Sticking to Your Plan: Hyperbolic Discounting and Credit Card Debt Paydown

Theresa Kuchler

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Goal and Data

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Data: Sample of users of financial management website

- Account balances
- Spending on credit and debit card
- Income
- Planned paydown

Present Bias - Definition

Present Bias

- More impatient in short-run ($\beta\delta$) than long-run (δ)

$$U_t = u(c_t) + \beta \sum_{\tau=t+1}^{\infty} \delta^{\tau} u(c_{\tau})$$

$\rightarrow$ Time **in**consistent

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  - Fully Aware $\rightarrow$ Sophisticated
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$\rightarrow$ Two features of present bias:
  - Extent of short-run impatience (β)
  - Sophistication

Analysis

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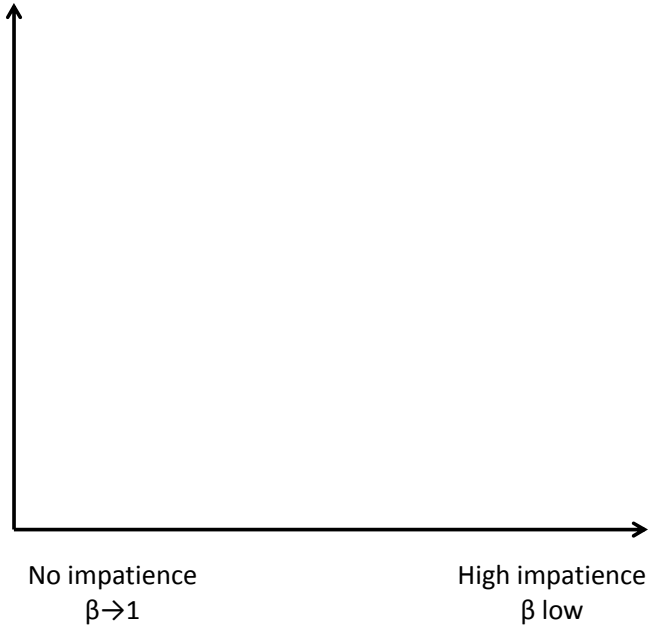
   - *Naive/Unaware of future present bias*:

     Repeatedly fail to pay down debt as planned
   - *Sophisticated*:

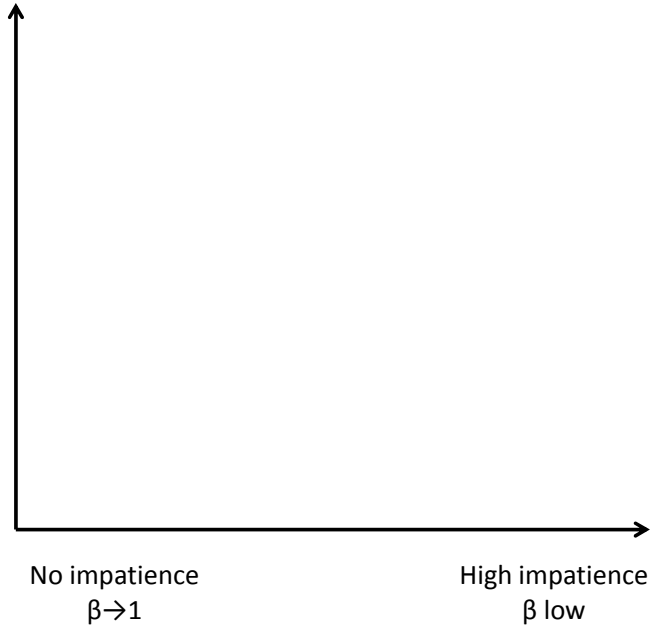
     Follow plan, but pay down less the more impatient

Effect of Present Bias - Joint Pattern

Sophisticated



Naive



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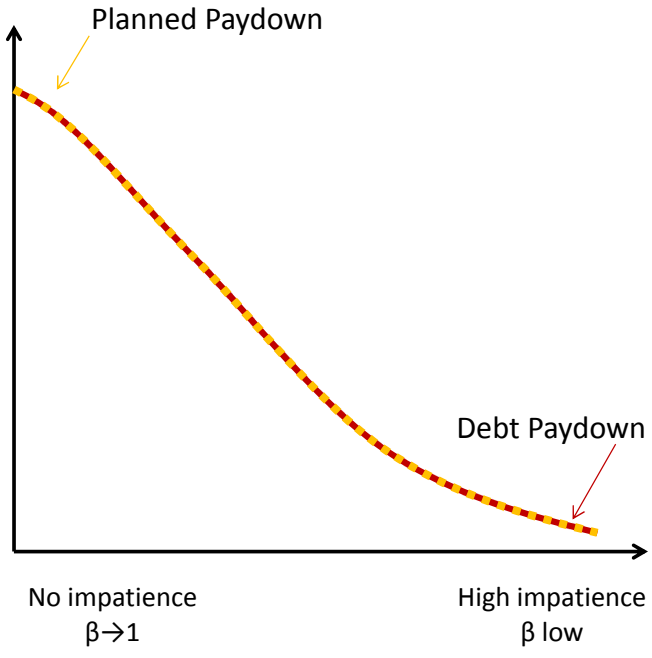

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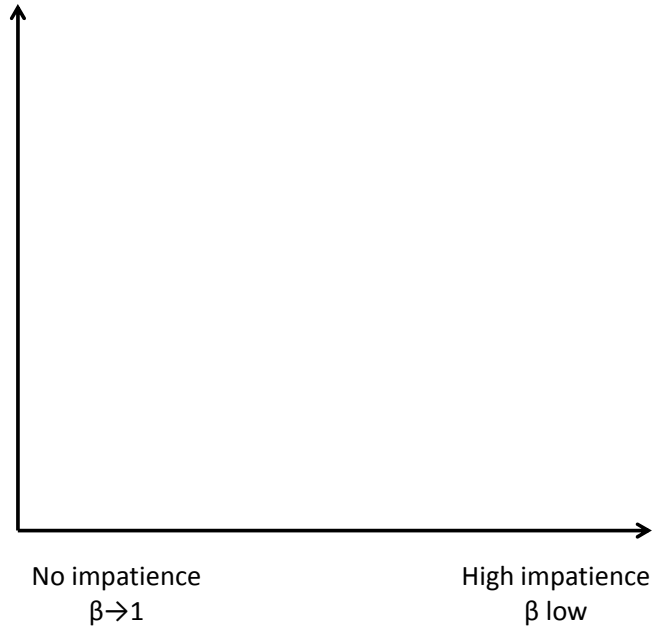

