The Impact of Consumer Credit Access on Self-Employment and Entrepreneurship*

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Abstract

We examine how consumer credit affects entrepreneurship by linking 3 million earnings and pass-through tax records to credit reports. We show that self-employment without employees and employer firm ownership increase monotonically with credit limits and credit scores. We isolate the impact of credit on both types of entrepreneurs by exploiting bankruptcy flag removals. After emerging from bankruptcy, self-employed individuals earn more and borrow more and individuals are more likely to start a new employer business and borrow extensively. Those who own businesses with employees borrow $40,000 more after bankruptcy flag removal, a 33% gain relative to the sample average.

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We contribute to the recent literature on consumer credit and startups (e.g., *inter alia* Hurst and Pugsley [2011] and Robb and Robinson [2012]) by building a dataset that directly links occupation outcomes (self-employment with no employees, self-employment with employees which we call 'firm ownership,' and formal work) with credit limits.[1] We first document several new correlations between credit limits and entrepreneurship through self-employment and firm ownership in the overall population. We then isolate individuals that have had discrete increases in credit limits after exogenous bankruptcy flag removals to measure the effects of personal credit on entrepreneurship.

We begin our analysis by documenting positive relationships between available personal credit and both self-employment flows and firm ownership for a large random sample of three million prime-age individuals. Prior studies such as Hurst and Lusardi [2004] have proxied access to capital markets using wealth and shown that business ownership rates are largely unresponsive to wealth, except among the very wealthy. We complement this prior work by directly measuring credit access using credit reports and showing that self-employment increases monotonically with available personal credit. In addition, we show that firm ownership sharply increases with an owner's personal credit. Our initial findings for this broad sample of individuals are in agreement with Robb and Robinson [2012], who find that many startups receive debt financing through the personal balance sheets of the entrepreneur and that borrowers in states with higher personal bankruptcy exemptions, and thus implicitly less credit available, have lower ratios of debt to personal capital.

We provide several measures of population semi-elasticities of self-employment to unused revolving credit and unused total credit. We find that if an individual's unused revolving credit increases by 10% in the current year, their firm ownership rate increases by .03 per-

[1]The topic of startups and access to consumer credit following the housing bust has also been a large area of research recently(*inter alia* Fairlie and Krashinsky [2012], Chatterji and Seamans [2012], Schmalz, Sraer, and Thesmar [2013], Adelino, Schoar, and Severino [2013], Jensen, Leth-Petersen, and Nanda [2014], Kerr, Kerr, and Nanda [2014] as well as Greenstone, Mas, and Nguyen [2014] for bank credit)

centage points in the subsequent two years. This increase represents a 10% increase relative to the sample average rate of firm ownership, suggesting a large elasticity of firm ownership to borrowing capacity. We also find that self-employment rates also increase by .75 percentage points in the year following a 10 percent increase in an individual's unused revolving credit. Relative to the sample average self-employment rate of 11.1%, this increase represents a 6.7% increase. These elasticities suggest a potentially large role of consumer credit as a determinant of startups.

However, the central issue with determining the impact of personal credit on job and startup outcomes is that personal credit is highly correlated with an individual's earnings and job history, as well as their wealth. Thus, it is hard to separate out fundamental ability and wealth effects from access to credit. Our approach to this question is to examine individuals after bankruptcy flags are removed from consumer credit reports, similar to Musto [2004]. These removals occur, by law, no more than ten years after bankruptcy and give rise to large increases in credit ratings, while not reflecting large changes in an individual's credit worthiness.

Our empirical approach is to compare bankrupt individuals over time, before and after flag removal. Consistent with prior studies such as Musto [2004] and Han and Li [2011], we show that access to credit increases among the subgroup of individuals who have their bankruptcy flags removed. Our analysis of bankruptcy flag removal is focused on the *credit-access* effect: credit constraints loosen after flag removal allowing individuals to potentially finance entry into business ownership. We also explore the impact of flag removal on employment rates.

We first study self-employment. We find that bankruptcy flag removal has a limited effect on the stock of self-employed individuals, as some individuals leave self-employment for formal-employment and other individuals enter self-employment. We find that those who

transition into self-employment after a bankruptcy flag removal borrow $15k more than those who transition into self-employment prior to flag removal. This finding represents a 12.4% increase in borrowing relative to the sample average.[2] They earn ∼$1,000 more Schedule C net income at any time horizon we observe (an increase of about 4% relative to the sample average).[3]

We then use the new Integrated Longitudinal Business Database to measure transitions from self-employment to hiring paid employees in the Longitudinal Business Database (LBD). We believe focusing on this conditional sample of self-employed individuals examines people who are closer to the active margin of having demand for credit and shows how extra credit affects the tendency to start a new firm that has employees. We find that after flag removal, individuals are more likely to own a business with employees, i.e., enter firm ownership. Among these firm owners, they borrow on average $40,000 more after flag removal, a 33% gain relative to the sample average.

We test several competing hypotheses for our results showing the importance of consumer credit to individual self-employment and entrepreneurship. The first hypothesis is that our results are driven by credit constraints, and so once the bankruptcy flag is removed, individuals enter self-employment because they can now borrow to finance their business. The second hypothesis is that rising borrowing among the self-employed simply reflects inter-temporal consumption smoothing. The third hypothesis is that credit provides insurance against bad self-employment outcomes, and so individuals with greater unused credit buffers enter self-employment at a higher rate. Lastly, the observed borrowing could simply be signaling. Individuals borrow after their flag is removed to signal their type and obtain future increases in credit limits and credit scores.

[2]The average total balance across all forms of credit one year prior to removal is $121k in our sample.

[3]Relative to national averages, this effect is still a 2.2% treatment effect. The median self-employment income is $45,000 and calculated as the pooled average of all heads of household who have positive self-employment income from the 1998 SCF through the 2010 SCF, weighted.

We test these hypotheses on why consumer credit is important by isolating the self-employed population and measuring various correlations between self-employed income and consumer credit. To test the role of credit constraints versus consumption smoothing, we measure the covariance between self-employment income changes and borrowing changes. Consumption smoothing motives imply a negative relationship since the self-employed should borrow more when income falls in order to maintain consumption. On the other hand, we show in an illustrative model in Appendix K that credit constraints give rise to a positive relationship between self-employed income and borrowing.

In both our population and bankrupt samples, we find that changes in self-employed income and borrowing are positively and significantly related, providing evidence against the consumption smoothing channel and in support of a credit constraints channel. Second, we test whether or not credit markets are used to insure income variability by measuring the correlation between the coefficient of variation of self-employed income and credit limits. If credit is used to insure risky self-employment ventures, we would expect those with the greatest income variability would have the largest buffers of credit (higher limits), similar to models of precautionary saving (e.g., Carroll and Samwick [1998]).

We find that self-employed income risk is negatively correlated with credit limits and unused credit. Moreover, we find that those with greater income variability borrow less. These findings suggest that post-flag removal entry into self-employment is unlikely to be driven by the fact that credit provides insurance for self-employed income volatility. Lastly, signaling would imply a positive relationship between borrowing changes today and future credit score and credit limit changes. We find a negative relationship in the data, suggesting that signaling is not driving our results. While these tests are unable to directly measure why the self-employed borrow and what the marginal borrowed dollar is financing, individuals who enter self-employment after their bankruptcy flag removals have greater access to credit

markets, borrow more, and earn more consistent with credit constraints being relaxed.

To further test the hypothesis that the post-removal relaxation of credit constraints is driving our results, we explore the relationship between pre-determined characteristics and entry into self-employment and borrowing. We first explore demographics. There is a large literature arguing that age and education are important determinants of entrepreneurship. Age tends to *increase* entrepreneurship (ceteris paribus) and college education is a positive but much weaker predictor of entry into entrepreneurship than it was in the past (*inter alia* Karahan et al. [2019] and Salgado [2017]). When we split our sample by age and college education, we find very similar responses of entrepreneurship to increased credit access. These results suggest that age and education do not interact with increased credit access. A consequence of these findings is that the flow into entrepreneurship after bankruptcy flag removal is unlikely to be driven by selection of entrepreneurs along these dimensions.

Our next set of tests isolates individuals who receive the greatest increase in credit limits after their bankruptcy flag is removed. We find that pre-determined financial characteristics are the best predictors of subsequent credit limit increases after bankruptcy flag removal. We find that those individuals whose credit is not "maxed-out" and have above median unused credit and credit scores (measured in the year prior to flag removal) have the largest increase in limits. These individuals also enter self-employment at the greatest rate, consistent with the hypothesis of increased access to credit relaxing financial constraints.

Finally, we provide an assessment of whether our results are externally valid by comparing the responsiveness of startup rates to credit in our bankrupt sample versus the population. In a series of comparisons, we show that the elasticity of firm ownership with respect to credit is larger in the bankrupt sample compared to the population, suggesting that bankrupt individuals are more constrained and responsive to credit. However, responsiveness of self-employment and formal-employment are weaker in the bankrupt sample than the general

population, which suggests that bankrupt workers may have some unobserved characteristics limiting their ability to work, e.g., bad health. We argue that while our results are specific to a particular subgroup of individuals, our estimates provide an upper bound on the responsiveness of firm employment to credit and a lower bound on the responsiveness of formal and self-employment to credit.

Literature. Our paper contributes to several literatures, including the theoretical and empirical literature on credit constraints and startup rates, cited on the first page of the introduction. Of particular note is the concurrent, independent work by Bos, Breza, and Liberman [2015] and Dobbie, Goldsmith-Pinkham, Mahoney, and Song [2016]. Bos et al. [2015] focus on the way reported delinquencies, i.e., skipped payments as opposed to debt discharge, in the Swedish pawn-registry affect earnings and self-employment. Bos et al. [2015] show that individuals whose past defaults are publicly available for longer are less likely to have a job, are more likely to be self-employed and earn lower incomes on average.

Dobbie et al. [2016] merge bankruptcy court records with SSA administrative earnings and study the impact of bankruptcy flag removal on labor market outcomes. Dobbie et al. [2016] find insignificant impacts of flag removal across most of their specifications, but where our papers overlap, our point estimates fall within their confidence intervals. One key advantage of our dataset is that we observe credit bureau records and see the actual date bankruptcy flags are removed from credit reports, whereas Dobbie et al. [2016] must infer removal of bankruptcy flags from court filing records and there are sometimes leads and lags in the flag removals in the credit bureau removals of flags, leading to some measurement error in the removal date.

Relative to existing and concurrent work, our most important contribution is to go beyond previous research and examine early entrepreneurial firms from the Integrated Longitudinal Business Database to show where consumer credit has the largest impact. We show that

there is a large impact of personal credit on new employer businesses. In particular, we show that transitions from non-employer to employer businesses increase sharply as credit access expands, a new result that has not been shown anywhere previously to our knowledge.

We also show a large increase in borrowing by the owners of these firms that occurs in the year of hiring their first employee. We thus are the first, to our knowledge, to measure the impact of consumer credit access, independent of entrepreneurial ability, on the rate at which individuals move from being a non-employer to employer business and on the amount owners of new employer firms borrow. We thus add to the work of Robb and Robinson [2012], who document that small entrepreneurial firms borrow from banks, as we show they also borrow using their own personal credit. Overall, we provide a full characterization of the consumer-credit choices of these new entrants given we are the first to merge credit reports with firm ownership records. We believe this new evidence to be an advance over survey data which often aggregates sources of credit or does not measure all sources of consumer credit.

1 Theoretical Explanations for the Importance of Credit

There are several potential theoretical explanations for why personal credit can be important for self-employment and for entrepreneurs starting a new employer firm. We present four different explanations here and in later sections we test the importance of these explanations for self-employed individuals, both in and out of bankruptcy.

The first explanation we consider is that credit can be used to relax financial constraints. If individuals want to become entrepreneurs (either self-employed or a small business owner) but lack the necessary wealth to do so, they borrow. If credit markets are closed to these individuals, they remain formally employed or unemployed. When these individuals expe-

rience an exogenous increase in the availability of credit, they borrow and transition into self-employment and small firm ownership. We expect that individuals borrow more when the returns to entrepreneurship are higher. We show that models with working capital constraints can generate this type of positive correlation between self-employment income and borrowing in Appendix K.

We measure the relationship between self-employed income and borrowing for all individuals in the population, as well as for the sample of bankrupt individuals. Of course, borrowing may be correlated with earnings ability and quality, and so for the full population we will not be able to distinguish borrowing due to quality and borrowing due to credit constraints. We thus also examine a sample of bankrupt individuals pre- and post-bankruptcy where the bankruptcy flag removal arises exogenously and increases credit access. If bankrupt individuals are constrained, we expect to see that when individuals have their bankruptcy flag removed, they enter self-employment and also start new firms while increasing the amount they borrow.

The second explanation we consider is that credit can be used by self-employed individuals to smooth consumption. Under a consumption-smoothing motivation, individuals with access to credit borrow when their self-employed income is low. Thus, we expect to see a negative correlation between self-employment income and borrowing. Again, we expect this pattern both for the full population and for bankrupt individuals, though it would be mitigated for individuals in bankruptcy if bankruptcy kept individuals from borrowing the full amount they wish to borrow. When individuals emerge from bankruptcy, under a consumption smoothing hypothesis, we expect borrowing to increase more for individuals with lower self-employment income. We show that models with uninsurable self-employment earnings risk can generate this type of negative correlation between self-employment earnings and borrowing in Appendix K.

The third explanation for the use of credit by the self-employed is an insurance motivation. It is related to the consumption-smoothing explanation, but focuses on how the variance or risk of self-employment income is related to the demand for credit, parallel to precautionary saving in the Bewley literature (e.g., Carroll and Samwick [1998]). Under this explanation, individuals with higher variance of self-employment income will obtain higher credit limits that they can draw down later if they experience negative outcomes. Empirically, in the full population we expect credit limits to be positively related to the volatility of self-employment income, measured as the coefficient of variation for self-employment income. We expect that while in bankruptcy, the relation will become insignificant or negative and on the removal of the bankruptcy flag, the positive relation will return.

The fourth explanation we examine is whether credit is used by the self-employed to signal unobserved quality. Under this explanation, a self-employed individual who is of higher quality will borrow more than needed to signal their ability. In subsequent periods, they will then have a higher capacity to borrow more. Empirically, if this explanation is a key motivation for the use of credit, we will see a positive relation between today's borrowing and tomorrow's credit score (an indicator of future quality) and also the change in credit limits tomorrow.

To summarize, here are the four theoretical explanations for the use of personal credit by the self-employed.

1. Credit constraints: Credit is used by individuals to help finance self-employment and new firm creation. As their credit standing improves, they are able borrow more to finance self-employment and new firm creation.

2. Consumption Smoothing: Credit is used by self-employed individuals to smooth consumption.

3. Credit Access as Insurance: Those with more volatile self-employment incomes have greater buffers of credit (e.g., higher credit limits).

4. Credit Signaling: Credit is used to signal quality by self-employed individuals and thus increase their capacity for subsequent borrowing.

In subsequent sections, we examine these four motivations for the use of credit using both an overall large sample of 3 million individuals and a sample of 240,000 bankrupt individuals. The advantage of examining both samples of individuals is that we can see if patterns that exist in the full population hold for the bankrupt sample which is the focus of this paper. These comparisons thus examine whether the bankrupt sample can be used to learn about the population more generally.

2 Data Description and Empirical Approach

Our self-employment and firm-ownership measures are derived from the Integrated Longitudinal Business Database (ILBD). This database integrates self-employment records (identified by a unique scrambled version of an individual's social security number) with the employer-firms that are subsequently created and owned by the same individuals. We use the non-employer/employer links built by Davis et al. [2007], but, for the sake of self-containment, in Appendix B we briefly describe the way the non-employer/employer universes were linked. In short, the links are derived from administrative data sources and are therefore of the highest possible quality. The self-employment income comes from the universe of Schedule C tax records for sole-proprietors across all U.S. states. We therefore have net self-employment income annually from 1998-2010, as well as indicators of whether or not the self-employed individual began employing others.

All consumer credit information is taken from TransUnion at an annual frequency from 2001 to 2010. TransUnion is one of the three largest credit scoring companies in the United States, and it has a similar market share to Equifax and Experian. Our main sample is an approximately 5% random sample of individuals with credit reports from the 11 states for which we have LEHD data. The TransUnion data is then merged based on an anonymized unique identifier to the LEHD. Our data includes information on the balance, limit, and status (delinquent, current, etc.) of different classes of accounts held by individuals.[4]

Our data on unemployment-insured (UI) jobs (or formal sector jobs) comes from the Longitudinal-Employer Household Dynamics (LEHD) database. The LEHD, which is a matched employer-employee dataset that covers 95% of U.S. private sector jobs, includes information on worker flows between UI jobs as well as quarterly earnings.[5] Our employment and earnings data span from 1995 (or 1998 in some cases) to 2008 for 11 states: California, Maryland, Illinois, Texas, Indiana, Nevada, New Jersey, Oregon, Rhode Island, Virginia, and Washington.

Each database contains the same anonymized unique identifiers that can be used to link the datasets together. Our resulting panel is unbalanced and contains earnings (1998-2008), self-employment income (1998-2010), and credit reports (2001-2010) at an annual frequency.

2.1 Variable Definitions

All nominal variables such as self-employed net income, credit balance, and labor earnings are deflated by the CPI (expressed in 2008 dollars), and we winsorize the top 1% of each continuous variable, except variables pertaining to the ILBD (since fewer than 1% of our sample has admissible values).

[4]See the data Appendix A for more details on the TransUnion sample.
[5]See Abowd et al. [2009] for an extensive description of the LEHD.

We define an individual to be self-employed in a given year if they earn at least $1,000 of real Schedule C net income throughout the year, and we define an individual to be formally employed if they earn at least $1,000 of real labor earnings throughout the year in an unemployment-insured job. Transitions are defined at an annual frequency, e.g., an individual is counted as transitioning into self-employment if they earn less than $1,000 of real Schedule C net income in the prior year and then earn at least that much in the current year.

To measure firm ownership, we isolate those who own a firm in the LBD and thus have paid employees. An individual is counted as owning a firm in the LBD if their social security number or any other comparable identifier is linked to the ownership of a firm.[6] We define two measures of firm ownership, the first of which only requires one year of ownership (e.g., ownership in the contemporaneous year t) and includes potentially transitory businesses. Our second definition is more stringent and requires at least two years of ownership (e.g., ownership in years t and t+1). Thus, our central variable 'Firm Ownership, 2+ years' is forward looking and covers the current year and the subsequent year.

Rather than using a traditional credit risk score, we use the TransUnion bankruptcy score which is designed to be a measure of bankruptcy propensity. The bankruptcy score lies between 0 and 1000 and higher scores reveal lower odds of bankruptcy. Bankruptcy scores are used only by more sophisticated lenders, and when they are used, they are used in conjunction with a traditional credit risk score. The Revolving Balance variable includes any type of credit that can be rolled over at a preset interest rate (including bankcards, revolving personal finance loans, and other revolving lines of credit). The combined sum of Home Equity Lines of Credit (HELOCs) are included in the HELOC Balance variable.

[6]Links are made to firmids, which refer to firms, not establishments. See Appendix B and Davis et al. [2007] for more details on the links. The 1+ years ownership equals one if the individual has a valid 'firmid' in that year. The 2+ years ownership equal one if the individual has a valid 'firmid' for at least two years in a row.

Traditional unsecured credit cards that are issued by banks are included in the Bankcard Balance variable.

3 Population Relations Between Credit Constraints, Employment, and Self-Employment

In this section, we assess the relation between credit constraints, self-employment, and new firm ownership in the full TransUnion-LEHD sample (we will refer to this sample as the 'population' or the '100% Sample'). We impose minimal restrictions on the data. The sample includes prime age individuals aged 24 to 65 between 2002 and 2007 who earned at least $1,000 of self-employment or labor earnings in any year in the sample window. Our restrictions yield 16.4 million person-year observations generated by roughly three million individuals.[7]

Table 1 presents data which shows that the mean prior-year bankruptcy score (which we will refer to as the 'credit score') is 414, and on average, self-employed individuals in our sample earned $29.3k per annum. Those who work in the formal-employment sector earned $40.2k per annum. The self-employment rate is 11.1% and the transition rate into self-employment is 3.7% per annum. The transition rate out of self-employment is 3.1% per annum. Very few individuals own a firm with an employee, and even less own a firm that survives for 2 or more years. Roughly 79.4% of our sample are employed in the formal sector, 6.0% are simultaneously self-employed, and 15.6% are non-employed.

In Table 2, we regress outcome variables such as self-employment and formal-employment on deciles of unused revolving credit, controlling for the marginal cost of funds as proxied by

[7]We over-sampled bankrupt individuals, so we must reweight the sample to have a sample that is representative of the population.

the credit score, as well as other forms of available credit. We examine revolving credit, which includes home equity lines of credit (HELOCs), since the borrowing limit is well defined for these credit products. We also examine our results for combined total credit access of the household. Let i index individuals, t index years, and j index pooled deciles of unused revolving credit. We estimate regressions of the following form, which include fixed effects (α_i), year dummies (γ_t), and dynamic controls ($X_{i,t}$):

$$Y_{i,t+1} = \alpha_i + \gamma_t + \sum_{j=2}^{10} \beta_j I(Unused\ Credit_{i,t}\ in\ Decile\ j) + \Gamma X_{i,t} + \epsilon_{i,t}$$

These regressions are designed to capture the correlation between the current stock of credit (measured at date t) and future labor market outcomes (measured at date $t+1$). Our regressions include credit scores as a control for the marginal cost of credit, unused mortgage credit to proxy for available housing wealth, as well as the unused balance of all other non-revolving and non-mortgage forms of credit.[8] Furthermore, we include deciles of cumulative lagged earnings as controls.[9] This cumulative lagged earnings control is designed to proxy for all other forms of accumulated wealth other than through home equity. Our remaining dynamic controls include quadratics in both age and tenure. In all specifications we include individual fixed effects to capture non-dynamic heterogeneity.

