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What Drives Self-Employment Survival for Women and Men? Evidence from Canada

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Abstract This paper investigates the determinants of self-employment survival among women and men using the Canadian Survey of Labour and Income Dynamics. Survival is analyzed in the context of a single outcome (exiting self-employment) and in the context of multiple outcomes or competing risks (i.e. self-employment exit due to failure, versus non-failure exits). The largest detriment to survival for women is number of children. Whereas children improve survival rates for men. Non-participation in the labor force prior to starting a self-employment spell increases the probability of failure for women, but not men. Consistent with the liquidity constraint hypothesis, women who have personal wealth are less likely to exit self-employment. For women, this wealth effect does not depend on exit type. However, for men, the availability of personal wealth reduces the probability of exiting self-employment due to failure, but increases the probability of non-failure exits.

Keywords Self-employment · Gender · Credit constraints · Competing risks

JEL Classification J16 · J23

Introduction

Similar to the United States, self-employment rates in Canada are substantially lower for women than for men. In 2013, approximately 36 percent of the self-employed

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were women, a figure that has changed little since the 1980s.[1] Khun and Schuetze (2001) report that in 1998, only 7.77 percent of Canadian women were self-employed, relative to 11.05 percent of men. Moreover, exit rates are 27 percent higher for female self-employed over the 1981-1994 period in Canada.[2] Yet little is understood about what drives these gender differences in self-employment survival.

Some insight may be gained from the literature on gender differences in the credit market. For example, in 1994, the Canadian Federation of Independent Businesses report that women are 20 percent more likely to be refused financing than men, and those women who do obtain funds are charged higher interest rates.[3]

This paper contributes to the literature on self-employment by exploring the determinants of self-employment survival for men and women using the Canadian Survey of Labour and Income Dynamics (SLID). Given the large gender gap in business financing in Canada, I will focus substantial attention to the issue of liquidity constraints and personal funds. In particular, I introduce a new measure to proxy for liquidity constraints; I consider the non-linearity of the relationship between personal funds and self-employment survival; and finally, I investigate whether this relationship differs if one exits self-employment for personal reasons versus business failure. Estimation is carried out with proportional hazards analysis, and I address the concern of unobserved heterogeneity using two separate techniques.

The paper is organized as follows: the first section, "Liquidity Constraints and Other Factors Associated with Self-Employment Survival," briefly describes factors associated with self-employment survival in the literature; "Methodology" outlines the empirical methodology and proxies for liquidity constraints; "Data" describes the structure of the data; Regression results and sensitivity analysis are discussed in "Results"; "Discussion and Caveats" concludes.

Liquidity Constraints and Other Factors Associated with Self-Employment Survival

There is a large and growing empirical literature investigating whether liquidity constraints limit self-employment entry, and a somewhat smaller literature that considers

[1]During the 1980s approximately 30 percent of self-employed were women. Author's calculations using the Canadian Labour Force Survey.

[2]Lin et al. (2000) report separate ln(exit rate) of 3.178 for female and 2.936 for male self-employed.

[3]Several studies, in Canada and abroad, suggest that personal and business characteristics can explain most of this gender gap (e.g., Fabowale et al. 1995; Haines et al. 1999; Coleman 2000; and Blanchflower et al. 2003). However, there are two reasons to question the validity of these findings. First, the majority of these studies use survey data composed of business owners only. Such data cannot account for differences in rejection rates among individuals who applied for loans, but ended up not starting a business. Studies which use proprietary bank data, like Haines et al. (1999), may still be biased because, as Blanchflower et al. (2003) suggest, loan rejection gaps will be underestimated if minority (female) application rates are low from fear of rejection. As an example, Coleman (2000) finds that only 35 percent of female business owners applied for external funding, versus 45 percent of men. Evans and Jovanovic (1989) suggest that binding liquidity constraints can inhibit both entry and success in self-employment. Thus, poorer access to capital may be behind at least some of the gender differences in self-employment exit rates. Indeed, Fairlie and Robb, 2009 find that lower amounts of start-up capital among women can account for over 40 percent of the gender gap in business closure rates in the United States.

business survival. Across both the entry and survival literature personal wealth is typically used as a proxy for liquidity constraints because, in the presence of binding constraints, individuals with personal funds will be among the few that have sufficient capital to start and succeed in business. Several of the entry studies (e.g., Evans and Jovanovic 1989; Holtz-Eakin et al. 1994a; Fairlie 1999; Dunn and Holtz-Eakin 2000; Kan and Tsai 2006), find results consistent with liquidity constraints inhibiting self-employment entry. However, Hurst and Lusardi (2004) report that the positive association between wealth and capital disappears when one controls for the endogeneity of wealth. Among the studies on self-employment survival, Taylor (1999) finds an insignificant relationship between a proxy for wealth and self-employment duration for men and women, while Evans and Leighton (1989); Bates (1990); Holtz-Eakin et al. (1994b); and (Fairlie and Robb 2007, 2009), report evidence consistent with the theory that business survival is inhibited by the presence of liquidity constraints. Fairlie and Robb (2009) further estimate that differences in start-up capital can account for a substantial portion (over 40 percent) of the racial differences and gender differences in business closures in the United States.

In addition to capital, several other characteristics are associated with incidence and success in self-employment. For example, presence of children is a determining factor for self-employment selection among women (Hundley 2000), and Fairlie and Robb (2009) find that twice as many women report owning a business to manage family responsibilities, whereas a greater share of men own their business to have a primary source of income. Fairlie and Robb (2009) further note gender differences in the reasons for entering a business may be behind some of the male-female gap in business success.

