Small Victories: Creating Intrinsic Motivation in Task Completion and Debt Repayment

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Debt-Reduction

- For millions of Americans, debt is an issue.
  - In 2007, lowest quintile of population has average net worth of -$2100. (Federal Reserve Board, 2010)
  - In 2009, credit card debt was $976 billion. (Federal Reserve Board, 2009)
  - Debt can be an impediment to retirement savings.
- But there's "help"!
  - Debt-reduction strategies are delivered in a variety of ways.
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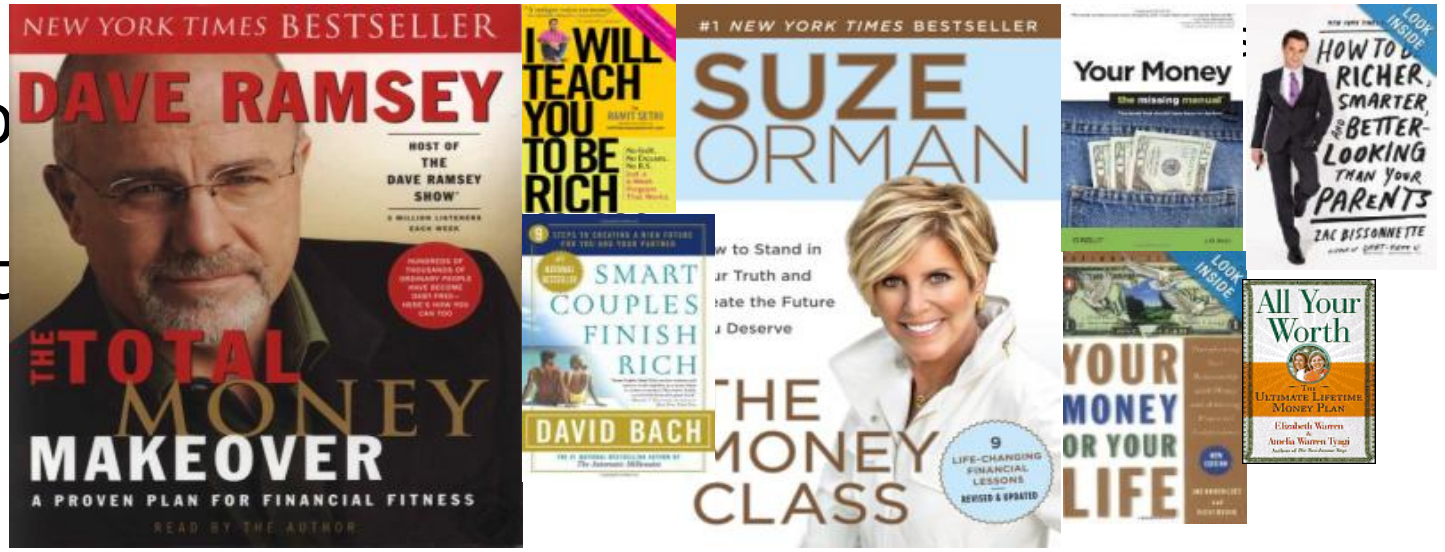


Why the debt-snowball?

- "The reason we list [debts from] smallest to largest is to have some quick wins…When you start the Debt Snowball and in the first few days pay off a couple of little debts, trust me, it lights your fire…When you pay off a nagging $52 medical bill or that $122 cell-phone bill from eight months ago, your life is not changed that much mathematically *yet*. You have however, begun a process that works, and you have seen it work, and you will keep doing it because you will be fired up about the fact that it works." (Ramsey, *The Total Money Makeover,* 1998, p. 114-117)
- After completing a small subgoal, one increases motivation toward the larger goal.
- "post-subgoal" motivation
  - Inspired by self-efficacy from social-cognitive theory (Bandura 1977; 1986)
    - Completing subgoals increases concept of self-efficacy thereby motivation and performance.

Criticism of the debt-snowball

- "To the extent that becoming debt free is perceived as a difficult superordinate goal, consumers may adopt subgoals focused on paying off individual loans. The danger in such an approach is that focusing on and achieving subgoals can actually diminish the motivation to pursue superordinate goals…consumers may be more motivated to achieve goals that are proximal (e.g., paying off debts with small balances) than goals that are distal (e.g., becoming debt free)." (Amar et al., *Journal of Marketing Research*, 2011, p. S39)
- The added drive to complete the subgoal is the motivation.
- "pre-subgoal" motivation
  - Inspired by Goal-gradient hypothesis (Heilizer 1977; Hull 1932).
    - Motivation increases with the proximity to completion of a subgoal, increasing performance.

What do we do?

- Develop and differentiate pre- and post-subgoal motivation.
  - Use existing psychology literature.
  - Formalize mathematically.
  - Develop hypotheses to test.
- Take it to the laboratory setting.
  - Can focus on the mechanics of behavior.
  - Clean from distractions (separate from debt).
  - Find evidence supporting theories of goals and motivation.
  - Does having a small win improve performance? (Yes).
    - What does this mean for the debt-snowball? (We'll explain).

