

Pinching pennies or money to burn? The role of grit in financial behaviors

Abstract: We explore whether gritty individuals are better savers by virtue of their wealth or due to diligent choices that benefit their long-term economic health. We test these competing hypotheses by examining the ways in which grit influences how LMI tax filers report spending or saving their tax refund in the months following tax filing. We leverage a novel dataset combining longitudinal household financial survey data with administrative tax data for a sample of 6,904 low- and moderate-income tax filers. After balancing individuals on grit with propensity score weighting and machine learning, we find that grit was associated with better financial behaviors, even among individuals with lower incomes. Furthermore, the influence of grit on savings behaviors held in the presence of key life stressors that low-income individuals often face. Furthermore, we find that gritty individuals prioritized spending on education over gifts, resembling the determination and passion to pursue their long-term goals.

Statement of Relevance: Savings are among the most important correlates of general and financial well-being, yet an alarming number of people are ill-prepared for financial emergencies and retirement. While attempts to address this issue typically involve direct financial support or behavioral interventions, these approaches often overlook the broad individual differences that can shape savings behaviors. One of the major individual traits associated with greater savings and wealth is grit. Despite observed correlations between grit and wealth, the mechanisms underlying this relationship remain unclear. In exploring these underlying mechanisms, we demonstrate that gritty people have positive long-term financial outcomes not only because of greater career attainment, but also because of better financial behaviors—even under duress. As recent research has demonstrated the malleability of grit, our findings suggest that interventions to increase grit or activate some of its core mechanisms at financial decision points should be pursued as a strategy for increasing social mobility.

Financial assets are important in promoting both household economic stability and economic mobility, and savings are among the most important correlates of both general well-being (Martin & Hill, 2015) and financial well-being (Consumer Financial Protection Bureau, 2017; Roll, Kondratjeva, Bufe, Grinstein-Weiss, & Skees, 2021). Despite this, an alarming number of people are ill-prepared for even modest financial emergencies or retirement, even in advanced economies like the United Kingdom and United States (Larrimore, Dodini, & Thomas, 2016). Attempts to address this issue typically involve direct financial support, such as tax credits or monetary incentives to save (e.g., Duflo, Gale, Liebman, Orszag, & Saez, 2007), or altering choice environments to promote savings behaviors, such as making retirement savings contributions opt-out rather than opt-in (Madrian & Shea, 2001). However, these approaches mostly overlook the broad individual differences that shape savings behavior; an important consideration given that some people are better at setting aside away money for rainy days than others.

Most of the research into who saves more focuses on financial capabilities (Sherraden, 2013) or financial knowledge (Lusardi & Mitchell, 2014), access to savings vehicles (Nam, Kim, Clancy, Zager, & Sherraden, 2013), and broader social and economic factors (e.g., Lunt, & Livingstone, 199). By contrast, a relatively limited number of studies have examined broad personality characteristics relationship with consumption and savings behaviors, despite evidence of its importance (Asebedo 2019; Duckworth, et al., 2012; Matz, et al., 2016; Rosen et al., 2021). One of the major broad individual traits associated with greater savings and wealth is “grit” (Leckelt et al., 2019; Loibl, Grinstein-Weiss, Zhan, M., & Red Bird, 2010)—a personality disposition marked by perseverance toward long-term goals and resilience in the face of setbacks (Duckworth, Petersen, Matthews, & Kelley, 2007). Despite observed correlations between grit

and wealth, the mechanisms underlying this disposition remain unclear. The current study tests two competing reasons why the personality trait of grit is associated with greater wealth: First, that gritty individuals save more because they have higher levels of wealth; second, that gritty individuals save more due to a different propensity to make certain financial choices that build wealth. To examine these potential mechanisms, we employ a novel dataset combining longitudinal survey data with administrative tax data for a sample of low- and moderate-income (LMI) tax filers, which allows us to observe reported tax refund savings behaviors over time for individuals with different levels of grit.

Grit and life outcomes

Grit is a personality disposition marked by perseverance of goals, and is strongly related to character traits like conscientiousness and impulse control (Crede, Tynan & Harms, 2017; Jackson & Hill, 2018). Grit and closely related constructs are associated with numerous positive outcomes such as greater net worth (Letkiewicz & Fox, 2014), lower personal debt and better household finances (Brown & Taylor, 2014), and less financial distress in general (Xu et al., 2015; Donnellan et al., 2009). Moreover, these constructs are related to markers of “success” such as obtaining college degrees (Duckworth et al., 2012), having high paying jobs (Heineck, 2011; Robert et al., 2011), being less likely to experience unemployment (Uysal & Pohlmeier, 2011), and living longer lives (Kern & Friedman, 2008). Gritty individuals are thought to do many behaviors that lead to these outcomes such as continue working when facing challenges and putting in long hours of work (Jackson et al., 2009).