- *Sophisticated*:
  Follow plan to pay down
  Pay down less the more impatient

Effect of Present Bias - Joint Pattern

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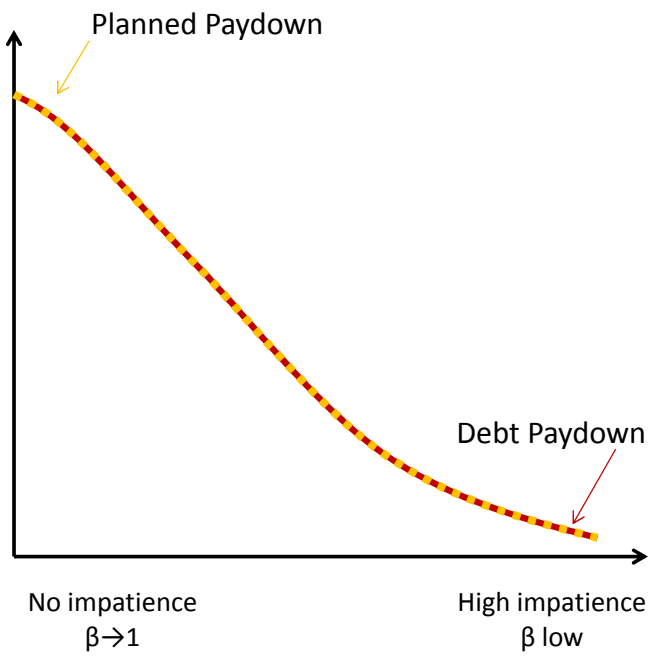

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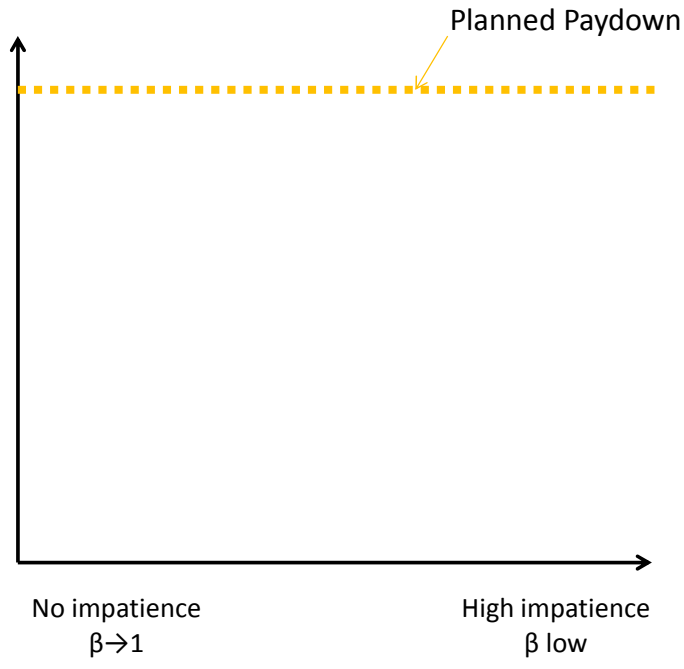

- *Naive*:

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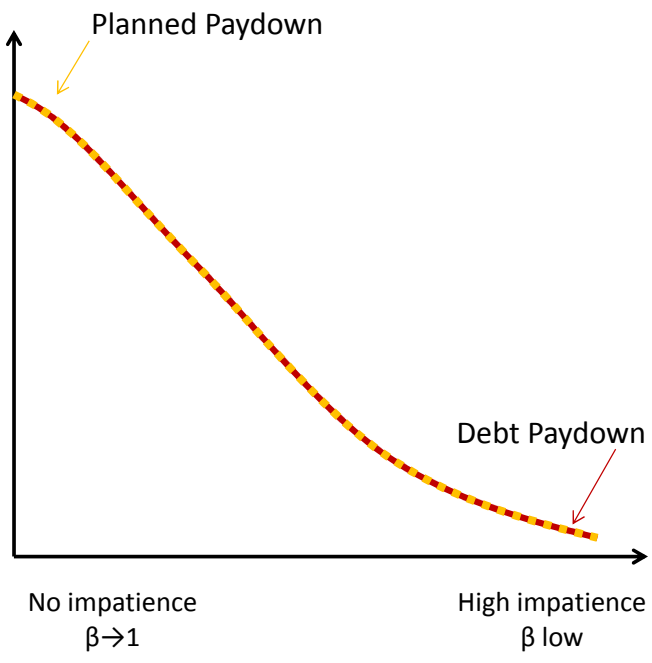

