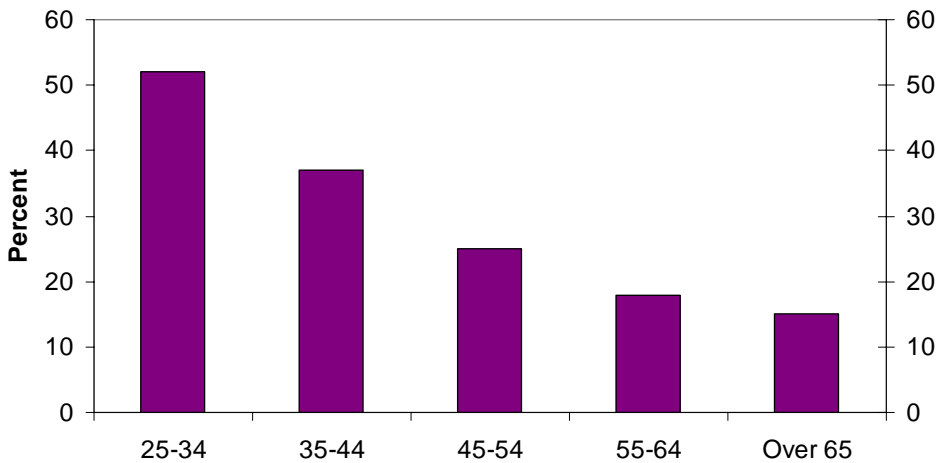
# Why are characteristics so important?

- CS variation in demographics, income is relatively small
- CS variation in payment characteristics is huge
- Demographics are more important for adoption than use
- Let's look at the example of online banking...