Column (1) of Table 2 demonstrates that the stock of self-employed individuals, measured in year $t+1$, rises as available credit increases, measured in year t. Moreover, this relationship is monotonic. The first two deciles of unused revolving credit correspond to \$0 of available credit, while the third decile in Table 2 corresponds to \$100 dollars in unused revolving credit

[8]Unused mortgage credit is defined as the difference between the highest observed mortgage balance and the current mortgage balance.

[9]The deciles are computed using cumulative earnings since 1998.

Table 1: Population Summary Statistics (Source: 100% Sample)

Variable	**Mean**	**Variable**	**Mean**
Credit Score	414.5	Transition Into Self-Employed, $1,000+ (d)	3.7%
Real Annual Self-Employed Net Income ($29,300 without $0 self-employed individuals)	$3,256	Transition Out of Self-Employed, $1,000+ (d)	3.1%
Real Annual Labor Earnings ($40,200 without $0 earnings)	$31,939	Firm Ownership, 1+ Yrs	0.5%
Age	40.9	Firm Ownership, 2+ Yrs	0.3%
Imputed Years of Education	13.1	Both Self- and Formal- Employed, $1,000+ (d)	6.0%
Total Credit Balance	$107,000	Non-Employed, $1,000+ (d)	15.6%
Self-Employed, $1,000+ (d)	11.1%	Formal-Employed, $1,000+ (d)	79.4%
Observations (millions)	16.40		

Notes: The symbol (d) denotes 0,1 binary indicator variable. 'Firm Ownership, 1+ (2+ Yrs)' are forward looking variables that take the value 1 if an individual owns a firm in year t (and the subsequent year t + 1).

Table 2: Population Relationship Between Self/Formal-Employment Outcomes and Credit. (Source: 100% Sample).

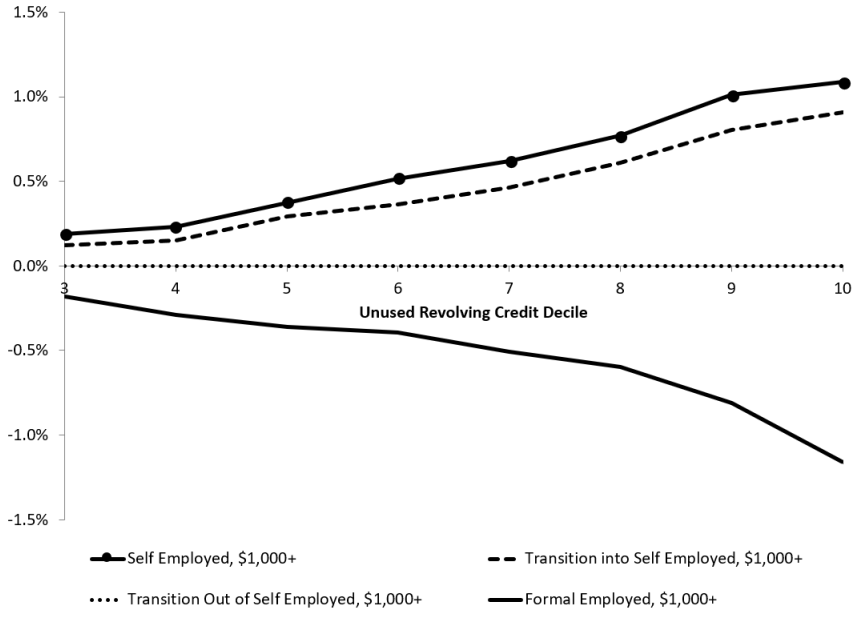
	(1) Self Employed $1,000+, t+1	**(2)** Transition Into Self-Employed $1,000+, t+1	**(3)** Transition Out of Self-Employed $1,000+, t+1	**(4)** Firm Ownership 1+ Yrs	**(5)** Firm Ownership 2+ Yrs, t and t+1	**(6)** Formal-Employed $1,000+, t+1
Unused Revolving Credit Decile 3, t	0.00189***	0.00123***	-0.000176	0.000142***	7.78e-05**	-0.00179***
	(0.000299)	(0.000249)	(0.000222)	(5.13e-05)	(3.89e-05)	(0.000380)
Unused Revolving Credit Decile 4, t	0.00229***	0.00150***	-9.31e-05	0.000182***	0.000128***	-0.00290***
	(0.000286)	(0.000232)	(0.000208)	(5.49e-05)	(4.21e-05)	(0.000359)
Unused Revolving Credit Decile 5, t	0.00375***	0.00292***	0.000178	0.000216***	0.000163***	-0.00362***
	(0.000310)	(0.000249)	(0.000224)	(6.25e-05)	(4.94e-05)	(0.000384)
Unused Revolving Credit Decile 6, t	0.00517***	0.00364***	-0.000279	0.000233***	0.000110**	-0.00393***
	(0.000336)	(0.000266)	(0.000240)	(7.03e-05)	(5.56e-05)	(0.000411)
Unused Revolving Credit Decile 7, t	0.00619***	0.00462***	2.46e-05	0.000279***	0.000148**	-0.00507***
	(0.000366)	(0.000287)	(0.000259)	(7.89e-05)	(6.31e-05)	(0.000441)
Unused Revolving Credit Decile 8, t	0.00770***	0.00608***	0.000371	0.000212**	0.000163**	-0.00599***
	(0.000408)	(0.000315)	(0.000286)	(9.20e-05)	(7.47e-05)	(0.000486)
Unused Revolving Credit Decile 9, t	0.0101***	0.00806***	-0.000126	0.000340***	0.000156*	-0.00812***
	(0.000470)	(0.000358)	(0.000325)	(0.000112)	(9.15e-05)	(0.000550)
Unused Revolving Credit Decile 10, t	0.0109***	0.00907***	-6.03e-05	0.000732***	0.000458***	-0.0116***
	(0.000569)	(0.000429)	(0.000392)	(0.000149)	(0.000123)	(0.000649)
Fixed Effects	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
R-squared	0.019	0.061	0.074	0.002	0.001	0.170
Individuals (millions)	3.06	3.06	3.06	3.06	3.06	3.06
Total Person-Year Obs. (millions)	16.40	16.40	16.40	16.40	16.40	16.40

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All variables are 0,1 binary indicator variables. 'Firm Ownership, 1+ (2+ Yrs)' are forward looking indicator variables that take the value 1 if an individual owns a firm in year t (and in the subsequent year t + 1), and 0 otherwise. Controls include: deciles of credit scores dummies, deciles of unused mortgage credit dummies, deciles of unused non-mortgage and non-revolving credit dummies, lagged labor earnings and self-employed income, deciles of cumulative lagged earnings dummies, quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies.*

and the 9th decile corresponds to $32k in unused revolving credit.[10]

Figure 1 plots the coefficients on the unused revolving credit deciles in Table 2. Prior studies such as Hurst and Lusardi [2004] have proxied access to capital markets using wealth; those studies find that business ownership rates are largely unresponsive to wealth, with a pronounced rise only among the very wealthy. In our dataset, in which we directly observe credit constraints, self-employment is increasing across all deciles of credit access.

Figure 1: Self-employment and formal-employment by unused revolving credit decile in population



Notes: Coefficients from Unsecured Revolving Credit Deciles in Table 2, Cols (1), (2), (3), and (6).

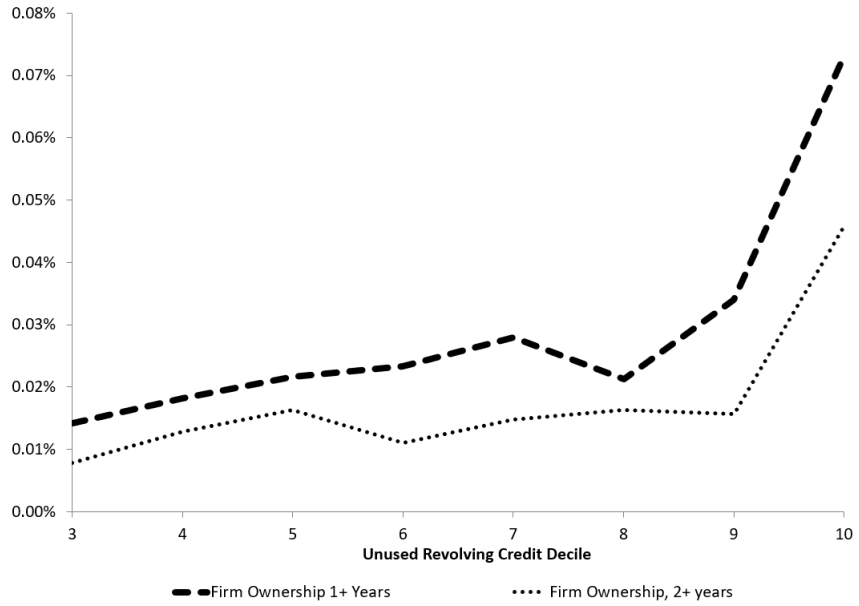
Columns (2) and (3) of Table 2 show that the transition rate into self-employment rises with available credit, and the transition rate out of self-employment is not impacted. Columns (4) and (5) illustrate a positive relationship between new firm ownership, which indicates that the individual hired an employee, and the stock of available credit. Similar

[10]Mean unused credit by Decile: Decile 1 $0; Decile 2 $0; Decile 3 $100.8; Decile 4 $492.0; Decile 5 $1,537; Decile 6 $3,788; Decile 7 $8,085; Decile 8 $16,083; Decile 9 $32,362; Decile 10 $65,904.

to the non-linear relationship between wealth and business ownership in Hurst and Lusardi [2004], the strongest relationship between credit and ownership of firms is in the last decile of credit.

Figure 2 plots the coefficients for the relationship between firm ownership and available credit. Moving from the third decile to the 10th decile of available credit corresponds to an increase in firm ownership of .06 percentage points, which is a 10% increase relative to the sample average. In Column (6), we show that as self-employment rises, formal-employment falls, as expected. Due to space constraints, we include additional analysis in Appendix Table A1, including the full set of coefficients on the controls for the other stocks of credit (which are present in each regression but suppressed due to space constraints), as well as the coefficients on credit scores, our proxy for the marginal cost of funds.

Figure 2: Firm ownership by unused revolving credit decile in population



Notes: Coefficients plotted are from unsecured revolving credit deciles in Table 2, Cols (4) and (5). 'Firm Ownership, 1+ (2+ Yrs)' are forward looking indicator variables that take the value 1 if an individual owns a firm in year t (and in the subsequent year t + 1), and 0 otherwise.

In the Appendix, we repeat this exercise using total unused credit (including mortgages).

While there may be some advantages to focusing on total unused credit, there are significant measurement issues associated with mortgages. A new first-mortgage involves a downpayment transfer of money from a household to a bank and is not associated with an increase in liquid resources available to the household.[11] In contrast, an increase in revolving credit balances is always associated with an increase in liquid resources available to the household. Nonetheless, in the Appendix Table A2 we report the correlation of various entrepreneurship measures and total unused credit deciles. We find very similar results.

3.1 Population Semi-Elasticities

In Table 3 we report the population elasticities of self-employment and firm ownership with respect to unused credit. The point estimate in Column (1) is a semi-elasticity since the dependent variable is binary. The coefficient implies that if an individual's unused revolving credit increases by 10% in the prior year t-1, their firm ownership rate increases by .03 percentage points in year t and the subsequent year t+1. That represents a 10% increase relative to the sample average firm ownership rate for 2+ years. This magnitude is in line with Figure 2, but ignores the inherent non-linearity between credit and firm ownership. Nonetheless, this elasticity is new to the literature and may provide a useful benchmark for future studies that incorporate links between consumer credit and entrepreneurship.

We repeat the same exercise using total unused credit, and we find a similar result. The magnitude in Column (3) implies a significantly larger elasticity of self-employment with respect to unused revolving credit. If an individual's unused revolving credit increases by 10% in the prior year t-1, their self-employment rate increases by .75 percentage points in year t. Relative to our sample average of 11.1% self-employed individuals, that represents

[11] Moreover, our dataset is not a mortgage-level dataset. We cannot distinguish cash-out refinancing nor can we clearly identify first mortgages.

a 6.7% increase. Column (4) is the corresponding – and nearly identical – elasticity of self-employment with respect to total unused credit. A consequence of the result in Columns (3) and (4) is that formal-employment falls at a similar rate. Column (5) shows that if an individual's unused revolving credit increases by 10% in the prior year t-1, their formal-employment rate falls by .5 percentage points in year t.

Table 3: Population elasticities. (Source: 100% Sample)

	(1) Firm Ownership, 2+ Yrs	**(2)** Firm Ownership, 2+ Yrs	**(3)** Self Employed, $1,000+	**(4)** Self Employed, $1,000+	**(5)** Formal-Employed, $1,000+	**(6)** Formal-Employed, $1,000+
Log Unused Revolving Credit, t-1	3.12e-05***		0.000754***		-0.000569***	
	(6.53e-06)		(4.10e-05)		(5.09e-05)	
Log Unused Total Credit, t-1		2.39e-05***		0.000765***		-0.000769***
		(5.77e-06)		(4.07e-05)		(5.55e-05)
Fixed Effects	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
R-squared	0.001	0.001	0.019	0.019	0.170	0.170
Round N	1.640e+07	1.640e+07	1.640e+07	1.640e+07	1.640e+07	1.640e+07
N Indiv	3.060e+06	3.060e+06	3.060e+06	3.060e+06	3.060e+06	3.060e+06

*Notes: Standard errors clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. All dependent variables are 0,1 binary indicator variables. 'Firm Ownership, 2+ Yrs' is a forward looking indicator variable that takes the value 1 if an individual owns a firm in year t and subsequent year $t+1$, and 0 otherwise. Controls include: lagged labor earnings and self-employed income, deciles of cumulative lagged earnings dummies, quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies.*

These regressions suggest that consumer credit, self-employment, and formal-employment comove in meaningful ways. However, these regressions are not causal, as access to credit is likely correlated with underlying worker characteristics which are time-varying and unobserved. One example includes the stock of wealth. We use a number of proxies to control for wealth, but we are unable to directly observe it. We therefore turn to a natural experiment, bankruptcy flag removal, in order to isolate the impact of consumer credit access on both self-employment and new firm ownership.

4 Bankruptcy and Bankruptcy Flag Removals

To isolate exogenous changes in credit, our empirical strategy is to compare previously bankrupt individuals before and after their bankruptcy flag removal. Our discussion of the bankruptcy institutions in the United States is abbreviated and based largely on the discussion by Han and Li [2007], Li and White [2009], and Han and Li [2011]. There are two main types of bankruptcy filings in the United States, Chapter 7 (liquidation) and Chapter 13 (repayment plan), however we are unable to differentiate between the two in our dataset. As Han and Li [2007] discuss, more than 70% of bankruptcy filings in the US are Chapter 7 filings, and of those filings that initially begin as Chapter 13 filings, many are subsequently converted into Chapter 7 filings.[12] As Han and Li [2011] explain, the Fair Credit Reporting Act (FCRA) and the original Bankruptcy Code itself largely govern how bankruptcy filings appear on a credit report. Chapter 7 bankruptcy information is removed up to 10 years after the date of filing, whereas Chapter 13 is removed up to 7 years after filing.[13] What is important for the purpose of our regression design is that the removal of the bankruptcy flag follows a cutoff rule. One key advantage of our dataset is that we observe credit bureau records, and so we can identify the date bankruptcy flags are actually removed from credit reports, as there are sometimes leads and lags in the flag removals, given some differences in court bureaucracies, reporting of filings and the conversions of Chapter 13 into Chapter 7.

[12] In short, Chapter 7 involves the liquidation of an individual's assets and the discharge of certain debts (student debt for instance cannot be discharged, and home equity is often protected up to a state-specific limit, and so we include individual fixed effects to absorb this variation), whereas Chapter 13 is essentially a repayment plan and it allows individuals to repay all or part of their debts. See Li and White [2009] for discussion of the way repayments are used strategically to save one's home.

[13] Quoting from Han and Li [2011]: "The FCRA states: '605 (a) Information excluded from consumer reports. (1) Cases under title 11 [United States Code] or under the Bankruptcy Act that, from the date of entry of the order for relief or the date of adjudication, as the case may be, antedate the report by more than 10 years'; and '(5) Any other adverse item of information, other than records of convictions of crimes which antedates the report by more than seven years.' The FCRA has no rule on the minimum period of time that credit bureaus have to report a bankruptcy filing. Indeed, it is common that credit bureaus remove a Chapter 13 bankruptcy record from a credit report after only seven years. Also, the Act has no time restrictions on using the bankruptcy record that is maintained in the creditors proprietary database."

Our sample window is 2001-2007[14] and we always restrict our attention to 24-65 year olds.[15] Even though our sample window stops in 2007, our credit data allows us to identify flag removals between 2002 and 2010. We include all flag removal cohorts in our analysis.

Let i index individuals and t index years (from 2001 to 2007). Let α_i denote a set of individual fixed effects, and γ_t denote year dummies. Let $Y_{i,t}$ denote the outcome of interest (a self-employment indicator variable, earnings, etc.) of individual i in year t. Let $D_{x,i,t}$ be an indicator variable taking the value 1 when an individual is x periods before (if x is negative) or after (if x is positive) flag removal in year t. e.g., $D_{-2,i,t}$ is an indicator variable indicating if an individual is 2 periods before flag removal, likewise $D_{0,i,t}$ takes a value of 1 if the individual is in the year of flag removal, and $D_{1+,i,t}$ takes a value of 1 if the individual is 1 or more years past flag removal. The specifications we use are of the following form:

$$Y_{i,t} = \alpha_i + \gamma_t + \beta_{-2}D_{-2,i,t} + \beta_{-1}D_{-1,i,t} + \beta_0 D_{0,i,t} + \beta_{1+}D_{1+,i,t} + \Gamma X_{i,t} + \epsilon_{i,t} \tag{1}$$

The objects of interest are β_0 and β_{1+} which summarize the impact of flag removal on the outcome variable in the year of removal as well as subsequent years, respectively, relative to the omitted group of individuals who are 3 or more years prior to bankruptcy flag removal.

Our identification exploits individual level variation in bankruptcy status, and thus we cluster our standard errors at the individual level. We also cluster the standard errors at a higher level than the individual level (cohort by zip), and we show that our main results persist.[16]

[14] Since we use forward lags of variables, we cannot include 2008 in our sample window.

[15] We do note that while our time period includes individuals whose flags are removed before and after the bankruptcy reform act of 2005, our research design is unaffected since everyone in our sample previously filed bankruptcy before 2005. In results that are available upon request, we limit the sample window to 2001-2005, and we use alternate variable definitions; our main results are nearly identical.

[16] See Appendix G.

4.0.1 Time-since-bankruptcy and cohort effects

A limitation of this study, as well as all other regression designs, is that one cannot simultaneously include time-since-bankruptcy, cohort fixed effects, and time fixed effects (e.g., in labor economics, one cannot distinguish age, cohort, and time effects in Mincer wage regressions). Our individual fixed effects include cohort effects. The individual fixed effect along with the year dummies can be combined to recover time-since-bankruptcy (since it increases linearly, and the fixed effect allows for an arbitrary intercept), thus generating collinearity.

While we cannot separately identify time-since-bankruptcy and cohort effects, our fixed effects are removing variation that is linear in time-since-bankruptcy. Thus, our exclusion restriction is that variables satisfy a linear trend in time-since-bankruptcy. A necessary (but not sufficient) condition for causal inference is that there are no pretrends prior to flag removal, (i.e., β_{-2} and β_{-1} are not statistically different from zero, or β_{-2} and β_{-1} are statistically different from zero but $\beta_{-2} \approx \beta_{-1}$).

Thus, we test the presence of observable pretrends that are not captured by our specifications by showing that β_{-2} and β_{-1} are not statistically different from zero in the majority of our specifications.

4.1 Summary Statistics Surrounding Bankruptcy Flag Removals

Table 4 compares the mean values of our main variables of interest one year before bankruptcy flag removal to one year after bankruptcy flag removal. This analysis compares the pooled outcomes of everyone in our sample one year before flag removal to one year after flag removal. Since some of the later cohorts (2007 through 2010) of flag removals are not observed one year

after the flag removal, the sample sizes differ across the columns of Table 4.[17] This section is designed to provide raw averages of important variables and summarize broad changes in those variables. In the sections that follow, we will address cohort and compositional issues by including fixed effects and dynamic controls in all regressions.