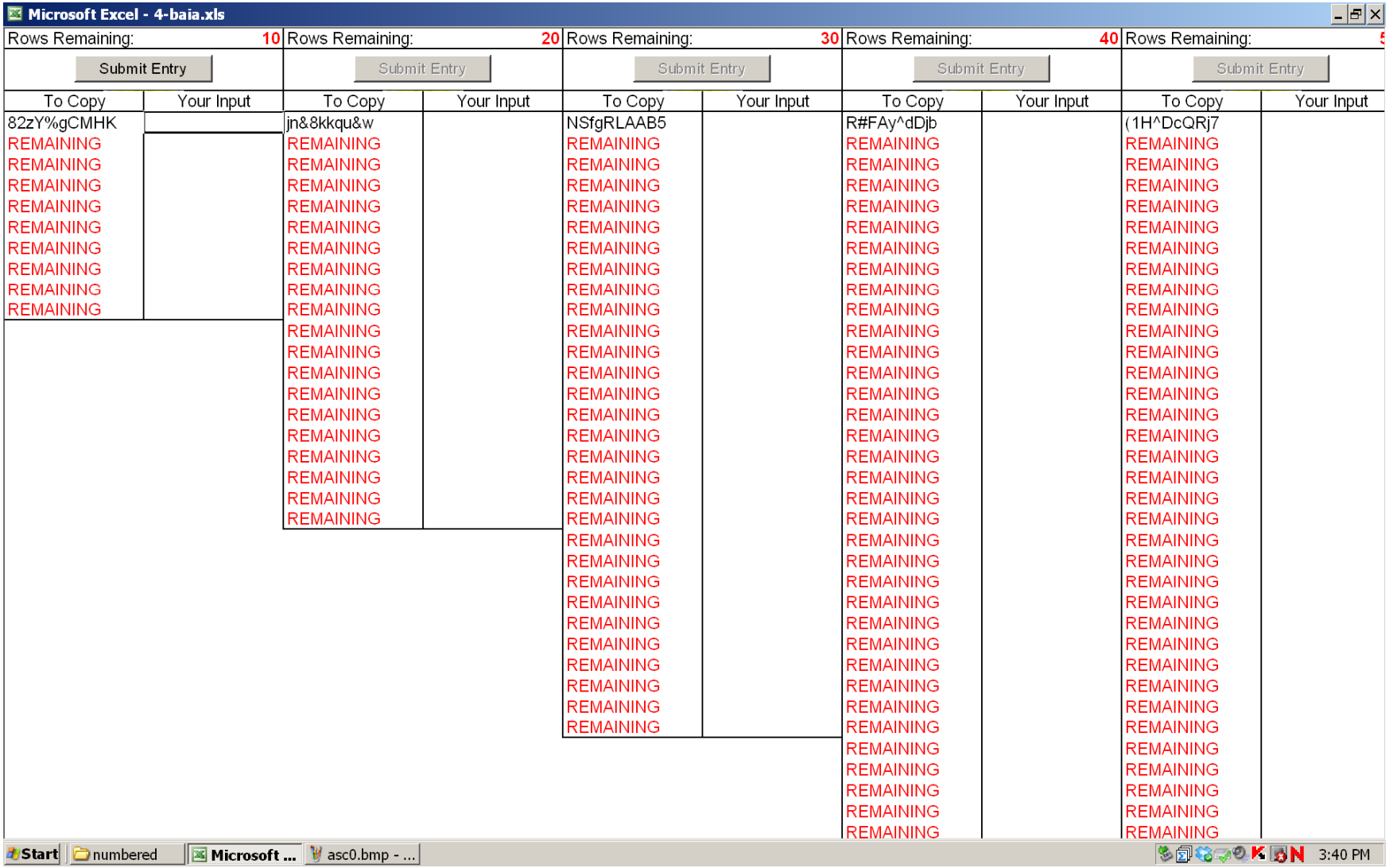
Previous Research on Debt Snowball

- Empirical/Field (pro debt snowball):
  1. Gal & McShane (2012)
     - People using debt snowball were more likely to eliminate their debt balance, controlling for debt size.
- Experimental/Lab (pro and con):
  1. Kettle, Trudel, Blanchard, and Haubl (2014)
     - Subjects who pay down debts one-at-a time are more committed to debt repayment than those who try to pay all simultaneously.
  2. Amar, Ariely, Ayal, Cryder, and Rick (2011)
     - Experimental subjects decide how to pay off debt in a purely financial debt problem.
       - Most subjects choose debt snowball approach.
       - None choose the economically optimal way.

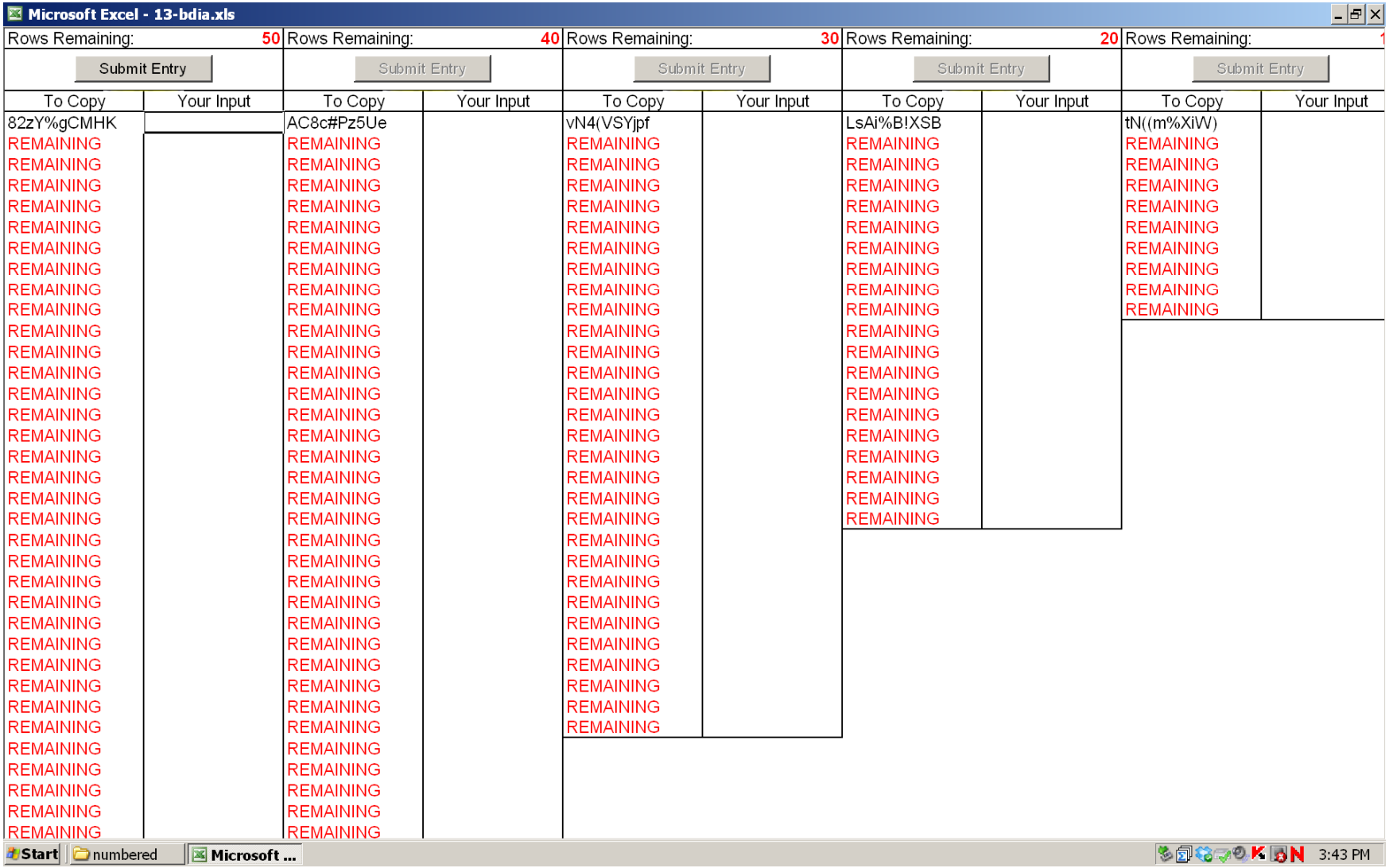
The Experiment

- Copy 150 ten character lines of text in 30 minutes.
  - Reward: $10 + $0.50 (early minutes) – $0.05 (lines remaining).
- No debt context, but embodies essential features:
  1. Not conceptually difficult.
  2. Temptation to not complete task.
  3. Uncertainty about ultimate success.
- Lines are arranged in 5 columns, ordered
  1. Ascending: 10-20-30-40-50 (like debt-snowball)
  2. Descending: 50-40-30-20-10 (opposite of debt-snowball)
  3. Even: 30-30-30-30-30 (control)
  - A message box congratulates subjects upon each column completion.
  - 10-line practice before task begins, identical across treatment.
- 91 Texas A&M undergraduates
  - Subjects earned $11.25 on average for a 35 minute session.