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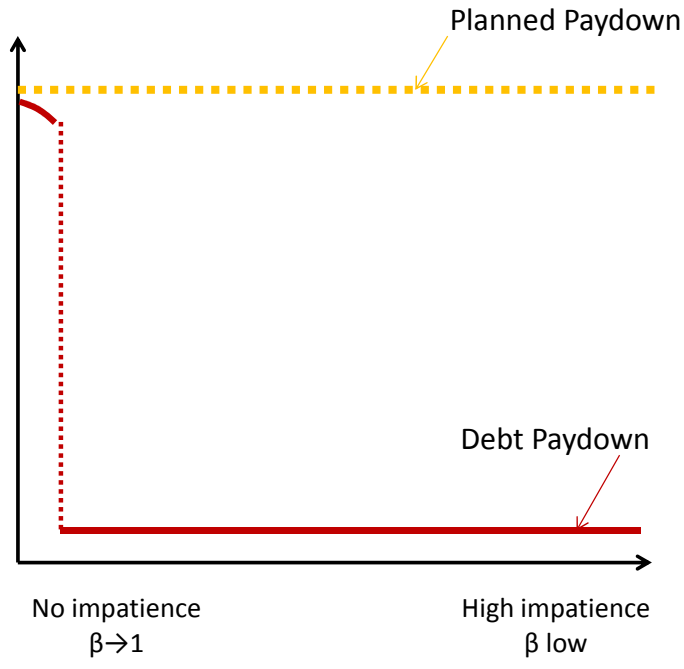

- *Naive*:
  Repeatedly plans to pay off next period

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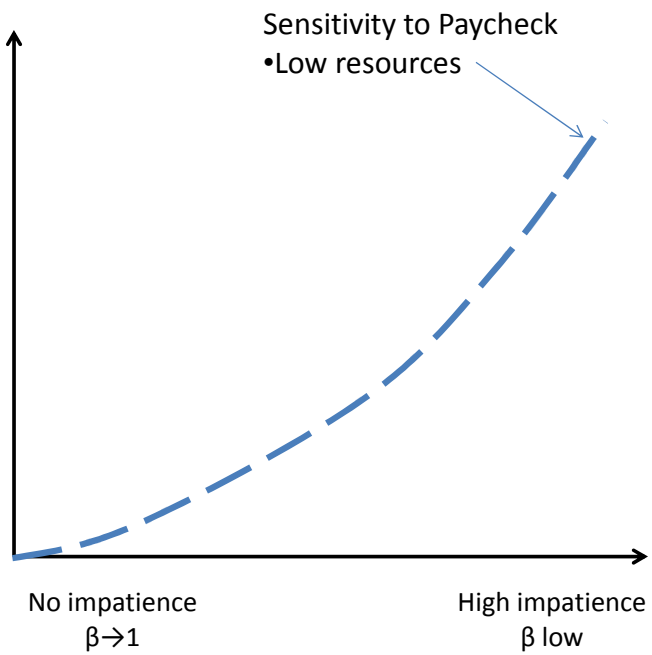

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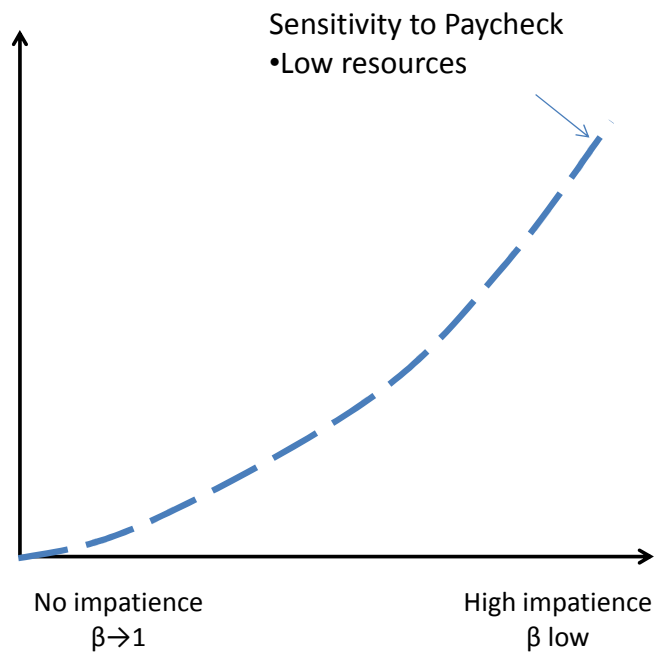

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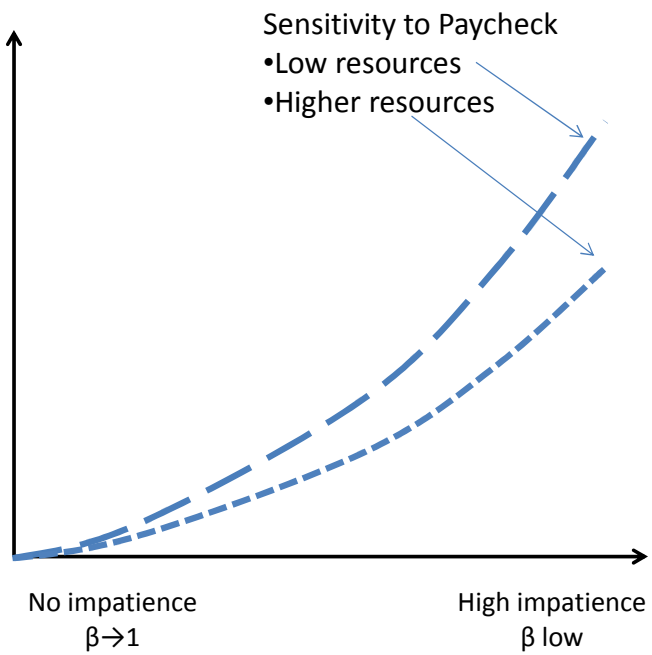