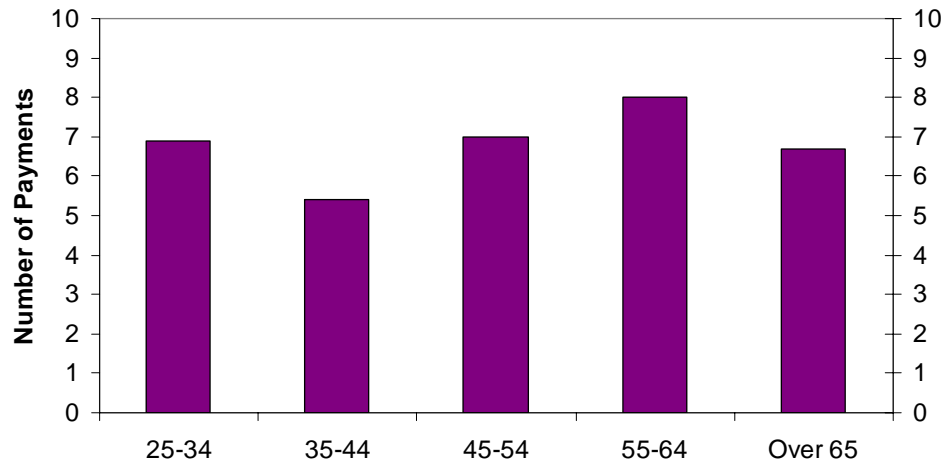
# Example: Online Banking

Unconditional age profiles of adoption and use differ

Adoption

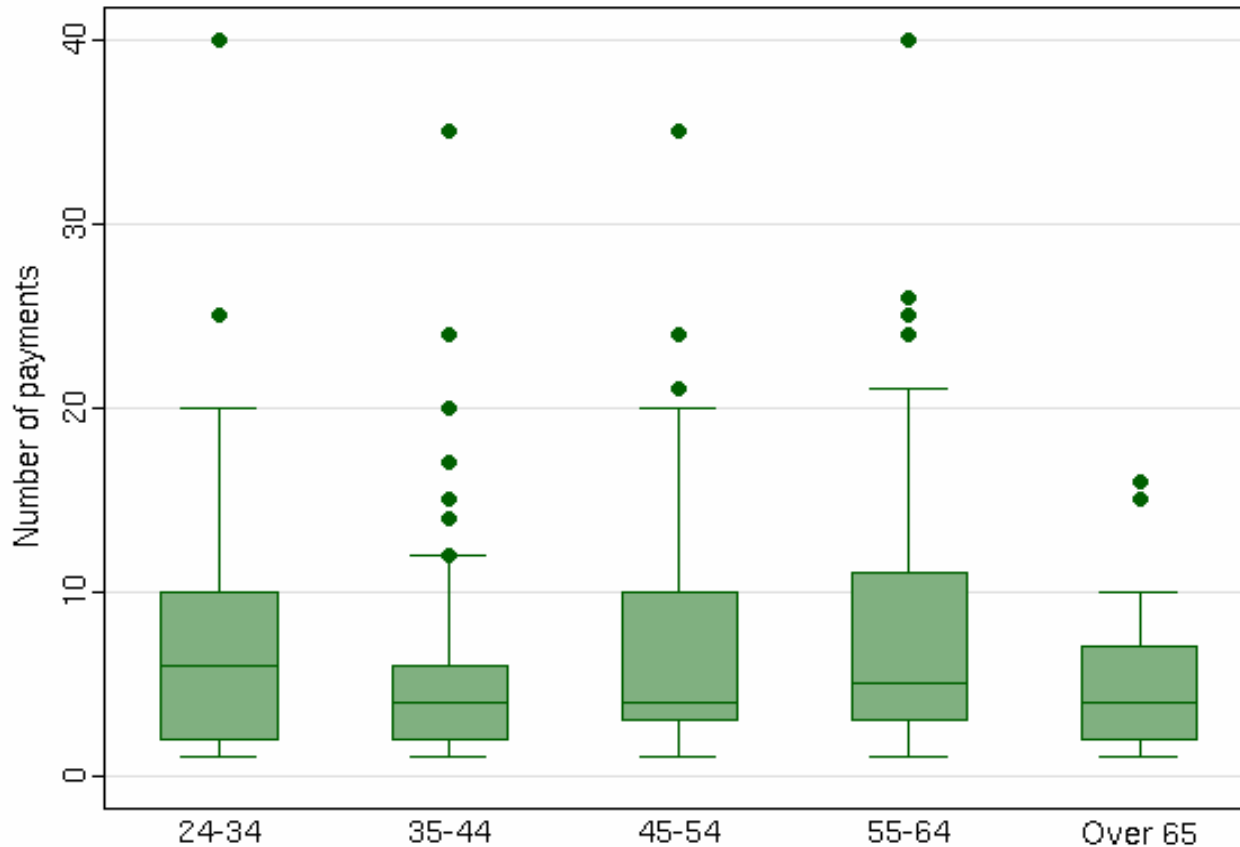


Use (by Adopters)