Table 4: Summary Statistics Before and After Flag Removal

	Sample Averages			
	(1)	(2)	(3)	(4)
	1 Yr. Before Flag Drop	1 Yr. After Flag Drop	Diff. ((1)-(2))	Sig. Diff.
(A) Employment Stocks				
Self-Employed, $1,000+ (d)	9.00%	9.60%	0.60%	*
Formal-Employed, $1,000+ (d)	78.70%	78.60%	-0.10%	
Both SE and Formal-Employed, $1,000+ (d)	6.10%	6.40%	0.30%	*
Non-Employed, $1,000+ (d)	18.40%	18.20%	-0.20%	
Firm Ownership, 1+ Yrs. (d)	0.40%	0.40%	0.00%	
Firm Ownership, 2+ Yrs. (d)	0.20%	0.30%	0.10%	*
(B) Employment Flows				
Transition into Self-Employed, $1,000+ (d)	3.10%	3.40%	0.30%	*
Transition out of Self-Employed, $1,000+ (d)	2.80%	2.80%	0.00%	
Transition out of Self Empl. Next Year, $1,000+ (d)	2.90%	3.10%	0.20%	*
(C) Earnings				
Real Annual Self-Employed Net Income ($23,800 without $0s)	$2,140	$2,300	$161	*
Real Annual Labor Earnings ($41,500 without $0s)	$32,683	$33,005	$323	*
Real Annual Total Income (SE and Non-SE)	$34,822	$35,305	$483	*
(D) Credit Variables				
Credit Score	288.0	351.8	63.8	*
Real Bankcard Balance	$3,441	$4,467	$1,027	*
Real Revolving Balance	$7,601	$10,475	$2,874	*
Real Mortgage Balance	$92,417	$104,000	$11,583	*
Real HELOC Balance	$3,355	$5,181	$1,825	*
Observations	170000	110000		

Notes: Column (1) computes averages using the individuals in our sample who are 1 year before bankruptcy flag removal. Column (2) computes averages using the individuals in our sample who are 1 year after bankruptcy flag removal. Column (3) is the difference in means between Columns (1) and (2), and Column (4) indicates if that difference in means is significant at the 10% level. The symbol (d) denotes a 0,1 binary indicator variable. 'Formal-Employed, $1,000' is an indicator that equals one when an individual earned at least $1,000 in a UI insured job covered by the LEHD. 'Self-Employed, $1,000+ (d)' is an indicator that equals one when an individual earned at least $1,000 in net income on their 1040 Schedule C. 'Firm Ownership, 1+ (2+ Yrs)' are forward looking indicator variables that take the value 1 if an individual owns a firm in year t (and in the subsequent year t + 1), and 0 otherwise. For all other definitions, see Section 2.1.

[17] We include these cohorts to maximize power since these cohorts still allow us to inform at least one of the coefficients $\{D_{-2,i,t}, D_{-1,i,t}, D_{0,i,t}, D_{1+,i,t}\}$ and are thus used in the main regression analysis. So while the total number of individuals in our sample frame is 220k, only 170k reach one year before flag removal, and only 110k reach one year after flag removal.

Panel (A) of Table 4 describes the main 'stock' (or 'level') variables. If we define self-employment and formal-employment based on a $1,000 earnings threshold, Column (1) of Table 4 shows that 9.0% of individuals are self-employed one year before bankruptcy flag removal and 78.7% of individuals are formally employed. Following flag removal, Column (2) shows that the self-employment rate increases by .6% to 9.6%, whereas the formal-employment rate decreases by .1% to 78.6%. Column (4) shows that the change in self-employment is significant at the 10% level while the change in formal-employment is not.

Roughly 6.1% of individuals in our sample are simultaneously formally-employed and self-employed (SE), and roughly 18.4% of the individuals in our sample are non-employed. Following flag removal, the fraction who hold two jobs increases, whereas non-employment moves insignificantly.[18] Prior to flag removal, .4% of our sample own a firm in the LBD for 1+ years, whereas .2% of our sample own a firm in the LBD for 2+ years (e.g., we require ownership in years t and t+1). Following flag removal, we see a significant increase in the latter definition of firm ownership by .1%.

Panel (B) of Table 4 describes the main flow variables. Prior to flag removal, 3.1% of individuals transition into self-employment whereas 2.8% transition out of self-employment. In the year after flag removal, the transition rate into self-employment increases by .3% per annum to 3.4%, which is significant at the 10% level. The rate at which individuals transition out of self-employment also increases from 2.9% before flag removal to 3.1% after flag removal, and this difference is significant at the 10% level.

Panel (C) of Table 4 describes the main earnings variables. Per capita self-employment income is about $2,140 per annum. If we adjust for the fact that most individuals are

[18] We examine these individuals who have both self-employment and formal-employment income prior to flag removal separately in some tests, examining if they increase their self-employment income more following flag removal. However, given this set of individuals with both self- and formal-employment income and are bankrupt is relatively smaller, we do not find significantly different results relative to the full sample of firms.

not self-employed, annual self-employed net income per self-employed individual is $23,800 (=$2,140/.09). Following flag removal, self-employed net income per capita increases by $161. Per capita formal earnings in the sample is $32,683. Following flag removal, real annual labor income increases significantly by $300. If we adjust for the fact that some individuals are not working, annual labor earnings per worker is approximately $41,500 (=$32,683/.787). Real annual total income is the sum of both self-employed (SE) net income and labor (non-SE) earnings.

Panel (D) of Table 4 describes the main credit variables. We see large credit balances prior to flag removal since the individuals have a partial recovery in credit access before their flag is removed (for more discussion, see Cohen-Cole et al. [2009]). Following flag removal, however, we see a large increase across all types of credit, especially mortgage credit (see Han and Li [2011] for more results on credit portfolios after flag removal).

4.2 Bankruptcy Flag Removal: Baseline regression results

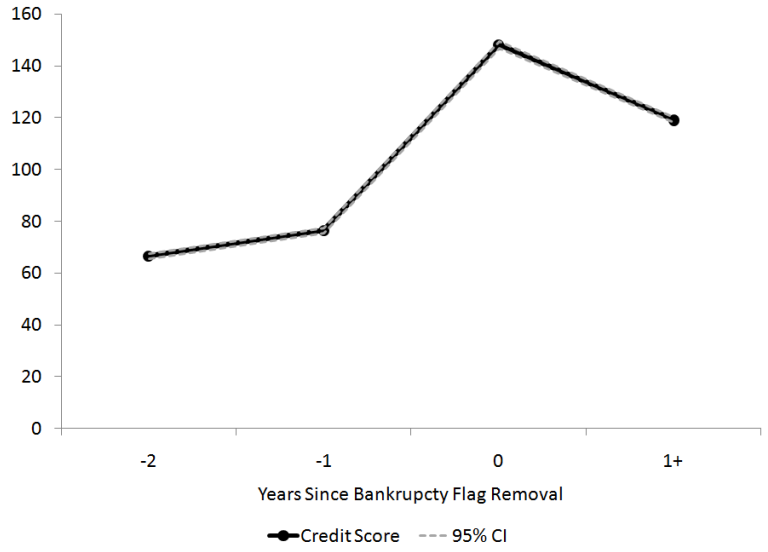
We begin our regression results for bankruptcy flag removal and examine changes in credit scores, entry into self-employment, and hiring the first employees. Table 5 illustrates the impact of flag removal on credit scores, self-employment, and firm ownership. The coefficients in Table 5 correspond to $(\beta_{-2}, \beta_{-1}, \beta_0, \beta_{1+})$ in equation 1. The final two rows of Table 5 test equality of coefficients (e.g., 'Sig Diff 1+Yr & -2Yr at 10%' is equal to 'Y' if we can reject equality of β_{1+} and β_{-2} at a 10% significance level).

Table 5: Credit Scores and Entrepreneurial Outcomes after Bankruptcy Flag Removal

	(1) Credit Score	**(2)** Credit Score	**(3)** Self-Employed, $1,000+ (d)	**(4)** Transition into Self-Employed, $1,000+ (d)	**(5)** Firm Ownership, 1+ Yrs (d)	**(6)** Firm Ownership, 2+ Yrs (d)
2 Years Before Removal (d)	66.52***	19.70***	0.000600	0.000527	-0.000126	1.30e-05
	(0.513)	(0.444)	(0.000701)	(0.000576)	(0.000172)	(0.000110)
1 Year Before Removal (d)	76.39***	13.26***	-0.000384	2.64e-05	-0.000110	0.000113
	(0.528)	(0.592)	(0.000903)	(0.000635)	(0.000215)	(0.000149)
Year of Removal (d)	148.2***	68.70***	0.000950	0.00161**	0.000179	0.000394**
	(0.675)	(0.798)	(0.00112)	(0.000740)	(0.000259)	(0.000191)
1+ Years After Removal (d)	119.1***	7.046***	0.00108	0.000649	0.000297	0.000540**
	(0.524)	(0.939)	(0.00137)	(0.000891)	(0.000334)	(0.000230)
Individual Fixed Effects	N	Y	Y	Y	Y	Y
Year Fixed Effects	N	Y	Y	Y	Y	Y
Age and Tenure Controls	N	Y	Y	Y	Y	Y
R-squared	0.116	0.134	0.003	0.000	0.001	0.000
Round N	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06
N Indiv	220000	220000	220000	220000	220000	220000
Sig Diff 1+Yr & -2Yr at 10%	Y	Y	N	N	N	Y
Sig Diff 0Yr & -2Yr at 10%	Y	Y	N	N	N	Y

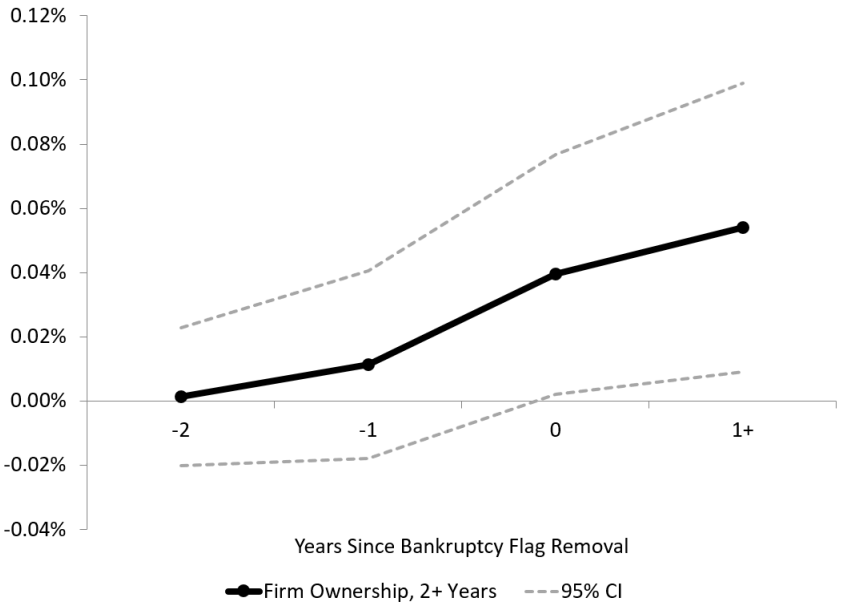
*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Age and Tenure controls include quadratics in age and tenure. The symbol (d) denotes a 0,1 binary indicator variable. Credit score refers to the TransUnion bankruptcy score. Transition into Self-Employed, $1,000+ (d) is an indicator variable that takes the value 1 when an individual earns less than $1,000 of self-employed earnings this year, and more than $1,000 of self-employed earnings this year. 'Firm Ownership, 1+ (2+ Yrs)' are forward looking indicator variables that take the value 1 if an individual owns a firm in year t (and in the subsequent year $t+1$), and 0 otherwise. For more details on the firm ownership measures, see Section 2.1. 'Sig Diff 1+Yr & -2Yr at 10%' is an indicator that the coefficients are different on the terms '1+ Years After Removal (d)' and '2 Years Before Removal (d)' at the 10% level. 'Sig Diff 0Yr & -2Yr at 10%' is an indicator that the coefficients are different on the terms 'Year of Removal (d)' and '2 Years Before Removal (d)' at the 10% level.*

Figure 3: Credit score following bankruptcy flag removal



Notes: Coefficients from Table 5, Column (1). Standard errors clustered at individual level.

Figure 4: Firm ownership following bankruptcy flag removal



Notes: Coefficients from Table 5, Column (6). Standard errors clustered at individual level. 'Firm Ownership, 2+ Yrs' is a forward looking indicator variable that takes the value 1 if an individual owns a firm in year t and $t+1$, and 0 otherwise.

In all regressions of Table 5, we include year fixed effects and individual fixed effects

in order to correct for time trends, and compositional differences in state laws, industry, occupation, and any other static characteristics of the individual. We also include dynamic controls such as quadratics in age and tenure.

Columns (1) and (2) of Table 5 demonstrate the large increase in credit scores following bankruptcy flag removal. This finding corroborates the prior work of Musto [2004] and Han and Li [2011], and is at the core of the credit access effect we study below. To visualize this change in credit scores, Figure 3 illustrates the regression coefficients from Column (1), showing the stable trend in credit scores leading up to the flag removal, followed by a punctuated one-time level shift in credit scores. Column (2) illustrates that after we take out a quadratic age trend, individuals' credit scores one or more years after flag removal are close to pre-flag removal scores; however, this subsequent mean-reversion in scores is largely due to the increased borrowing following flag removal.

Column (3) of Table 5 defines self-employment using a $1,000 annual Schedule C net income cutoff. There is no significant effect of flag removal on self-employment. Column (4) of Table 5 shows that the transition rate into self-employment is significant and positive in the year of flag removal. Relative to the omitted group, individuals are .161% more likely to transit into self-employment in the year of flag removal. Relative to the sample average, this .161% represents a 5% increase (=.161/3.1). However, this increase is quite transitory, and we are not able to reject equality of β_{-2} and β_{1+} at a 10% significance level.

Columns (5) and (6) of Table 5 illustrate the impact of bankruptcy flag removal on whether the individual owns a firm in the Longitudinal Business Dynamics (LBD) database. Firms in the LBD database must have at least one employee. In Column (5), we define firm ownership to be at least one or more years of firm ownership (from date t onward). This definition includes relatively transitory firm ownership spells of one year and less. We find that following flag removal, ownership of new firms increases, but insignificantly. In Column

(6), we define firm ownership to be at least two or more years of firm ownership (from date t and t+1 onward). Column (6) illustrates that under this more stringent definition, there is now a significant and positive increase in firm ownership following bankruptcy flag removal, relative to the omitted group. Following flag removal, the odds that an individual owns a firm in the LBD increases by .05% (or approximately 1000 startups in our sample of 1.5m person-year observations). Relative to the sample average, the .05% represents a 25% increase (=.05/.2). We can reject equality of β_{-2} and β_{1+} (as well as equality of β_{-2} and β_0) at a 10% significance level. Figure 4 plots the results from Column (6), illustrating the rise in employer firms following flag removal.

4.3 Transitions Into Self-Employment

We now examine characteristics of individuals that enter self-employment using the ILBD to measure transitioners' Schedule C net income as well as exit rates, and we use TransUnion credit reports to measure borrowing behavior.

Panel (A) of Table 6 describes summary statistics for the borrowing patterns of those who transition into self-employment. Those who transition into self-employment have total credit balances of $149,300 one year prior to flag removal versus $169,900 after flag removal, a raw difference of $20,600. We see similar patterns for revolving balances and home equity loans.

Table 7 regresses the income and borrowing of bankrupt individuals surrounding bankruptcy flag removals with indicator variables for transitions into self-employment. We include fixed individual characteristics, age, tenure, and year effects, as well as an individual fixed effects. While flag removal is exogenous, the decision to transition into self-employment is not, so these results may contain selection effects into self-employment, which we discuss in Sections

Table 6: Summary Statistics among Self-Employed and LBD Business Owners.

	1 Year Before	1 Year After	Diff.	Sig Diff?
(A) Self-Employed				
Total Balance, Transition into Self Employed $1,000+	$149,300	$169,900	$20,600	*
Revolving Balance, Transition into Self-Employed $1,000+	$9,361	$12,202	$2,841	*
Home Equity, Transition into Self-Employed $1,000+	$4,669	$6,686	$2,017	*
(B) Firm Owners				
Total Balance, Firm Ownership 2+ Yrs.	$205,800	$239,000	$33,200	*
Revolving Balance, Firm Ownership 2+ Yrs.	$15,344	$19,461	$4,117	*
Home Equity, Firm Ownership 2+ Yrs.	$10,558	$12,884	$2,326	*

Notes. Column (1) computes averages using the individuals in our sample who are 1 year before bankruptcy flag removal. Column (2) computes averages using the individuals in our sample who are 1 year after bankruptcy flag removal. Column (3) is the difference in means between Columns (1) and (2), and Column (4) indicates if that difference in means is significant at the 10% level. 'Firm Ownership, 2+ Yrs' is a forward looking indicator variable that take the value 1 if an individual owns a firm in year t and in the subsequent year $t+1$, and 0 otherwise.

5.2 and 7. To meaningfully interpret the interaction terms, we compare those who transition into self-employment 2 years before flag removal to those who transition into self-employment 1 year after flag removal.

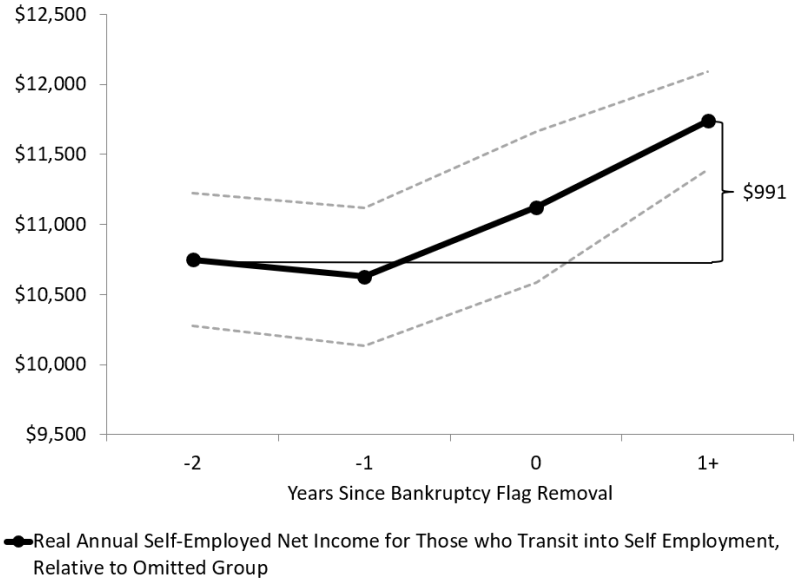
Column (1) illustrates that among individuals who transition into self-employment, those who transition into self-employment one or more years after flag removal earn on average $991 (=(3376-158.2)-(2274-47.61)) more in Schedule C net income relative to those who transition into self-employment two years prior to flag removal. Relative to the sample average self-employed net income of $23,800 (adjusting for 0s in Table 4), $991 represents a 4% gain. We arrive at this number by first computing the net income gain of an individual who transits into self-employment one or more years after flag removal. For such an individual, three coefficients are non-zero and must be summed to obtain the overall effect of $11,740 (='1+ Years After Removal (d) x Trans. into Self-Employed, $1,000+ (d)' + '1+ Years After Removal (d)' +'Transition into Self-Employed, $1,000+ (d)' = 3376-158+8522). Repeating this exercise for those who transition two years before flag removal, the overall effect is $10,748 (=2274-48+8522). Taking the difference yields $991 (= $11,739.8-$10,748.39). Since

Table 7: Transitions into Self-Employment and Earnings, Borrowing, and Turnover

	(1) Real Self-Employed Earnings	(2) Real HELOC Balance	(3) Real Total Balance	(4) Transition out of Self-Employment Next Yr., $1,000+ (d)
2 Yrs. Before Removal (d) x Trans Into Self-Employed, $1,000+ (d)	2,274***	277.8	6,422***	-0.00672
	(268.1)	(270.1)	(1,955)	(0.00830)
1 Yr. Before Removal (d) x Trans Into Self-Employed, $1,000+ (d)	2,185***	575.8*	11,815***	0.00761
	(274.8)	(298.1)	(2,011)	(0.00850)
Yr. of Removal (d) x Trans Into Self-Employed, $1,000+ (d)	2,704***	640.2*	8,511***	-0.0128
	(297.7)	(331.9)	(2,162)	(0.00889)
1+ Yrs. After Removal (d) x Trans Into Self-Employed, $1,000+ (d)	3,376***	1,253***	16,195***	0.00437
	(212.7)	(267.9)	(1,594)	(0.00649)
Transition Into Self-Employed, $1,000+ (d)	8,522***	-486.9***	-6,483***	0.380***
	(123.4)	(88.90)	(790.1)	(0.00392)
2 Years Before Removal (d)	-47.61**	759.8***	8,809***	0.000481
	(20.08)	(47.46)	(350.1)	(0.000456)
1 Year Before Removal (d)	-78.49***	1,377***	13,038***	0.000153
	(27.70)	(66.35)	(475.3)	(0.000509)
Year of Removal (d)	-101.3***	1,978***	15,800***	0.000583
	(34.61)	(84.78)	(598.6)	(0.000602)
1+ Years After Removal (d)	-158.2***	3,551***	14,373***	0.00117
	(43.52)	(98.35)	(728.1)	(0.000754)
Individual Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Age and Tenure Controls	Y	Y	Y	Y
R-squared	0.077	0.026	0.105	0.158
Round N	1.500e+06	1.500e+06	1.500e+06	1.500e+06
No. Person-Yr. Obs.	1.500e+06	1.500e+06	1.500e+06	1.500e+06
No. Indiv. Obs.	220000	220000	220000	220000
Combined Coeff Diff 1+ Yrs & -2 Yrs	991	3,766	15,337	1.18%
Combined Coeff Diff Sig at 10%	Y	Y	Y	N

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (d) denotes a 0,1 binary indicator variable. Age and Tenure controls include quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies. The row titled 'Combined Coeff Diff 1+ Yrs & -2 Yrs' calculates the difference in the summed coefficients for those who transition 1 year after flag removal (Sum the coefficients on '1+ Years After Removal (d)' +'1+ Yrs. After Removal (d) x Trans into Self-Empl, $1,000+ (d)'=3376-158.2) minus the summed coefficients for those who transition 2 years before flag removal (=2274-47.61). Taking the difference yields $991 (=(3376-158.2)-(2274-47.61)) which is the additional amount earned by those who transition into self-employment 1 year after flag removal, relative to 2 years before. The titled 'Combined Coeff Diff Sig at 10%' is an indicator if that difference is significant at the 10% level. See text for dependent variable definitions.*

Figure 5: Schedule C net income among new self-employed entrants following bankruptcy flag removal



Notes: Coefficients from Col. (1), Table 7. Sum of coefficients on the flag removal indicator (e.g., '2 Years Before Removal (d)'), interaction term (e.g., '2 Years Before Removal (d) x Trans. Into Self-Employed, $1,000+ (d)') and the transition term (e.g., 'Transition Into Self-Employed, $1,000+ (d)'), and we compute standard errors using the delta method. The points on the plotted line can be interpreted as the differential gain in self-employed income from entering self-employment, relative to a non-transitioner in the omitted group, where the omitted group is those who are three or more years prior to flag removal.

the unconditional transition term ('Transition into Self-Employed, $1,000+ (d)') cancels in these calculations, we omit it in the remainder of the paper. This combined difference of coefficients between the year after flag removal and two years before is the key statistic from the transition tables since it captures the impact of flag removal on transition outcomes. Therefore it is reported in the bottom two rows of every table along with its significance level.