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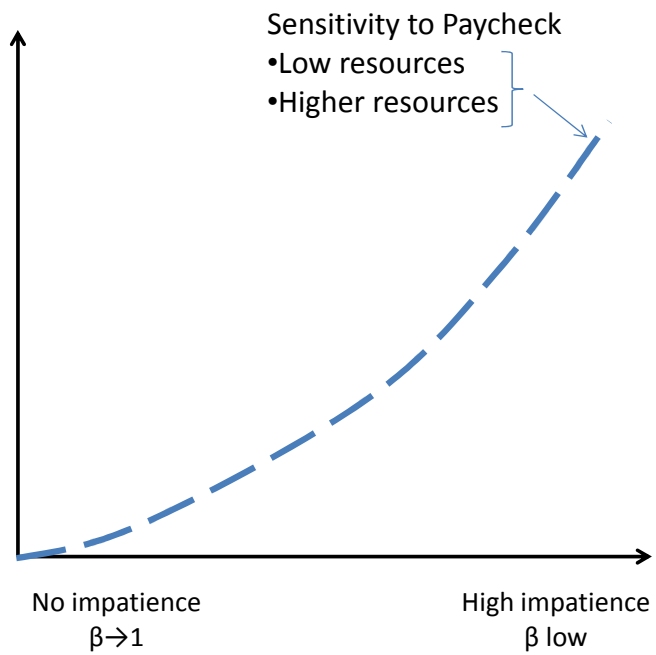

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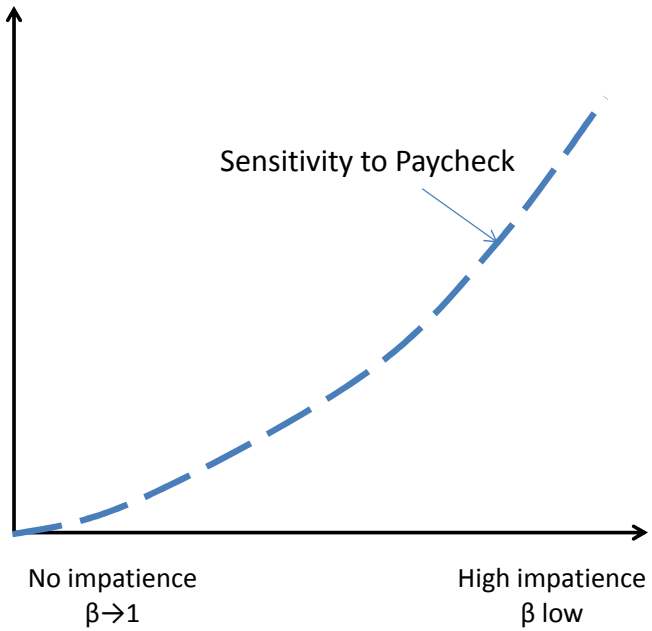

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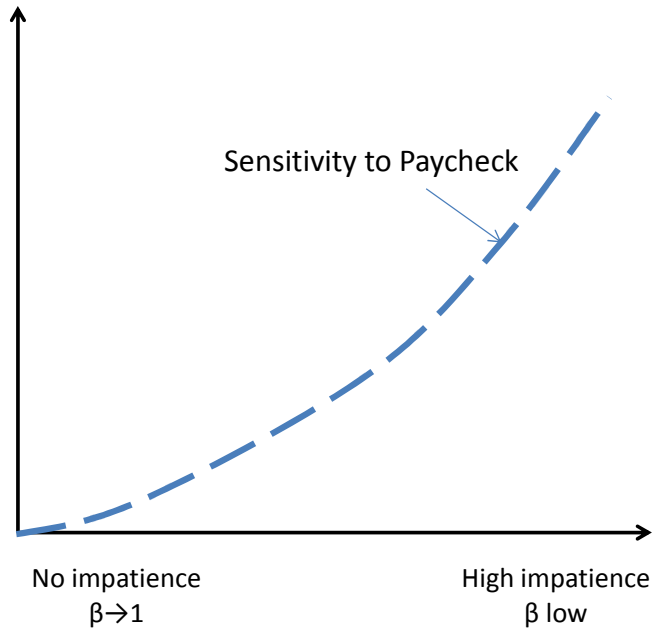

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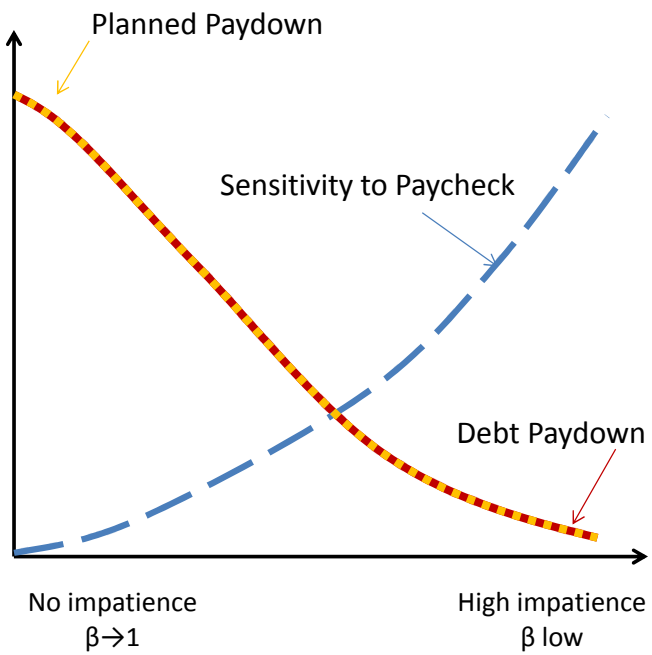

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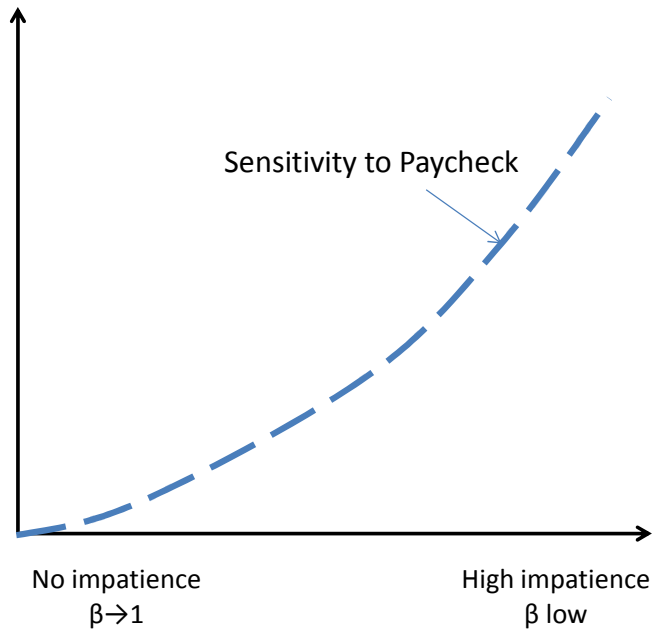