Two pathways to gritty success

Yet the pathways between grit and saving behaviors are not well understood. Gritty people may have good outcomes not because of saving behaviors, but may instead reap the

benefits of greater educational and career attainment (Hill & Jackson, 2015; Jackson & Hill, 2019). Rather than being better savers per se they are able to save more only after they accrue more wealth through educational attainment and by working hard to achieve high paying and stable jobs. The result of this tenacity is that there are extra funds available, thus reducing budgetary constraints and increasing the amount of money available to save. In this sense, grit promotes savings behaviors because saving is *easier* as a result of promoting individual economic circumstances that minimize the psychological and financial barriers of savings.

An alternative hypothesis is that gritty individuals are more likely to view savings as a priority that is at least somewhat independent of cash flow. Gritty individuals are thought to have better future time perspectives, and thus by focusing on future goals they may want to obtain (e.g., saving enough for a down payment on a house), they prioritize savings rather than the immediate payoff of consuming income (Duckworth, et al., 2012). Moreover, gritty people are thought to focus on their goals when shopping and are therefore less likely to make impulsive purchases; gritty people are also thought to follow through on plans to save. Thus, gritty individuals should have a better capacity to save, regardless of their financial means.

Previous studies show that those high in constructs associated with grit have less debt (Brown & Taylor, 2014; Donnelley et al., 2012), even after accounting for household income and assets, indicating that gritty individuals use excess funds more responsibly. Though others find no effect on savings or debts (Nyhus & Webley, 2001), some find an effect on savings only when looking at those in the lower quartile of wealth (Mosca & McCrory, 2016). In terms of savings behaviors there are few, if any, studies that examine savings behaviors as they occur, as most of the studies examining savings focus on accumulated savings rather than people faced

with a choice to spend or save. We offer one of the first studies that demonstrates how grit influences a savings *decision*, rather than how it is correlated with overall savings *levels*.

Methods

We test whether gritty individuals are better savers by virtue of their wealth or due to diligent choices that benefit their long-term economic health by examining the ways in which grit influences how LMI tax filers report spending or saving their tax refund in the months following tax filing. Tax refunds are often the largest “lump sum” payment that LMI individuals receive during the year (Roll, Davison, Grinstein-Weiss, Despard, & Bufe, 2018). We leverage a unique two-wave household financial survey that has been merged with administrative federal tax filing records to test three hypotheses concerning grit and the usage of the tax refund and two hypotheses concerning grit and household balance sheets more generally. First, we test the hypothesis that grit will be positively associated with an increase in refund savings and that this association will hold in the face of adverse life experiences. Second, we test the hypothesis that grit will be positively associated with an increase in using the refund to pay down debts. Third, we test the hypothesis that grit will be positively associated with the proportion of the refund both saved and used to pay down debt among savers and debt-payers. Fourth, we test the hypothesis that grit will be positively associated with expenditures that can increase an individual’s long-term development, and negatively associated expenditures related to short-term consumption. Finally, we test the hypothesis that grit will be positively associated with increased assets and negatively associated with increased debts.

Sample

Our sample was created from Waves 1 and 2 of the 2013 Household Financial Survey (HFS). In addition to grit, the HFS gathered detailed information on a variety of measures related

to household finances, such as liquidity, debt, assets, educational attainment, student enrollment and employment status, and financial habits and plans. Wave 1 of the HFS was administered to individuals who consented to participate in the survey following completion of their tax preparation in Intuit's TurboTax Freedom Edition (TTFE) in 2013, and Wave 2 was administered to these individuals roughly 6 months after they completed Wave 1. In total, 16,929 individuals completed Wave 1 of the HFS and 7,769 of these completed Wave 2. Previous analyses of the HFS demonstrate that there is no evidence of systematic attrition between survey waves (Kondratjeva, Roll, Bufe, Grinstein-Weiss, 2020). The small number of respondents who did not provide responses to every measure used in this study were excluded using listwise deletion.

As part of the Internal Revenue Service's (IRS) Free File Alliance Program,¹ the TTFE tax-preparation and tax-filing software is free for LMI tax filers who meet certain income and/or military service criteria. In 2013, the qualifying criteria for using TTFE were: (a) claiming the Earned Income Tax Credit, (b) having an adjusted gross income (AGI) less than or equal to \$30,000, or (c) being an active duty military serviceperson with an adjusted gross income less than or equal to \$58,000. For the following analyses, HFS data were merged with administrative tax records. By using administrative data, we were able to observe the precise values of household adjusted gross income (AGI), federal tax refunds, tax filing status, and the number of dependents in a household.

Among our analytic sample of LMI individuals, the majority identified as female (61%) and White (76%), filed their taxes as single (64%), and were unmarried without a partner (60%). The average age was 35.33 (sd = 13.03) and the average number of dependents was 0.57 (sd = 0.93). The majority of individuals in our sample had at least some college (86%), and a

¹ <https://freefilealliance.org/>

substantial proportion were currently enrolled in school (29%). Unsurprisingly, a substantial proportion were not currently employed (30%). The average tax refund (\$2,174.33; sd = \$2,330.25) was roughly 12.5% of the average income (\$17,550.34; sd = \$10,140.52), and the average amount of liquid assets in our sample (\$3,923.12; sd = \$8,990.46) was slightly higher than the average amount of unsecured debt (\$2,807.01; sd = \$5,192.91).