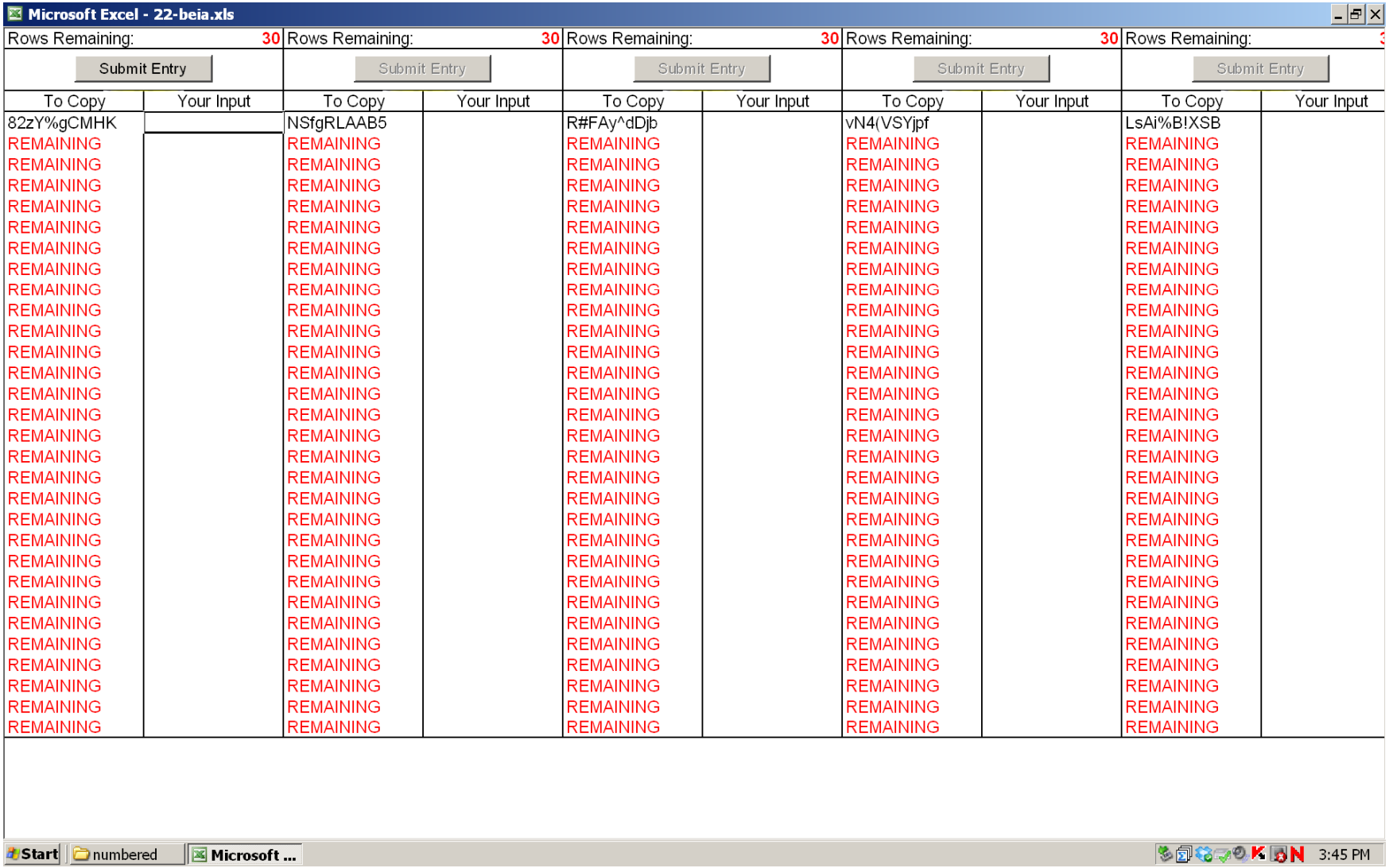
Ascending Order



Descending Order



Even Order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The Model

term	the model	in debt repayment	in experiment
X	ultimate goal	total debt paid off	worksheet
α_k	subgoal	individual debt paid off	column
x	element	individual payment made	cell

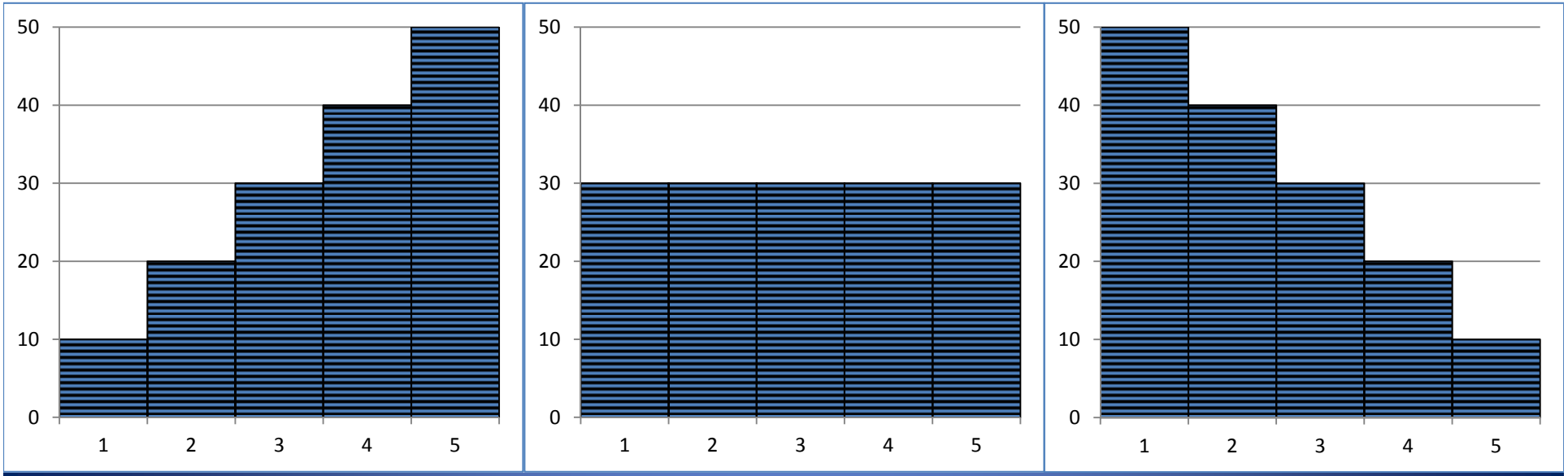
- Ultimate goal X is made up of discrete elements x.
- The subgoal partition α divides X into m subgoals, $\alpha=(\alpha_1,\ldots, \alpha_k,\ldots, \alpha_m)$, each containing distinct x's.
- Completing x depends on x's position in partition α.

time to complete $x \sim$ v(#subgoals completed) + h(#elements left in current subgoal)

  - v is decreasing (post-subgoal motivation).
  - h is increasing (pre-subgoal motivation).
  - Full function controls for individual ability, specific elemental idiosyncrasies, and orderings of elements.