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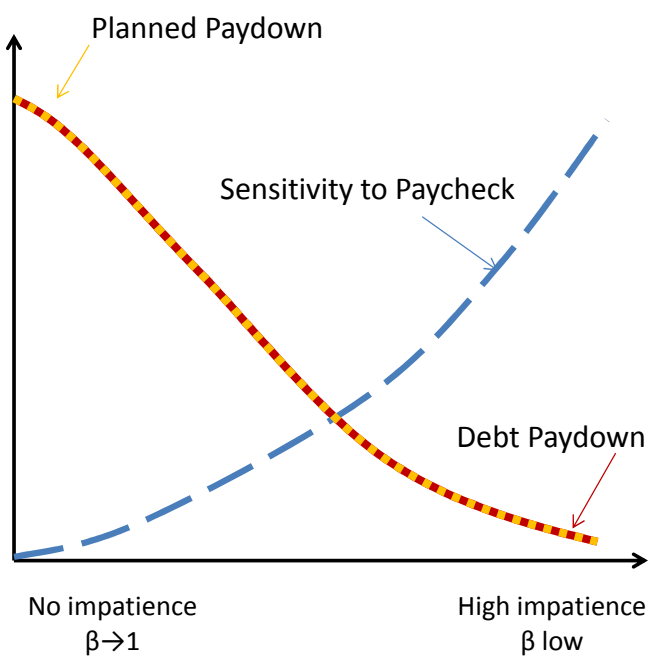

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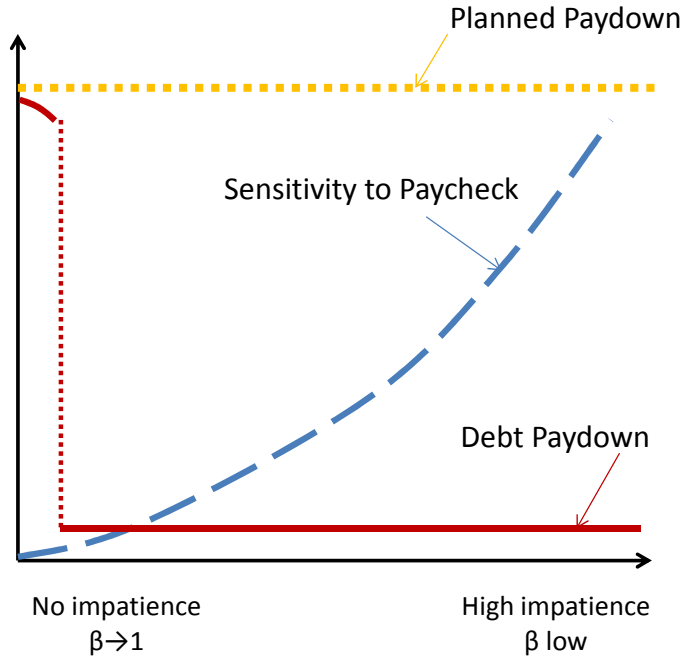

- *Sophisticated*:
  Pay down less the more impatient
- *Naive*:
  Delays irrespective of plans and impatience level

Regression Results - Debt Paydown

$$
\begin{aligned}
Paydown_i = \mu_0 &+ Sensitivity_i \mu_{1n} + PlannedPaydown_i \mu_{2n} \\
&+ Sensitivity_i * Sophist_i \mu_{1s} \\
&+ PlannedPaydown_i * Sophist_i \mu_{2s} \\
&+ X_i' \lambda + \nu_i
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	Paydown 90 Days		Paydown 180 Days	
	Short-run Consumables	Restaurant &Entertainment	Short-run Consumables	Restaurant &Entertainment
Sensitivity	7.35	-5.58	5.10	3.11
	(0.12)	(0.28)	(0.13)	(0.42)
Planned Paydown	0.14**	0.14**	0.07	0.09
	(0.02)	(0.04)	(0.19)	(0.10)
Sensitivity × Sophisticated	-20.41***	-7.32	-12.29***	-11.51**
	(0.00)	(0.38)	(0.01)	(0.02)
Planned Paydown × Sophisticated	0.21*	0.17	0.23**	0.27**
	(0.09)	(0.22)	(0.04)	(0.02)
Median Paycheck	2.47***	2.56***	0.92***	0.70***
	(0.00)	(0.00)	(0.00)	(0.01)
Original Debt	0.09***	0.10***	0.09***	0.04
	(0.00)	(0.00)	(0.00)	(0.17)
Sophisticated	-5.85	-4.78	-4.72	-5.81*
	(0.12)	(0.27)	(0.12)	(0.06)
Constant	-3.06	-3.70*	-0.35	0.11
	(0.10)	(0.10)	(0.81)	(0.94)
Nr of Individuals	556	510	556	510

P-values of bootstrapped standard errors in parentheses. Significance: * (p<0.10), ** (p<0.05), *** (p<0.01).