By comparing Wave 1 responses, which asked how individuals *planned* to use their refund, and Wave 2 responses, which asked how individuals *did* use their refund, we can assess the relationship between refund intentions and refund usage. More individuals saved part of their refund (27%) than who had originally planned (14%), and the average percent of an individuals' refund used to pay down debt (43.08; sd = 40.33) was also larger than what was originally planned (32.77; sd = 35.23). Finally, more individuals spent part of their refund on gifts (29%) than education or training (11%).

Analytic Strategy

While previous studies of tax refund savings tend to measure the influence of certain “treatments” on refund usage, such as low-touch “nudges” (e.g., Roll, Grinstein-Weiss, Gallagher, & Cryder, 2020; Roll, Russell, Perantie, & Grinstein-Weiss, 2019), grit does not operate as a typical treatment, as it cannot be randomly assigned or selected into. Thus, in order to understand the influence of grit, we isolate the trait using machine learning and propensity score weighting in order to balance grit on observable characteristics. Specifically, we utilize generalized propensity score estimation using GBM (generalized boosted modeling) to create our propensity score weights. Inspired from McCaffrey, Ridgeway, and Morral’s (2004) original strategy for estimating propensity scores through boosted regression, Zhu, Coffman, and Ghosh’s (2015) ‘ps.cont’ package in R allowed us to estimate weights for a continuous “treatment” from a

series of trees that optimizes minimal correlations between grit and its observed covariates. In estimating the weights, the marginal density of the grit is divided by the conditional density of the grit on the observed covariate for each unit (Greifer, 2020). These weights are then applied in multivariate response models with additional covariates for the outcomes. We utilized logistic regression for binary outcomes and linear regression for continuous outcomes.

As seen in Table 1, there were only modest correlations among grit and the observed characteristics prior to our propensity score estimation strategy. Among LMI individuals, those who identified as Black had a small positive correlation with grit ($r = 0.083$), while those who identified as White ($r = -0.059$) and male ($r = -0.072$) had a small negative correlation with grit. While age ($r = 0.108$) and the number of dependents ($r = 0.054$) had a small positive correlation with grit, those who filed their taxes as single had a small negative correlation with grit ($r = -0.066$). An individual's income ($r = 0.031$) and federal tax refund amount ($r = 0.058$) were positively correlated with grit. These correlations were further reduced to near zero after we employed our propensity score estimation strategy. Nevertheless, it is important to note that while this strategy allows us to limit some of the bias of grit's observable characteristics in the relationship between grit and financial behaviors, it does not allow us to remove the possibility that some of these characteristics did not previously influence the development of grit *or* that grit did not influence the development of some of these characteristics. It also does not allow us to remove the potential biases of grit's unobserved correlates. As a result, we view our analytical approach as a bias reduction technique rather than as identifying causal relationships.

Measures

Grit. The key predictor in our study was a short (eight-item) grit scale (Duckworth & Quinn, 2009) collected in Wave 1 of the survey. The average grit score in our sample was 3.51

(sd = 0.64), which had an Alpha reliability coefficient of 0.77. Grit was balanced on observed variables from administrative tax records that are theoretically related to grit, as well as the outcomes under study. These variables included race/ethnicity, gender, age, tax filing status, number of dependents, household's AGI, and federal tax refund amount. Additional covariates from Wave 1 were utilized in our multivariate response models in order to account for other variables that might explain the outcomes. Specifically, we added marital status, dependent status, educational attainment, student status, employment status, liquid assets (including amounts reported in checking accounts, savings accounts, and cash), and unsecured debt (including amounts reported on credit cards, payday loans, and negative balances in checking accounts). In order to censor extreme outliers, age, liquid assets, and unsecured debt variables were winsorized at the upper-bound 99th percentile in the multivariate response models.

Savings, Debts, and Expenditures. When considering our outcome measures, we examined grit's association with whether or not an individual had saved any of their tax refund at Wave 2 (1 = yes; 0 = no)—when accounting for whether an individual planned on saving any of their refund at Wave 2 (1 = yes; 0 = no). Here, we see that a greater proportion of individuals saved their refund at Wave 2 (27%) than had originally planned to at Wave 1 (14%). We also examined grit's association with whether or not an individual had used any of their tax refund to pay down debt at Wave 2 (1 = yes; 0 = no)—when accounting for whether an individual planned on using any of their refund to pay down debt at Wave 1 (1 = yes; 0 = no). Here, we see that a similar proportion of individuals used their tax refund to pay down debt at Wave 2 (65%) than had originally planned to at Wave 1 (64%). We also examined grit's association with the percentage of a refund used to save or pay down debt at Wave 2—when accounting for the percentage of a refund planned on being used to save or pay down debt at Wave 1. Additionally,

we examined grit's association with whether individuals used their refund to pay for education and training (1 = yes; 0 = no) or gifts and toys (1 = yes; 0 = no). Here, fewer individuals used their refund to pay for education and training (11%) than gifts and toys (29%). Finally, we examined and grit's association with recent changes in liquid assets and unsecured debt.