Simplification of Main Mathematical Results

1. With post-subgoal motivation, optimal performance occurs with multiple subgoals in an ascending order of length/difficulty. (Propositions 1,2)
   - Provides the theoretical basis for debt-snowball.
2. With pre-subgoal motivation, optimal performance occurs with multiple subgoals of equal length/difficulty. (Proposition 3)
   - Provides an alternative goal division for debt-snowball critics.
3. In either case, suboptimal performance occurs with multiple subgoals in a descending order. (Corollary)

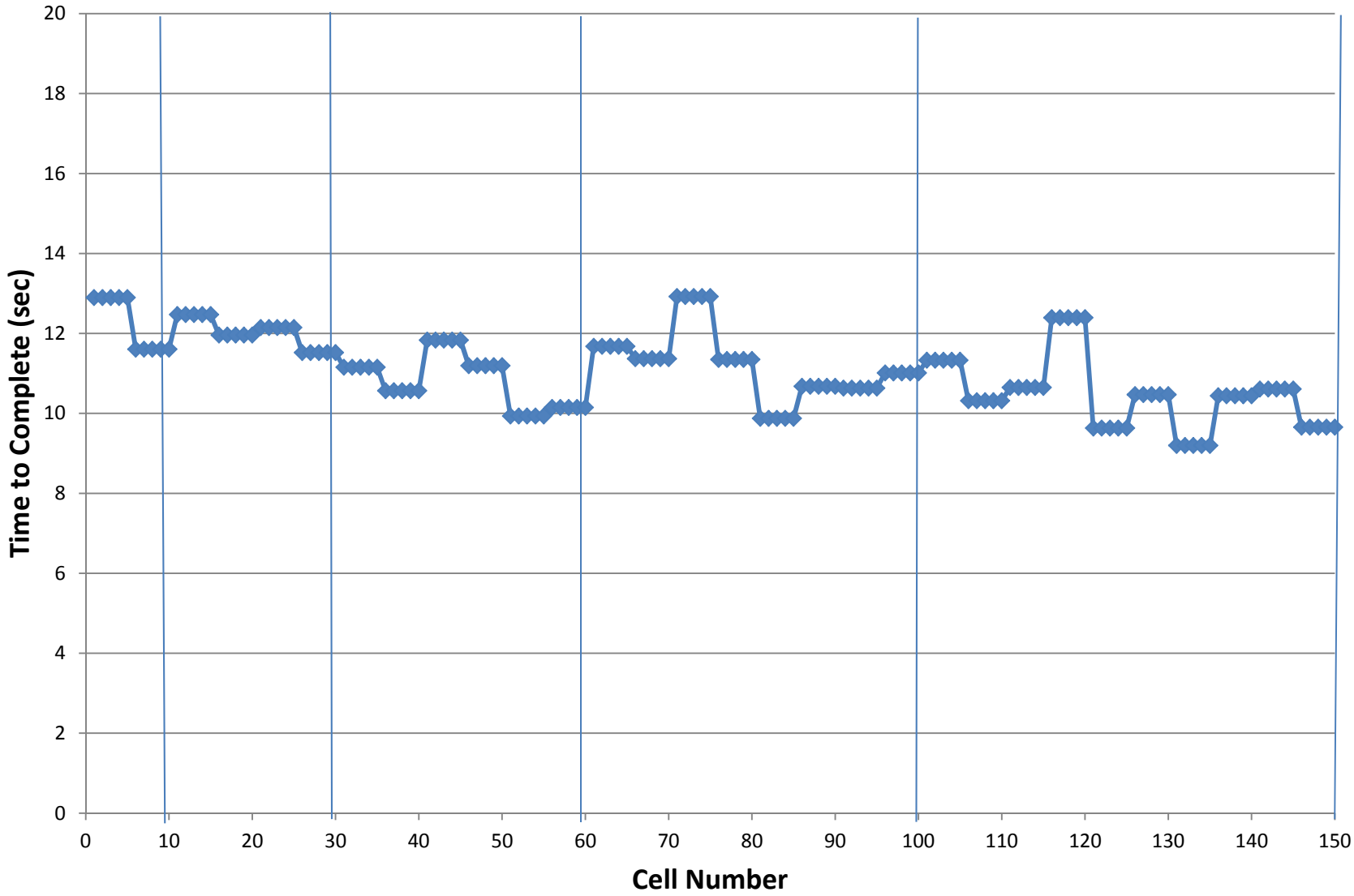


Main Results

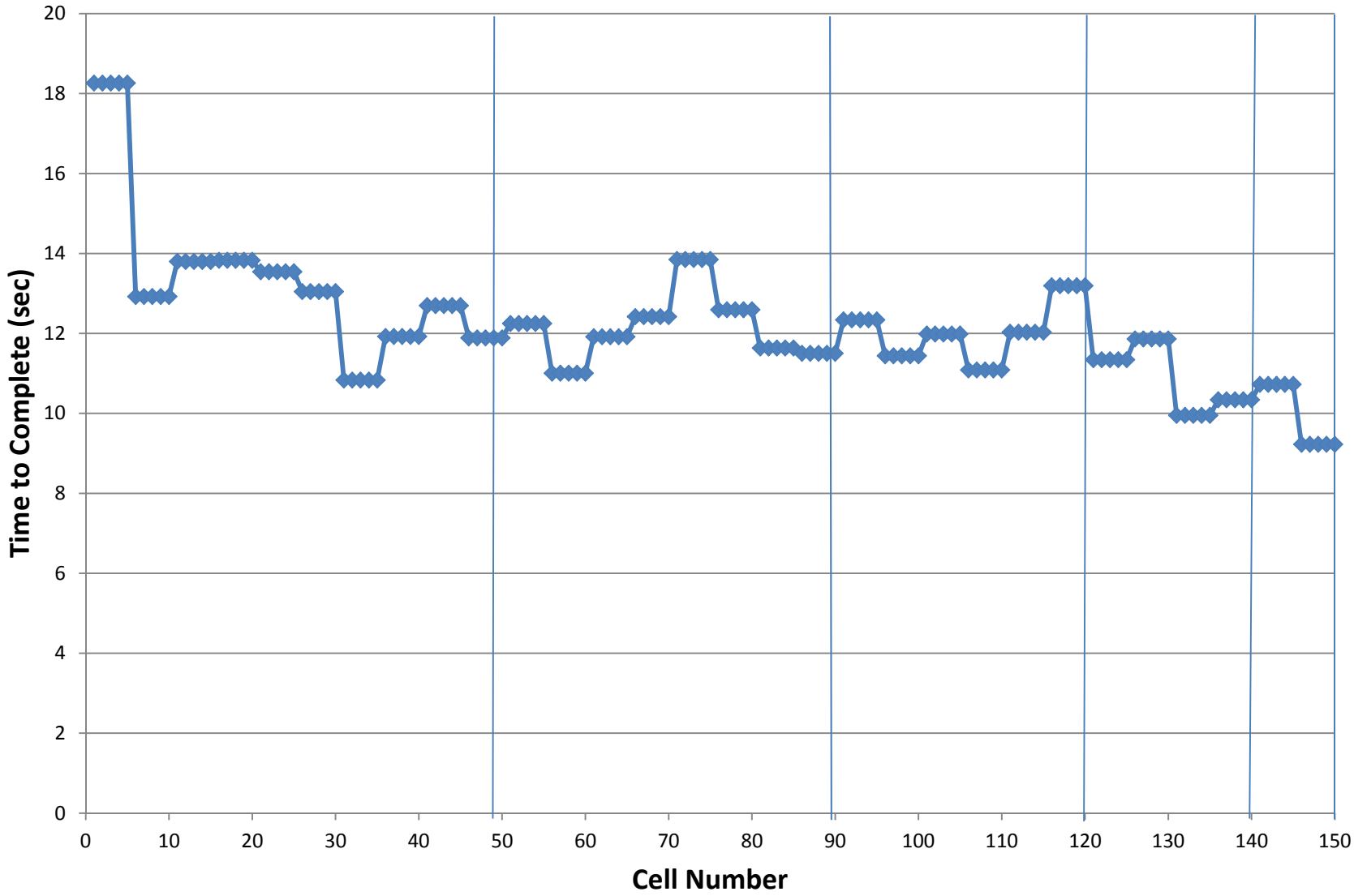
Panel I: Time to complete a cell				
	Mean (in sec)	N	Mean-Asc	p (two-sided)
Ascending	11.08	31		
Not Ascending	12.31	60	1.23	0.019
Even	12.13	31	1.05	0.078
Descending	12.50	29	1.42	0.015
Kruskal Wallis				0.084

