Bank funding and the survival of start-ups

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Motivation 1

▶ Startups are important for growth, employment and innovation.

▶ Startups play an important competitive role in their industries.

▶ But...

    ▶ Startups fail at alarming rates.

    ▶ Startups lack credit history and reputation: hamper their ability to raise external financing.

Motivation 2

▶ At some point during their lives firms need to make investments for which they need access to external funding.

▶ What if banks are unable to extend credit or demand a high spread the next time they go for a loan?

▶ This uncertainty is critical for very young firms:

  ▶ It may lead them to make suboptimal investment decisions with long lasting effects.

  ▶ It can make them more unstable since they have not yet built protection to overcome adverse shocks.

  ▶ It may put them at a competitive disadvantage when compared to established firms.

Literature

From the literature on the causes of startups failure two ideas are particularly important for our paper:

▶ Decisions made at the formation stage of a firm cannot be reversed and can therefore dictate its performance for many years to come:

  ▶ MacDougal, Covin, Robinson and Herron (1994) find evidence that start-ups' survival depends on their initial business strategies.

  ▶ Geroski, Mata and Portugal (2010) focus on firms' entry size.

  ▶ Keeley and Roure (1990) focus on the degree of completeness of firms' management teams.

  ▶ Duchesneau and Gartner (1990) focus on firms' capitalisation.

▶ Startups information and incentive problems hamper their ability to raise all forms of external funding:

  ▶ Robb and Robinson (2012), show that startups rely more on bank funding than is usually conjectured.

This paper

- ▶ Investigates the importance of securing steady access to bank funding for startups survival.

- ▶ Considers stable funding: long-term loans and unused credit lines.

- ▶ Relies on survival analysis.

- ▶ Relies on a very rich database.

- ▶ Deals with endogeneity issues:

  - ▶ Focusing on firms' access to stable funding in their first year of activity (controlling for a wide range of factors affecting survival).

  - ▶ Using an instrumental variables approach (controlling reverse causality).

Baseline model

► Following Geroski, Mata and Portugal (2010), we first estimate a semiparametric discrete proportional hazard model:

$$\log \lambda(t|\mathbf{x}_t) = \lambda_0(t) + \beta \mathbf{x}_t$$

► The hazard rate is the probability that a start-up exits at time t conditional on having survived until time.

► We model the hazard rate as a function of a set of covariates X.

► The variable of interest is stable funding, measured by the sum of the unused amount in bank credit lines and long-term bank loans.

► We control for: start-ups leverage, size, ability to pledge collateral, liquidity, profitability, number of bank relationships, human capital and entry rate of the start-up's industry.

Dealing with endogeneity 1

Focusing on the effect of securing access to stable funding at birth:

▶ Including the set of covariates measured at date t=0 and rewriting

$$\log \lambda(t|\Delta\mathbf{x}_t, \mathbf{x}_0) = \lambda_0(t) + \beta\Delta\mathbf{x}_t + \theta\mathbf{x}_0 \tag{1}$$

▶ Testing the hypothesis that initial conditions matter is equivalent to testing H_0: $\theta = \beta$

▶ To assess whether the effects of initial conditions are transitory or permanent we allow the coefficient θ to change with time

$$\log \lambda(t|\Delta\mathbf{x}_t, \mathbf{x}_0) = \lambda_0(t) + \beta\Delta\mathbf{x}_t + \eta\mathbf{x}_0 + \delta t\mathbf{x}_0. \tag{2}$$

▶ To limit possible endogeneity problems driven by differences in firm quality, we also consider a duration model with unobserved heterogeneity.

Dealing with endogeneity 2

Instrumental variable approach: instrumenting stable bank funding with the duration of enforcement proceedings in the comarcas (jurisdictional areas)

▶ Using a two-stage procedure, in the first stage we estimate:

$$b_{it} = \beta_0 + \beta_1 ln(duration) + \gamma X_{it} + \alpha_i + \theta_t + \lambda_s + \phi_{mb} + u_{it} \qquad (3)$$

▶ In the second stage we estimate:

$$exit_{it} = \beta_0 + \beta_1 b_{it} + \psi u_{it} + \gamma X_{it} + \theta_t + \lambda_s + \phi_{mb} + u_{it} \qquad (4)$$

Data

Very rich datasets:

- Balance sheet information (IES)

    - New firms established in Portugal in the period 2005-2012 are identified using the founding year that they report in IES

    - A firm exits at time t if it is absent from IES at time $t + 1$ and $t + 2$

- Credit register data (CRC)

- Matched employer-employee data (QP)

- Data on the quality of judicial procedures

New firms and survival rates by cohort

Table: New firms and survival rates by cohort

	Cohort	Start-ups	Entry rate	Survival rates by life duration of the firm (in percentage)							
				1	2	3	4	5	6	7	8
2005	12,514	3.42	99	92	82	73	65	59	53	48	
2006	14,227	3.81	94	85	74	65	58	52	46		
2007	15,100	3.92	93	82	71	63	55	48			
2008	14,642	3.77	94	83	72	62	55				
2009	9,721	3.00	93	83	72	63					
2010	8,883	3.24	95	86	76						
2011	10,143	3.72	95	85							
2012	8,205	3.16	95								

Entry rate: number of new firms divided by the total number of firms (entrants plus incumbents)