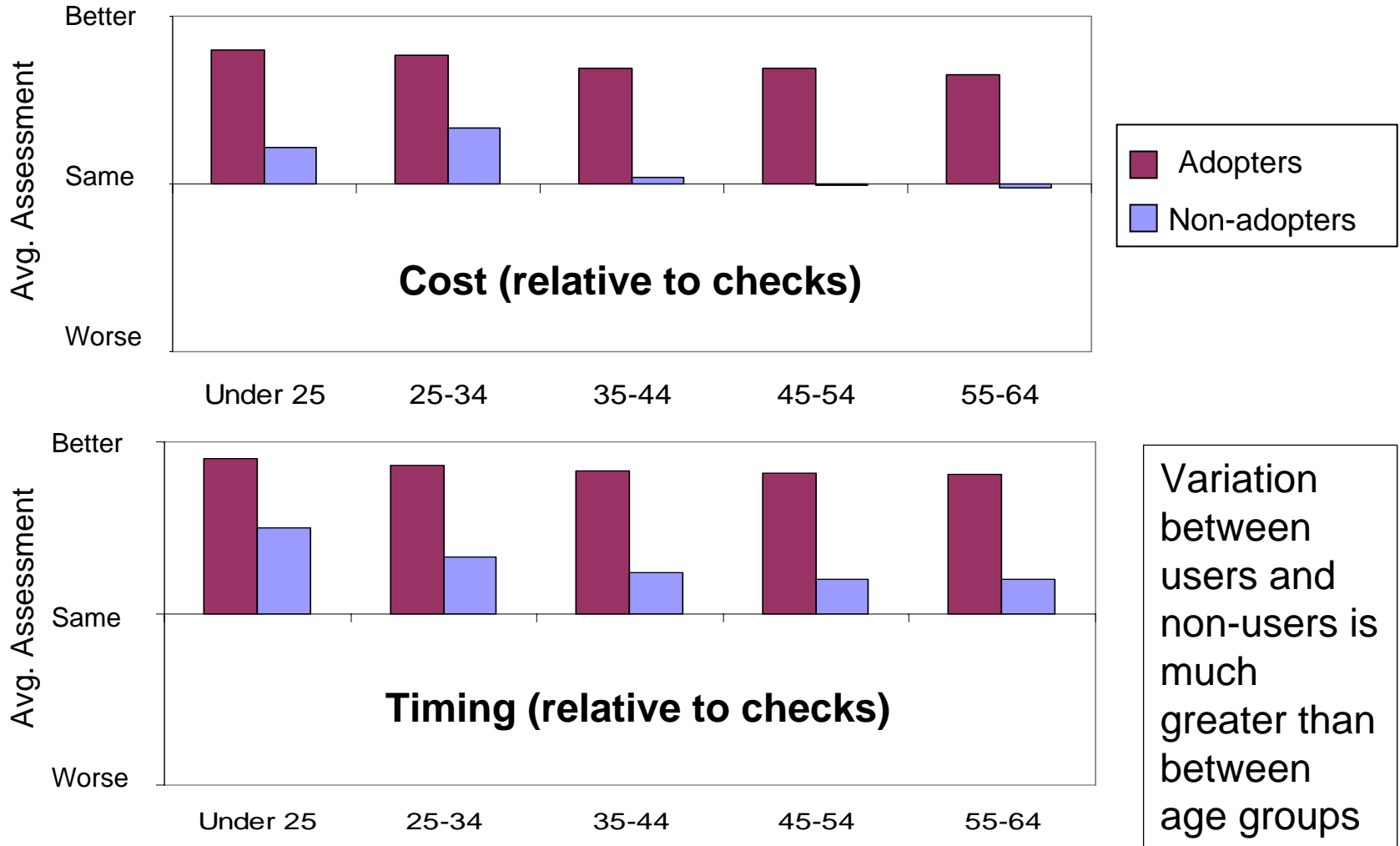
# Example: Online Banking

Average use is similar across ages but varies widely within age; characteristics help explain this large within-group CS variation



SOURCE: AARP (2006).

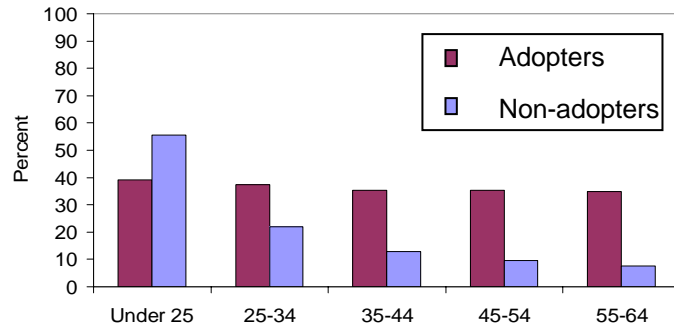
# Online Bill Payment Characteristics



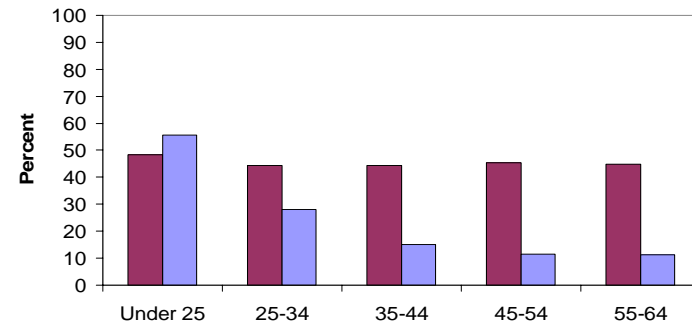
# Online Banking Adoption by Age

Age effects result from age variation in views of characteristics by non-adopters; adopters rate characteristics similarly