- Average time to complete cells in ascending order significantly faster than even or descending.
  - Robust to controlling for practice time.
  - Consistent the existence of post-subgoal motivation, the basis for the debt-snowball approach.
- Ordered tests (ascending<even<descending) significant ($p<0.02$)

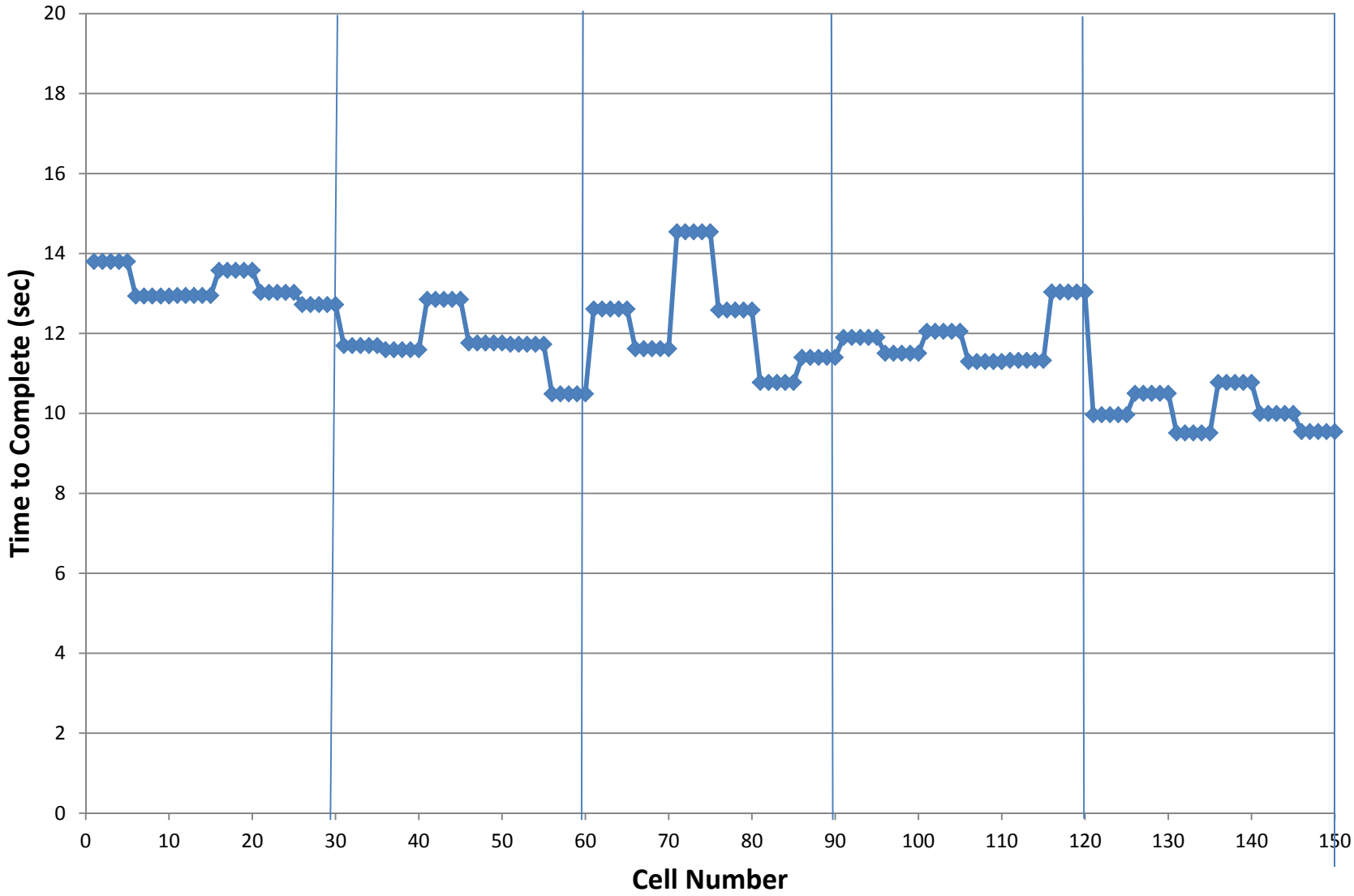
Average Time to Complete Cell (in seconds) - Ascending Order



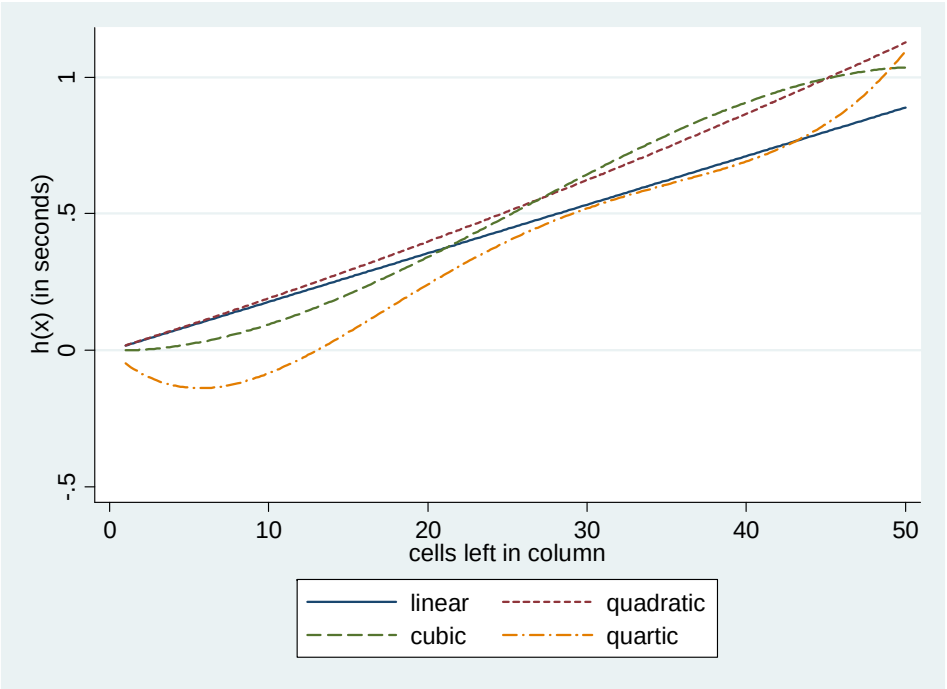
Average Time to Complete Cell (in seconds) - Descending Order