Among the most influential characteristics associated with business survival versus failure are: age, education, capital, number of children, previous labor market experience (prior work experience, experience in a family business, business experience, unemployment, quitting one's previous job), industry, marital status, and urban versus rural location (e.g. See Bates 1990; Holtz-Eakin et al. 1994b; Taylor 1999; Lin et al. 2000; Fairlie and Robb 2009; Haapanen and Tervo 2009; Millán et al. 2010). Moreover, Fairlie and Robb (2009) find that major contributors to the higher rates of business failure among women (relative to men) are startup capital, prior work experience in a family business, prior work experience in a similar business, education and marital status. This study employs a similar set of covariates in the proportional hazards and competing risks analysis.

Methodology

Proportional Hazards Analysis

Duration analysis is carried out on a sample self-employment spells. Because I have precise data on spell start and end dates, I use a continuous time duration analysis, the Cox (1972) proportional hazard rate model, to investigate spell duration.

The hazard rate, $\lambda(t; X)$, is the conditional probability of spell end at time t, where t depicts the amount of time that has passed since the start of a job spell. In the proportional hazards model, observable characteristics, X, are assumed to affect a baseline probability of failure at an equal proportion for any time t. The model is thus:

$$\lambda(t; X) = \lambda_0(t)e^{X\beta} \quad (1)$$

where $\lambda_0(t)$ is the baseline hazard at time t, that is, the probability of exiting self-employment in time t, conditional on survival up to time t. Estimation involves a partial likelihood technique and, as such, the functional form of $\lambda_0(t)$ need not be specified. Thus, no restrictions are imposed on duration dependence. Rather than reporting coefficients, β, I report hazard ratios: $\exp(\beta)$. A positive coefficient, β, results in a proportional hazard contribution greater than 1; therefore a hazard greater than 1 indicates an increased probability of business exit. For example, a hazard ratio of 1.10 for a particular characteristic is interpreted as a ten percent increase in the probability of exit, at any time t, given a one unit increment of that characteristic. The variables in X include characteristics which are associated with business survival. Thus, X includes a proxy for liquidity constraint, indicator variables for age categories, marital status, previous labor force status, immigrant status, and home ownership, log(income), log(income)^2, tenure at previous job, tenure^2 number of self-employed in family, number of children under 15, the provincial unemployment rate, and region[4] and annual fixed effects. Values for these characteristics are recorded the year prior to the spell start.[5] This baseline specification is similar to that of Taylor (1999), with the exception that he includes education, industry, and involuntary job end, which I incorporate in the sensitivity analysis.

Sensitivity analysis includes both alternative specifications and estimation techniques. A discrete analogue to Cox proportional hazards, the Prentice and Gloeckler (1978) model is implemented to ensure that the assumption of continuous time does not affect the results. Further, I consider the sensitivity of these results to potential unobserved heterogeneity by including gamma distributed frailty in the Cox framework, and a discrete mixture distribution, recommended by Heckman and Singer (1984), in the Prentice and Gloeckler (1978) framework.[6] Alternative starting values for two mass points are considered in the discrete mixture model. Finally, I investigate duration by exit type in a competing risks framework, where competing risks are analyzed by treating all self-employment exits, other than the one being analyzed, as censored. (See Jenkins (2005) for a detailed discussion of competing risks models).

Liquidity Constraint Proxies

A common method used to ascertain the presence of liquidity constraints is to investigate the effect of wealth on self-employment outcomes. A positive coefficient on

[4]The regions are Eastern, Ontario, Quebec, Prairies, and BC. Ontario is omitted.

[5]One benefit of the panel data is that the values of explanatory variables can be taken from the year prior to a spell start, mitigating the issue of endogenous personal characteristics. If these values were taken during the spell and an exit probit performed, then business success could be determining both the characteristics and exit probability.

[6]I gratefully acknowledge the use of Jenkins (2006, 2008) code, hshaz and pgmhaz, and supporting documentation, to estimate the discrete models.

wealth is consistent with binding liquidity constraints. However, measures of wealth are not always available. In such cases, investment income is often used. Fairlie (1999), Georgellis and Wall (2005), Taylor (1999), Bruce (1999), and Cowling and Taylor (2001) all use investment income as a proxy for wealth (liquidity). Taylor (1999) and Cowling and Taylor (2001) use a binary cutoff rather than a linear format. Evans and Leighton (1989) subtract labor from total earnings, to obtain an estimate of capital income, while Holtz-Eakin et al. (1994b) impute asset holdings from investment income by assuming constant rates of interest. Both Fairlie (1999) and Holtz-Eakin et al. (1994b) note that investment income, as a proxy, may be noisy. The latter authors employ inheritance as a preferred proxy, while Fairlie (1999) uses cash payments (which include inheritances) in this regard. Hurst and Lusardi (2004), however, demonstrate that inheritances are not random events since the impact of an inheritance received after starting self-employment is as much a predictor as receiving an inheritance beforehand.

Theoretically a cut-off, rather than a continuous variable, is a reasonable measure. Once a person has sufficient capital to fund a business, additional capital should have little impact on ability to enter and succeed. As such, the first liquidity constraint proxy that I employ is a flag equaling one if an individual's own investment income is at or above \$200 annually. The cut-off of \$200 is chosen because it implies (at five percent interest) an amount of capital that is large enough to cover minimal start-up costs, \$4,000.[7] This cut off is also consistent with Taylor's (1999) wealth proxy, a flag for £100 in investment income.