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  - Habits, non-separabilities
  - Unrealistic expectations, overoptimism
  - Impatient users drive difference btw sophisticated and naive

Backup Slides

Classification into Sophisticated / Naive

- Classify based on effect of resources on sensitivity (coefficient on $payweek * resources$)
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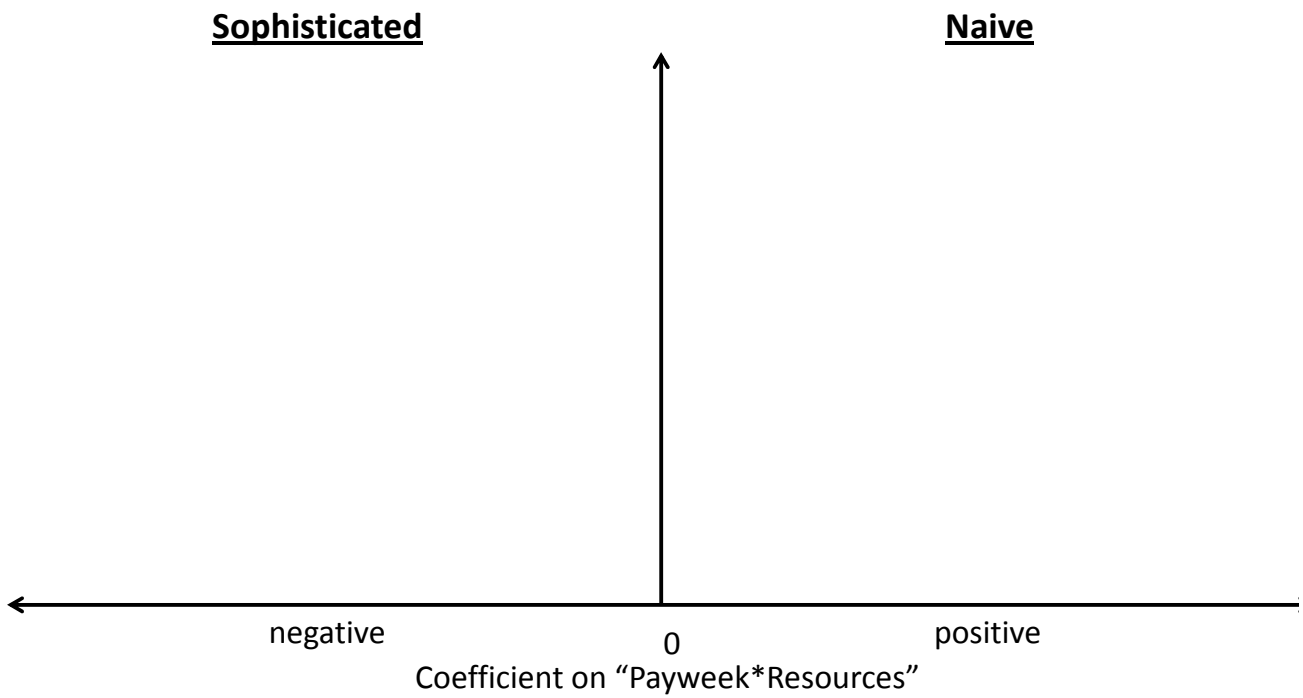

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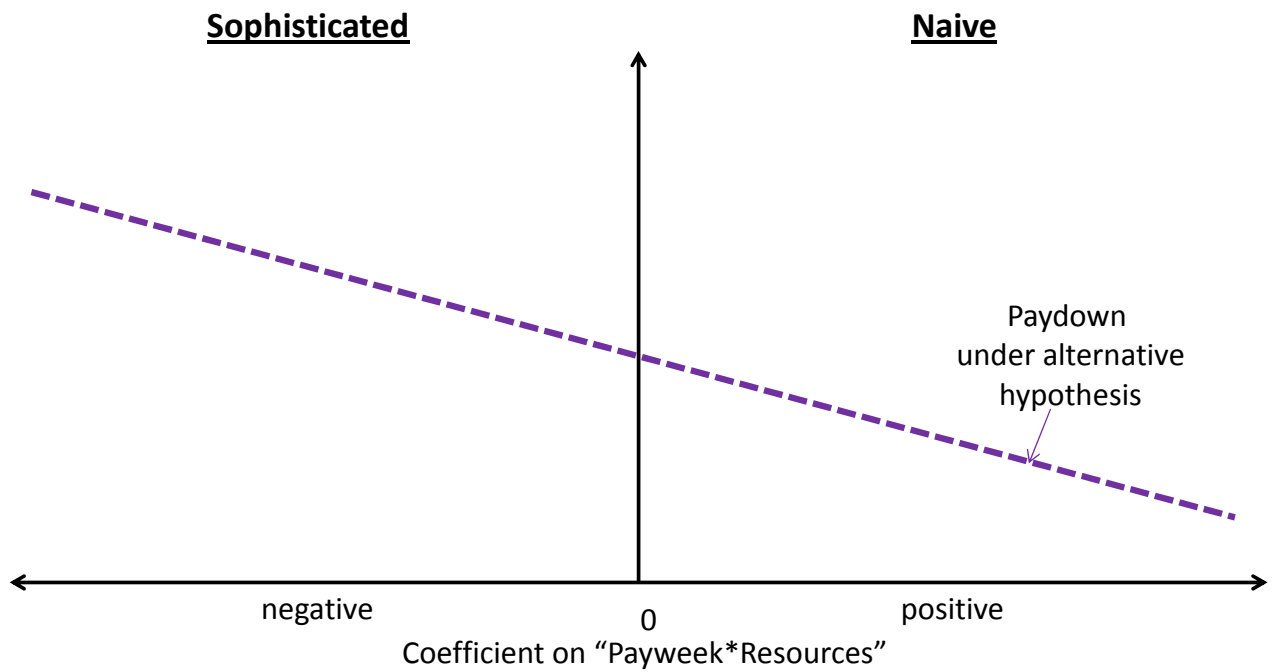