Figure 5 plots the summed coefficients from Column (1) of Table 7. The points on the plotted line can be interpreted as the gain in Schedule C net income from entering self-employment, relative to a non-transitioner in the omitted group (i.e., those who are three or more years prior to flag removal). In particular, we add the coefficients on the flag removal indicator (e.g., '2 Years Before Removal (d)'), interaction term (e.g., '2 Years Before Removal

(d) x Trans. Into Self-Employed, $1,000+ (d)') and the transition term (e.g., 'Transition Into Self-Employed, $1,000+ (d)'), and we compute standard errors using the delta method. As the figure demonstrates, there is a stable trend for self-employed income prior to flag removal. Following flag removal, the net income gain for those who enter self-employment increases rapidly. The difference in self-employed income for those who transition into self-employment one or more years after removal versus two years prior to removal is, as we saw before, $991. This calculation is illustrated on the graph.

Given the importance of housing equity in survey evidence of entrepreneur balance sheets (e.g., Robb and Robinson [2012] and Adelino et al. [2013]), we separately consider home equity lines of credit (HELOCs). Column (2) of Table 7 shows HELOC balances of individuals who transition into self-employment. Those who transition into self-employment following a bankruptcy flag removal borrow $3,766 (=1,253+3,551-(278+760)) more using HELOCs relative to those who transition into self-employment prior to flag removal.

Column (3) of Table 7 shows the total borrowing of individuals who transition into self-employment. Those who transition into self-employment following a bankruptcy flag removal borrow $15,337 (=16,195+14,373-(6,422+8,809)) more relative to those who transition into self-employment prior to flag removal.

Finally, we assess whether those who transition into self-employment following flag removal are 'marginal' entrepreneurs. We address this question by focusing on the turnover rates of new entrants, pre and post flag removal. Column (4) of Table 7 regresses future exits (those who exit in year $t+1$) on self-employed entrant dummies (those who enter in year t) interacted with the bankruptcy flag removal dummies. Column (4) shows that newly self-employed individuals are transitioning out of self-employment at a very high rate, 38% per annum, unconditionally. However, following flag removal we see no disproportionate change in the subsequent rate at which these individuals exit self-employment. The finding

of no change in exit from self-employment suggests that the post-flag removal new entrants are not marginal, and we can make this statement with a high degree of confidence since our point estimates in Column (4) are precisely estimated.

4.4 Borrowing by Firm Owners

We now examine the borrowing behavior of individuals who are firm owners and therefore have paid employees. Similar to our previous analysis, we recognize that there may be selection effects into firm ownership post-flag removal. We discuss these selection concerns in subsequent sections.

Panel (B) of Table 6 presents summary statistics on the borrowing behavior for firm owners before and after flag removal. For those individuals who are firm owners, we see their borrowing total $205,800 prior to flag removal and then increase by $33,200 one year after flag removal. They also borrow more using revolving credit and HELOCs.

Table 8 formalizes these summary statistics by regressing borrowing on a window of dummies around flag removal interacted with an indicator for firm ownership (2+ years). We include the same set of controls as our prior regressions. Column (1) of Panel (B) shows that firm owners who are one or more years after flag removal borrow $1,591 (=(1,067+904.1)-(205+175.4)) more using unsecured ('bankcard') credit than firm owners who are two years prior to flag removal. Column (2) shows that firm owners who are one or more years after flag removal borrow $8,138 (=(8,645+4,291)-(3,683+1,116)) more using revolving credit than firm owners who are two years prior to flag removal.

The next two columns of Table 8 isolate housing credit. Column (3) shows that firm owners who are one or more years after flag removal borrow $29,693 (=(37,997+8,462)-(7,493+9,273)) more using mortgage credit than firm owners who are two years prior to flag

removal. In terms of HELOCs, Column (4) shows that firm owners who are one or more years after flag removal borrow $9,208 (=(7,716+3,576) - (1,317+767)) more using HELOCs than firm owners who are two years prior to flag removal. Turning to total debt balances (including secured and unsecured debts), Column (5) shows that firm owners who are one or more years after flag removal borrow $39,835 (=(47,332+14,812)-(13,318+8,991)) more across all lines of credit than firm owners who are two years prior to flag removal.

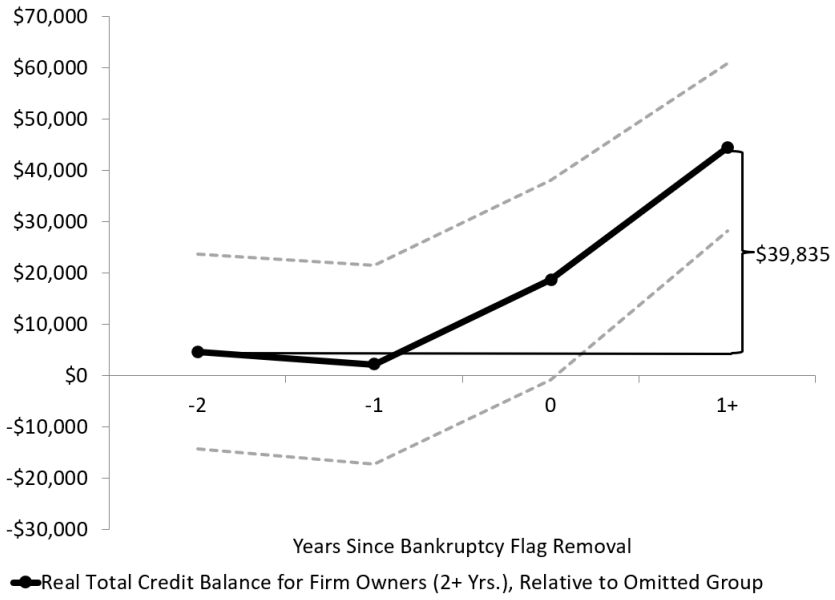
Table 8: Firm Ownership and Borrowing

	(1) Real Bankcard Balance	**(2)** Real Revolving Balance	**(3)** Real Mortgage Balance	**(4)** Real HELOC Balance	**(5)** Real Total Balance
2 Yrs. Before Removal (d) x Firm Ownership, 2+ Yrs. (d)	175.4	3,682***	7,493	1,317	13,318
	(300.3)	(1,269)	(9,526)	(1,408)	(10,209)
1 Yr. Before Removal (d) x Firm Ownership, 2+ Yrs. (d)	449.7	4,326***	4,209	4,520**	6,382
	(334.4)	(1,646)	(10,123)	(2,149)	(10,937)
Yr. of Removal (d) x Firm Ownership, 2+ Yrs. (d)	902.0**	4,843***	18,303*	5,953**	20,255*
	(383.7)	(1,742)	(10,899)	(2,437)	(11,717)
1+ Yrs. After Removal (d) x Firm Ownership, 2+ Yrs. (d)	1,067***	8,645***	37,997***	7,716***	47,332***
	(406.2)	(1,487)	(9,793)	(2,030)	(10,710)
Firm Ownership, 2+ Yrs. (d)	-195.6	-3,055***	-16,342**	-3,674***	-17,637**
	(172.8)	(808.7)	(6,410)	(989.6)	(6,862)
2 Years Before Removal (d)	205.0***	1,116***	6,189***	766.9***	8,991***
	(12.96)	(40.32)	(326.3)	(47.19)	(347.2)
1 Year Before Removal (d)	338.4***	1,812***	9,273***	1,388***	13,406***
	(18.10)	(56.18)	(441.9)	(66.23)	(474.3)
Year of Removal (d)	586.0***	2,745***	10,597***	1,988***	16,045***
	(23.73)	(72.00)	(555.6)	(84.50)	(598.0)
1+ Years After Removal (d)	904.1***	4,291***	8,462***	3,576***	14,812***
	(28.44)	(83.73)	(675.5)	(98.32)	(728.0)
Individual Fixed Effects	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y
Age and Tenure Controls	Y	Y	Y	Y	Y
R-squared	0.027	0.050	0.092	0.026	0.105
No. Person-Yr Obs.	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06
No. of Indiv.	220000	220000	220000	220000	220000
Combined Coeff Diff 1+ Yrs & -2 Yrs	1,591	8,138	32,777	9,208	39,835
Combined Coeff Diff Sig at 10%	Y	Y	Y	Y	Y

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (d) denotes a 0,1 binary indicator variable. 'Firm Ownership, 2+ Yrs' is a forward looking variable that takes the value 1 if an individual owns a firm in year t and t + 1, and 0 otherwise. Age and Tenure controls include quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies. 'Combined Coeff Diff 1+ Yrs & -2 Yrs' compares the overall effect of firm ownership one or more years after flag removal to the overall effect of firm ownership two years before flag removal. See text for variable definitions.*

Figure 6 plots the summed coefficients from Column (5) of Table 8. The points on the

Figure 6: Total credit balance among firm owners following bankruptcy flag removal



Notes: Coefficients from Col. (5), Table 8. (d) denotes a 0,1 binary indicator variable. Sum of coefficients on the flag removal indicator (e.g., 2 Years Before Removal (d)), interaction term (e.g., 2 Years Before Removal (d) x Firm Ownership, 2+ Yrs. (d)) and the ownership term (e.g., Firm Ownership, 2+ Yrs (d)), and we compute standard errors using the delta method. The points on the plotted line can be interpreted as the differential increase in borrowing from firm owners, relative to non-owners in the omitted group, where the omitted group is those who are 3+ years prior to flag removal.

plotted line can be interpreted as the increase in total credit balances among firm owners, relative to non-owners in the omitted group (i.e., those who are three or more years before flag removal).[19] As the figure demonstrates, there is a stable trend in borrowing prior to flag removal. Following flag removal, relative borrowing among firm owners increases rapidly. The difference in borrowing for those who are firm owners one or more years after removal versus two years prior to removal is $39,835 (=(47332+14812)-(13318+8991)).

These results suggest that firm owners, as opposed to the self-employed, rely heavily on credit markets. Firm owners borrow nearly five times as much using personal credit. This large increase in borrowing confirms the innovative cross-sectional survey work by Robb and

[19]In particular, we add the coefficients on the flag removal indicator (e.g., 2 Years Before Removal (d)), interaction term (e.g., 2 Years Before Removal (d) x Firm Ownership, 2+ Yrs. (d)) and the ownership term (e.g., Firm Ownership, 2+ Yrs (d)), and we compute standard errors using the delta method.

Robinson [2012] who document that many startups rely on secured and unsecured consumer credit to finance their businesses.

5 Mechanisms

Following bankruptcy flag removal (a) credit scores increase, (b) new firm ownership increases, (c) there is a marginal increase in the flow rate into self-employment, (d) self-employed entrants earn more post flag removal, (e) self-employed entrants borrow more post flag removal, and (d) firm owners borrow fives times more than self-employed entrants post flag removal.

In this section we explore several hypotheses for our results. We first entertain the hypothesis that our results are driven by unobserved heterogeneity. We narrow our window, estimating our fixed effects using $+/-$ 1 year of flag removal; we find that our results persist. The robust results suggests that our results are not driven by comparing those with flag removals to cohorts that are much closer to their entry into bankruptcy, who may have different unobservable characteristics, e.g., health status or wealth.

We then interact our flag removal variables with pre-determined characteristics to assess the potential role of credit constraints and selection. We find that subsets of individuals who receive the largest increase in credit limits enter self-employment at a higher rate. We find no differential response by age or education, suggesting that our results regarding flows into self-employment and subsequent borrowing are not driven by selection on these characteristics.

We then test three other competing hypotheses for the rise in self-employment and borrowing after flag removal: (1) credit increases after flag removal because of consumption

smoothing motives, (2) self-employment increases because credit provides insurance against shocks, and (3) individuals may be borrowing to signal that they are 'high-quality', thus borrowing may not reflect immediate credit constraints. We provide evidence that refutes each of these three hypotheses.

Lastly, despite the fact that we do not directly observe employer screening (e.g., credit checks) in our data, we briefly discuss the formal and self-employment flows following flag removal. Flows into formal-employment and out of self-employment increase, which is qualitatively consistent with credit checks being present. These flows are unlikely to affect our point estimates or interpretation of increased borrowing and profitability of new self-employed entrants following bankruptcy flag removal.

5.1 Unobserved Heterogeneity

Since our benchmark results use relatively wide panels of individuals, one may be concerned that individual "types" are changing over time in a way not reflected by individual fixed effects, year dummies, or age. One concern may be that those who are still years away from leaving bankruptcy have different unobserved characteristics than those who just leave bankruptcy, e.g., health status, wealth, marital status, etc. To address concerns of unobserved heterogeneity, we narrow the window of observations around $+/-1$ year around bankruptcy flag removal. In this specification, we are only comparing individuals before and after flag removal, excluding all observations prior to that time window. The omitted group are those one year prior to flag removal. Table 9 reports our main results for the narrow window.

Inspection of Table 9 reveals similar effects of flag removal for our main outcome variables. As in our benchmark specifications, following flag removal, Column (1) shows that the credit

Table 9: Baseline Results, Narrow Window Around Bankruptcy

	(1) Credit Score	(2) Self-Employed, $1,000+ (d)	(3) Transition into Self-Employed, $1,000+ (d)	(4) Firm Ownership, 1+ Yrs (d)	(5) Firm Ownership, 2+ Yrs (d)
Year of Removal (d)	78.86***	0.00519***	0.00312***	-0.000221	0.000548***
	(0.539)	(0.000713)	(0.000709)	(0.000181)	(0.000105)
1 Year After Removal (d)	70.07***	0.0101***	0.00342***	-0.000586**	0.000923***
	(0.787)	(0.00100)	(0.000859)	(0.000281)	(0.000154)
Individual Fixed Effects	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y
Age and Tenure Controls	Y	Y	Y	Y	Y
R-squared	0.103	0.001	0.000	0.001	0.000
No. Person-Yr. Obs.	410000	410000	410000	410000	410000
No. Indiv. Obs.	170000	170000	170000	170000	170000

*Notes: Standard errors clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. (d) denotes a 0,1 binary indicator variable. Sample includes only those in our baseline sample within +/- 1 year of bankruptcy flag removal. The interpretation is similar, except the omitted group is 1 year prior to flag removal. 'Firm Ownership, 1+ (2+ Yrs)' are forward looking indicator variables that take the value 1 if an individual owns a firm in year t (and in the subsequent year t + 1), and 0 otherwise. See notes to Table 5. for other variable defination.*

score increases by 79 points in the year of flag removal. Column (2) shows that the self-employment rate increases by .5% percent in the year of flag removal. Column (3) shows that the transition rate into self-employment increases by .3% in the year of flag removal. Column (4) implies an insignificant decline in firm ownership for 1 or more years, which tends to include transitory business owners. In the year after the removal, the coefficient becomes negative. However, our preferred specification in Column (5) implies a positive and significant .06% increase in firm ownership for two or more years. Overall, these narrow window results are broadly consistent with our benchmark findings in Table 5.

5.2 Heterogeneous response of firm ownership

In this section, we examine the heterogeneous response of firm ownership to bankruptcy flag removal. We view these heterogeneous responses as informative of various mechanisms including selection and credit constraints. We split individuals according to (i) age, (ii) education (which is imputed in the LEHD, see Abowd et al. [2009] for more discussion),

(iii) unused revolving credit in the year before flag removal, (iv) unused total credit in the year before flag removal, and (v) credit score in the year before flag removal. If individuals are selecting into post-flag-removal self-employment or new firm ownership based on age and education, then we would expect a positive and significant interaction between these variables and flag removal. If pre-flag removal characteristics, including credit utilization and credit score, predict greater credit access after the flag is removed, we expect greater transitions into self-employment among those subgroups.

We present the heterogeneous response of new firm ownership in Table 10.[20] To facilitate exposition and interpretation, we limit our sample to individuals within $+/-1$ year of flag removal. Column (1) shows our results when we split the sample among those who are younger/older than 40 years of age at the date of flag removal.[21] We find a small and precisely estimated zero interaction effect between flag removal and age. Old households are not selecting into firm ownership at a higher rate following bankruptcy flag removal. Likewise, Column (2) shows our results when we split the sample among those who have college education versus those that do not. Again, we find a small and precisely estimated zero interaction effect between flag removal and college education. These results suggest that individuals are not differentially selecting into firm ownership after bankruptcy flag removal based on age or education. While other studies have shown that age and education are important determinants of self-employment (e.g., Karahan et al. [2019] and Salgado [2017]), our results indicate no *interaction* between age, education, and credit constraints.

Columns (3) through (4) of Table 10 split the sample by credit characteristics in the year before flag removal based on the following criteria: (i) above median unused revolving credit, (ii) above median unused total credit, and (iii) above median credit score. As we show in

[20] We include a full set of interaction terms, however, the pre-determined characteristics are constant throughout the panel and are thus absorbed into the individual fixed effects.

[21] We have considered alternative age and education splits of the sample and found similar results.

Table 11, these characteristics predict the largest subsequent increases in credit access after bankruptcy flag removal. The cutoff for above median unused revolving credit in the year before flag removal is $1,000 in 2008 dollars (rounded to the nearest significant digit), and the cutoff for median unused total credit is $8,000 (rounded to the nearest significant digit). The cutoff for median credit score is 200 (rounded to the nearest significant digit), which is extremely low. Column (3) of Table 10 shows that those with above median unused revolving credit are 50% more likely to be firm owners relative to the baseline effect. The same is true in Column (4) for unused total credit. Lastly, Column (5) shows that those with above median credit scores in the year before flag removal are much more likely to be firm owners. The magnitude of the interaction suggests a 100% increase in the transition rate into firm ownership for those who have above median credit scores prior to flag removal.

5.3 Heterogeneous credit responses

Table 11 examines heterogeneous changes in credit limits and borrowing responses for the same predetermined credit variables: (i) above median unused revolving credit, (ii) above median unused total credit, and (iii) above median credit score. We examine which characteristics predict the largest subsequent increases in credit access after bankruptcy flag removal. The only portion of the credit history that is being erased is the bankruptcy flag, and so individuals who have unused credit and are not likely to pose default risk based on other credit characteristics will be impacted the most and have higher credit limit increases and greater borrowing. Those individuals who pose substantial default risk along other dimensions, such as being "maxed-out" on their credit lines, will retain low scores after flag removal and will thus be impacted less and will have smaller credit limit increases.

Table 10: Firm Ownership and the interaction between flag removal and age, education, as well as pre-determined credit variables.

	(1) Firm Ownership, 2+ Yrs	**(2)** Firm Ownership, 2+ Yrs	**(3)** Firm Ownership, 2+ Yrs	**(4)** Firm Ownership, 2+ Yrs	**(5)** Firm Ownership, 2+ Yrs
Year of Flag Removal	0.000485***	0.000608***	0.000376***	0.000347***	0.000341***
	(0.000127)	(0.000133)	(0.000108)	(0.000115)	(0.000122)
1 Year After Flag Removal (d)	0.000870***	0.000962***	0.000737***	0.000736***	0.000660***
	(0.000184)	(0.000183)	(0.000172)	(0.000172)	(0.000184)
Year of Flag Removal × age≥ 40 (d)	0.000132				
	(0.000210)				
1 Year After Flag Removal × age≥ 40 (d)	0.000119				
	(0.000296)				
Year of Flag Removal × College Educ (d)		-0.000176			
		(0.000210)			
1 Year After Flag Removal × College Educ (d)		-0.000120			
		(0.000296)			
Year of Flag Removal × Unused Revolv.≥ p50 (d)			0.000350*		
			(0.000208)		
1 Year After Flag Removal (d) × Unused Revolv.≥ p50 (d)			0.000382		
			(0.000287)		
Year of Flag Removal × Unused Total Credit ≥ p50 (d)				0.000409**	
				(0.000207)	
1 Year After Flag Removal × Unused Total Credit ≥ p50 (d)				0.000385	
				(0.000287)	
Year of Flag Removal × Score ≥ p50 (d)					0.000419**
					(0.000207)
1 Year After Flag Removal × Score ≥ p50 (d)					0.000540*
					(0.000284)
Individual Fixed Effects	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y
Age and Tenure Controls	Y	Y	Y	Y	Y
R-squared	0.000	0.000	0.000	0.000	0.000
No. Person-Yr. Obs	410000	410000	410000	410000	410000
No. Indiv. Obs.	170000	170000	170000	170000	170000

*Notes: All dependent variables are indicator 0,1 binary variables. (d) denotes a 0,1 binary indicator variable. 'Firm Ownership, 2+ Yrs' is a forward looking indicator variable that take the value 1 if an individual owns a firm in year t (and in the subsequent year t + 1), and 0 otherwise. Standard errors clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Sample includes only those in our baseline sample within +/- 1 year of bankruptcy flag removal. All interaction variables for age, education, unused credit and scores are measured in the year prior to flag removal. The cutoff for median unused revolving credit is $1,000 in 2008 dollars rounded to the nearest significant digit. The cutoff for median unused total credit is $8,000 rounded to the nearest significant digit. The cutoff for median credit score is 200 rounded to the nearest significant digit. See notes to Table 5 for controls and variable definitions.*

Columns (1) to (3) of Table 11 examine revolving credit limits. The results in column (1) show that individuals with above median unused revolving credit in the year before flag removal have limit increases that are roughly four times larger than those with below median unused revolving credit. Individuals with below median unused revolving credit have less than $1,000 in unused credit prior to flag removal and are extremely constrained. Despite flag removal, pre-removal high utilization individuals have very small credit limit increases. Column (2) shows that this pattern is also true to total unused credit. Column (3) shows that an above median credit score prior to removal is also extremely predictive of a large increase in credit limits following flag removal.