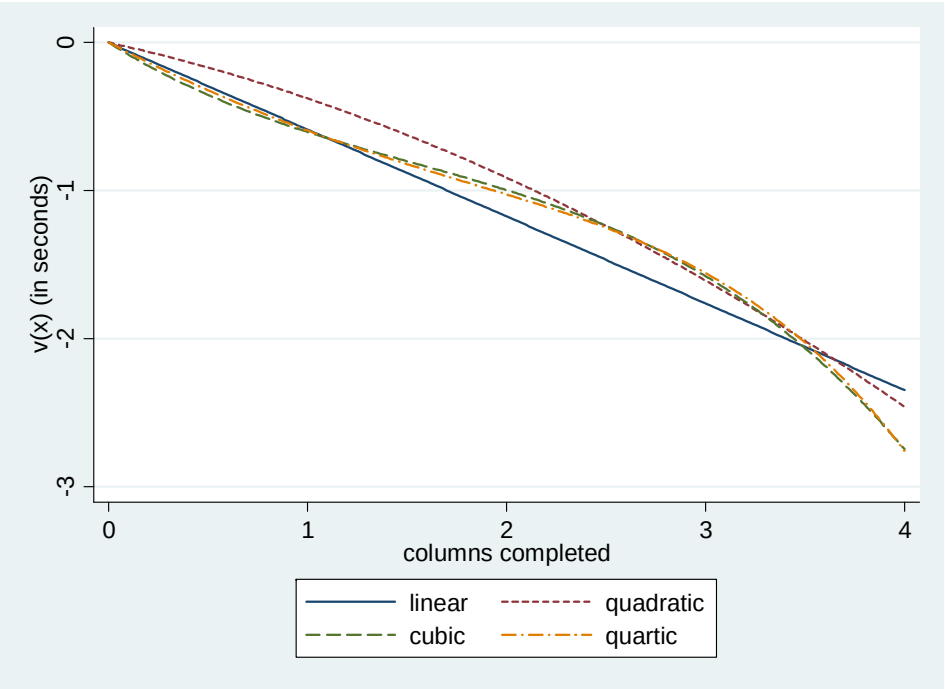


Average Time to Complete Cell (in seconds) - Even Order



Calibration of pre- and post- subgoal motivational functions





- Model Calibration provides evidence of both pre-subgoal motivation (right) and post-subgoal motivation (left).
  - Controls for practice time, cell fixed effects, clustering on subject.
- Functions have the general monotonic properties of the model (h is increasing, v is decreasing).
  - As expected, post-subgoal motivation is greater in magnitude.

Study 2: Subjects Choose Ascending Order Least Often

- Despite producing the best performance, the ascending order is chosen by subjects least often.
- Compared to initial study, choice improves overall performance.

Table 6: Choice

Panel I: What they chose

	N	Mean (in sec)
Ascending	16	10.85
Not Ascending	54	11.20
Even	31	11.03
Descending	23	11.44
chi-squared p-value	0.0894	

Panel II: Choice vs. Baseline

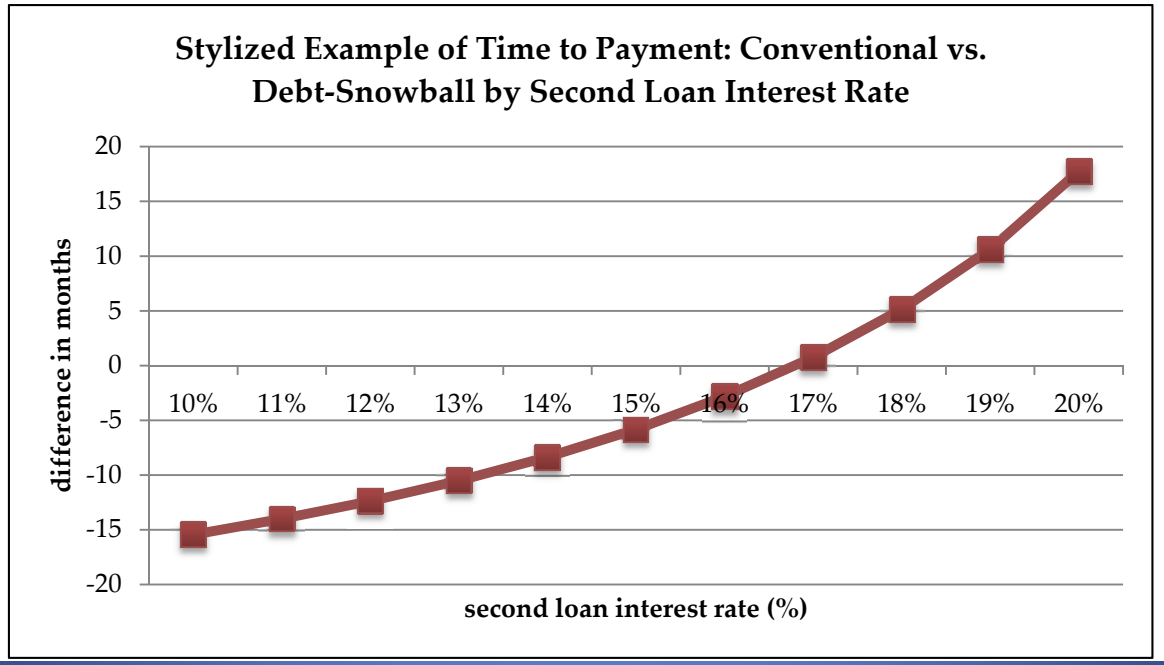
	N	Time per cell
Choice	70	11.12
Baseline	91	11.89
two-sided p-value	0.037	

Conclusion

- The experiment indicates subject performance is best when tasks are grouped from smallest to largest.
  - Consistent the existence of post-subgoal motivation, the basis for the debt-snowball approach.
  - Other evidence of pre-subgoal motivation, at a lesser magnitude.
- If such factors are found in debt-repayment, the debt-snowball may be effective.
  - Must be considered against losses due to differential interest rates.