Investment income includes (net of carrying charges): interest received on bonds, deposits and savings certificates, trust funds, estates, or other investment income, dividends, net rental income, as well as interest on mortgages, and loans. It also can include some income from partnerships and incorporated businesses, which is why it is essential that this variable be measured prior to the start of a business. Investment income does not include pension income, nor any support payments or scholarships. This measure is quite close with that used by Taylor (1999), Georgellis and Wall (2005) and Fairlie (1999).

As cited above, investment income may be a noisy measure of wealth. Moreover, neither wealth nor investment income is a perfect proxy for liquidity constraints.[8] For one, these proxies may be endogenous. Individuals with higher ability may succeed

[7] Hurst and Lusardi (2004) find that the lowest quantile of low capital industries start with an average of \$3,155. This information is derived from the National Survey of Small Business Finances (1987) and is converted to 1996 U.S. dollars. The equivalent amount in Canadian dollars is in the range of \$4,264.

[8] There are several different methods by which the literature measures liquidity constraints. Consistent with the literature I apply the term liquidity loosely as any measure of funds from which the individual may draw to start a business. Although liquidity and wealth are used interchangeably, it should also be noted that wealth measures are not entirely liquid. Wealth includes housing assets, which may be used as collateral, or sold for funds, but are not necessarily a preferred method for generating start-up capital. Moreover, liquidity and liquidity constraints have slightly different meanings. While ownership of liquidity implies the absence of constraints, a proxy for constraints need not be a quantitative measure of liquidity. For example, an alternative proxy for the presence of liquidity could be an indicator for withdrawal of retirement savings.

in both wealth accumulation and in self-employment survival. There are several additional concerns associated with the interpretation of the coefficient on the liquidity proxy. Cressy (1999) notes that a positive coefficient on wealth may be capturing risk aversion because higher wealth implies higher risk tolerance, which would increase the likelihood of riskier labor market choices. Furthermore, Treichel and Scott (1987) remark that women may have a preference to self-finance. This preference would generate a positive correlation between liquidity and self-employment, even in the absence of credit market constraints. Interpretation of gender differences in coefficients is also complicated. If the coefficient for men is zero, and the coefficient for women is positive, then results are consistent with the hypothesis that the liquidity constraint is binding for women, but not men. The interpretation is not straightforward if both sexes' coefficients are positive, even if one coefficient is significantly larger than the other.[9] The size of the coefficient indicates a magnitude of response, but does not necessarily identify the severity of the liquidity constraint itself.

In order to address all but the last of these issues, I employ a novel proxy for liquidity constraints: I construct an indicator variable which equals 1 if the person withdraws funds from their Registered Retirement Savings Plans (RRSPs). Unlike wealth, which represents an accumulated stock that is potentially correlated with ability, RRSP withdrawals are flows out of savings, and given the tax penalties involved, withdrawals are not likely to occur in the absence of a financial constraint. As discussed in Rybczynski (2013), approximately 65 percent of the population holds RRSPs. Moreover, one's own business is not an eligible RRSP investment. Thus, one must typically make a withdrawal to obtain RRSP funds for business. However, a major drawbacks of the RRSP proxy is that a relatively small fraction of the population makes an RRSP withdrawal in any given year. This low rate of withdrawal, coupled with the fact only a small fraction of individuals are self-employed, means that estimates will be based on the actions of a small number of observations. Thus, one must be cautious in using the results from this proxy to make inferences on the general population.

Data

I use Panel 1 (1993–1998) of the Canadian Survey of labor and Income Dynamics (SLID). I focus on the first panel because of the historically high sources of private funding during this period. Private funding and self-employment rates declined substantially after the dot-com bust in early 2000, and continued to fall for several years thereafter. Thus, the 1993–1998 period represents a rather stable period of easy access to credit, whereby if there is discriminatory lending, it is likely concentrated amongst marginalized groups. Moreover, RRSP contribution limits remained stable over this time period, and the absence of a recession during this time frame means that withdrawals are less likely to be made for income smoothing.

[9]However, Fairlie (1999), analyzing self-employment entry across race, interprets the larger positive coefficient estimate for blacks (relative to whites) as indicative that credit market discrimination may exist.

A major benefit to using the SLID is that it is a nationally representative, longitudinal survey, with detailed information on personal and job related characteristics for individuals (aged 15 and older), and their family. Information is collected for up to six jobs per year per person. The baseline sample is restricted to those who are over 20 at the start of the panel. Moreover, persons who are out of scope, or leave the panel due to institutionalization, or international migration are excluded. Because the numbers of self-employed are small, I drop observations for which data is missing, except when doing so would significantly diminish the sample. In such cases I include an indicator for the missing variables. Aside from stronger predicted associations and slightly lower statistical significance, results are not sensitive to this decision.

Duration analysis is carried out on self-employment job spells. Thus, each observation represents a self-employment job spell, not a person.[10] Individuals with more than one self-employment job spell will have more than one observation in this sample. As such, standard errors are adjusted by clustering on the person identifier. A job is categorized as self-employed if the reported class of worker is self-employed, incorporated or unincorporated, with employees or without.[11] Because I observe exact start and end dates in the SLID, I can retain multiple spells within the same year. Self-employment job duration is calculated as the difference between spell end and start dates. However, a fraction of spells do not end within the panel or have missing end dates (these are treated as right censored), and a fraction of spells start before 1993 or have missing start dates (these are treated as left censored).[12] Left censored spells are dropped, as is standard practice in the duration literature. Moreover, in order to observe the characteristics of the self-employed in period t-1, I only consider self-employment spells that start on or after 1994. Finally, home ownership information was not collected for 1993, so I extrapolate that those who owned a home in 1994 did so in 1993 as well. Results are not sensitive to these decisions.