Stressors. As we are interested if adverse financial events can moderate the relationships among grit and our outcomes, we also included a measure capturing the recent experience of these events in our analyses. These adverse financial events included whether or not individuals lost a job, had an emergency room visit, had an unexpected vehicle repair, or had unexpected legal fees. The majority of individuals (66%) experienced life stressors between Wave 1 and Wave 2 of the survey.

Results

Grit and Savings

In order to determine the influence of grit on savings behaviors, we ran two robust propensity score-weighted (PSW) binary logistic regression models ($n = 6,904$). First, we ran a model to determine the influence of grit on whether or not individuals saved any of their refund at Wave 2 when accounting for whether individuals planned on saving any of their refund at Wave 1 (Model 1). We found that for a one-unit increase in grit, the odds of an individual saving part of their refund increased by 14.8% (OR = 1.148; $se = 0.054$; $p < 0.01$). We then ran a similar model and added an interaction term between grit and whether or not individuals experienced stressors since Wave 1 in order to determine if the influence of grit on savings was moderated by unexpected setbacks (Model 2). However, the interaction was not significant, indicating that the relationship between grit and savings was not statistically different between individuals who experienced stressors and those who did not. In both models planning to save, identifying as

Asian, identifying as male, having a larger AGI and federal tax refund, having higher levels of education, and having a larger amount of liquid assets were associated with increased odds of saving part of one's refund. Conversely, identifying as Black, being older, being married/having a partner, having dependents, and having a larger amount of unsecured debt was associated with decreased odds of saving part of one's refund.

Grit and Debt Payments

We employed a similar process in order to determine the influence of grit on debt payments. When accounting for whether individuals planned on using any of their refund at Wave 1 to pay down debts (Model 3), we found that for a one-unit increase in grit, the odds of an individual using part of their refund to pay down debt increased by 14.2% (OR = 1.142; se = 0.055; $p < 0.01$). We then added an interaction term between grit and whether or not individuals experienced stressors since Wave 1 in order to determine if the influence of grit on debt payments was moderated by unexpected setbacks (Model 4). Similarl to Model 2, the interaction was not significant, indicating that the relationship between grit and debt payments was not statistically different between individuals who experienced stressors and those who did not. In Model 3, planning to use one's refund to pay down debt, identifying as Black, identifying as Hispanic, being older, being married/having a partner, having dependents, having a larger AGI and federal tax refund, having a higher level of education, and having a larger amount of unsecured debt were associated with increased odds of using part of one's refund to pay down debt. Conversely, having a larger amount of liquid assets was associated with decreased odds of using part of one's refund to pay down debt. However, in Model 4 an individual's grit score lost statistical significance.

Grit and Allocations across Savings and Debt Payments

Next, we wanted to determine whether grit was positively associated with the proportion of an individual's tax refund saved *among Wave 2 savers* and, likewise, whether grit will be positively associated with the proportion of an individual's tax refund used to pay down debt *among Wave 2 debt-payers*. First, we ran a robust propensity score-weighted (PSW) linear regression model with a subset of individuals who saved part of their refund at Wave 2 ($n = 1,856$). However, when accounting for the percentage of a refund planned on being saved at Wave 1, there was no significant relationship between grit and the actual percentage of an individual's refund saved at Wave 2 (Model 5). Next, we ran a robust propensity score-weighted (PSW) linear regression model with a subset of individuals who used part of their refund to pay down debt at Wave 2 ($n = 4,504$). When accounting for the percentage of a refund planned on being used to pay down debt at Wave 1, a one-unit increase in grit was associated with a 3.734 point increase in the percentage of one's refund used to pay down debt at Wave 2 ($b = 3.734$; $se = 0.699$; $p < 0.001$) (Model 6). In Model 5 the percentage of a refund planned on being saved, identifying as male, being older, and having a larger amounts of liquid assets were associated with increased savings, while identifying as Black, having dependents, having a larger federal tax refund, having a higher level of education, and having a larger amount of unsecured debt were associated with decreased savings. In Model 6 the percentage of a refund planned on being used to pay down debt and being older were associated with increased debt payments, while having a larger federal tax refund and having a larger amount of liquid assets were associated with decreased debt payments.

Grit and Expenditures

Additionally, in order to determine the influence of grit on expenditures, we ran two robust propensity score-weighted (PSW) binary logistic regression models. These analyses were

limited to individuals that spent part of their refund ($n = 4,955$). First, we ran a model to determine the influence of grit on whether individuals used their refund to pay for education or training (Model 7). We found that for a one-unit increase in grit, the odds of an individual spending part of their refund on education or training increased by 23.9% (OR = 1.239; se = 0.101; $p < 0.01$). We then ran a similar model to determine the influence of grit on whether individuals used their refund to pay for gifts or toys (Model 8). Here, we found that for a one-unit increase in grit, the odds of an individual spending part of their refund on gifts or toys *decreased* by 16.0% (OR = 0.840; se = 0.044; $p < 0.001$). In Model 7 having a larger federal tax refund, having higher levels of education, and not working were associated with increased odds of spending one's refund on education/training, while being older, being married/having a partner, and having a larger AGI were associated with decreased odds of spending one's refund on education/training. In Model 8, having a larger federal tax refund, having a higher level of education, and having a larger amount of liquid assets was associated with increased odds of spending one's refund on gifts/toys, while being older and being currently unemployed were associated with decreased odds of spending one's refund on gifts/toys.