A final caveat about the debt snowball…

- Whatever the benefit of the debt snowball, there exists a difference in interest rates that will overcome it.
  - In such cases one should follow the standard economic approach.
- Consider if debt-snowball produces a 13% higher payment.
- Two ≈$10,000 loans: 10% and 10-20%.
  - Agent can pay $300/$369 monthly. Which method is better?



Extensions

- We've identified the components that may make the debt snowball work. Possible extensions include:
  - Lab experiments that add additional factors
    - Interest rates
    - Minimum payments
    - Actual cash values
  - Field experiments
    - Model calibration with debt repayment
    - Model calibration with another activity (e.g., athletic performance, worker productivity)
  - Entrepreneurial endeavor
    - The debt-snowball is costly in terms of interest.
    - Could a debt consolidation firm frame debt-repayment in a way to maximize motivation without altering interest rates?
      - Would customers pay more for this service?

Extra Slides

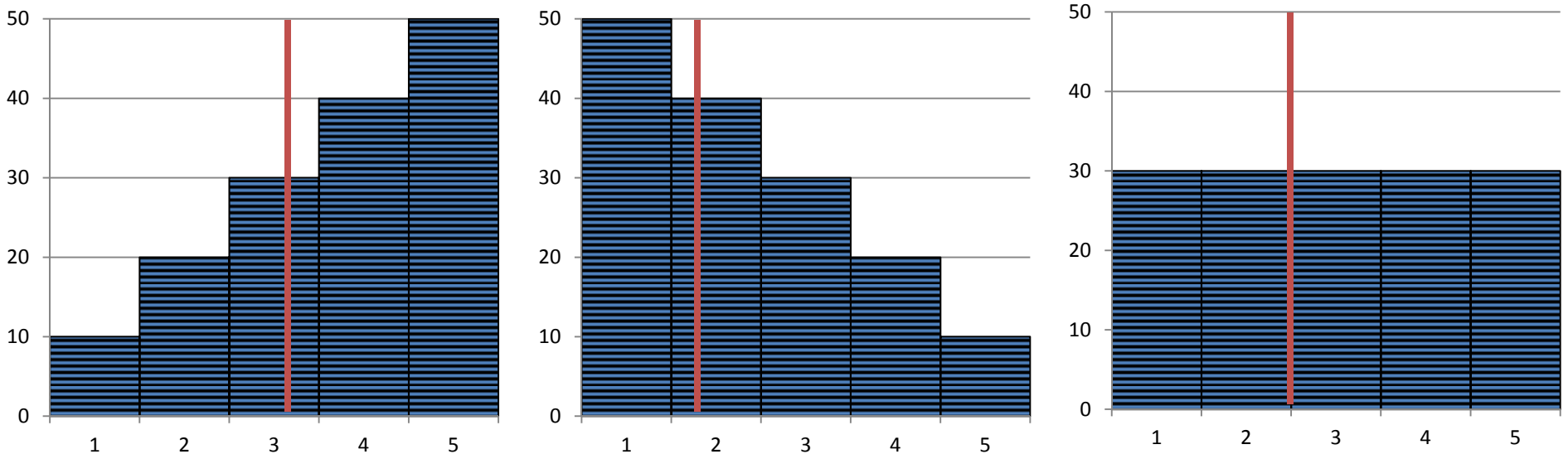
Cosmic Introduction

1. Ongoing debate: Is it helpful to break up a large goal into smaller subgoals?
   - Yes. (Bandura and Schunk, 1981; Bandura and Simon 1977; Kettle et al. 2014; Latham and Seijts 1999; Morgan 1985; Stock and Cervone 1990)
   - No, it crowds out or distracts from motivation to complete large goal. (Amir and Ariely 2008; Fishbach and Dhar 2005; Fishbach, Dhar and Zhang 2006; Heath, Larrick and Wu, 1999)
2. Our paper unifies the underlying principals from this debate to determine ideal divisions of a large goal.
3. Why should this concern the CFPB? Debt-reduction

Psychological principles

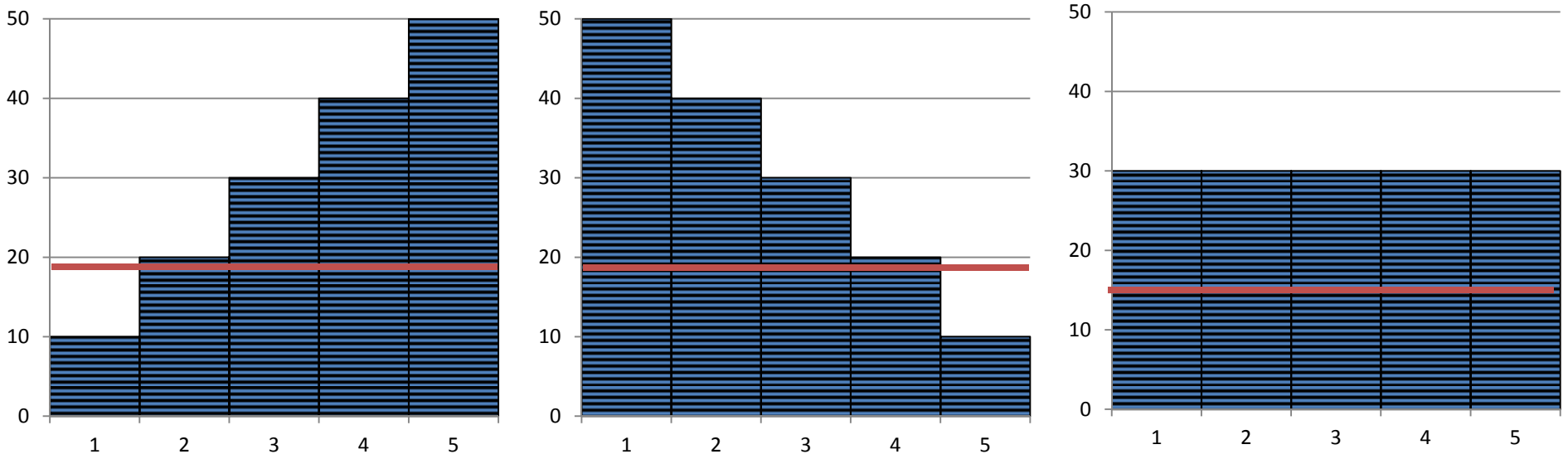
1. Social-cognitive theory (Bandura 1977; 1986)
   - Successful past task completion provides further motivation and increased performance for the next task.
   - Support:
     - Goal setting in learning situations, eating situations.
       - Intrinsic vs. extrinsic motivation.
     - Attainable vs. unattainable goals.
2. Goal-gradient hypothesis (Hull 1932; Heilizer 1977)
   - As one moves closer to the goal, individual motivation and performance increase.
   - Support:
     - Studies done with rats in mazes.
     - Marketing situations: one coffee away from a reward.
       - Not just marginal cost/benefit: 10 vs. (12 – 2) stamps.

Prediction for Experiment (1a)



- **Mathematical fact 1**. Over all cells, the average number of columns completed is *greatest* in the ascending order.
- **Prediction 1a (post-subgoal motivation)**. If post-subgoal motivation is the dominant effect, subjects in the ascending orders should complete cells fastest.