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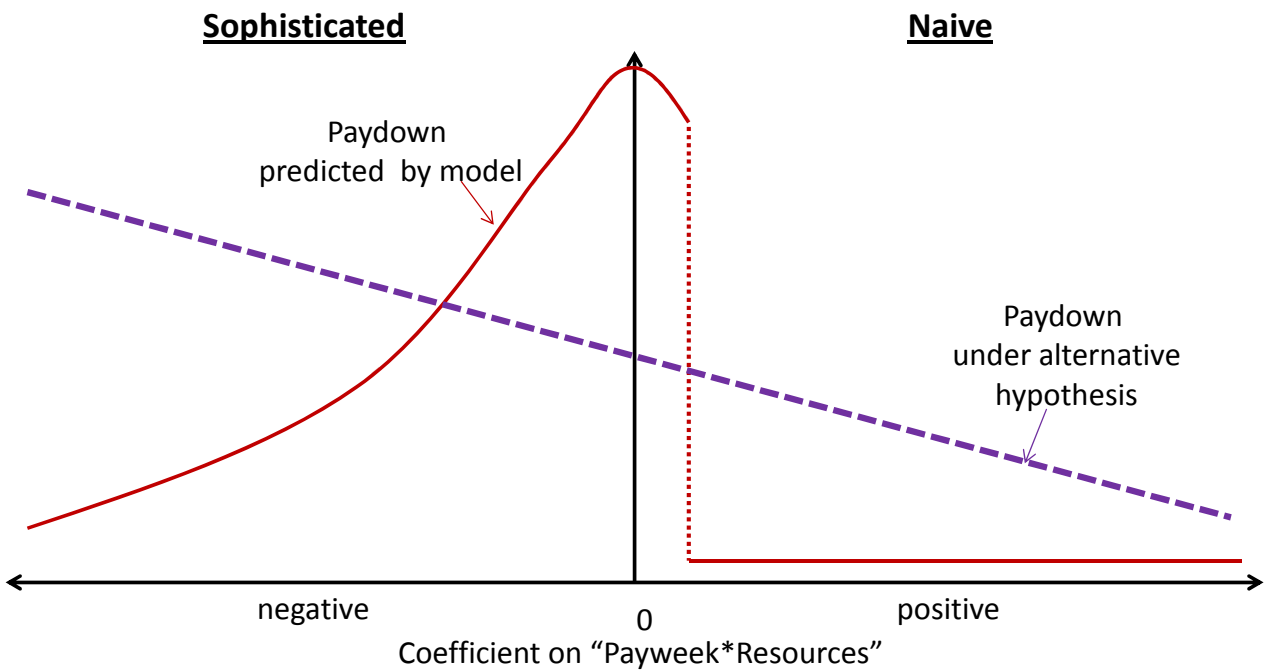

Classification into Sophisticated / Naive

$$Paydown_i = \mu_0 + (coefficient\_on\_payweek * resources)\mu_1 + X_i'\lambda + \nu_i$$

	Paydown 90 Days				Paydown 180 Days			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Short-run Consumables								
Coefficient on	0.13	2.32	-0.03	2.03	-0.20	0.88	-0.31	0.66
Resources*Payweek	(0.83)	(0.08)	(0.96)	(0.13)	(0.67)	(0.25)	(0.52)	(0.39)
winsorized	1%	5%	1%	5%	1%	5%	1%	5%
Controls	·	·	✓	✓	·	·	✓	✓
N	556							
Mean of Regressor	-0.032							
75^{th} - 25^{th} pctile	0.43							

P-values in parentheses. Significance: * (p<0.10), ** (p<0.05), *** (p<0.01).

▸ Back

Credit Constraints

Sensitivity caused by credit constraints?

- Estimation restricted to when spending of payweek affordable in non-payweek

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  $\rightarrow$ Baseline: *Category spending* possible

  $\rightarrow$ Now: 1. *Total discretionary spending* possible

  2. Category spending possible with *buffer stock* (10^{th} percentile of resources)

Total Discretionary Spending Affordable

$$Paydown_i = \mu_0 + Sensitivity_i\mu_{1n} + PlannedPaydown_i\mu_{2n} + Sensitivity_i * Sophist_i\mu_{1s} + PlannedPaydown_i * Sophist_i\mu_{2s} + X_i'\lambda + \nu_i$$

	Paydown 90 Days		Paydown 180 Days	
	Short-run Consumables	Restaurant &Entertainment	Short-run Consumables	Restaurant &Entertainment
Sensitivity	7.053	-4.861	3.443	3.635
	(0.179)	(0.388)	(0.324)	(0.288)
Planned Paydown	0.137*	0.138**	0.068	0.089
	(0.055)	(0.047)	(0.328)	(0.114)
Sensitivity ×	-21.645***	-7.184	-10.373**	-12.067**
Sophisticated	(0.008)	(0.416)	(0.047)	(0.026)
Planned Paydown ×	0.201	0.176	0.216*	0.271**
Sophisticated	(0.102)	(0.239)	(0.071)	(0.032)
Sophisticated	-5.715	-5.225	-5.428	-6.283*
	(0.229)	(0.230)	(0.132)	(0.063)
Median Paycheck	✓	✓	✓	✓
Original Debt	✓	✓	✓	✓
Constant	✓	✓	✓	✓
Nr of Individuals	551	501	551	501

P-values of bootstrapped standard errors in parentheses. Significance: * (p<0.10), ** (p<0.05), *** (p<0.01).

Spending Affordable with Buffer Stock

$$Paydown_i = \mu_0 + Sensitivity_i \mu_{1n} + PlannedPaydown_i \mu_{2n} + Sensitivity_i * Sophist_i \mu_{1s} + PlannedPaydown_i * Sophist_i \mu_{2s} + X_i' \lambda + \nu_i$$

	Paydown 90 Days		Paydown 180 Days	
	Short-run Consumables	Restaurant &Entertainment	Short-run Consumables	Restaurant &Entertainment
Sensitivity	-0.157	-13.095***	4.606	2.289
	(0.974)	(0.009)	(0.156)	(0.527)
Planned Paydown	0.144**	0.145**	0.060	0.100
	(0.031)	(0.047)	(0.309)	(0.127)
Sensitivity ×	-3.684	11.056	-9.248*	-8.057
Sophisticated	(0.629)	(0.151)	(0.071)	(0.131)
Planned Paydown ×	0.182	0.300**	0.258**	0.299**
Sophisticated	(0.173)	(0.049)	(0.027)	(0.028)
Sophisticated	-3.972	-6.586	-6.841**	-7.116*
	(0.362)	(0.150)	(0.037)	(0.054)
Median Paycheck	✓	✓	✓	✓
Original Debt	✓	✓	✓	✓
Constant	✓	✓	✓	✓
Nr of Individuals	542	490	542	490

P-values of bootstrapped standard errors in parentheses. Significance: * (p<0.10), ** (p<0.05), *** (p<0.01).