Grit and Household Balance Sheets

Finally, in order to determine the influence of grit on household balance sheets, we ran two robust propensity score-weighted (PSW) linear regression models ($n = 7,329$). First, we ran a model to determine influence of grit on liquidity at Wave 2 when accounting for liquidity at Wave 1 (Model 9). We found that for a one-unit increase in grit, an individual's liquid assets increased by \$321.95 ($b = 321.95$; se = 164.06; $p < 0.05$). We then ran a similar model to determine the influence of grit on unsecured debt at Wave 2 when accounting for unsecured debt at Wave 1 (Model 10). However, we did not find a significant relationship. In Model 9, Wave 1

liquidity, identifying as Asian, identifying as male, and having a larger AGI were positively associated with increased liquidity, while identifying as Black and having dependents was negatively associated with increased liquidity. In Model 10, Wave 1 unsecured debt and having a larger AGI were positively associated with increased unsecured debt.

Discussion

This study sought to examine whether wealth accumulation is due, at least in part, to the relationship between grit and financial decisions (e.g., spenders vs. savers) *or* if wealth accumulation is solely the result of gritty individuals gaining access to wealth-building assets, such as higher education and better-paid employment. By accounting for wealth-building assets, we were able to explore the relationship between grit and financial decisions. Furthermore, in order to develop a better understanding of the extent to which grit might influence financial decisions for lower-income populations, we explored whether the influence of grit on financial decisions altered in the face of life stressors.

Because tax refunds often represent the largest “lump sum” payment that LMI individuals receive during the year, our combination of administrative tax data from a large sample of low- and moderate-income (LMI) filers with two waves of household financial survey data provides an exceptionally strong set of information for exploring the influence of grit on financial behaviors. Moreover, our study’s rigorous analytic strategy, which combined propensity score weighting with machine learning, allowed us to adequately balance individuals on the personality trait of grit. Given the multidimensional nature of grit, machine learning allows for the most effective and efficient balancing of observed covariates with a continuous treatment.

Prior to propensity score weighting, we observed both expected and unexpected patterns. As expected, both age and income were positively associated with grit; however, while we did

not expect to observe correlations with demographic dimensions, we found that identifying as White and male were negatively associated with grit, while identifying as Black was positively associated with grit. As previous research has explored the importance of grit among Black college students (Strayhorn, 2014), this is a promising finding for racial equity.

In total, we ran ten different models to test our hypotheses and examine the influence of grit on a wide range of financial behaviors. Among other factors, these models accounted for the size of tax refunds, as well as savings and debt amounts. Testing our first set of hypotheses, we found that grit was positively associated with an increase in savings when accounting for prior savings intentions and that this association holds in the face of adversarial life experiences. While there were no significant interaction among recent stressors, the relationship between grit and debt payments no longer remained significant when recent stressors were added to the model. Here, stressors may explain part of the relationship among grit and debt payments but do not appear to significantly interact with grit. Future research should further explore the moderating effects of life stressors on the relationships among grit and financial behaviors. Furthermore, when taking a closer look among grit and financial behaviors, we found that grit was associated with a higher proportion of the refund used for debt payments among those using the refund to pay down debts, but not a higher proportion of the refund used for long term savings among those who saved. Thus, grit was more salient in the act of saving *any* amount among LMI individuals than saving *more* among savers.

Additionally, when testing the hypotheses that grit would be positively associated with expenditures that can increase an individual's long-term development, and negatively associated expenditures related to short-term consumption, we found that grit was associated with spending more on education and less on gifts among those who chose to spend a portion of their tax

refund. With a heightened future orientation, gritty individuals may be more likely to view spending on education as an investment in their future, as attaining higher education could help them to achieve their life goals. Finally, while we hypothesized that grit would be positively associated with increased assets and negatively associated with increased debts, we only found a significant relationship among increased assets. As gritty individuals are more likely to pay down their debts, this finding was somewhat surprising. Even though most financially prudent people tend to report clearing debt and remaining debt-free as a first step towards building wealth and achieving their long-term financial goals, different factors may be at play for lower-income individuals. For example, lower-income individuals may be continually acquiring more sources of debt in order to get by. In doing so, lower-income individuals may have to carry debt for extended periods of time as they work to achieve their long-term financial goals.