The final sample of self-employment job spells contains 987 male and 734 female spells. I conduct robustness checks on alternative sample criterion, and results are substantively similar.

Results

Spell durations by gender are presented in Table 1. On average, female spells are shorter than male spells. This result is echoed in the Kaplan-Meier[13] survival

[10]However, the characteristics associated with a particular job, are the characteristics of the person in the year prior to the start of this specific job.

[11]I classify jobs by the respondents self-report; however, some self-employment may be less serious than others. Some entrepreneurs have multiple jobs, and have businesses lasting less than one month. Short spells cannot be distinguished as failures or planned contract work. As such, I do not pre-condition my measure of self-employment status on duration or success. This definition is similar, in spirit, to that of Hurst and Lusardi (2004).

[12]The majority of unknown ends occur at the termination of the Panel. However, 16–18 percent are truly unknown. Such ends may occur if subsequent interviewees deny the existence of a job (for example, a proxy respondent may not be aware of a job spell).

[13]The Kaplan-Meier curve, survivor function, shows the conditional probability of an agent surviving time t, given that they reach time t.

Table 1 Self-employment spell characteristics

	Male	Female
# individuals	804	637
# distinct self-employment spells	987	734
average spell duration (months)	13.31	12.09
% right censored	51	54
% exit by exit type		
exit family reasons	–	0.04
exit personal reasons	0.15	0.28
exit failure	0.23	0.50
exit voluntary	0.62	0.17

The column of exit types for female spells sums to 101 due to rounding. Gender differences are significant, at conventional levels, for the lower portion of the table

curves, depicted in Fig. 1. Note that survival time is scaled to months, rather than days, for ease of viewing. Women have slightly higher survival probabilities over the first few months of a job spell, but for all later months men have substantially higher survival probabilities. A log rank test for the equality of the survivor functions rejects gender differences in duration. Table 2 shows summary characteristics of self-employment spells by gender. Provincial unemployment rate, squared terms, missing value, industry, regional, and annual indicators are omitted for brevity. The

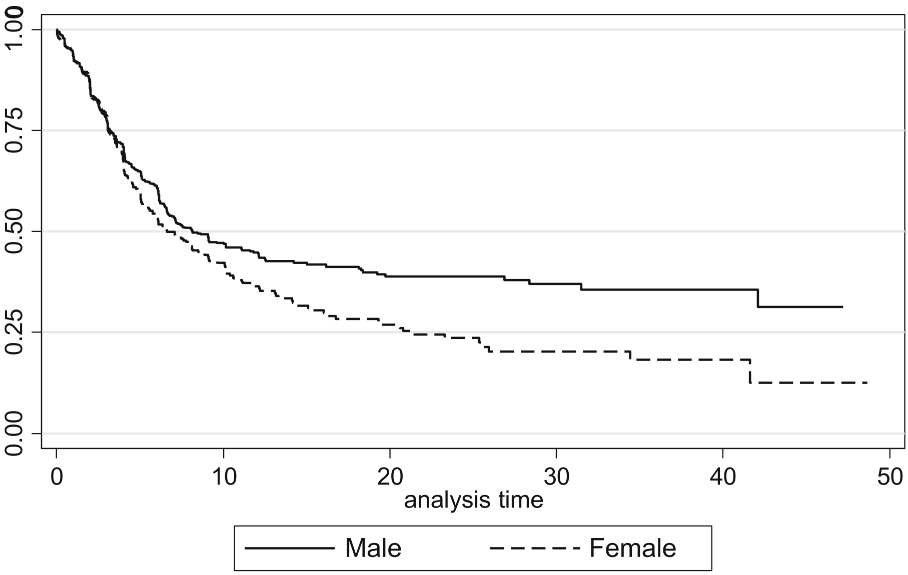

Fig. 1 Kaplan-Meyer survival curves by gender

Table 2 Sample characteristics (year prior to spell start)

	Male	Female
liquidity constraint proxies (indicators)		
investment income 200+	0.1601	0.1526
home ownership	0.7344	0.7007
rrsp withdrawal flag	0.0699	0.0490
age (indicators)		
age 23 to 29	0.1814	0.1907
age 30 to 44	0.4529	0.5041
age 45 to 54	0.1753	0.1540
age over 55	0.1125	0.0586
family details		
married (indicator)	0.7123	0.6826
# kids under 15	0.4245	0.4946
# self-employed in family	0.1692	0.2752
spousal self-employment (indicator)	0.0866	0.1894
labor force history		
unemployed full/part year (indicator)	0.3029	0.2616
not in labor force full/part year (indicator)	0.2432	0.2684
tenure	2.7110	1.8407
	(5.441)	(3.9309)
log income	9.6465	8.7283
	(1.7181)	(2.2254)
self-employment experience (indicator)	0.3688	0.3038
management experience (indicator)	0.2817	0.1989
involuntary end to last job (indicator)	0.0770	0.0545
worked at home (indicator)	0.1753	0.2629
full-time year prior (indicator)	0.7497	0.4905
unemployment insurance receipt (indicator)	0.3445	0.2302
education (indicators)		
high school graduate	0.1165	0.1335
some post secondary	0.1469	0.1689
certificate	0.3769	0.3869
bachelors	0.0669	0.1131
professional or graduate degree	0.0415	0.0450
#observations	987	734

Means are displayed (with standard deviations in brackets underneath for non-binary variables). Variables omitted from the table are: regional indicators, provincial unemployment rate, immigrant, and invalid response flags, industry and annual dummies. All displayed means have significant gender differences except the constraint proxies, ages 23 to 29 and 45 to 54, and education (except bachelors) values of characteristics are taken from the year prior to the start of the spell. Of note is that women in self-employment jobs spells are less likely than men to have high investment income, to own a home or to withdraw RRSPs prior to the start of the job.