Columns (4) through (6) of Table 11 examine total real revolving balances. The results show that these individuals with unused existing credit and higher scores are the ones who borrow the most. In Column (4) the dependent variable is real revolving credit balances. Those individuals who have above median unused revolving credit balances prior to flag removal borrow an additional $2,514 in the year after flag removal (their limits increase by $4,155). Column (5) also shows an increase in borrowing when individuals are split by their total unused credit. Column (6) provides the strongest result. Those with above median credit scores in the year prior to flag removal borrow an additional $3,521 after flag removal. Those below the median borrow much less.

Table 11: Credit Access and the interaction between flag removal and age, education, as well as pre-determined credit variables.

	(1) Revolving Credit Limit	(2) Revolving Credit Limit	(3) Revolving Credit Limit	(4) Real Revolving Balances	(5) Real Revolving Balances	(6) Real Revolving Balances
Year of Flag Removal (d)	1,060***	1,612***	386.0***	302.4***	581.7***	-195.8***
	(41.14)	(47.06)	(45.13)	(29.46)	(33.76)	(33.55)
1 Year After Flag Removal (d)	2,607***	3,661***	1,408***	1,210***	1,683***	225.4***
	(76.35)	(84.03)	(81.59)	(52.14)	(57.20)	(56.38)
Year of Flag Removal (d) × Unused Revolv.≥ p50 (d)	4,155***			2,514***		
	(108.6)			(81.07)		
1 Year After Flag Removal (d) × Unused Revolv.≥ p50 (d)	8,333***			4,390***		
	(165.0)			(117.2)		
Year of Flag Removal (d) × Unused Total Credit ≥ p50 (d)		3,016***			1,937***	
		(108.4)			(80.81)	
1 Year After Flag Removal (d) × Unused Total Credit ≥ p50 (d)		6,144***			3,407***	
		(164.4)			(116.5)	
Year of Flag Removal (d) × Score ≥ p50 (d)			5,514***			3,521***
			(106.5)			(79.48)
1 Year After Flag Removal (d) × Score ≥ p50 (d)			10,750***			6,388***
			(161.4)			(114.4)
R-squared	0.060	0.054	0.070	0.029	0.026	0.038
No. Person-Yr Obs.	410000	410000	410000	410000	410000	410000
No. Indiv. Obs.	170000	170000	170000	170000	170000	170000

*Notes: Standard errors clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Sample includes only those in our baseline sample within +/- 1 year of bankruptcy flag removal. (d) denotes an indicator 0,1 binary variable. The cutoff for median unused revolving credit is $1,000 in 2008 dollars rounded to the nearest significant digit. The cutoff for median unused total credit is $8,000 rounded to the nearest significant digit. The cutoff for median credit score is 200 rounded to the nearest significant digit. See notes to Table 5 for controls and variable definitions.*

5.4 Tests of Alternative Rationales for Increased Borrowing

Our results show that individuals with the largest credit limit increases after bankruptcy flag removal enter entrepreneurship at a higher rate. These results are consistent with credit constraints being relaxed. However, as we discussed in Section 1 there may still be alternative explanations that can explain our results. These explanations include: (1) consumption smoothing motives that coincidentally imply increased borrowing post-flag removal, (2) better ability to insure post-flag removal allowing individuals to coincidentally enter self-employment, or (3) signaling motives that coincidentally drive borrowing. We test each of these mechanisms among self-employed individuals in both the population sample and our bankrupt sample.

We first assess whether self-employed individuals smooth consumption with credit by measuring the correlation between changes in self-employed income and changes in borrowing. A consumption smoothing motive (as well as if credit was being used as insurance) would imply that in response to self-employed income losses, individuals should borrow more. Table 12 reports the results for the population sample in Columns (1) and (2) and for the bankrupt sample in Columns (3) and (4). In Column (1), we find a positive correlation between self-employed income and changes in revolving credit balances. In Column (2) we find a negative correlation between changes in self-employed income and log revolving credit balances (in levels). These results strongly refute the hypothesis that self-employed individuals are using credit to smooth consumption.

Our model in Appendix K, as would many models in which credit access is limited by self-employed income, predicts a positive correlation between changes in self-employed income and credit due to a working-capital constraint. We take the strong positive correlation as suggestive evidence that credit constraints are relevant among the self-employed.

Table 12: Correlation of self-employed income growth and revolving balance growth.

	(1) Δ Log revolving balance t minus t-1	(2) Log revolving balance t	(3) Δ Log revolving balance t minus t-1	(4) Log revolving balance t
Δ Log income t minus t-1	0.00358***	0.00694***	0.00365**	0.00712***
	(0.000528)	(0.000379)	(0.00160)	(0.00117)
Sample	Population	Population	Bankrupt	Bankrupt
Fixed Effects	Y	Y	Y	Y
Controls	Y	Y	Y	Y
R-squared	0.001	0.003	0.002	0.016
Observations	1,840,000	1,840,000	190000	190000
Individuals	670,000	670,000	50,000	50,000

*Notes: Standard errors clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Columns (1) and (2) include all individual person-year observations that are within +/- 1 year of a self-employment spell in the population sample. Columns (3) and (4) include person-year observations that are within +/- 1 year of a self-employment spell in the bankrupt sample. Fixed effects include individual and time fixed effects. Controls include lagged labor and self-employment earnings as well as a quadratic in age.*

To further test whether consumer credit is used to provide insurance against self-employed income losses, we measure the relationship between self-employed income volatility and the credit buffer of individuals. Our measure of self-employed income volatility is the coefficient of variation (standard deviation over mean) of self-employed income in our sample period. If credit were being used to provide insurance against losses, we would expect those individuals with the greatest self-employed income volatility to have the largest buffers of credit limits and unused credit, and conditional on receiving a shock they should borrow more. We measure these correlations in Table 13. We find negative relationships between self-employed income volatility and balances (Column (1)), limits (Column (2)), and unused credit (Column (3)) for the full sample. The same is true for the bankrupt sample (Columns (4) through (6)). These results suggest that credit is not being used to insure volatile income processes. Individuals with the most volatile self-employed income processes are not applying for greater credit limits, nor are they borrowing more.

Lastly, we test the signaling hypothesis that self-employed individuals are borrowing to signal that they are high quality, thus increasing their future access to credit. To test

Table 13: Correlation of coefficient of variation of self-employed income and various measure of credit borrowing and utilization.

	(1) Log revolving balance t	(2) Log revolving limit t	(3) Log unused revolving credit t	(4) Log revolving balance t	(5) Log revolving limit t	(6) Log unused revolving credit t
Log of coefficient of variation of self-employed income	-0.686***	-0.836***	-0.908***	-0.757***	-0.812***	-0.843***
	(0.0134)	(0.0134)	(0.0143)	(0.0477)	(0.0488)	(0.0497)
Sample	Population	Population	Population	Bankrupt	Bankrupt	Bankrupt
Fixed Effects	N	N	N	N	N	N
Controls	Y	Y	Y	Y	Y	Y
R-squared	0.065	0.089	0.091	0.058	0.070	0.075
Observations	1,840,000	1,840,000	1,840,000	190000	190000	190000
Individuals	670,000	670,000	670,000	50,000	50,000	50,000

*Notes: Standard errors clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Columns (1) and (2) include all individual person-year observations that are within +/- 1 year of a self-employment spell in the population sample. Columns (3) and (4) include individual person-year observations that are within +/- 1 year of a self-employment spell in the bankrupt sample. Fixed effects include individual and time fixed effects. Controls include lagged labor and self-employment earnings as well as a quadratic in age.*

this hypothesis, we examine two different correlations: the correlation between changes in revolving credit balances and (i) future changes in credit scores and (ii) future changes in credit limits. The signaling hypothesis would imply a positive correlation between borrowing today and future credit access. Table 14 reports these two correlations. Columns (1) and (2) show that among the population of self-employed individuals who borrow more between years t and t-1, they have negative credit score growth and credit limit growth between years t+1 and t. This result also holds true in our bankrupt sample (Columns (3) and (4)). These results suggest that signaling is unlikely to play a significant role in generating the borrowing patterns we observe after flag removal among the self-employed.

5.5 Formal-Employment Flows

In this section, we discuss formal-employment job transitions to provide a complete characterization of the effects of flag removal. We present these results in the Appendix D given these results are secondary to our main entrepreneurship results. Credit can impact flows

Table 14: Correlation of revolving credit balance growth and future credit score and credit limit growth.

	(1) Δ Log score t+1 minus t	(2) Δ Log revolving limit t+1 minus t	(3) Δ Log score t+1 minus t	(4) Δ Log revolving limit t+1 minus t
Δ Log revolving balance t minus t-1	-0.0124***	-0.154***	-0.00862***	-0.174***
	(0.000222)	(0.000902)	(0.000699)	(0.00269)
Sample	Population	Population	Bankrupt	Bankrupt
Fixed Effects	Y	Y	Y	Y
Controls	Y	Y	Y	Y
R-squared	0.005	0.045	0.012	0.050
Observations	1,840,000	1,840,000	190000	190000
Individuals	670,000	670,000	50,000	50,000

*Notes: Standard errors clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Columns (1) and (2) include all individual person-year observations that are within +/- 1 year of a self-employment spell in the population sample. Columns (3) and (4) include individual person-year observations that are within +/- 1 year of a self-employment spell in the bankrupt sample. Fixed effects include individual and time fixed effects. Controls include lagged labor and self-employment earnings as well as a quadratic in age.*

into formal-employment through two channels. First, employees may be able to use credit to help get a new job. Second, employers may use credit checks and the existence of bankruptcy flags to screen potential employees. We do not observe credit checks directly and thus our analysis and discussion is limited to flows into and out of formal and self-employment. Given we do not observe credit checks, we leave direct evidence of screening to future research.

There are two testable implications of employer screening that we examine: (1) flows into formal-employment increase since employers no longer see a bankruptcy flag on the worker's record, and (2) flows out of self-employment and unemployment increase if individuals are able to enter the formal-employment sector. We find that formal-employment increases, as do gross flows both into and out of formal-employment. We also find that flows out of self-employment increase. This analysis reconciles our findings with Bos et al. [2015] by showing that flows into and out of self-employment increase in response to bankruptcy flag removal, suggesting that there may be a role for both credit constraints and screening. Other phenomena could be consistent with higher flows into formal-employment and greater flows

out of self-employment, e.g., if credit facilitates job search (Herkenhoff et al. [2015]), however we are unable to distinguish these phenomena from screening in our context.

6 Representativeness and External Validity

Our identification strategy focuses on the population of bankrupt individuals that have had their bankruptcy flag removed. Nearly 10% of Americans have ever filed for some type of bankruptcy protection (Indarte [2019]). To test how representative the bankrupt sample is, in Table 15 we examine how the full population and bankrupt sample differ in terms of their responsiveness of self/formal-employment to credit. In particular, we re-estimate the population semi-elasticities from Table 3, except now we include an interaction term between unused credit and a time-invariant flag for whether the individual is in our bankrupt sample. This interaction term captures the difference in responsiveness of bankrupt and non-bankrupt individuals to credit.

In Column (1) of Table 15, we measure the elasticity of firm ownership in years t and t+1 with respect to unused revolving credit at year t-1. We find that bankrupt individuals have similar firm ownership responsiveness to unused revolving credit, however the point estimate is measured imprecisely. In column (2), we re-estimate the same regression using total unused credit. We find that bankrupt individuals are significantly more responsive to this measure of credit access. The elasticity is roughly two times larger, although it is significant only at the 10% level and thus relatively imprecisely estimated.

In Columns (3) and (4), we repeat this exercise for self-employment. We find that the elasticity of self-employment with respect to credit is roughly 50% smaller in the bankrupt sample, regardless of the type of credit considered. Lastly, in Columns (5) and (6) we study the relationship between formal-employment and unused revolving and total credit,

respectively. We find that the bankrupt individuals have a similar, precisely estimated elasticity of formal-employment with respect to unused revolving credit. When we consider the elasticity of formal-employment to total unused credit, we find a positive interaction coefficient on the bankrupt sample indicator, implying that bankrupt individuals are 25% less responsive to credit.

Overall, bankrupt households appear to be more responsive to credit when making the choice to hire workers and enter firm ownership, but less responsive in terms of self-employment and formal-employment. These findings suggest that our estimates relating responsiveness of firm ownership to credit in the bankrupt sample may be an upper bound, whereas our estimates regarding self-employment and formal-employment may be a lower bound.

Table 15: Representativeness of the Bankrupt Sample. (Source: 100% Sample and Bankrupt Sample)

	(1) Firm Ownership, 2+ Yrs	**(2)** Firm Ownership, 2+ Yrs	**(3)** Self Employed, $1,000+	**(4)** Self Employed, $1,000+	**(5)** Formal-Employed, $1,000+	**(6)** Formal-Employed, $1,000+
Log Unused Revolving Credit, t-1	1.97e-05***		0.000789***		-0.000691***	
	(5.86e-06)		(3.51e-05)		(4.34e-05)	
Log Unused Revolving Credit, t-1 × Bankrupt Sample (d)	1.30e-06		-0.000391***		9.91e-05	
	(1.76e-05)		(0.000109)		(0.000136)	
Log Unused Total Credit, t-1		1.60e-05***		0.000740***		-0.000782***
		(5.24e-06)		(3.46e-05)		(4.65e-05)
Log Unused Total Credit, t-1 × Bankrupt Sample (d)		2.61e-05*		-0.000322***		0.000262*
		(1.46e-05)		(0.000105)		(0.000142)
Fixed Effects	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
P-value (Bankrupt Sample Flag + Interaction=0)	0.209	0.00206	0.000130	2.55e-05	4.81e-06	0.000106
R-squared	0.001	0.001	0.019	0.019	0.170	0.170
Round N	1.640e+07	1.640e+07	1.640e+07	1.640e+07	1.640e+07	1.640e+07
N Indiv	3.060e+06	3.060e+06	3.060e+06	3.060e+06	3.060e+06	3.060e+06

*Notes: Standard errors clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. All dependent variables are binary 0,1 indicator variables. 'Firm Ownership, 2+ Yrs' is a forward looking indicator variable that take the value 1 if an individual owns a firm in year t (and in the subsequent year t + 1), and 0 otherwise. Controls include: lagged labor earnings and self-employed income, deciles of cumulative lagged earnings dummies, quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies. 'Log Unused Revolving Credit, t-1 × Bankrupt Sample (d)' is the interaction between log unused revolving credit at date t-1 and a flag for whether or not the individual is in our bankrupt sample (this flag is time invariant).*

7 Robustness

We discuss three additional robustness exercises in this section. We consider alternative definitions of self-employment; we test for differences in lagged earnings among pre- and post-flag removal new self-employed entrants; lastly, we show that non-self-employed job transitioners borrow much less than new self-employed entrants.

We re-estimate our benchmark specifications for alternative definitions of self-employment and present these results in Appendix E. We examine self-employment definitions that require, (i) $5,000 of Schedule C net income, (ii) two consecutive years of $1,000 Schedule C net income, (iii) two consecutive years of $5,000 Schedule C net income, and (iv) 50% of total income (defined as the sum of formal labor market earnings and Schedule C net income) is derived from Schedule C net income. These additional results confirm that while the stock of self-employed individuals remains constant, we do see marginal changes in both the flow rate in and flow rate out of self-employment. The flow rate into self-employment is positive and marginally significant after bankruptcy flag removal in three of six definitions considered in this paper. Despite the relatively small effect of flag removal on self-employment flows, individuals who subsequently flow into self-employment following bankruptcy flag removal borrow more and earn more net income.

Since flag removal is foreseeable, there may be concern that better entrepreneurs who anticipate the need for credit deliberately wait until the flag is removed to start a business. There are two ways we address this potential issue: (i) if 'better' entrepreneurs are waiting until their flag is removed in order to borrow at a lower cost to start a business, then waiting until credit is cheaper simply reinforces the point that credit matters for startups, and (ii) to test for selection over and above the results in Section 5.2, we take advantage of the panel dimension to our data and compare pre-bankruptcy entrepreneurial performance and labor

earnings among those who enter entrepreneurship before and after flag removal. In Appendix H we show that the entrepreneurs who transition into self-employment following flag removal are very similar in terms of prior self-employment income and prior labor earnings.

Moreover, recent independent work by Gross et al. [2016] has also provided formal tests of the anticipation of bankruptcy flag removal by looking at credit application behavior. They show that rather than waiting an additional quarter for credit at more favorable rates after their flag is removed, individuals continue to apply for credit normally prior to the removal, indicating a lack of foresight.

Finally, are all job-transitioners more likely to borrow, simply because they have (and expect) earnings gains, or do the newly self-employed rely particularly heavily on credit?[22] As another test of the importance of credit for the self-employed, Appendix J compares borrowing by those who transition into formal sector employment and those who transition into self-employment. Both sets of individuals realize income gains (new self-employed entrants have net income increase by roughly $1,000 and new formal sector entrants earn roughly $1,500 more, see Appendix I). However, those who transition into formal-employment borrow less than non-transitioners. In contrast, those who transition into self-employment after flag removal borrow $15,337 more relative to those who transition prior to flag removal. Thus, even though self-employed entrants have smaller earnings gains than new formal-employment entrants after flag removal, the self-employed borrow much more heavily following flag removal. This evidence is consistent with the credit-access effect being an important determinant of self-employment.

[22]We thank Nawid Siassi for suggesting this exercise.

8 Conclusions

We construct a new administrative dataset to examine how consumer credit access impacts employment prospects, earnings, and entrepreneurship. Using a sample of three million prime age individuals, we show that self-employment and firm ownership are increasing functions of available credit. In contrast, formal-employment declines as access to credit increases. Our results, which are based on direct measures of credit constraints, contrast with prior studies, including Hurst and Lusardi [2004], who find that business ownership, as well as self-employment, are largely flat functions of wealth. Our findings are in agreement with Robb and Robinson [2012] who find that many startups receive debt financing through the personal balance sheets of the entrepreneur.

We use individual bankruptcy flag removals and compare to individuals still in bankruptcy to isolate a large discrete increase in credit access which is not directly associated with differences in credit worthiness, wealth, or any other unobserved characteristics of the individual. We find that following a bankruptcy flag removal: (1) credit scores and credit access increase, (2) the fraction of individuals who start businesses that hire employees (firm ownership) increases, (3) the transition rate into self-employment is higher, (4) new self-employed entrants earn more, (5) new self-employed entrants borrow more, and (6) firm owners borrow five times more than self-employed entrants.

We test several explanations for the rise in self-employment and borrowing after bankruptcy flag removal including: (1) credit constraints are relaxed after flag removal, (2) credit increases after flag removal because of consumption smoothing motives, (3) borrowing to provide insurance against shocks, and (4) borrowing by individuals to signal that they are 'high-quality', thus borrowing may not reflect immediate credit constraints.

Our evidence and tests provide support for credit constraints in explaining the use of

credit for the self-employed as well as new firm owners in both the general population as well as for our bankrupt sample. In particular, we find strong positive correlations between self-employment income changes and borrowing, suggesting a limited role of credit as a consumption smoothing device for the self-employed. Models with working capital financial constraints are consistent with this positive correlation. Moreover, we show that income volatility and credit limits are negatively correlated, limiting the role for precautionary credit accumulation or insurance as in explanation for the increased borrowing. Lastly, we see that contemporaneous borrowing is associated with lower subsequent credit access, inconsistent with signaling higher future quality as an explanation for the increased borrowing we document.

Overall, our findings contribute to the understanding of how individuals use credit in entrepreneurship by linking direct measures of secured and unsecured consumer credit access (including limits and scores) to new firms and measuring the reliance on personal credit to each stage of entrepreneurship. By merging the credit reports with the Integrated Longitudinal Business Database, we add to the work of Robb and Robinson [2012] by providing the first set of summary statistics that describe the relationship between unsecured and secured credit limits, credit scores, and entry into non-employer and employer startups. Combining this new data with bankruptcy flag removals allows us to provide a unique characterization of the way credit access affects entry into non-employer and employer businesses.

Our results can also be used to test the growing class of models that link consumer credit to self-employment dynamics. In terms of policy, our results are consistent with entrepreneurs in bankruptcy being credit constrained. On exit from bankruptcy, entrepreneurs use significant amounts of consumer credit when starting a business, suggesting by revealed preference that alternative sources of credit are more expensive and that they face credit constraints in alternative sources of finance as well. Our research suggests that making

bankruptcy more pro-debtor and shortening time in bankruptcy may have positive effects on entrepreneurship.

Our research also suggests that recent legislation that makes consumer bankruptcy more pro-creditor may also be contributing to the reduced rates of entrepreneurship that research by (Decker et al. [2014]) has documented. The data we have used in this project can be used to address these questions and a range of future questions related to entrepreneurial finance and subsequent outcomes.