Overall, as grit was associated with better (i.e., more prudent) financial behaviors, even among individuals with lower incomes, our findings support the important influence of personality traits—specifically grit—on wealth accumulation. Additionally, our findings align with the definition of grit, in which gritty individuals possess the determination and passion to pursue their long-term goals (Duckworth et al, 2012). This determination and passion was perhaps most evident in the spending behaviors of gritty individuals that prioritized education over gifts. Moreover, as the influence of grit on savings behaviors held in the presence of key life stressors that often plague low-income individuals, such job loss, medical emergencies, and other unexpected financial shocks, it was not merely gritty individuals' determination and passion to pursue long-term goals that was remarkable, but also their ability to persevere in the face of adverse life events. Thus, it is not only that gritty people have good outcomes because of greater career attainment (Hill & Jackson, 2015; Jackson & Hill, 2019), but rather that gritty people have

good long-term outcomes because of better financial behaviors—even under duress.

Conclusion

We are the first to use administrative tax data to explore the relationship among grit and financial behaviors over time among a sample of LMI individuals. Nevertheless, while we were able to use propensity score weighting and machine learning to balance individuals on grit, we are only able to do so on observed characteristics, which leaves our study vulnerable to potential biases based on unobserved characteristics. Thus, we are not able to establish a causal mechanism. Nevertheless, this study underscores the importance of *personality* traits, such as grit, in shaping financial behaviors and decisions. Given the findings presented in this paper, future research should focus on (a) identifying factors that promote the development of grit in the face of financial obstacles or barriers and (b) developing and testing interventions targeted to school-age children and young adults that attempt to increase grit early in the life course.

Disclaimer

Statistical compilations disclosed in this document relate directly to the bona fide research of, and public policy discussions concerning, financial security of individuals and households as it relates to the tax filing process and more generally. Compilations follow Intuit's protocols to help ensure the privacy and confidentiality of customer tax data.

Table 1: Propensity Score Weighting

<u>Variables</u>	<u>PEARSON ABSOLUTE CORRELATION</u>	
	<u>Before PS Weighting</u>	<u>After PS Weighting</u>
Race/Ethnicity:		
White	-0.059	-0.014
Black	0.083	0.013
Asian	-0.037	-0.011
Hispanic	0.002	0.005
Other	0.029	0.013
Gender: Male	-0.072	-0.011
Age	0.108	0.011
Tax Filing Status		
Single	-0.066	-0.008
Married Filing Jointly	0.009	-0.003
Other	0.071	0.012
Dependents	0.054	0.004
Adjusted Gross Income	0.031	0.004
Federal Refund	0.058	0.008

Table 2: Descriptive Statistics

VARIABLES	Mean	SD	Min	Max
<i>Wave Two Variables</i>				
Saved Any Refund	0.27		0.00	1.00
Percent of Refund Saved	14.25	29.96	0.00	100.00
Used Any Refund to Pay Down Debt	0.65		0	1.00
Percent of Refund Used to Pay Down Debt	43.08	40.33	0.00	100.00
Spent Refund on Education or Training	0.11		0.00	1.00
Spent Refund on Gifts, Toys, or Vacation	0.29		0.00	1.00
Liquidity (\$)	4,748.27	10,742.71	0.00	73,000.00
Unsecured Debt (\$)	2,807.01	5,192.91	0.00	30,000.00
Experienced Any Stressors in Last 6 Months	0.66		0.00	1.00
<i>Wave One Variables</i>				
Planned to Save Any Refund	0.14		0.00	1.00
Prcnt. of Refund Planned for Long-Term Saving	3.84	14.22	0.00	100.00
Panned to Use Any Refund to Pay Down Debt	0.64		0.00	1.00
Prcnt. of Refund Planned for Paying Down Debt	32.77	35.23	0.00	100.00
Liquidity (\$)	3,923.12	8,990.46	0.00	62,000.00
Unsecured Debt (\$)	2,944.79	5,442.38	0.00	30,000.00
Grit Score	3.51	0.64	1.00	5.00
<i>Race/Ethnicity</i>				
White	0.76		0.00	1.00
Black	0.10		0.00	1.00
Asian	0.03		0.00	1.00
Hispanic	0.08		0.00	1.00
Other	0.04		0.00	1.00
Gender: Male	0.39		0.00	1.00
Age	35.33	13.03	18.00	74.00
<i>Tax Filing Status</i>				
Single	0.64		0.00	1.00
Married Filing Jointly	0.16		0.00	1.00
Other	0.20		0.00	1.00
Number of Dependents	0.57	0.93	0.00	3.00
Adjusted Gross Income (\$)	17,550.34	10,140.52	0.00	56,594.00
Federal Tax Refund (\$)	2,174.33	2,330.25	1.00	13,147.00
Is Married/Has Partner	0.40		0.00	1.00
<i>Education Level</i>				
Some High School	0.02		0.00	1.00
High School Diploma	0.11		0.00	1.00
Some College	0.36		0.00	1.00
College Degree	0.29		0.00	1.00
Some Graduate School	0.10		0.00	1.00
Graduate School Degree	0.11		0.00	1.00
Student Status: Currently Enrolled	0.29		0.00	1.00
Employment Status: Not Working	0.30		0.00	1.00

Table 3: Does Grit Influence whether Individuals Saved their Tax Refund?