Cox proportional hazard estimates for the baseline specification are reported in Table 3.[14] Rather than coefficients, the hazard ratio contributions are presented, due to the ease of interpretation. A value less than one indicates a negative impact on the hazard ratio, and thus a lower propensity to exit self-employment. The hazard rate contribution of 0.69 for investment income 200+ implies that those with over \$200 in investment income have a 31 percent lower probability of exit than those with less than \$200 in investment income. Because I report hazard ratios, and because their relationship with the coefficients is non-linear, P-values are presented rather than standard errors.

Estimating the proportional hazard model for each sex individually, I note that different characteristics correlate with male versus female survival probabilities. In particular, additional children and self-employed in family are associated with an increase in the probability of exit for women, but a decrease for men. Moreover, the hazard ratios on the liquidity proxy are distinct. Unlike Taylor (1999), I find results consistent with the credit constraint hypothesis for women. A self-employed woman who has \$200 or more in investment income, the year before she starts a self-employed spell, is associated with approximately 31 percent lower probability of exit. The same is not true for men. A self-employed man, with high investment income, faces a half percent greater probability of self-employment exit. Home ownership indicator variables are insignificant for both sexes.

I consider whether estimates on the liquidity constraint proxy are robust to alternative specifications, subsamples, and proxies. Table 4 presents this sensitivity analysis. The first row re-states the baseline specification estimates. In the second row, I present the hazard ratios for spells of unmarried observations only, since the financial resources of a married person may greater than their individual resources. However, I find that the hazard ratios for the unmarried subsample are not significant.

Industry Canada (2003) reports that new businesses are less likely to obtain commercial financing than existing firms. My results suggest the same. When I omit spells of those who were previously self-employed (those who would most likely have developed banking relationships) high investment income is even more strongly associated with survival for female spells. Female self-employment spells with high investment income have nearly a 60 percent lower probability of failure than those without high investment income. Moreover, this estimate is significantly different across the sexes.[15]

[14]Prior to inference using proportional hazard estimates, one should first confirm that the impact of characteristics is indeed constant (proportional). Two tests are run to consider the proportionality of the investment variable: plotting the observed against the predicted hazard, and plotting the -ln(-ln(survival)) curves at each value of the investment income 200+ flag. Adjusting for other covariates, both tests indicates that the proportional hazards is not violated.

[15]The benefits to more restrictive samples is that interpretation is cleaner on a more homogeneous sample. The drawback to restricted samples, and novel proxies for liquidity constraints as well, is that the samples can become quite small. In some cases, the sample may be too small to obtain precise estimates and the external validity of the results on small samples is questionable.

Table 3 Self-employment exits, by gender, Cox proportional hazard rate model

	Male	Female
liquidity constraint proxies (indicators)		
investment income 200+	1.005	0.6866**
	(0.973)	(0.036)
home ownership flag	0.8025	0.8743
	(0.150)	(0.431)
age dummies		
age 23 to 29	0.7753	0.6696*
	(0.194)	(0.073)
age 30 to 44	0.6940*	0.5423***
	(0.078)	(0.006)
age 45 to 54	0.5717**	0.6177*
	(0.015)	(0.081)
age over 55	0.6898	0.5522*
	(0.152)	(0.083)
family details		
married	0.7705	0.6865**
	(0.102)	(0.025)
# kids under 15	**0.8415***	**1.1857***
	(0.081)	(0.066)
# self-employed in family	0.8864	1.1343
	(0.294)	(0.291)
labor force history		
unemployed part/full year	1.227	0.9955
	(0.051)	(0.972)
not in labor force part/full year	1.0626	1.3873**
	(0.568)	(0.012)
tenure	0.9584*	0.9052**
	(0.091)	(0.011)
tenure^2	1.0009	1.0036**
	(0.192)	(0.042)
log(income)	1.0334	1.0174
	(0.719)	(0.823)
log(income)^2	0.9988	0.9974
	(0.868)	(0.681)
#observations	987	734
Log likelihood	−2988.99	−1953.75
LR Chi squared	169.64	171.80

Hazard ratio contributions presented with p-values in brackets underneath. Standard errors corrected by clustering on personid. Chi squared is a likelihood ratio test of all coefficients=0. Omitted from the table but included in the regression are indicators for immigrant status, region and annual fixed effects. *, ** and *** indicate statistical significance at the 0.1, 0.5 and 0.01 % levels respectively. Pooled regression with gender interaction on all covariates yields a pvalue of 0.113 on the gender*liquidity proxy interaction. Gender differences, significant at the 10 % level or better, are in bold

Table 4 Cox proportional hazards results on the liquidity constraint proxy, by gender, for alternative specifications, samples