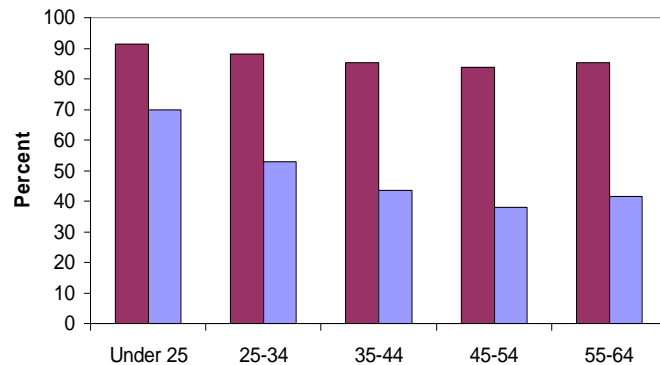
### Privacy



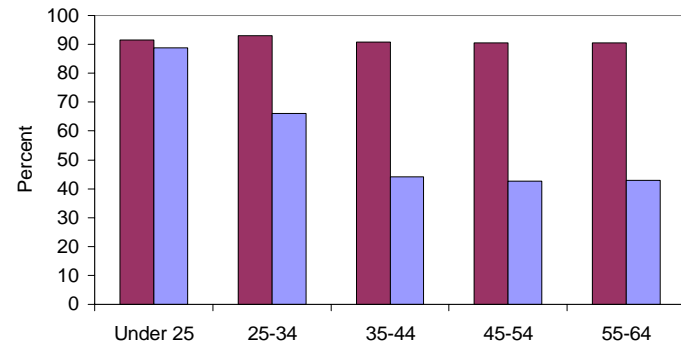
### Safety



### Timing



### Ease



SOURCE: Federal Reserve Bank of Boston Consumer Payments Survey (2004).

# Conclusions

- Payment characteristics are more important determinants of consumer payment demand than demographics and income-related variables
  - Convenience, cost, timing, recordkeeping are most important
- But we need better measures of characteristics
  - Changes over time, more precise and complete, etc.
- Ultimately, need better (structural) theories
  - Models should explore the four most important payment characteristics

**Table 2: Rates of Adoption of Payment Instruments by U.S. Consumers (in percent)**

		Checks	Credit Cards	Debit Cards	ACH	Bank Site Online Banking	SVC
<b>Total</b>		<b>87</b>	<b>74</b>	<b>62</b>	<b>49</b>	<b>24</b>	<b>26</b>
<b>Age</b>	<b>25-34</b>	88	73	83	54	68	27
	<b>35-44</b>	81	67	68	49	27	24
	<b>45-54</b>	85	79	56	42	20	27
	<b>55-64</b>	92	76	59	50	16	30
	<b>65 or Over</b>	89	74	40	49	8	22
<b>Education</b>	<b>HS or Less</b>	76	60	49	39	11	22
	<b>Some College</b>	94	78	73	53	31	27
	<b>College Degree</b>	94	89	71	58	36	30
	<b>Post-Graduate School</b>	97	93	67	60	42	36
<b>Income</b>	<b>&lt;50,000</b>	80	60	57	39	15	24
	<b>\$50,000 - \$74,999</b>	97	84	77	61	37	26
	<b>75,000-100,000</b>	91	90	66	57	34	30
	<b>&gt;100,000</b>	94	95	84	74	54	29
<b>Marital Status</b>	<b>Married</b>	91	82	65	53	30	27
	<b>Divorced</b>	77	56	56	40	17	16
	<b>Widowed</b>	87	66	43	48	8	24
	<b>Single</b>	79	61	63	39	18	31
<b>Race</b>	<b>White</b>	91	76	61	51	23	28
	<b>Latino</b>	78	79	68	47	29	26
	<b>Black</b>	64	48	61	43	13	13
	<b>Asian</b>	92	89	82	47	35	22
	<b>American Indian</b>	73	49	74	63	20	48
	<b>Other</b>	81	58	52	22	21	21
<b>Gender</b>	<b>Male</b>	86	75	60	48	28	23
	<b>Female</b>	87	73	63	49	20	29

**Table 3a: Use of Payment Instruments by U.S. Consumers (in percent share of all payments)**

		Cash	Checks	Credit Cards	Debit Cards	ACH	Bank Site Online Banking	SVC
<b>Total</b>		<b>26</b>	<b>34</b>	<b>9</b>	<b>14</b>	<b>8</b>	<b>5</b>	<b>2</b>
<b>Age</b>	25-34	23	21	6	24	10	9	2
	35-44	32	29	7	17	7	5	2
	45-54	25	36	10	13	6	4	2
	55-64	24	40	11	10	8	3	2
	65 or Over	24	44	12	6	10	2	1
<b>Education</b>	HS or Less	29	35	6	11	8	3	2
	Some College	25	35	8	17	8	5	2
	College Degree	21	30	14	19	9	7	2
	Post-Graduate School	23	32	19	14	7	6	1
<b>Income</b>	<25,000	36	31	3	11	6	1	3
	\$25,000-\$50,000	25	36	9	14	7	4	2
	\$50,000 - \$74,999	22	32	10	17	11	7	1
	75,000-100,000	23	29	14	19	8	4	1
	>100,000	17	28	14	19	10	11	1
<b>Marital Status</b>	Married	23	35	11	15	8	6	1
	Divorced	32	31	5	14	8	3	1
	Widowed	25	43	9	8	10	2	2
	Single	30	24	7	17	6	2	3
<b>Race</b>	White	24	37	10	14	8	4	1
	Latino	25	30	7	14	9	9	4
	Black	34	21	3	16	10	2	1
	Asian	34	27	21	10	4	5	1
	American Indian	33	17	4	24	8	2	3
	Other	25	30	7	14	5	5	2
<b>Gender</b>	Male	25	32	9	15	9	7	1
	Female	26	36	9	14	7	3	2