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Online Appendix, Not For Publication

"The Impact of Consumer Credit Access on Employment, Earnings and Entrepreneurship"

Kyle Herkenhoff, Gordon Phillips, and Ethan Cohen-Cole[23]

January 25, 2020

[23]Any opinions and conclusions expressed herein are those of the author(s) and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed. This research uses data from the Census Bureau's Longitudinal Employer Household Dynamics Program, which was partially supported by the following National Science Foundation Grants SES-9978093, SES-0339191 and ITR-0427889; National Institute on Aging Grant AG018854; and grants from the Alfred P. Sloan Foundation.

A Data Appendix

Our credit data is measured as of September in each year t, so there are instances in which flags are removed in October, November, or December of the prior year t-1 (i.e., prior fiscal year t-1 ending Dec. 31 through which we measure earnings and self-employment earnings), but the flag removal is classified as a removal only in the following year t. In results available on request, we attempt to capture these early transitions by using beginning-of-year employment (e.g., if an individual earned $1,000 last year and $1,000 this year, then they were employed at the beginning of the year, and they may have transited from bankruptcy in October - December of the prior year). Under these alternate beginning-of-year definitions of employment and self-employment, our main results persist.

B The Integrated Longitudinal Business Database (ILBD)

The ILBD merges two different databases. The first database is the Longitudinal Business Database (LBD) which tracks the universe of all U.S. establishments that have paid employees.[24] The second database is the universe of IRS non-employer tax records (i.e., those who fill out 1040 Schedule C tax returns). As soon as an entity hires a non-contractor, full-time employee, the business owner must obtain an EIN and will enter the LBD.[25] Davis et al.

[24] "Overview: The Longitudinal Business Database (LBD) is a research dataset constructed at the Center for Economic Studies (CES) in the U.S. Census Bureau. The LBD contains the universe of all U.S. business establishments with paid employees listed in the Census Bureaus business register." http://maryannfeldman.web.unc.edu/data-sources/longitudinal-databases/longitudinal-business-database/

[25] According to the IRS, "As a business owner, when another person performs work for you, you must first correctly classify that person as an independent contractor or employee. If the person is an independent contractor, refer to Forms and Associated Taxes for Independent Contractors for your tax responsibilities. If the person is classified as an employee you must have an Employer Identification Number (EIN). Your tax responsibilities include withholding, depositing, reporting, and paying employment taxes. You must also give certain forms to your employees, they must give certain forms to you, and you must send certain forms to the IRS and SSA." https://www.irs.gov/businesses/small-businesses-self-employed/businesses-with-employees

[2007] construct the ILBD using the SSN-EIN link found on the application for an EIN, and they also use exact business name matches. These matches yield a crosswalk between non-employers and the subsequent businesses they become.[26] We subsequently merge the ILBD using anonymized unique identifiers to our credit bureau data and the LEHD.

C Full Population Regressions

Table A1 reports the full regression from Table 2, including the coefficients on the terms for the levels of credit and credit scores. The table also includes non-employment and dual employment measures. Self-employment and transitions into self-employment increase as the marginal cost of $1 of credit declines (i.e., as the credit score improves). Credit scores are an ordinal rank, and thus the deciles convey information about the ranking of marginal costs of funds, not the level. While revolving credit limits are typically populated in our dataset, the unused mortgage credit is defined as the highest mortgage balance observed less the current mortgage balance and is therefore zero for non-mortgagors. Likewise, the unused non-mortgage and non-revolving credit corresponds to the highest non-mortgage and non-revolving debt observed less the current non-mortgage and non-revolving debt. The mortgage deciles 1 through 6 include those with a zero balance for their mortgage (roughly 40% of US households have a mortgage). Table A2 yields similar results when we aggregate all forms of credit.

[26] Quoting from Davis et al. [2007] "...we create a set of firm-level matches between employers and nonemployers for our selected industries. These matches rely on numeric identifiers and exact literal matches on business names. In matching on numeric identifiers, we exploit the fact that many business records contain both an EIN and an SSN. For example, when a business owner or officer applies for an EIN, he or she must fill out an SS-4 form for the IRS. This form includes the business name, the EIN and the SSN of the business owner or chief officer, all of which are included in Census Bureau business registers. These data allow us to build a crosswalk between EINs and SSNs, which we then use to match business records across universes... we rely only on the EIN-SSN crosswalk and exact literal matches on business name. As an example of how our matching algorithm works, consider all establishments with employees in our selected industries as of 2000. Using the longitudinal links in the LBD, we first create a set of identifiers (EINs, SSNs and business names) associated with each establishment with employees in 2000 for each year back to 1992... About 17 percent of our employer-nonemployer matches rely on exact literal matches on business name strings."

Table A1: Population Relationship Between Self/Formal-Employment Outcomes and Credit. (Source: 100% Sample).

	(1) Self Employed $1,000+ (d), t+1	(2) Transition Into Self-Employed $1,000+ (d), t+1	(3) Transition Out of Self-Employed $1,000+ (d), t+1	(4) Firm Ownership, 1+ Yrs, t+1	(5) Firm Ownership 2+ Yrs, t+1 and t+2	(6) Formal-Employed $1,000+ (d), t+1	(7) Both Self and Formal-Employed $1,000+ (d), t+1	(8) Non-Employed $1,000+ (d), t+1
Credit Score Decile 2, t (d)	-0.000457	-0.000438	0.000149	-0.000106	-6.07e-05	-0.000490	-0.000163	0.000784*
	(0.000334)	(0.000270)	(0.000247)	(6.67e-05)	(5.28e-05)	(0.000429)	(0.000289)	(0.000431)
Credit Score Decile 3, t (d)	0.000410	0.000435*	-0.000555**	-0.000172***	-0.000104**	-0.00308***	-8.04e-05	0.00258***
	(0.000322)	(0.000263)	(0.000240)	(6.50e-05)	(5.09e-05)	(0.000411)	(0.000277)	(0.000415)
Credit Score Decile 4, t (d)	0.00127***	0.000921***	-0.000662***	-0.000180***	-0.000146***	-0.00454***	0.000276	0.00354***
	(0.000327)	(0.000264)	(0.000242)	(6.80e-05)	(5.38e-05)	(0.000411)	(0.000282)	(0.000416)
Credit Score Decile 5, t (d)	0.00229***	0.00142***	-0.00155***	-0.000180**	-0.000114**	-0.00531***	0.000678**	0.00370***
	(0.000338)	(0.000271)	(0.000248)	(7.29e-05)	(5.79e-05)	(0.000421)	(0.000291)	(0.000426)
Credit Score Decile 6, t (d)	0.00224***	0.00120***	-0.00158***	-0.000204***	-0.000108*	-0.00628***	0.000428	0.00447***
	(0.000354)	(0.000282)	(0.000258)	(7.71e-05)	(6.11e-05)	(0.000439)	(0.000305)	(0.000444)
Credit Score Decile 7, t (d)	0.00225***	0.00159***	-0.00167***	-0.000213***	-0.000130**	-0.00765***	0.000275	0.00567***
	(0.000371)	(0.000295)	(0.000269)	(8.27e-05)	(6.58e-05)	(0.000458)	(0.000320)	(0.000464)
Credit Score Decile 8, t (d)	0.00174***	0.00133***	-0.00194***	-0.000258***	-0.000165**	-0.00968***	-7.55e-05	0.00786***
	(0.000393)	(0.000311)	(0.000284)	(8.93e-05)	(7.17e-05)	(0.000483)	(0.000339)	(0.000489)
Credit Score Decile 9, t (d)	0.00236***	0.00170***	-0.00254***	-0.000189*	1.42e-05	-0.0119***	3.00e-05	0.00959***
	(0.000428)	(0.000337)	(0.000307)	(0.000101)	(8.20e-05)	(0.000521)	(0.000370)	(0.000529)
Credit Score Decile 10, t (d)	0.000791*	0.000604*	-0.00243***	-0.000288***	-0.000214***	-0.0120***	-0.000537	0.0107***
	(0.000446)	(0.000348)	(0.000314)	(0.000100)	(8.14e-05)	(0.000562)	(0.000382)	(0.000570)
Unused Revolving Credit Decile 3, t (d)	0.00189***	0.00123***	-0.000176	0.000142***	7.78e-05**	-0.00179***	0.000472*	0.000371
	(0.000299)	(0.000249)	(0.000222)	(5.13e-05)	(3.89e-05)	(0.000380)	(0.000261)	(0.000383)
Unused Revolving Credit Decile 4, t (d)	0.00229***	0.00150***	-9.31e-05	0.000182***	0.000128***	-0.00290***	0.000568**	0.00119***
	(0.000286)	(0.000232)	(0.000208)	(5.49e-05)	(4.21e-05)	(0.000359)	(0.000246)	(0.000363)
Unused Revolving Credit Decile 5, t (d)	0.00375***	0.00292***	0.000178	0.000216***	0.000163***	-0.00362***	0.00133***	0.00120***
	(0.000310)	(0.000249)	(0.000224)	(6.25e-05)	(4.94e-05)	(0.000384)	(0.000267)	(0.000388)
Unused Revolving Credit Decile 6, t (d)	0.00517***	0.00364***	-0.000279	0.000233***	0.000110**	-0.00393***	0.00206***	0.000830**
	(0.000336)	(0.000266)	(0.000240)	(7.03e-05)	(5.56e-05)	(0.000411)	(0.000290)	(0.000416)
Unused Revolving Credit Decile 7, t (d)	0.00619***	0.00462***	2.46e-05	0.000279***	0.000148**	-0.00507***	0.00208***	0.000963**
	(0.000366)	(0.000287)	(0.000259)	(7.89e-05)	(6.31e-05)	(0.000441)	(0.000315)	(0.000446)
Unused Revolving Credit Decile 8, t (d)	0.00770***	0.00608***	0.000371	0.000212**	0.000163**	-0.00599***	0.00280***	0.00110**
	(0.000408)	(0.000315)	(0.000286)	(9.20e-05)	(7.47e-05)	(0.000486)	(0.000352)	(0.000493)
Unused Revolving Credit Decile 9, t (d)	0.0101***	0.00806***	-0.000126	0.000340***	0.000156*	-0.00812***	0.00346***	0.00146***
	(0.000470)	(0.000358)	(0.000325)	(0.000112)	(9.15e-05)	(0.000550)	(0.000406)	(0.000559)
Unused Revolving Credit Decile 10, t (d)	0.0109***	0.00907***	-6.03e-05	0.000732***	0.000458***	-0.0116***	0.00336***	0.00404***
	(0.000569)	(0.000429)	(0.000392)	(0.000149)	(0.000123)	(0.000649)	(0.000493)	(0.000663)
Unused Mortgage Credit Decile 7, t (d)	0.00325***	0.00153***	0.000244	0.000141**	9.39e-05*	-0.00347***	0.00180***	0.00203***
	(0.000277)	(0.000224)	(0.000203)	(6.25e-05)	(4.94e-05)	(0.000305)	(0.000245)	(0.000310)
Unused Mortgage Credit Decile 8, t (d)	0.00339***	0.00179***	0.000319	0.000176***	0.000134**	-0.00378***	0.00177***	0.00215***
	(0.000276)	(0.000219)	(0.000200)	(6.52e-05)	(5.24e-05)	(0.000307)	(0.000244)	(0.000312)
Unused Mortgage Credit Decile 9, t (d)	0.00335***	0.00164***	0.000277	0.000311***	0.000145**	-0.00542***	0.00158***	0.00365***
	(0.000302)	(0.000232)	(0.000215)	(7.60e-05)	(6.21e-05)	(0.000337)	(0.000265)	(0.000344)
Unused Mortgage Credit Decile 10, t (d)	0.000795**	0.000995***	0.000751***	0.000240**	0.000163*	-0.00773***	0.000308	0.00724***
	(0.000362)	(0.000272)	(0.000255)	(0.000105)	(8.72e-05)	(0.000401)	(0.000313)	(0.000416)
Unused Non-Mortgage and Non-Revolving Credit Decile 4, t (d)	0.000900***	0.000651***	0.000160	-8.77e-05	-0.000122***	0.000206	8.85e-05	-0.00102***
	(0.000270)	(0.000225)	(0.000205)	(6.03e-05)	(4.75e-05)	(0.000332)	(0.000232)	(0.000339)
Unused Non-Mortgage and Non-Revolving Credit Decile 5, t (d)	0.00149***	0.00127***	8.63e-05	-4.98e-05	-5.15e-05	-0.000848***	0.000120	-0.000520*
	(0.000239)	(0.000198)	(0.000177)	(4.73e-05)	(3.73e-05)	(0.000297)	(0.000208)	(0.000300)
Unused Non-Mortgage and Non-Revolving Credit Decile 6, t (d)	0.00196***	0.00188***	0.000152	-3.74e-05	-3.70e-05	-0.00110***	0.000310	-0.000544*
	(0.000245)	(0.000200)	(0.000180)	(5.08e-05)	(4.00e-05)	(0.000298)	(0.000213)	(0.000301)
Unused Non-Mortgage and Non-Revolving Credit Decile 7, t (d)	0.00245***	0.00220***	0.000135	2.50e-05	1.84e-06	-0.000635**	0.000634***	-0.00118***
	(0.000252)	(0.000204)	(0.000184)	(5.45e-05)	(4.32e-05)	(0.000302)	(0.000220)	(0.000306)
Unused Non-Mortgage and Non-Revolving Credit Decile 8, t (d)	0.00285***	0.00283***	0.000260	9.12e-06	6.53e-06	-0.000193	0.000927***	-0.00173***
	(0.000262)	(0.000209)	(0.000190)	(5.84e-05)	(4.69e-05)	(0.000309)	(0.000228)	(0.000312)
Unused Non-Mortgage and Non-Revolving Credit Decile 9, t (d)	0.00248***	0.00271***	0.000571***	5.47e-05	5.71e-05	0.000261	0.000380	-0.00236***
	(0.000275)	(0.000217)	(0.000199)	(6.49e-05)	(5.24e-05)	(0.000319)	(0.000240)	(0.000324)
Unused Non-Mortgage and Non-Revolving Credit Decile 10, t (d)	0.00228***	0.00295***	0.000193	0.000407***	0.000276***	-0.000848**	0.000386	-0.00104***
	(0.000319)	(0.000246)	(0.000228)	(8.81e-05)	(7.30e-05)	(0.000353)	(0.000277)	(0.000363)
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	0.019	0.061	0.074	0.002	0.001	0.170	0.005	0.140
Individuals (millions)	3.06	3.06	3.06	3.06	3.06	3.06	3.06	3.06
Total Person-Year Obs. (millions)	16.40	16.40	16.40	16.40	16.40	16.40	16.40	16.40

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (d) denotes an indicator variable that takes the values 0,1. Controls include: lagged labor earnings and self-employed income, deciles of cumulative lagged earnings dummies, quadratics in age and tenure. Fixed effects include individual fixed effects and year effects.*

Table A2: Population Relationship Between Self/Formal-Employment Outcomes and Total Credit. (Source: 100% Sample).

	(1) Self Employed $1,000+ (d), t+1	**(2)** Transition Into Self-Employed $1,000+ (d), t+1	**(3)** Transition Out of Self-Employed $1,000+ (d), t+1	**(4)** Firm Ownership 1+ Yrs, t+1	**(5)** Firm Ownership 2+ Yrs, t+1 and t+2	**(6)** Formal-Employed $1,000+ (d), t+1
Unused Total Credit Decile 2, t	0.00141***	0.000981***	8.32e-06	0.000117**	3.29e-05	-0.00303***
	(0.000302)	(0.000253)	(0.000222)	(4.80e-05)	(3.69e-05)	(0.000427)
Unused Total Credit Decile 3, t	0.00312***	0.00228***	0.000248	0.000158***	4.48e-05	-0.00434***
	(0.000312)	(0.000257)	(0.000227)	(5.22e-05)	(4.05e-05)	(0.000429)
Unused Total Credit Decile 4, t	0.00430***	0.00316***	0.000439*	0.000204***	6.59e-05	-0.00501***
	(0.000328)	(0.000267)	(0.000237)	(5.70e-05)	(4.39e-05)	(0.000443)
Unused Total Credit Decile 5, t	0.00573***	0.00415***	0.000702***	0.000241***	8.41e-05*	-0.00495***
	(0.000343)	(0.000277)	(0.000247)	(6.16e-05)	(4.84e-05)	(0.000455)
Unused Total Credit Decile 6, t	0.00615***	0.00502***	0.00106***	0.000329***	0.000168***	-0.00537***
	(0.000359)	(0.000288)	(0.000258)	(6.77e-05)	(5.35e-05)	(0.000470)
Unused Total Credit Decile 7, t	0.00718***	0.00570***	0.000857***	0.000383***	0.000199***	-0.00664***
	(0.000381)	(0.000302)	(0.000271)	(7.55e-05)	(6.00e-05)	(0.000489)
Unused Total Credit Decile 8, t	0.00845***	0.00721***	0.000979***	0.000409***	0.000219***	-0.00738***
	(0.000413)	(0.000323)	(0.000292)	(8.81e-05)	(7.09e-05)	(0.000518)
Unused Total Credit Decile 9, t	0.0104***	0.00868***	0.000592*	0.000645***	0.000315***	-0.00942***
	(0.000463)	(0.000358)	(0.000325)	(0.000108)	(8.78e-05)	(0.000567)
Unused Total Credit Decile 10, t	0.00939***	0.00889***	0.000924**	0.000936***	0.000522***	-0.0139***
	(0.000557)	(0.000425)	(0.000390)	(0.000149)	(0.000123)	(0.000657)
Fixed Effects	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
R-squared	0.019	0.061	0.074	0.002	0.001	0.170
Individuals (millions)	3.06	3.06	3.06	3.06	3.06	3.06
Total Person-Year Obs. (millions)	16.40	16.40	16.40	16.40	16.40	16.40

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (d) denotes an indicator variable that takes the values 0,1. Controls include: deciles of credit scores dummies, deciles of unused mortgage credit dummies, deciles of unused non-mortgage and non-revolving credit dummies, lagged labor earnings and self-employed income, deciles of cumulative lagged earnings dummies, quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies.*

D Gross Formal and Self-Employment Flow Results

Columns (1) and (2) of Table A3 show the impact of flag removal on formal-employment. Column (1) defines formal-employment to be those who have earned at least $1,000 in an unemployment-insured job, whereas Column (2) defines formal-employment to be those who have earned at least $5,000 in an unemployment-insured job. Using the $1,000 threshold, Column (1) shows that the stock of formally employed individuals increases by .465% after flag removal. Using the $5,000 threshold in Column (2), formal-employment increases by .323% after flag removal.

Columns (3) through (6) of Table A3 illustrate the impact of bankruptcy flag removal on formal-employment flows. Columns (3) and (4) show that for the baseline definition of formal-employment, the flows in and flows out are insignificant. We attribute the lack of significance to the sample size and churn, since the level increases significantly.

In Columns (5) and (6) of Table A3, if we define formal-employment using a more stringent earnings threshold of $5,000, we do see flows into and out of formal-employment increase significantly following flag removal. The flow rate into formal-employment increases by .24% in the year of removal, relative to the omitted group. We can reject equality of coefficients in the year of removal and 2 years prior to removal, but the increase is short lived. The flow rate out of formal-employment also increases following flag removal.

Lastly, we reconcile our results with Bos et al. [2015] by examining gross flows into and out of self-employment. In the U.S., flows into and out of self-employment increase in response to bankruptcy flag removal, suggesting that there may be a role for both credit constraints and screening. In Columns (7) and (8) of Table A3, we use a $5,000 cutoff for self-employment (see Table 5 for $1,000 results), we find that flows into self-employment still increase by .11% and flows out of self-employment increase by .13%. While we do not

have direct evidence of the credit constraint and screening channels, the flow rate into self-employment is qualitatively supportive of a role for credit constraints, and the flow rate out of self-employment is qualitatively supportive of a role for employer screening.

Table A3: Baseline Formal-Employment Results

	(1) Formal-Employed	(2) Formal-Employed, $5,000+	(3) Transition into Formal-Employed, $1,000+	(4) Transition out of Formal-Employed, $1,000+	(5) Transition into Formal-Employed, $5,000+	(6) Transition out of Formal-Employed, $5,000+	(7) Transition into Self-Employed, $5,000+	(8) Transition out of Self-Employed, $5,000+
2 Years Before Removal (d)	0.000308	0.000425	-0.000892	0.000709	0.000788	0.000595	0.000536	0.000644
	(0.000897)	(0.000914)	(0.000687)	(0.000686)	(0.000711)	(0.000703)	(0.000491)	(0.000458)
1 Year Before Removal (d)	0.00154	0.00129	0.000127	0.000421	0.00118	0.000927	0.000219	0.000939*
	(0.00120)	(0.00121)	(0.000763)	(0.000764)	(0.000786)	(0.000784)	(0.000540)	(0.000509)
Year of Removal (d)	0.00289*	0.00292*	-0.000380	0.000932	0.00241***	0.00224**	0.00107*	0.00131**
	(0.00149)	(0.00151)	(0.000878)	(0.000887)	(0.000907)	(0.000912)	(0.000630)	(0.000590)
1+ Years After Removal (d)	0.00465**	0.00323*	-0.00121	0.00168	0.000713	0.00303***	0.000119	0.00149**
	(0.00185)	(0.00187)	(0.00107)	(0.00108)	(0.00110)	(0.00111)	(0.000757)	(0.000708)
Individual Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Age and Tenure Controls	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	0.122	0.122	0.026	0.026	0.018	0.011	0.000	0.001
Round N	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06
N Indiv	220000	220000	220000	220000	220000	220000	220000	220000
Reject Equality of 1+ Yrs & 2 Yrs at 10%	Y	Y	N	N	N	Y	N	N
Reject Equality of 0 Yrs & 2 Yrs at 10%	Y	Y	N	N	Y	Y	N	N

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All dependent variables are 0,1 binary indicator variables. (d) denotes an indicator variable that takes the values 0,1. Age and Tenure controls include quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies. See notes to Table 7.*

D.1 Self and Formal-Employment

Table A4 compares our baseline results to those who retain their formal sector job while entering self-employment (non-exclusive entrepreneurs). We see similar earnings growth and borrowing patterns as our benchmark definition of entrepreneurship in Table 7 which includes exclusive and non-exclusive entrepreneurs.