Specification	Male	Female
Hazard ratios for investment income 200+, unless otherwise specified		
1. Baseline-Full Sample	1.005	0.6866**
[987 male, 734 female spells]	(0.973)	(0.036)
2. Unmarried only	1.2119	0.8462
[284 male, 233 female]	(0.399)	(0.564)
3. No Self-Employment Previous Year	**0.9313**	**0.4139*** **
[456 male, 433 female]	(0.741)	(0.003)
4. log(invest income)	0.9341*	0.9318*
[987 male, 734 female]	(0.076)	(0.092)
5. abs(invest income)	1.0110	0.9617*
[987 male, 734 female]	(0.538)	(0.066)
6. invest income 400+	0.9037	0.7399
[987 male, 734 female]	(0.498)	(0.131)
7. Second Specification ψ	1.0570	0.7357*
[987 male, 734 female]	(0.689)	(0.096)
8. restricted sample	0.9187	0.5040*
[401 male, 259 female]	(0.739)	(0.075)
9. Discrete	1.0013	0.6672**
[987 male, 734 female]	(0.993)	(0.044)
10. Heckman-Singer ψ	0.9855	0.6408**
[987 male, 734 female]	(0.945)	(0.040)
11. Frailty	0.9857	0.6679*
[987 male, 734 female]	(0.924)	(0.056)
Coefficients on RRSP withdrawal Flag		
12. RRSP withdrawal flag	1.0619	0.7663
[987 male, 734 female]	(0.729)	(0.392)

Hazard ratio contributions presented with p-values in brackets underneath. Sample size is in square brackets. Standard errors corrected by clustering on personid. Except as indicated, subsamples and covariates used are the same as in the baseline specification. ψ indicates use of alternative specification. The specification for row 10 is more parsimonious in order to to achieve convergence. *, ** and *** indicate statistical significance at the 0.1, 0.5 and 0.01 % levels respectively. Gender differences,significant at the 10 % level or better, are in bold

Alternative proxies, in the form of alternative investment income covariates (rows 4–6), are consistent with the liquidity constraint hypothesis, with the exception of investment income over \$400.[16] Similarly, estimates remain consistent with liquidity constraints when I include additional controls for education, industry, management and self-employment experience, involuntary end to last job, full-time, worked at home, spousal self-employment, spousal log income, and unemployment insurance receipt (row 7). In row 8, I consider whether estimates are robust to dropping spells with missing values, older and younger observations, as well as agricultural and professional workers (restricted sample), results are unchanged.

Although my duration data is at the daily level, daily is still inherently discrete. As such, I consider a discrete proportional hazard model popularized by Prentice and Gloeckler (1978). Results, in row 9, are similar to the continuous time model. I also estimate models with unobserved heterogeneity for both the continuous and discrete cases. For the continuous case, I use a gamma distributed frailty model, and for the discrete case, the Heckman and Singer (1984) approach (rows 10 and 11).[17] In both cases, the hazard ratio remains less than one and statistically significant for female spells. In other words, high investment income is associated with a lower probability of failure among women. Finally, in row 12, I report the estimated hazard ratio on the RRSP withdrawal indicator. The estimate for female spells is less than 1, but it not significant; however, such a result should not be surprising given the small sample of self-employed spells coupled with the small fractions that withdraw RRSPs. For example, in the base sample, only 36 female spells involve a withdrawal of RRSPs. Additional robustness tests include Cox proportional hazards regressions with alternative methods for ties (the Efron and exact methods), and the baseline specifications on a sample where I remove the restriction of spell starts after 1994. These results are omitted because the coefficients from these models were substantively similar with significant hazard contributions around 0.6–0.7 (on the liquidity proxy) for female spells. The ratios are typically over 1 and insignificant for male spells.

The final analysis in this paper is a consideration of self-employment duration by exit type. I use the competing risks categories employed by Taylor (1999), but further disaggregated. I divide business exits into three categories: failure, non-failure and personal. Failure includes self-employment job ends due to: going out of business, business slowdown, dismissal, movement of company and workplace conflict. The latter three purport to capture partnership issues. Non-failure is applied to those who find a new job or who will focus on another job (which may or may not be self-employment). Personal reasons include illness/disability, moving, school, and

[16] Because there is no reason to suppose that the amount of capital necessary to propel a person to become self-employed is the same amount of capital that would enable them to survive, I also test a lower cut off of \$100 in investment income. Hazard ratios are similar: larger than 1 for men, smaller than 1 for women, and both insignificant. Although the cell sizes are limited, I further test the non-linearity effect of liquidity on duration by using a series of investment income indicator variables. For the full sample, all categories are insignificant for men, while women have significant coefficients at 200–299 and over 5000. However, when missing values are dropped, the lower ranges 100, 200(peak for women) and 400 become more significant, and 5000 much less so.

[17] Jenkins' (2006) Hshaz and (2008) pgmhaz are used for the Heckman-Singer approach and for the discrete proportional hazards (Prentice-Gloeckler) model. Alternative specifications and starting values for two mass points are considered in the Heckman-Singer approach. Note that a reduced covariate list and a more aggregated baseline hazard (measured in one year intervals, merged for years 5 and 6) were necessary in order to estimate duration dependence as well as unobserved heterogeneity.

retirement. There are too few observations which indicate family related reasons for exit to include these as a separate category from "Personal."