VARIABLES	Model 1		Model 2:	
	No Interaction OR	SE	Stressor Interaction OR	SE
Grit Score	1.148**	(0.054)	1.194*	(0.091)
Planned to Save Any Refund	2.539***	(0.199)	2.594***	(0.207)
Experienced Any Stressors			0.795	(0.276)
Experienced Any Stressors x Grit			0.920	(0.089)
Race/Ethnicity (reference=White)				
Black	0.713**	(0.082)	0.727**	(0.084)
Asian	1.631**	(0.276)	1.592**	(0.275)
Hispanic	0.889	(0.102)	0.888	(0.103)
Other	1.118	(0.166)	1.146	(0.174)
Gender: Male	1.145*	(0.070)	1.150*	(0.071)
Age	0.993*	(0.003)	0.993*	(0.003)
Is Married/Has Partner	0.748***	(0.048)	0.776***	(0.051)
Has Dependents	0.611***	(0.067)	0.647***	(0.071)
Adjusted Gross Income/\$1k	1.018***	(0.003)	1.016***	(0.003)
Federal Tax Refund/\$1k	1.172***	(0.024)	1.178***	(0.024)
Educational Attainment (reference=HS or less)				
Some College	1.043	(0.108)	1.031	(0.107)
College Degree	1.564***	(0.161)	1.547***	(0.161)
Some Graduate School	1.655***	(0.210)	1.574***	(0.201)
Graduate School Degree	1.476**	(0.180)	1.397**	(0.172)
Student Status: Currently Enrolled	1.049	(0.078)	1.035	(0.079)
Employment Status: Not Working	1.015	(0.072)	1.069	(0.077)
Liquidity/\$1k	1.046***	(0.004)	1.045***	(0.004)
Unsecured Debt/\$1k	0.943***	(0.008)	0.944***	(0.008)
Constant	0.114***	(0.024)	0.136***	(0.042)
Observations		6,904		6,839
Pseudo R-squared		0.098		0.108

*** p<0.001, ** p<0.01, * p<0.05

Table 4. Does Grit Influence whether Individuals Used their Refund to Pay Down Debt?

VARIABLES	Model 3		Model 4:	
	No Interaction OR	SE	Stressor Interaction OR	SE
Grit Score	1.142**	(0.055)	1.164	(0.094)
Planned to Pay Down Debt	5.715***	(0.359)	5.667***	(0.358)
Experienced Any Stressors			1.268	(0.454)
Experienced Any Stressors x Grit			0.973	(0.098)
Race/Ethnicity (reference=White)				
Black	1.587***	(0.196)	1.584***	(0.197)
Asian	0.827	(0.159)	0.831	(0.159)
Hispanic	1.803***	(0.229)	1.777***	(0.227)
Other	1.112	(0.173)	1.125	(0.177)
Gender: Male	0.920	(0.057)	0.923	(0.058)
Age	1.008**	(0.003)	1.008**	(0.003)
Is Married/Has Partner	1.159*	(0.075)	1.138*	(0.074)
Has Dependents	1.258*	(0.137)	1.238	(0.135)
Adjusted Gross Income/\$1k	1.011**	(0.004)	1.011**	(0.004)
Federal Tax Refund/\$1k	1.133***	(0.028)	1.135***	(0.028)
Educational Attainment (reference=HS or less)				
Some College	1.234*	(0.127)	1.235*	(0.127)
College Degree	1.187	(0.123)	1.181	(0.123)
Some Graduate School	1.057	(0.138)	1.064	(0.139)
Graduate School Degree	0.929	(0.113)	0.927	(0.113)
Student Status: Currently Enrolled	0.869	(0.069)	0.865	(0.069)
Employment Status: Not Working	0.877	(0.064)	0.871	(0.064)
Liquidity/\$1k	0.961***	(0.004)	0.962***	(0.004)
Unsecured Debt/\$1k	1.033***	(0.007)	1.033***	(0.007)
Constant	0.190***	(0.041)	0.163***	(0.053)
Observations		6,904		6,839
Pseudo R-squared		0.222		0.222

*** p<0.001, ** p<0.01, * p<0.05

Table 5: How Does Grit Influence the Percentage of an Individual's Tax Refund Saved or used to Pay down Debt?