Prediction for Experiment (1b)



- **Mathematical fact 2.** Over all cells, the average number of cells remaining in current column is lower in the even order than ascending or descending.
- **Prediction 1b (pre-subgoal motivation)**. If pre-subgoal motivation is the dominant effect, subjects in the even orders should complete cells faster than those in the ascending or descending orders.

Prediction for Experiment (2)

- **Mathematical facts.**
  1. Over all cells, the average number of cells remaining in current column is lower in the even order than ascending or descending.
  2. Over all cells, the average number of columns completed is *lowest* in the descending order.
- **Prediction 2**. As long as either pre- or post-subgoal motivation exists, subjects in the descending orders should complete cells the slowest.

Goal-Gradient Effects

Deviation from average time in first 5 vs. last 5 cells in column, collapsed to subject					
Order	In First Five Cells	In Last Five Cells	Difference	Observations	p-value
Ascending	-0.2660	-1.2599	-0.99	31	0.0350
Descending	2.3895	0.7737	-1.62	29	0.1474
Equal	0.4238	0.1144	-0.31	31	0.3121
Overall	0.8153	-0.1437	-0.96	91	0.0487

- Subjects perform faster at end of columns than beginning.
  - Relative to average performance for that *nth* cell.
    - Controls for increasing performance trend.
  - Effect most pronounced in ascending order.
  - Conservative estimate: analysis restricted to subject specific observations.

Model Calibration

- we estimate the *h* and *v* functions up to fourth-degree polynomials (P = 4).
- $\tau'_{ij} = \beta_1 \mu + h(l) + v(k) + \gamma_j + \epsilon_{ij}$
- where $h(l) = \sum_{p=1}^{P} \beta_{p+1} l^p$ and $v(k) = \sum_{p=1}^{P} \beta_{P+p+1} k^p$ for *P*=1, 2, 3, 4.

Study 2: Choice

- Participants were allowed to choose which condition they were in prior to the experiment
  - Ascending
  - Descending
  - Even
- Survey measures
  - Self-control uses Tangney-Baumeister-Boone measure– alternative to Barratt Impulsivity
  - Critical reasoning skills measured by Cognitive Reflection Test (CRT)
  - Risk aversion from Eckel and Grossman

Study 2: Choice

- Despite having the best performance, the ascending is chosen by subjects least often.
- Overall performance improves in choice.
  - Effect mitigated controlling for practice speed.
- Interaction terms show ascending order performance is driven by risk-averse, high-self control, high critical reasoning types.
  - Types likely to be in debt?

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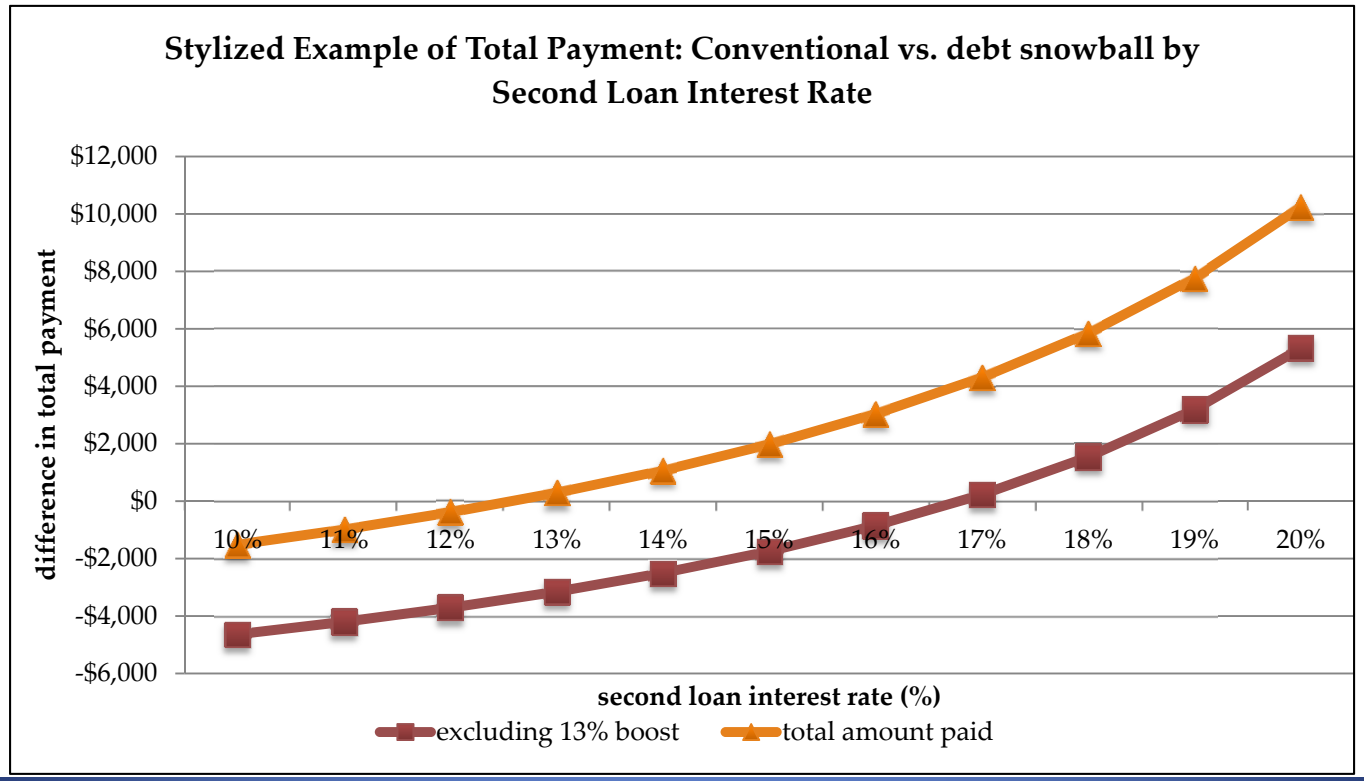
debt snowball helps some people more

Table 7: Effect of choice interactions with survey data on average cell time

	X=Self-control	X=Critical Reasoning	X=Risk Aversion
	(1)	(2)	(3)
X*ascending	-0.139	-1.060	-0.710
	(0.070)	(0.586)	(0.390)
X*descending	-0.026	-0.735	-0.410
	(0.062)	(0.401)	(0.317)
ascending	6.333	0.825	2.495
	(3.280)	(0.793)	(1.599)
descending	1.241	0.935	1.178
	(2.600)	(0.663)	(1.013)
X	-0.011	0.073	0.188
	(0.046)	(0.231)	-0.174
practice average	0.257	0.253	0.274
	(0.068)	(0.070)	(0.069)
Observations	64	64	64

A final caveat about the debt snowball…

- Ascending subjects are 13% faster than descending.
- Heroic debt-reduction implication: 13% higher payment.
- Example: Two ≈$10,000 loans: 10% and 10-20%.
  - Agent can pay $300/$369 monthly. Which method is better?