The primary motivation for disaggregating analysis by exit type is that an individual whose business ends for personal reasons or due to a better job offer, should not be considered the same light as those who exit involuntarily. In the case of better job offers, optimal capitalization may even increase the probability of an exit from self-employment. Selling one's business and/or accepting an upper management position for a larger company are more probable if current business is successful. Exiting for personal reasons might also be positively correlated with liquidity (if wealth enables loose labor attachment). However, sufficient funds are likely to reduce exits when exit implies a non-voluntary business failure. Indeed, results, presented in Table 5, support this hypothesis among male spells. For involuntary or failure exits, investment income \$200+ reduces the probability of exit for both male and female spells, significantly so for the former. For non-failure exits, men with high investment income are significantly more likely to exit a self-employment job spell, women are not. Indeed, women's response to the liquidity proxy is similar across all exit types, suggesting that if the self-employment job provides at least sufficient earnings, women may not seek to use entrepreneurship to leverage salary. This interpretation is consistent with Cliff (1998) who suggests that women entrepreneurs typically prefer smaller businesses than men and do not seek growth beyond a fairly low threshold.

Table 5 Liquidity Constraint Proxy Hazard Contribution, by Gender and Exit Type

Exit type	Male	Female
Hazard ratios for investment income 200+		
all exits	1.005	0.6866**
	(0.973)	(0.036)
failure exits	0.4150**	0.5040
	(0.020)	(0.111)
non-failure exits	**1.3816****	**0.7833**
	(0.046)	(0.344)
personal reason exits	1.0371	0.8487
	(0.918)	(0.618)
# observations	987	734

Hazard ratio contributions presented with p-values in brackets underneath. Standard errors corrected by clustering on personid. Covariates are as in the baseline specification. *, ** and *** indicate statistical significance at the 0.1, 0.5 and 0.01 % levels respectively. Gender differences, significant at the 10 % level or better, are in bold

Discussion and Caveats

In sum, I find differences in the determinants of self-employment duration among Canadian men and women that are consistent with the work-family balance hypothesis and, to some extent, the liquidity constraint hypothesis. The probability of exiting a self-employment spell increases in the number of children for female spells, but decreases in the number of children for male spells. Being out of the labor force prior to spell start, is associated with a higher probability of failure for female spells, while the result for male spells is insignificant; however the gender difference in hazard ratios is not statistically significant. Evidence consistent with liquidity constraints is found using a series of proxies for personal capital. High levels of investment income are correlated with a lower probability of exit for female self-employment spells. While the hazard for the liquidity proxy is insignificant for men across most specifications. The gender difference is statistically significant for the sample that is restricted to those who were not previously self-employed. However, when I investigate duration by exit type, results support the credit constraint hypothesis for men as much as women, for the "failure" exit type. In the case of failure, high investment income is associated with a significant reduction in the probability of exit for male spells. Whereas investment income \$200+ correlates to an increase in exit rates to 'non-failure' outcomes for male spells, but not female spells, indicating that men may utilize self-employment to obtain better wage jobs, while women do not. Note that gender differences are only significant for the non-failure exit type.

This paper reports estimates consistent with the theory that female self-employment spell motivated by family responsibilities (children) may have lower rates of survival. Moreover, results are consistent with the hypothesis that removing liquidity constraints would increase female self-employment duration, regardless of exit type. For men, liquidity constraints also appear to inhibit business failure, but increase the conditional probability of non-failure exits. These results are apparent during the peak of small business lending, and as such represent conservative estimates.

One caveat is that caution should be applied in the interpretation of the investment income results. First, because the investment income variables are likely to suffer from endogeneity. Second, a positive correlation between wealth and self-employment may result from decreasing relative risk aversion instead of credit constraints. However, results with the alternative proxy, the RRSP withdrawal flag, suggest that risk aversion is not the entire story. A hazard ratio below one on the RRSP withdrawal flag suggests that many women withdraw funds prior to starting a business. The RRSP withdrawal flag cannot distinguish whether this estimate is picking up liquidity constrains or a preference to self-fund. Yet, whether the issue is credit constraints or a preference to self finance, one should note that both have at least one similar policy implication: improving access of credit to women can increase credit utilization even if the preference for self-financing is strong. Outreach and micro-credit programs could be effective, both in reducing constraints and in helping women become more comfortable with external funding.

References

Blanchflower DG, Levine PB, Zimmerman DJ (2003) Discrimination in the Market for Small Business Credit Market. Rev Econ Stat 85(4):930–943

Blanchflower DG, Oswald A (1998) What Makes an Entrepreneur? J Labor Econ 16(1):26–60

Bates T (1990) Entrepreneur Human Capital Inputs and Small Business Longevity. Rev Econ Stat 72(4):551–559

Bruce D (1999) Do Husbands Matter? Married Women Entering Self-Employment. Small Bus Econ 13(4):317–329

Buttner EH, Rosen B (1992) Rejection in the Loan Application Process: Male and Female Entrepreneur's Perceptions and Subsequent Intentions. J Small Bus Manag 30(1):58–65

Canadian Federation of Independent Business (1995). Financing Double Standard, Report. http://www.cfib.ca/research/reports/financin.asp, accessed July 27, 2006

Clain SH (2000) Gender Differences in Full-Time Self-Employment. J Econ Bus 52:499–513

Cliff JE (1998) Does One Size Fit All? Exploring the Relationship Between Attitudes Towards Growth, Gender, and Business Size. J Bus Ventur 13:523–542

Coleman S (2000) Access to Capital and Terms of Credit: A Comparison of Men- and Women-Owned Small Businesses. J Small Bus Manag 38(3):37–52

Cowling M, Taylor M (2001) Entrepreneurial Men and Women: Two Different Species? Small Bus Econ 16(3):167–175