Excluding Low Sensitivity

Classification into sophisticated/naive of low sensitivity users

- Not meaningful theoretically
- More likely to be potentially misclassified

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$\rightarrow$ Exclude users with low estimated sensitivity/short-run impatience

Robustness: Impatient users drive results

$$Paydown_i = \mu_0 + Sensitivity_i \mu_{1n} + PlannedPaydown_i \mu_{2n} + Sensitivity_i * Sophist_i \mu_{1s} + PlannedPaydown_i * Sophist_i \mu_{2s} + X_i' \lambda + \nu_i$$

	Estimates for Short-run Consumables					
	Baseline	Exclude lowest 10%	Exclude lowest 20%	Baseline	Exclude lowest 10%	Exclude lowest 20%
	90 Days			**180 Days**		
Sensitivity	7.35	7.18	9.93**	5.10	5.46	6.52**
	(0.12)	(0.15)	(0.04)	(0.13)	(0.11)	(0.05)
Planned Paydown	0.14**	0.14**	0.19***	0.07	0.06	0.09
	(0.02)	(0.03)	(0.01)	(0.19)	(0.26)	(0.19)
Sensitivity ×	-20.41***	-20.62***	-24.01***	-12.29***	-12.38**	-13.73***
Sophisticated	(0.00)	(0.01)	(0.00)	(0.01)	-(0.01)	-(0.01)
Planned Paydown ×	0.21*	0.21*	0.23	0.23**	0.23**	0.19
Sophisticated	(0.09)	(0.09)	(0.14)	(0.04)	(0.04)	(0.17)
Sophisticated	-5.85	-5.80	-3.97	-4.72	-4.48	-3.03
	(0.12)	(0.15)	(0.35)	(0.12)	(0.14)	(0.38)
Controls						
Median Paycheck	✓	✓	✓	✓	✓	✓
Original Debt	✓	✓	✓	✓	✓	✓
Constant	✓	✓	✓	✓	✓	✓
Nr of Individuals	556	500	444	556	500	444

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$$Paydown_i = \mu_0 + Sensitivity_i\mu_{1n} + PlannedPaydown_i\mu_{2n} + Sensitivity_i * Sophist_i\mu_{1s} + PlannedPaydown_i * Sophist_i\mu_{2s} + X_i'\lambda + \nu_i$$

	Estimates for Restaurant&Entertainment					
	Baseline	Exclude lowest 10%	Exclude lowest 20%	Baseline	Exclude lowest 10%	Exclude lowest 20%
	90 Days			**180 Days**		
Sensitivity	-5.578	-5.367	-8.631	3.106	3.899	2.494
	(0.276)	(0.315)	(0.114)	(0.416)	(0.294)	(0.529)
Planned Paydown	0.142**	0.151**	0.098	0.090	0.115*	0.081
	(0.037)	(0.040)	(0.219)	(0.100)	(0.052)	(0.252)
Sensitivity×	-7.314	-8.092	-5.165	-11.510**	-12.603***	-11.246**
Sophisticated	(0.377)	(0.336)	(0.543)	(0.023)	-(0.009)	-(0.032)
Planned Paydown×	0.165	0.182	0.244*	0.268**	0.269**	0.320**
Sophisticated	(0.219)	(0.203)	(0.097)	(0.024)	(0.034)	(0.031)
Sophisticated	-4.783	-4.912	-7.962*	-5.814*	-6.105*	-8.489**
	(0.265)	(0.274)	(0.062)	(0.064)	(0.071)	(0.026)
Controls						
Median paycheck	✓	✓	✓	✓	✓	✓
Original debt	✓	✓	✓	✓	✓	✓
Constant	✓	✓	✓	✓	✓	✓
Nr of individuals	510	459	408	510	459	408

P-values of bootstrapped standard errors in parentheses. Significance: * (p<0.10), ** (p<0.05), *** (p<0.01).

Robustness: Impatient users drive results

▸ Back

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  This paper: Field data, explicitly measure sophistication

- Sensitivity to paycheck receipt
  - Shapiro (2005), Stephens (2006), Hastings, Washington (2010), Kaur, Kremer, Mullainathan (2010), Van Wesep, Parsons (2012)

  This paper: Sensitivity as proxy for present bias

Data

Users of a website to help manage and pay down credit card debt (www.readyforzero.com)

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Information on:

- Balance, credit limit, available credit of accounts
- Transaction level data for checking and credit card
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Include users in sample if:

- Linked checking account
- Regular, bi-weekly paychecks
- Data on all linked accounts available from signup till 180 days

Summary Statistics

	N	Mean	p25	p50	p75
Users					
Days in sample	556	471	339	442	619
Days in sample after sign-up		399	252	354	562
Income					
Avg. monthly income	556	3,913	2,607	3,526	4,669
Assets					
Credit Card Debt - $	556	15,204	4,962	10,669	19,303
Credit Card Debt - rel. to income		4.52	1.46	3.03	5.10
Cash Balances - $		3,954	637	1,812	4,452
Total Credit - $		27,111	9,750	19,875	34,625
Available Credit - $		11,907	1,776	5,697	16,250
Debt Paydown					
Change in Debt - 90 days - $	556	-736	-1,332	-234	363
Change in Debt - 90 days - %		0.03	-0.14	-0.02	0.04
Planned Paydown - 90 days - $		2,747	1,121	1,947	3,484

▸ Spending Summary Statistics