Table A4: Transitions into Self-Employment: Earnings, Borrowing, and Turnover

	(1) Real Self-Employed Earnings	**(2)** Real Total Balance	**(3)** Transition out of Self-Employment Next Yr., $1,000+ (d)
2 Yrs. Before Removal (d) x Trans Into Non-Exclusive Self-Employed, $1,000+ (d)	1,834***	5,000**	358.4
	(261.3)	(2,172)	(306.1)
1 Yr. Before Removal (d) x Trans Into Non-Exclusive Self-Employed, $1,000+ (d)	1,891***	12,090***	617.7*
	(276.6)	(2,260)	(343.6)
Yr. of Removal (d) x Trans Into Non-Exclusive Self-Employed, $1,000+ (d)	2,339***	9,628***	864.9**
	(298.0)	(2,434)	(379.2)
1+ Yrs. After Removal (d) x Trans Into Non-Exclusive Self-Employed, $1,000+ (d)	2,922***	14,340***	1,206***
	(209.2)	(1,815)	(303.4)
Transition Into Trans Into Non-Exclusive Self-Employed, $1,000+ (d)	5,862***	-6,687***	-587.1***
	(120.5)	(912.2)	(101.8)
2 Years Before Removal (d)	-15.27	8,892***	759.9***
	(21.43)	(349.4)	(47.38)
1 Year Before Removal (d)	-52.90*	13,120***	1,381***
	(28.67)	(475.1)	(66.30)
Year of Removal (d)	-59.87*	15,840***	1,978***
	(35.91)	(598.7)	(84.77)
1+ Years After Removal (d)	-113.4**	14,560***	3,563***
	(44.32)	(728.1)	(98.27)
Individual Fixed Effects	Y	Y	Y
Year Fixed Effects	Y	Y	Y
Age and Tenure Controls	Y	Y	Y
R-squared	0.032	0.105	0.026
No. Person-Yr Obs.	1.500e+06	1.500e+06	1.500e+06
No. of Indiv.	220000	220000	220000
Combined Coeff Diff 1+ Yrs & -2 Yrs	989.87	15008.00	3650.70
Combined Coeff Diff Sig at 10%	Y	Y	Y

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (d) denotes an indicator variable that takes the values 0,1. Age and Tenure controls include quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies. 'Transition Into Trans Into Non-Exclusive Self-Employed, $1,000+ (d) ' is an indicator variable that takes the value 1 when someone transitions into self-employment while being formally employed. See notes to Table 7.*

E Alternate definitions of self-employment

In this section, we consider alternative definitions of self-employment. Table A5 illustrates the impact of bankruptcy flag removal on more stringent definitions of self-employment. Columns (1) and (2) define an individual as self-employed if they earn $1,000 of Schedule C net income consecutively in year t and year $t-1$. Using this definition in Column (1), we see no significant effects of flag removal on the stock of self-employed. However, in Column (2), we do see a significant increase in the flow rate into self-employment one or more years after flag removal. Columns (3) and (4) define self-employment using the requirement that individuals earn at least $5,000 of Schedule C net income in consecutive years. There are no significant effects of bankruptcy flag removal on the stock or flow-rate of self-employment using this definition. Lastly, Columns (5) and (6) define the self-employed as those who earned at least $5,000 of Schedule C net income and their Schedule C net income was at least 50% of their total income (formal labor earnings plus Schedule C net income). Again, there are no significant effects of flag removal on the stock of self-employed. However, in Column (6) there is a marginally significant increase of the flow-rate into self-employment. Column (7) repeats this exercise using a $5,000 cutoff for self-employment, which also yields an insignificant effect. Column (8) yields a similar result to the baseline, Table 5, which is that the flow rate into self-employment increases with marginal significance after flag removal.

Table A5: Alternate definitions of self-employment

	(1) Self-Employed, Consecutive $1,000+	**(2)** Transition into Self-Employed, Consecutive $1,000+	**(3)** Self-Employed, Consecutive $5,000+	**(4)** Transition into Self-Employed, Consecutive $5,000+	**(5)** Self-Employed, At Least $5,000+ and 50% of Total Income	**(6)** Transition into Self-Employed, At Least $5,000+ and 50% of Total Income	**(7)** Self-Employed, $5,000+	**(8)** Transition into Self-Employed, $5,000+
2 Years Before Removal (d)	7.26e-05	4.94e-05	0.000383	0.000121	0.000780*	0.000547	0.000919	0.000536
	(0.000552)	(0.000420)	(0.000469)	(0.000358)	(0.000473)	(0.000390)	(0.000597)	(0.000491)
1 Year Before Removal (d)	-0.000410	0.000747	0.000134	0.000545	0.000641	0.000462	0.000353	0.000219
	(0.000750)	(0.000474)	(0.000638)	(0.000405)	(0.000609)	(0.000429)	(0.000772)	(0.000540)
Year of Removal (d)	-0.000659	9.20e-05	1.10e-05	0.000395	0.000902	0.000893*	0.00108	0.00107*
	(0.000931)	(0.000543)	(0.000794)	(0.000466)	(0.000754)	(0.000502)	(0.000955)	(0.000630)
1+ Years After Removal (d)	0.000428	0.00153**	0.000864	0.000897	0.00147	0.000533	0.000983	0.000119
	(0.00115)	(0.000664)	(0.000978)	(0.000568)	(0.000925)	(0.000603)	(0.00117)	(0.000757)
Individual Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Age and Tenure Controls	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	0.003	0.001	0.003	0.001	0.007	0.001	0.003	0.000
Round N	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06
N Indiv	220000	220000	220000	220000	220000	220000	220000	220000

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. All dependent variables are binary 0,1 indicator variables. (d) denotes an indicator variable that takes the values 0,1. Age and Tenure controls include quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies. 'Transition Into Trans Into Non-Exclusive Self-Employed, $1,000+ (d)' (or $5,000) is an indicator variable that takes the value 1 when someone transitions into self-employment while being formally employed and 0 otherwise. See notes to Table 7.*

F Borrowing by new self-employed entrants

Table A6 illustrates the borrowing behavior of individuals who transition into self-employment. Individuals who transit into self-employment following a bankruptcy flag removal borrow heavily using revolving and secured credit. Column (1) of Table A6 shows that individuals who transit into self-employment, regardless of whether their flag is removed or not, borrow very little using their bankcards (note, 'bankcards' refers to traditional unsecured credit cards issued by banks). However, following flag removal, those who transition into self-employment borrow significantly using revolving credit (e.g., revolving personal finance loans) as shown in Column (2). They also take out large amounts of mortgage credit as shown in Column (3).

There are two caveats that must be discussed. Table A6 exhibits a pretrend due to the fact that credit partially recovers before flag removal (e.g., see the discussion in Cohen-Cole et al. [2009]). However, we argue that a better gauge of ability to borrow is the credit score. The total amount which can be borrowed is proportional to the credit score and the credit score exhibits a stable trend prior to flag removal (e.g., Figure 3) and a large discrete rise following flag removal. Throughout the main text, we formally test for parallel trends in every specification by including dummies for years prior to flag removal. It is the exception that our regressions show significant pretrends.

G Alternate Clustered Standard Errors

To address concerns about potential cohort and regional labor market effects, in this table we also double cluster standard errors at the zipcode and bankruptcy cohort. Columns (1) and (5) show that the increase in credit scores and new firm ownership (2+ years) after flag

Table A6: Transitions into Self-Employment: Borrowing

	(1) Real Bankcard Balance	**(2)** Real Revolving Balance	**(3)** Real Mortgage Balance
2 Yrs. Before Removal (d) x Trans Into Self-Employed, $1,000+ (d)	99.73	298.4	5,642***
	(66.47)	(216.5)	(1,835)
1 Yr. Before Removal (d) x Trans Into Self-Employed, $1,000+ (d)	91.64	822.2***	10,086***
	(74.23)	(252.3)	(1,875)
Yr. of Removal (d) x Trans Into Self-Employed, $1,000+ (d)	46.52	598.9**	7,348***
	(86.61)	(271.6)	(2,026)
1+ Yrs. After Removal (d) x Trans Into Self-Employed, $1,000+ (d)	416.6***	1,610***	13,714***
	(74.15)	(211.2)	(1,483)
Transition Into Self-Employed (d)	-62.55***	-461.9***	-5,635***
	(24.01)	(75.81)	(742.6)
2 Years Before Removal (d)	202.1***	1,112***	6,023***
	(13.09)	(40.60)	(329.1)
1 Year Before Removal (d)	336.3***	1,793***	8,957***
	(18.21)	(56.30)	(443.1)
Year of Removal (d)	586.4***	2,735***	10,387***
	(23.83)	(72.19)	(556.3)
1+ Years After Removal (d)	892.7***	4,257***	8,084***
	(28.47)	(83.77)	(675.8)
Individual Fixed Effects	Y	Y	Y
Year Fixed Effects	Y	Y	Y
Age and Tenure Controls	Y	Y	Y
R-squared	0.027	0.050	0.092
No. Person-Yr Obs.	1.500e+06	1.500e+06	1.500e+06
No. of Indiv.	220000	220000	220000
Combined Coeff Diff 1+ Yrs & -2 Yrs	1,007	4,457	10,133
Combined Coeff Diff Sig at 10%	Y	Y	Y

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (d) denotes an indicator variable that takes the values 0,1. Age and Tenure controls include quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies. 'Combined Coeff Diff 1+ Yrs & -2 Yrs' compares the overall effect of transitioning 1+ years after flag removal to the overall effect of transitioning 2 years before flag removal.*

removal are still significant even after clustering at an alternative level. Column (3) shows that the marginal increase of the flow rate into self-employment after flag removal remains significant even after clustering at an alternative level.

Table A7: Main Results with Clustered Standard Errors at the Cohort × Zip level.

	(1) Credit Score	(2) Self-Employed (d)	(3) Transition into Self-Employed, $1,000+ (d)	(4) Firm Ownership 1+ Years, (d)	(5) Firm Ownership 2+ Years, (d)
2 Years Before Flag Removal (d)	19.70***	0.000600	0.000527	-0.000126	1.30e-05
	(0.506)	(0.000701)	(0.000576)	(0.000172)	(0.000110)
1 Year Before Flag Removal (d)	13.26***	-0.000384	2.64e-05	-0.000110	0.000113
	(0.698)	(0.000902)	(0.000635)	(0.000214)	(0.000148)
Year of Flag Removal (d)	68.70***	0.000950	0.00161**	0.000179	0.000394**
	(0.944)	(0.00112)	(0.000747)	(0.000259)	(0.000191)
1+ Years After Flag Removal (d)	7.046***	0.00108	0.000649	0.000297	0.000540**
	(1.153)	(0.00138)	(0.000895)	(0.000334)	(0.000230)
Individual Fixed Effects	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y
Age and Tenure Controls	Y	Y	Y	Y	Y
R-squared	0.134	0.003	0.000	0.001	0.000
No. Person-Yr. Obs.	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06
No. Indiv. Obs.	220000	220000	220000	220000	220000

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (d) denotes an indicator variable that takes the values 0,1. 'Firm Ownership, 1+ (2+ Yrs)' are forward looking indicator variables that take the value 1 if an individual owns a firm in year t (and in the subsequent year t + 1), and 0 otherwise. Age and Tenure controls include quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies. See notes to Table 7.*

H TransUnion/LEHD Additional Results: Tests for Selection Among Self-Employed Transitioners

In this Appendix, we discuss the role of selection for the transition results. Since flag removal is foreseeable, there is the concern that better entrepreneurs who anticipate the need for credit deliberately wait until the flag is removed to start a business to access cheaper credit. However, such selection still suggests credit can play an important role for business startups. In this section, we examine whether the entrepreneurs who transition into self-employment following flag removal are very close in terms of 1, 2, and 3 year lags of annual labor earnings

relative to those who flow into self-employment 1 or 2 years prior to flag removal. We repeat the same exercise using 1, 2, and 3 year lags of annual self-employed income. The idea is that if these were repeat entrepreneurs as in Gompers et al. [2006], then we should see non-zero or greater lagged self-employed income.

Table A8 provides the regression results. Columns (1) through (3) regress lagged labor earnings on the self-employment transition indicator interacted with the window of dummies around flag removal. Columns (4) through (6) regress lagged self-employed income on an indicator interacted with the window of dummies around flag removal. To interpret the coefficients and test for selection, Table A9 tests whether those who transition into self-employment in the year of flag removal differ from those who transition into self-employment 1 and 2 years before flag removal. For example, the upper left hand cell of Table A8 computes prior labor earnings of those transitioning into self-employment in the year of removal \$552 (= -120.5+1731 -1058) less the prior labor earnings of those transitioning into self-employment 1 year before flag removal \$944 (=-36.63+1731 -749.7) to arrive at a difference in prior labor earnings between these two cohorts of self-employed individuals of \$-391.9 (=-36.63+1,731 -749.7 -(-120.5+1,731 -1,058)).

The standard error of this difference in prior labor earnings is \$353, and the corresponding test statistic is -1.11, indicating that there is no difference in prior labor earnings between those who transition into self-employment one year before flag removal to one year after flag removal. The right-hand panel of Table A9 conduct the same exercise using self-employed earnings. Again, in all but one specification, we fail to reject that those who waited to start a business after flag removal had any difference in prior self-employment earnings to those who started their business one year before removal.

Table A10 conducts the same exercise for longer lags of self-employed income, from 7 to 12 years, which includes the period before entering bankruptcy (earnings data is not

Table A8: Measures of selection for those who transition into self-employment. Regressions of past labor earnings and self-employed earnings on transition dummies.

	(1) 1 Year Lagged Labor Earnings	(2) 2 Year Lagged Labor Earnings	(3) 3 Year Lagged Labor Earnings	(4) 1 Year Lagged Self Employed Income	(5) 2 Year Lagged Self Employed Income	(6) 3 Year Lagged Self Employed Income
2 Yrs. Before Removal (d) x Trans Into Self-Employed, $1,000+ (d)	-462.9*	-422.4	-582.9**	655.1***	1,152***	1,113***
	(271.2)	(277.0)	(281.8)	(184.4)	(196.8)	(182.1)
1 Yr. Before Removal (d) x Trans Into Self-Employed, $1,000+ (d)	-749.7***	-721.5**	-483.8*	516.7***	1,477***	760.6***
	(270.3)	(288.2)	(289.8)	(184.5)	(202.4)	(183.2)
Yr. of Removal (d) x Trans Into Self-Employed, $1,000+ (d)	-1,058***	-418.2	-1.496	847.6***	1,102***	1,178***
	(286.8)	(298.9)	(292.7)	(191.7)	(201.4)	(192.1)
1+ Yrs. After Removal (d) x Trans Into Self-Employed, $1,000+ (d)	-1,655***	-1,430***	-1,182***	1,802***	2,623***	2,382***
	(209.6)	(216.6)	(213.9)	(147.0)	(150.5)	(141.5)
Transition Into Self-Employed (d)	1,731***	1,934***	1,507***	-8,960***	-3,902***	-2,516***
	(118.6)	(120.7)	(121.1)	(94.26)	(87.84)	(78.77)
2 Years Before Removal (d)	42.06	110.4**	283.2***	40.16*	-12.00	15.14
	(43.19)	(45.68)	(46.65)	(21.50)	(21.71)	(21.50)
1 Year Before Removal (d)	-36.63	86.06	279.4***	36.16	7.120	35.83
	(58.90)	(62.34)	(64.85)	(29.28)	(28.82)	(28.62)
Year of Removal (d)	-120.5	24.97	348.5***	19.74	31.14	70.09**
	(74.07)	(78.21)	(82.17)	(36.79)	(36.17)	(35.66)
1+ Years After Removal (d)	-469.6***	-291.8***	178.6*	15.44	-3.157	89.44**
	(91.25)	(96.37)	(101.6)	(45.19)	(44.66)	(44.55)
Individual Fixed Effects	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
Age and Tenure Controls	Y	Y	Y	Y	Y	Y
R-squared	0.181	0.082	0.040	0.055	0.010	0.005
Round N	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06	1.500e+06
N Indiv	220000	220000	220000	220000	220000	220000

*Notes: *** p<0.01, ** p<0.05, * p<0.1. (d) denotes an indicator variable that takes the values 0,1. Age and Tenure controls include quadratics in age and tenure.*

available at these longer horizons). Again, the sample passes the selection tests in all but one specification, indicating that the people who wait to start a business are not necessarily repeat entrepreneurs who had higher income 7 to 12 years ago before entering bankruptcy.

Overall, the results show that those who transition into self-employment have very similar levels of previous self-employed earnings (i.e., they are not people who have previously failed disproportionately or succeeded disproportionately at entrepreneurship in the past). These results suggest that they have similar prior levels of entrepreneurial talent. However, we cannot definitively rule out differences in unobserved talent.

Table A9: Measures of selection for those who transition into self-employment. Comparison of past labor earnings and past self-employed net income between those who transit into self-employment 1 and 2 years before flag removal versus those who transition into self-employment in the year of flag removal

	Difference in Labor Earnings X years ago between those who become SE 1 year before flag removal vs. those who wait until year of flag removal				**Difference in Self-Employed net income X years ago between those who become SE 1 year before flag removal vs. those who wait until year of flag removal**		
X=	**1 Year**	**2 Years**	**3 Years**		**1 Year**	**2 Years**	**3 Years**
Difference Labor Earnings	-391.9	242.1	551.4	Difference in Net Income	314.4	-350.5	451.9*
Std. Error	353.7	376.1	371.3	Std. Error	241.3	256.9	240.3
T-stat	**-1.11**	**0.64**	**1.49**	**T-stat**	**1.30**	**-1.36**	**1.88**
	Difference in Labor Earnings X years ago between those who become SE 2 years before flag removal vs. those who wait until year of flag removal				**Difference in Self-Employed net income X years ago between those who become Self-Employed 2 years before flag removal vs. those who wait until year of flag removal**		
X=	**1 Year**	**2 Years**	**3 Years**		**1 Year**	**2 Years**	**3 Years**
Difference in Labor Earnings	-757.5**	-81.29	646.7*	Difference in Net Income	172.1	-6.9	120.6
Std. Error	355.7	365.6	362.8	Std. Error	231.5	252.6	237.2
T-stat	**-2.13**	**-0.22**	**1.78**	**T-stat**	**0.74**	**-0.03**	**0.51**

*Notes: *** p<0.01, ** p<0.05, * p<0.1. Estimates based on Table A8 and calculations are explained in detail in the text.*

Table A10: Measures of selection for those who transition into self-employment. Comparison of 7 to 12 year lagged self-employed net income between those who transit into self-employment 1 and 2 years before flag removal versus those who transition into self-employment in the year of flag removal

	Difference in Self-Employed net income X years ago between those who become Self-Employed 2 years before flag removal vs. those who wait until year of flag removal					
X=	**7 Years**	**8 Years**	**9 Years**	**10 Years**	**11 Years**	**12 Years**
Difference in Net Income	-282.6	581.2	35.5	273.3	497.4	319.9
Std. Error	458.8	482.3	480.4	569.2	590.0	363.8
T-stat	**-0.62**	**1.21**	**0.07**	**0.48**	**0.84**	**0.88**
	Difference in Self-Employed net income X years ago between those who become SE 1 year before flag removal vs. those who wait until year of flag removal					
X=	**7 Years**	**8 Years**	**9 Years**	**10 Years**	**11 Years**	**12 Years**
Difference in Net Income	-139.6	-1264	936.9	-831.5	727.1	-339.3
Std. Error	509.1	1178	470.8	754	551.6	416.6
T-stat	**-0.27**	**-1.07**	**1.99**	**-1.10**	**1.32**	**-0.81**

*Notes: *** p<0.01, ** p<0.05, * p<0.1.*

I Earnings Among New Formal Sector Entrants

This appendix section examines the impact of bankruptcy flag removals on formal sector employment. Table A11 includes interaction terms between the dummies surrounding the bankruptcy flag removal and an indicator for whether the individual transitioned into formal-employment. The non-interacted dummies around flag removal can be interpreted as the effect of flag removal on labor earnings of non-transitioners, i.e., those who remain employed throughout the flag removal; those dummies show a slightly declining profile of earnings for non-transitioners.

The interaction terms in Table A11 illustrate that among individuals who transition into formal-employment, earnings rise significantly, and this increase is largely driven by the interaction of having a bankruptcy flag removed and simultaneously transitioning into a formal sector job. For example, Column (1) shows that individuals who transition into formal-employment 1 or more years after bankruptcy flag removal earn \$1,816 (= (4033-847)-(1459-89.74)) more than individuals who transition into formal-employment 2 years prior to bankruptcy flag removal. Relative to the sample average of labor earnings which is \$41.5k (see Table 4), these labor earnings gains represent a 4.3% increase.

Column (2) of Table A11 shows that those who transition into formal sector employment earn less from self-employment. This result intuitively makes sense, since the individual is taking a formal sector job, they have less time to devote to self-employment.

Column (3) of Table A11 looks at the sum of labor earnings and self-employment earnings. Column (3) shows that individuals who transition into formal-employment 1 or more years after bankruptcy flag removal have a total annual income that is \$1,696 (= (3726-870.7)-(1209-49.87)) more than individuals who transition into formal-employment 2 years prior to bankruptcy flag removal. Relative to the sample average of total income which is \$34.8k,

these gains are quite large, approaching 5% of the average individual's total income.