**Table 3b: Use of Payment Instruments by Adopters (in percent share of all payments)**

		Cash	Checks	Credit Cards	Debit Cards	ACH	Bank Site Online Banking	SVC
<b>Total</b>		<b>27</b>	<b>38</b>	<b>12</b>	<b>23</b>	<b>16</b>	<b>18</b>	<b>6</b>
<b>Age</b>	25-34	24	24	8	29	19	20	7
	35-44	32	34	11	24	14	14	6
	45-54	26	42	13	23	14	20	8
	55-64	25	43	15	18	15	18	7
	65 or Over	26	49	16	14	20	20	5
<b>Education</b>	HS or Less	31	43	9	23	19	23	8
	Some College	26	37	10	23	16	17	6
	College Degree	22	32	16	26	15	19	5
	Post-Graduate School	23	32	20	20	12	14	4
<b>Income</b>	<25,000	38	43	8	22	18	16	13
	\$25,000-\$50,000	26	40	12	23	16	14	7
	\$50,000 - \$74,999	23	32	11	23	18	20	5
	75,000-100,000	23	32	16	29	14	13	4
	>100,000	18	29	15	23	14	20	5
<b>Marital Status</b>	Married	25	38	13	23	15	19	5
	Divorced	33	39	8	26	19	19	8
	Widowed	27	50	13	17	21	20	7
	Single	31	30	11	26	16	10	9
<b>Race</b>	White	28	37	9	21	20	25	16
	Latino	26	40	13	23	15	16	5
	Black	35	31	7	27	23	14	8
	Asian	34	29	24	13	8	13	2
	American Indian	35	24	7	33	13	11	7
	Other	26	34	11	25	19	22	8
<b>Gender</b>	Male	27	36	12	24	18	22	6
	Female	27	40	13	22	15	14	7

## Appendix

### Table 1: Instrumental Variable Definitions

Instrument	Definition
AARP membership	Equals 1 if respondent or spouse is AARP member
Bill payment: car	Equals 1 if respondent makes car payments
Bill payment: college tuition	Equals 1 if respondent makes college tuition payments
Bill payment: mortgage	Equals 1 if respondent makes mortgage payments; 0 otherwise
Bill payment: student loan	Equals 1 if respondent makes student loan payments
Cash withdrawal: ATM	Equals 1 if respondent uses ATM to withdraw cash from their checking account
Cash withdrawal: bank branch	Equals 1 if respondent goes to a bank branch office to have a bank employee withdraw cash for them
Cash withdrawal: cash back from debit transaction	Equals 1 if respondent uses the cash back option from a debit card transaction to withdraw cash
Cash withdrawal: check	Equals 1 if respondent writes a check to withdraw cash
Check truncation	Equals 1 if respondent has ever had a cashier immediately hand their check back to them after a completed purchase
Internet access: home	Equals 1 if respondent has access to the Internet for personal use at home
Internet access: work	Equals 1 if respondent has access to the Internet for personal use at work
Internet access: other location	Equals 1 if respondent has access to the Internet for personal use at another location
Knowledge of check float	Equals 1 if respondent knows how many days it usually takes for the value of a check to be deducted from their checking account after they make a store purchase
Online financial experience	Level of experience conducting personal financial transactions online ranging from 1 (not at all experienced) to 5 (an expert).
Retirement Income	Equals 1 if respondent currently receives any form of retirement income such as Social Security, pensions, or any other type of retirement account
Returned checks: cancelled checks	Equals 1 if their bank returns their cancelled checks to them
Returned checks: electronic copies	Equals 1 if their bank returns electronic copies of their cancelled checks to them
Returned checks: paper copies	Equals 1 if their bank returns paper copies of their cancelled checks to them