VARIABLES	Model 5 (Saved)		Model 6 (Paid Debt)	
	COEF	SE	COEF	SE
Grit Score	0.520	(1.221)	3.734***	(0.699)
Percent of Refund Planned for Long-Term Saving	0.189***	(0.030)		
Percent of Refund Planned for Paying Down Debt			0.249***	(0.013)
Race/Ethnicity (reference=White)				
Black	-7.980**	(2.824)	2.010	(1.532)
Asian	0.162	(4.506)	-3.174	(3.228)
Hispanic	-1.706	(2.574)	2.356	(1.519)
Other	-3.318	(3.863)	1.279	(2.245)
Gender: Male	4.898**	(1.582)	1.014	(0.951)
Age	0.299***	(0.065)	0.331***	(0.040)
Is Married/Has Partner	-0.244	(1.606)	1.434	(0.928)
Has Dependents	-11.196***	(2.634)	-1.202	(1.460)
Adjusted Gross Income/\$1k	-0.044	(0.084)	0.017	(0.051)
Federal Tax Refund/\$1k	-2.522***	(0.486)	-2.384***	(0.285)
Educational Attainment (reference=HS or less)				
Some College	-5.333*	(2.700)	0.989	(1.432)
College Degree	-0.018	(2.693)	-1.727	(1.471)
Some Graduate School	-3.500	(3.407)	0.481	(2.051)
Graduate School Degree	2.035	(3.120)	-1.284	(1.822)
Student Status: Currently Enrolled	-0.365	(2.007)	0.422	(1.157)
Employment Status: Not Working	1.946	(1.890)	1.729	(1.108)
Liquidity/\$1k	0.649***	(0.071)	-0.195**	(0.073)
Unsecured Debt/\$1k	-0.782***	(0.162)	0.154	(0.080)
Constant	47.642***	(5.564)	35.760***	(3.276)
Observations		1,856		4,504
R-squared		0.250		0.143

*** p<0.001, ** p<0.01, * p<0.05

Notes: Model 5 was limited to individuals that saved part of their refund. Model 6 was limited to individuals that used part of their refund to pay down debt.

Table 6:
How Does Grit Influence Whether Individuals Spent Their Refund on Education or Gifts?

VARIABLES	Model 7: Spent on Education		Model 8: Spent on Gifts	
	OR	SE	OR	SE
Grit Score	1.239**	(0.101)	0.840***	(0.044)
Race/Ethnicity (reference=White)				
Black	1.063	(0.169)	0.811	(0.093)
Asian	1.593	(0.395)	0.977	(0.202)
Hispanic	1.070	(0.183)	0.990	(0.120)
Other	1.056	(0.249)	0.915	(0.159)
Gender: Male	1.119	(0.114)	0.950	(0.066)
Age	0.977***	(0.005)	0.986***	(0.003)
Is Married/Has Partner	0.767*	(0.081)	0.884	(0.062)
Has Dependents	0.973	(0.176)	1.173	(0.130)
Adjusted Gross Income/\$1k	0.988*	(0.006)	1.003	(0.004)
Federal Tax Refund/\$1k	1.152***	(0.037)	1.094***	(0.023)
Educational Attainment (reference=HS or less)				
Some College	3.683***	(0.822)	1.091	(0.113)
College Degree	3.194***	(0.743)	1.275*	(0.137)
Some Graduate School	5.090***	(1.278)	0.904	(0.130)
Graduate School Degree	3.639***	(0.941)	1.112	(0.151)
Employment Status: Not Working	1.665***	(0.172)	0.831*	(0.063)
Liquidity/\$1k	1.009	(0.005)	1.010*	(0.004)
Unsecured Debt/\$1k	0.981	(0.011)	0.996	(0.006)
Constant	0.028***	(0.011)	0.851	(0.195)
Observations	4,955		4,955	
Pseudo R-squared	0.057		0.023	

*** p<0.001, ** p<0.01, * p<0.05

Note: These analyses were limited to individuals that spent part of their refund.

Table 7:
How Does Grit Influence Changes in Liquid Assets and Unsecured Debt?

VARIABLES	Model 9 (Liquidity)		Model 10 (Unsecured Debt)	
	COEF(\$)	SE	COEF(\$)	SE
Grit Score	321.95*	(164.06)	29.30	(68.09)
Liquidity (Wave 1)	0.77***	(0.03)		
Unsecured Debt (Wave 1)			0.67***	(0.02)
Race/Ethnicity (reference=White)				
Black	-808.93***	(237.40)	211.34	(169.64)
Asian	1,990.09*	(795.69)	435.55	(299.11)
Hispanic	-120.62	(371.88)	97.85	(178.45)
Other	-165.62	(327.38)	220.23	(224.96)
Gender: Male	494.25*	(215.95)	-36.78	(92.08)
Age	-4.42	(9.34)	5.36	(3.99)
Is Married/Has Partner	-234.30	(202.19)	54.51	(94.84)
Has Dependents	-1,146.83***	(258.23)	-155.18	(156.58)
Adjusted Gross Income/\$1k	22.35*	(10.20)	20.80***	(5.15)
Federal Tax Refund/\$1k	41.85	(46.51)	-5.98	(30.15)
Educational Attainment (reference=HS or less)				
Some College	-32.84	(299.60)	123.43	(153.74)
College Degree	330.57	(313.79)	137.14	(156.68)
Some Graduate School	-97.11	(407.42)	91.57	(201.17)
Graduate School Degree	-101.25	(383.07)	141.71	(190.72)
Student Status: Currently Enrolled	191.40	(236.24)	102.58	(115.33)
Employment Status: Not Working	261.35	(235.10)	-11.19	(106.94)
Constant	411.81	(677.35)	50.11	(306.65)
Observations		7,313		7,329
R-squared		0.44		0.50

*** p<0.001, ** p<0.01, * p<0.05

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