Table A11: Transitions into Formal-Employment: Earnings

	(1) Real Annual Labor Earnings	**(2)** Real Annual Self-Employed Net Income	**(3)** Real Annual Total Income (SE and Non-SE)
2 Years Before Removal (d)	-89.74**	39.87*	-49.87
	(44.94)	(22.45)	(48.18)
1 Year Before Removal (d)	-239.8***	11.64	-228.1***
	(62.11)	(29.39)	(65.74)
Year of Removal (d)	-381.2***	10.57	-370.6***
	(78.42)	(36.76)	(82.76)
1+ Years After Removal (d)	-847.1***	-23.63	-870.7***
	(96.50)	(44.79)	(101.7)
Transition into Formal-Employed, $1,000+ (d)	2,673***	-332.2***	2,341***
	(91.15)	(47.31)	(98.08)
2 Yrs. Before Removal (d) x Trans. into Formal-Employed, $1,000+ (d)	1,459***	-249.9**	1,209***
	(207.1)	(110.8)	(225.6)
1 Yr. Before Removal (d) x Trans. into Formal-Employed, $1,000+ (d)	2,013***	-455.0***	1,558***
	(215.0)	(117.5)	(235.6)
Yr. of Removal (d) x Trans. into Formal-Employed, $1,000+ (d)	2,695***	-140.5	2,554***
	(237.3)	(131.0)	(259.2)
1+ Yrs. After Removal (d) x Trans. into Formal-Employed, $1,000+ (d)	4,033***	-307.3***	3,726***
	(169.9)	(91.28)	(185.4)
Individual Fixed Effects	Y	Y	Y
Year Fixed Effects	Y	Y	Y
Age and Tenure Controls	Y	Y	Y
R-squared	0.126	0.004	0.100
No. Person-Yr Obs.	1.500e+06	1.500e+06	1.500e+06
No. of Indiv.	220000	220000	220000
Combined Coeff Diff 1+ Yrs & -2 Yrs	1,817	-121	1,696
Combined Coeff Diff Sig at 10%	Y	N	Y

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (d) denotes an indicator variable that takes the values 0,1. Age and Tenure controls include quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies. 'Combined Coeff Diff 1+ Yrs & -2 Yrs' compares the overall effect of transitioning 1+ years after flag removal to the overall effect of transitioning 2 years before flag removal.*

J Importance of Credit for Newly Self-Employed vs. Other Job Transitioners

This section compares the borrowing of the newly self-employed to individuals that are newly formally employed. It thus examines whether all job-transitioners are more likely to borrow, simply because they have earnings gains, or whether the newly self-employed rely particularly heavily on credit.[27] Thus, as another test of the importance of credit for the self-employed, Table A12 compares borrowing by those who transition into formal sector employment and those who transition into self-employment.

Recall that both sets of individuals realize income gains, ($991 for the new self-employed entrants after flag removal and $1,817 for the new formal-employed entrants after flag removal). Table A12 illustrates that those who transition into formal-employment after flag removal borrow $4,526 relative to those who transition prior to flag removal; however, the interaction terms are negative, indicating that formal transitioners are just like everyone else, and if anything, they borrow less than non-transitioners. In contrast, those who transition into self-employment after flag removal borrow $15,337 more relative to those who transition prior to flag removal. So even though self-employed entrants have smaller earnings gains than new formal-employment entrants after flag removal, the self-employed borrow much more heavily following flag removal, nearly ∼10k more. This evidence is consistent with the credit-access effect being an important for self-employment entrants.

[27] We thank Nawid Siassi for suggesting this exercise.

Table A12: Comparison of Total Borrowing by Newly Formal-Employed and Newly Self-Employed.

	(1) Total Balance		(2) Total Balance
	Formal Trans.		**Self-Empl Trans.**
2 Yrs. Before Removal (d) x Trans into **Formal-Empl**, $1,000+ (d)	-5,095***	2 Yrs. Before Removal (d) x Trans Into **Self-Empl**, $1,000+ (d)	6,422***
	(1,361)		(1,955)
1 Yr. Before Removal (d) x Trans into **Formal-Empl**, $1,000+ (d)	-1,600	1 Yr. Before Removal (d) x Trans Into **Self-Empl**, $1,000+ (d)	11,815***
	(1,453)		(2,011)
Yr. of Removal (d) x Trans into **Formal-Empl**, $1,000+ (d)	-6,143***	Yr. of Removal (d) x Trans Into **Self-Empl**, $1,000+ (d)	8,511***
	(1,616)		(2,162)
1+ Yrs. After Removal (d) x Trans into **Formal-Empl**, $1,000+ (d)	-6,555***	1+ Yrs. After Removal (d) x Trans Into **Self-Empl**, $1,000+ (d)	16,195***
	(1,164)		(1,594)
Transition into **Formal-Employed**, $1,000+ (d)	-1,976***	Transition Into **Self-Employed** (d)	-6,483***
	(536.2)		(790.1)
2 Years Before Removal (d)	9,234***	2 Years Before Removal (d)	8,809***
	(353.2)		(350.1)
1 Year Before Removal (d)	13,483***	1 Year Before Removal (d)	13,038***
	(478.8)		(475.3)
Year of Removal (d)	16,355***	Year of Removal (d)	15,800***
	(602.0)		(598.6)
1+ Years After Removal (d)	15,220***	1+ Years After Removal (d)	14,373***
	(729.9)		(728.1)
Individual Fixed Effects	Y	Individual Fixed Effects	Y
Year Fixed Effects	Y	Year Fixed Effects	Y
Age and Tenure Controls	Y	Age and Tenure Controls	Y
R-squared	0.105	R-squared	0.105
No. Person-Yr Obs.	1.500e+06	No. Person-Yr Obs.	1.500e+06
No. of Indiv.	220000	No. of Indiv.	220000
Combined Coeff Diff 1+ Yrs & -2 Yrs	4,526		15,337
Combined Coeff Diff Sig at 10%	Y		Y

*Notes: SE in parentheses. *** p<0.01, ** p<0.05, * p<0.1. (d) denotes an indicator variable that takes the values 0,1. Age and Tenure controls include quadratics in age and tenure. Fixed effects include individual fixed effects and year dummies. 'Combined Coeff Diff 1+ Yrs & -2 Yrs' compares the overall effect of transitioning 1+ years after flag removal to the overall effect of transitioning 2 years before flag removal.*

K Theoretical Framework

In this section we present an illustrative model to derive some simple tests of alternative theoretical explanations for the importance of credit discussed in Section 1. Consider an individual who works for 2 periods, $t = 1, 2$. Suppose the individual either has access to credit markets (G denotes good credit standing) or is bankrupt and has no access to credit markets (B denotes bad credit standing). In the first period, an individual must choose between searching for a formal sector job, F, which pays a fixed wage, or becoming self-employed, S, and earning risky income that varies with entrepreneurial ability. In bad standing, agents cannot borrow. In good standing, agents can borrow up to $\underline{b}$. Those that become self-employed invest in capital to produce in the first period. Let k denote capital, p_k the price of capital, δ the depreciation rate, and let $b < 0$ denote borrowing and $b > 0$ denote saving. In the second period, all individuals have the option of receiving fixed income w, while entrepreneurs have the additional option of continuing to run their business.

We assume the individual has initial wealth b and unknown entrepreneurial ability z (this ability can simply be interpreted as *relative* entrepreneur ability relative to wage work). Let $F(z)$ denote the distribution of entrepreneurial ability. Lets σ_z denote the variance of $F(z)$. We assume that entrepreneur ability is only revealed after entry into self-employment – thus initial wealth and credit market standing determine entrepreneurial entry. Let $V^{S,G}(z, b)$ be the value of an entrepreneur in good credit standing, $V^{F,G}(z, b)$ be the value of entering the formal sector in good credit standing, let $V^{S,B}(z, b)$ be the value of an entrepreneur in bad credit standing, and let $V^{F,B}(z, b)$ be the value of entering the formal sector in good credit standing. The beginning-of-life decision is to work or start a business:

$$\max_{\text{self-empl , formal-empl.}} \{ \int V^{S,G}(z, b) dF(z), V^{F,G}(z, b) \}$$

$$\max_{\text{self-empl , formal-empl.}} \{ \int V^{S,B}(z,b)dF(z), V^{F,B}(z,b) \}$$

We assume entrepreneurs face a working capital constraint (payments to capital cannot exceed cash-on-hand, $p_k k \leq b - qb'$), and a borrowing limit ($b' \geq \underline{b}$). Entrepreneurs choose borrowing b' and capital purchases k subject to these constraints. In the second period of life, the entrepreneur may stop operating the business and receive a fixed wage income w or continue to operate the business with undepreciated capital. Regardless of their decision, they sell undepreciated capital after production in the second period. Those who choose to start a business in good credit standing have a continuation value given by,

$$V^{S,G}(z,b) = \max_{b',k} u(c) + \beta u\Big(\max_{work,\ run\ firm} \{ w + p_k k(1-\delta) + b', z(k(1-\delta))^{\alpha} + p_k k(1-\delta) + b' \} \Big)$$

subject to

$$c + qb' \leq zk^{\alpha} - p_k k + b$$

$$p_k k \leq b - qb'$$

$$b' \geq \underline{b}$$

$$q = \frac{1}{1 + r_f}$$

Those who start a business in bad credit standing have a continuation value given by,

$$V^{S,B}(z,b) = \max_{b',k} u(c) + \beta u\Big(\max_{work,\ run\ firm} \{ w + p_k k(1-\delta) + b', z(k(1-\delta))^{\alpha} + p_k k(1-\delta) + b' \} \Big)$$

subject to

$$c + qb' \leq zk^{\alpha} - p_k k + b$$

$$b' \geq 0$$

$$p_k k \leq b - qb'$$

For those who search for a job, they face employment risk. The notation convention we use is to script continuation values with W for those who find a job, e.g. $V^{W,G}(z,b)$, and script continuation values with U for those who do not find a job, e.g. $V^{U,G}(z,b)$. Suppose their job finding rate is p^G with good standing and p^B with bad standing. The value of searching for a formal job in good credit standing is therefore given by,

$$V^{F,G}(z,b) = p^G V^{W,G}(z,b) + (1-p^G)V^{U,G}(z,b)$$

and for those in bad credit standing,

$$V^{F,B}(z,b) = p^B V^{W,B}(z,b) + (1-p^B)V^{U,B}(z,b)$$

Conditional on finding a job, the value of an agent in good standing is given by,

$$V^{W,G}(z,b) = \max_{b'} u(c) + \beta u(w+b')$$

subject to

$$c + qb' \leq w + b$$

$$b' \geq \underline{b}$$

Similarly, the value of an agent in bad standing is given by,

$$V^{W,B}(z,b) = \max_{b'} u(c) + \beta u(w+b')$$

subject to

$$c + qb' \leq w + b$$

$$b' \geq 0$$

Conditional on not finding a job, workers receive home production g. In the second period of life, they receive fixed wage income w. Therefore, the value in good standing is given by,

$$V^{U,G}(z, b) = \max_{b'} u(c) + \beta u(w + b')$$

subject to

$$c + qb' \leq g + b$$

$$b' \geq \underline{b}$$

Likewise, the value in bad standing is given by,

$$V^{U,B}(z, b) = \max_{b'} u(c) + \beta u(w + b')$$

subject to

$$c + qb' \leq g + b$$

$$b' \geq 0$$

K.1 Parameterization

We parameterize the model so that each period corresponds to 15 years. We set risk aversion $\sigma = 2$, annual depreciation to 10%, the risk free rate to 4% per annum (the corresponding annual household discount factor is $\beta = .96$), the wage rate and price of capital are set to

unity ($w = p_k = 1$), benefits replace 50% of lost income $g = \frac{1}{2}w$, the borrowing limit is equal to labor income in the second period, $\underline{b} = -1$. The production technology assumes a capital share of $\alpha = \frac{1}{3}$. We set the job finding rate to produce the average formal-employment rate among our sample of 78.2%. We set the job finding rate of the good types to 78.7%, which is .5% higher according to our estimates.

We assume $z \in \{z_L, z_H\}$, and that $F(z)$ is a symmetric distribution, i.e., $F(z)$ places equal density on $\{z_L, z_H\}$ with corresponding variance σ_z and that z_H and z_L are also symmetrically spaced around the mean $\bar{z}$, $\bar{z} = \frac{1}{2}z_L + \frac{1}{2}z_H$. We assume $\bar{z} = 2$. In the numerical examples below, we consider mean-preserving spreads of $F(z)$. Given symmetry, a mean preserving spread of $F(z)$ is simply an expansion of the support from (z_L, z_H) to $(z_L - \Delta, z_H + \Delta)$ for arbitrary Δ.

K.2 Model Predictions

The model yields three testable predictions. First, Figure 7 shows that conditional on the same initial wealth, startup rates are higher for those in good relative to bad credit standing. As the riskiness of entrepreneurship increases, the region in which individuals start a new business declines.[28]

Second, Figure 8 shows that conditional on the same initial wealth, new entrants who realize high entrepreneur ability borrow to finance capital purchases (the working capital constraint binds). For a symmetric mean-preserving spread $F^1(z)$ (with new support $[z_L^1, z_H^1]$) of $F(z)$ (with support $[z_L, z_H]$) such that $\sigma_z^1 > \sigma_z$, we must have $z_H^1 > z_H$, and our model implies $b'(z_H^1) < b'(z_H)$. In other words, new entrants who realize higher entrepreneur

[28]While not depicted here, at some point the value of z_L is so low that the individual buys near-zero capital (effectively shutting-down), and higher values of entrepreneurial income variance *increase* the region in which individuals enter entrepreneurship. The value of operating with zero-capital implies a lower-bound on payoffs to entrepreneurs.

ability borrow more. They do so in order to produce more, and thus their self-employment income is higher. This borrowing generates a *negative* covariance between net assets and self-employment income, or in other words, a positive covariance between borrowing (defined to be the negative of net assets) and self-employment income.

Third, Figure 9 shows that conditional on the same initial wealth, new entrants who realize low entrepreneur ability borrow to smooth consumption. For a symmetric mean-preserving spread $F^1(z)$ of $F(z)$ (thus $\sigma_z^1 > \sigma_z$), we must have $z_L^1 < z_L$, and our model implies $b'(z_L^1) < b'(z_L)$. In other words, new entrants who realize lower entrepreneur ability borrow more as well. They do so in order to smooth consumption. The lower the ability, the less they produce and the more they borrow. This borrowing generates a *positive* covariance between net assets and self-employment income, or in other words, a negative covariance between borrowing (defined to be the negative of net assets) and self-employment income.

We formally measure this correlation between ability and borrowing by solving the model under various mean-preserving spreads $F^j(z)$, and then considering the covariance between ability and borrowing across these model economies. Consider a sequence of mean-preserving spreads, $\{F^1, \ldots, F^j, \ldots, F^J\}$, where $\sigma_z^1 < \ldots < \sigma_z^j < \ldots < \sigma_z^J$, and thus $z_L^1 > \ldots > z_L^j > \ldots > z_L^J$ and $z_H^1 < \ldots < z_H^j < \ldots < z_H^J$. Let the corresponding borrowing decisions be denoted by $\{b'^{,j}(z_L^j)\}$. To measure the way ability interacts with borrowing, we consider the correlation of $\{z_L^j\}_{j=1}^J$ with $\{b'^{,j}(z_L^j)\}_{j=1}^J$.[29] As discussed above, we expect a positive covariance – lower values of z_L^j are associated with lower values of $b'^{,j}(z_L^j)$ since low-ability entrepreneurs must borrow to smooth consumption, and the lower their ability the more they have to borrow.

Table A13 reports the the covariance between realizations of z and borrowing for high and low ability individuals. Rows 1 and 3 show that for low ability individuals, there

[29] We compute $\text{Corr}([z_L^1, \ldots, z_L^J]', [b'^{,1}(z_L^1), \ldots, b'^{,J}(z_L^J)])$ and $\text{Corr}([z_H^1, \ldots, z_H^J]', [b'^{,1}(z_H^1), \ldots, b'^{,J}(z_H^J)])$.

is a positive correlation of .97 between ability and net assets, and a positive correlation of the same magnitude between self-employed income and net assets. Row 5 shows that the correlation of income and 'borrowing' (which we approximate by the negative of net assets, $-b^{\prime,j}$) has a negative correlation of -.97. This correlation suggests that if there are consumption smoothing motives due to bad realizations of self-employment income shocks, those with lower self-employed income should borrow more.

Rows 2 and 4 of Table A13 show that for high ability individuals, there is a negative correlation of -.61 between ability and net assets; since self-employed income is proportional to ability, the correlation between self-employed income and net assets has the same sign and magnitude. Lastly, row 5 shows that the correlation of income and 'borrowing' (which we approximate by the negative of net assets, $-b^{\prime,j}$) has a positive correlation of +.61. Thus, if debt is used for investing in the business, we expect a positive correlation between borrowing and self-employed income.

It is important to note that the 'cash-on-hand' constraint drives this correlation between the high ability realization and self-employed income. These type of working capital constraints are used often in the literature, and covenants imply strong links between the amount that can be borrowed and contemporaneous profitability. Modeling alternative collateral constraints in a dynamic setting with time-to-build is beyond the scope of this paper, but we posit that higher ability entrepreneurs should borrow to finance investment, yielding a similar positive covariance between self-employed income and consumer credit.

Figure 7: Startup Decision

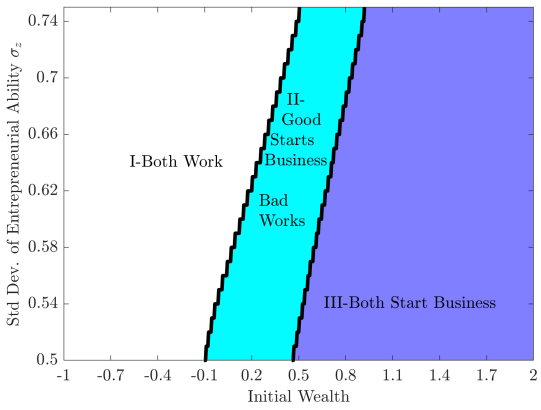

Figure 8: High ability entrepreneurs

Figure 9: Low ability entrepreneurs

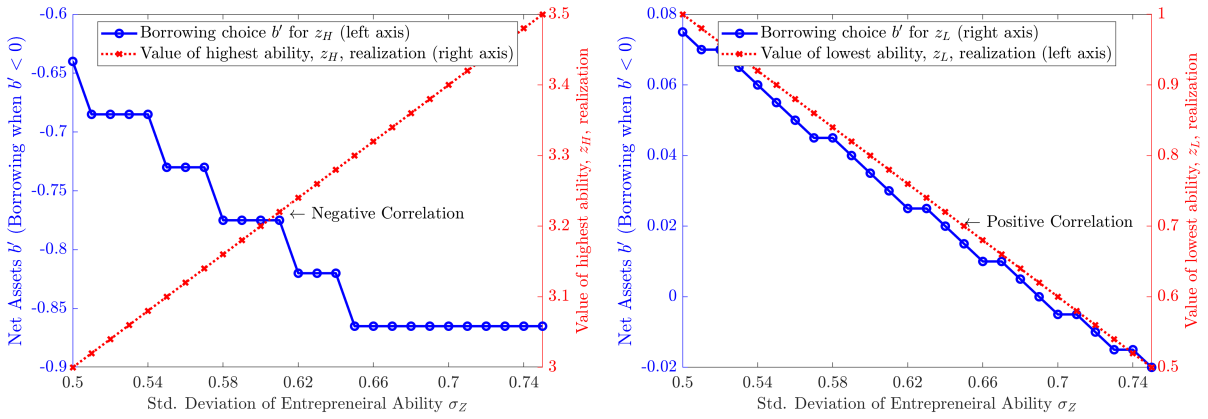

Table A13: Borrowing and self-employed income. Correlation between self-employed income and net assets as dispersion of $F(z)$ increases.

Description	**Correlation**
Correlation of net assets and ability z_L^j as σ_z varies, corr($b'^{,j}$,z_L^j)	+0.97
Correlation of net assets and ability z_H^j as σ_z varies, corr($b'^{,j}$,z_H^j)	-0.61
Corr. of net assets and self-empl. income for those with low realization z_L^j as σ_z varies, corr($b'^{,j}$,$z_L^j k^\alpha - p_k k$)	+0.97
Corr. of net assets and self-empl. income for those with high realization z_H^j as σ_z varies, corr($b'^{,j}$,$z_H^j k^\alpha - p_k k$)	-0.61
Corr. of borrowing (negative of net assets) and self-empl. income for those with low realization z_L^j as σ_z varies, corr(-$b'^{,j}$,$z_L^j k^\alpha - p_k k$)	-0.97
Corr. of borrowing (negative of net assets) and self-empl. income for those with high realization z_H^j as σ_z varies, corr(-$b'^{,j}$,$z_H^j k^\alpha - p_k k$)	+0.61

This table reports results from solving the model for each mean-preserving distribution F^j. Rows 1 and 2 compute the correlation of ability and net assets among low-z individuals across these model simulations, Corr($[z_L^1, \ldots, z_L^J]'$, $[b'^{,1}(z_L^1), \ldots, b'^{,J}(z_L^J)]$). Rows 3 and 4 compute the same correlation among high-z individuals, Corr($[z_H^1, \ldots, z_H^J]'$, $[b'^{,1}(z_H^1), \ldots, b'^{,J}(z_H^J)]$). Rows 5 and 6 replace net assets $b'^{,j}(\cdot)$ with the negative of net assets $-b'^{,j}(\cdot)$.