Cox D (1972) Regression models and life tables (with discussion). Suppl J R Stat Soc B 34:187–220

Cressy R (1999) The Evans Jovanovic Equivalence Theorem and Credit Rationing: Another Look. Small Bus Econ 12:295–297

Dunn T, Holtz-Eakin D (2000) Financial Capital, Human Capital, and the Transition to Self-Employment: Evidence from Intergenerational Links. J Labor Econ 18(2):282–305

Evans DS, Jovanovic B (1989) An Estimated Model of Entrepreneurial Choice under Liquidity Constraints. J Polit Econ 97(4):808–827

Evans DS, Leighton LS (1989) Some Empirical Aspects of Entrepreneurship. Am Econ Rev 79(3):519–535

Fabowale L, Orser B, Riding A (1995) Gender, Structural Factors, and Credit Terms between Canadian Small Businesses and Financial Institutions. Entrepreneurship Theory and Practice 19(4):41–65

Fairlie RW (1999) The Absence of African American Owned Business: An Analysis of the Dynamics of Self-Employment. J Labor Econ 17(1):80–108

Fairlie RW, Robb AM (2007) Why Are Black-Owned Businesses Less Successful than White-Owned Businesses? The Role of Families, Inheritances, and Business Human Capital. J Labor Econ 25(2):289–323

Fairlie RW, Robb AM (2009) Gender differences in business performance. evidence from the Characteristics of business Owners survey Small business Economics, 33(4): 375–395. Springer

Georgellis Y, Wall HJ (2005) Gender Differences in Self-Employment. Int Rev Appl Econ 19(3):321–342

Haines G, Orser B, Riding A (1999) Myths and Realities: An Empirical Study of Banks and the Gender of Small Business Clients. Canadian Journal of Administrative Sciences 16(4):291–307

Haapanen M, Tervo H (2009) Self-employment duration in urban and rural locations. Appl Econ 41(19):2449–2461

Heckman J, Singer B (1984) A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models. Econometrica 52(2):271–320

Holtz-Eakin D, Joulfaian D, Rosen HS (1994a) Entrepreneurial Decisions and Liquidity ConstraintsRand. J Econ 25(2):334–337

Holtz-Eakin D, Joulfaian D, Rosen HS (1994b) Sticking it Out: Entrepreneurial Survival and Liquidity Constraints. J Polit Econ 102(1):53–75

Hundley G (2000) Male/Female Earnings Differences in Self-Employment: The Effects of Marriage, Children and the Household Division of Labor. Ind Labor Relat Rev 54(1):95–114

Hurst E, Lusardi A (2004) Liquidity Constraints, Household Wealth, and Entrepreneurship. J Polit Econ 112(2):319–347

Industry Canada (2003). SME Financing in Canada. http://www.ic.gc.ca/epic/site/sme_fdi-prf_pme.nsf/en/h_01565e.html. Accessed August 10, 2008

Jenkins SP (2005) Survival Analysis. Unpublished manuscript, Institute for Social and Economic Research, University of Essex, Colchester

Jenkins SP (2006) HSHAZ Stata module to estimate discrete time (grouped data) proportional hazards models. Statistical Software Components Series S444601, Boston College Department of Economics, Chestnut Hill

Jenkins S (2008) Estimation of discrete time (grouped duration data) proportional hazards models: pgmhaz. http://www.iser.essex.ac.uk/teaching/degree/stephenj/ec968/pdfs/STB-39-pgmhaz.pdf. Accessed May, 2008

Jianakoplos NA, Bernasek A (1998) Are Women More Risk Averse? Econ Inq 36(4):620–630

Kan K, Tsai W-D (2006) Entrepreneurship and Risk Aversion. Small Bus Econ 26:465–474

Khun P, Schuetze H (2001) Self-Employment Dynamics and Self-Employment Trends: A Study of Canadian Men and Women, 1982-1998. Can J Econ 34(3):760–784

Lin Z, Picot G, Compton J (2000) The Entry and Exit Dynamics of Self-Employment in Canada. Small Bus Econ 15(2):105–125

Moore CS, Mueller RE (2002) The Transition from Paid to Self-Employment in Canada: The Importance of Push Factors. Appl Econ 34(6):791–801

Millán J-M, Congregado E, Romn C (2010) Determinants of self-employment survival in Europe. Small Bus Econ 38(2):231–258

Prentice R, Gloeckler L (1978) Regression analysis of grouped survival data with application to breast cancer data. Biometrics 34:57–67

Prime Minister's Task Force (2003) The Prime Minister's Task Force on Women Entrepreneurs Report and Recommendations. http://sen.parl.gc.ca/ccallbeck/Canada_Prime_Ministers_Task_Force_Report-en.pdf. accessed February 18, 2014

Rybczynski K (2013) Self-Employment Entry: Revisiting the Question of Liquidity. SWO-RDC working paper #1361

Schuetze H (2005) The Self-Employment Experience of Immigrants in Canada. mimeo. University of Victoria. http://web.uvic.ca/hschuetz/immigse3.pdf. Accessed Sept. 13, 2006

Schuetze H (2006) Income Splitting among the Self-Employed. Can J Econ 39(4):1195–1220

Taylor M (1999) Survival of the Fittest? An Analysis of Self-Employment Duration in Britain. Econ J 109(March):140–155

Treichel MZ, Scott JA (1987) Women-Owned Businesses and Access to Bank Credit. Evidence from Three Surveys Since. Ventur Cap 8(1):51–67