Sample characteristics - over the entire period

Table: Sample characteristics - over the entire sample period

	(1) Start-ups that survive	(2) Start-ups that fail	(3) Difference	(4) t-stat
Bank debt/Total funding	0.2521	0.2573	-0.0052*	-2.31
LT bank debt/Total funding	0.1209	0.0993	0.0216***	12.83
Credit lines/Total funding	0.0332	0.0256	0.0076***	13.46
Stable bank funding/Total funding	0.1541	0.1249	0.0292***	16.41
ST bank debt/Total funding	0.1312	0.1580	-0.0268***	-15.69
Debt/Total assets	0.1866	0.2361	-0.0495***	-24.89
ln turnover	11.4513	10.7768	0.6745***	72.30
Fixed assets/Total assets	0.2499	0.1990	0.0509***	31.55
Ebit margin	-0.1652	-0.5385	0.3733***	75.54
Cash/Total assets	0.1490	0.1479	0.0011	0.87
No. banks	1.1652	1.1958	-0.0306***	-3.42
Entry rates	0.0568	0.0574	-0.0006**	-2.72
College	0.1649	0.1275	0.0374***	14.53

Sample characteristics - at founding year

Table: Sample characteristics - at founding year

|	(1) Start-ups that survive	(2) Start-ups that fail	(3) Difference	(4) t-stat
Bank debt/Total funding	0.1551	0.1830	-0.0279***	-11.64
LT bank debt/Total funding	0.0655	0.0505	0.0150***	9.61
Credit lines/Total funding	0.0216	0.0218	-0.0001	-0.23
Stable bank funding/Total funding	0.0871	0.0723	0.0149***	8.87
ST bank debt/Total funding	0.0896	0.1324	-0.0429***	-21.93
Debt/Total assets	0.1275	0.1118	0.0156***	7.97
ln turnover	10.7310	10.4241	0.3069***	27.62
Fixed assets/Total assets	0.2513	0.2176	0.0337***	18.35
Ebit margin	-0.3151	-0.5624	0.2474***	29.76
Cash/Total assets	0.1759	0.1504	0.0255***	16.72
No. banks	0.5471	0.6424	-0.0953***	-15.41
Entry rates	0.0625	0.0694	-0.0069***	-23.49
College	0.1650	0.1278	0.0372***	13.26

Bank funding and firm survival

Figure: Kaplan-Meier survival function by current bank financing position.
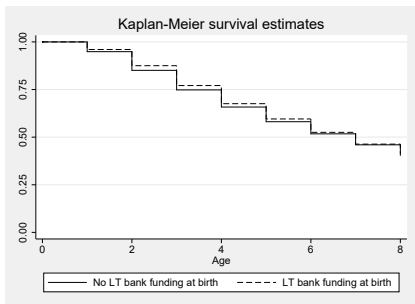
(A) Current long-term bank debt
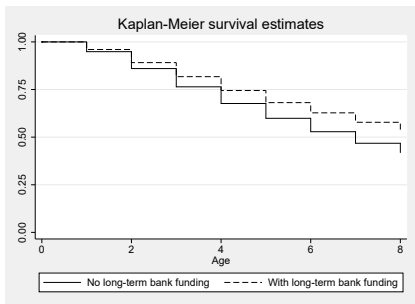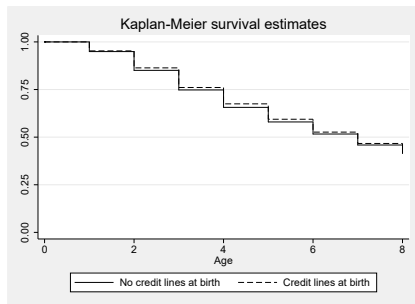

(B) Current credit lines
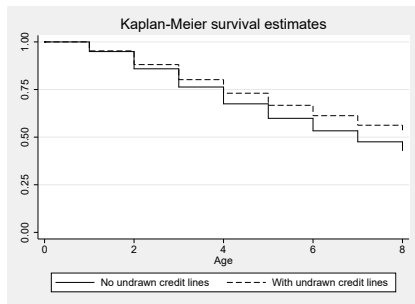
Bank funding at founding and firm survival

Figure: Kaplan-Meier survival function by bank financing position at birth.

(A) Long-term bank debt at birth

(B) Credit lines at birth

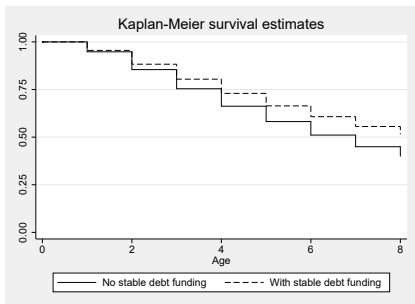Luísa Farinha, Sónia Félix, João Santos   Bank funding and the survival of start-ups

Bank funding and firm survival

Figure: Kaplan-Meier survival function by access to stable bank financing.

(A) Current stable bank debt
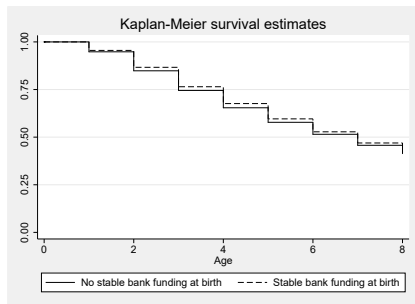
(B) Stable bank debt at birth

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Table: Determinants of start-ups' probability of exit: current conditions

	(1) Exit	(2) Exit
Stable funding/ Total funding	-0.6600***	
	(0.0445)	
LT bank debt/Total funding		-0.5717***
		(0.0460)
Credit lines/Total funding		-1.3513***
		(0.1198)
ST bank debt/Total funding	-0.1616***	-0.1438***
	(0.0384)	(0.0385)
Debt/Assets	0.4057***	0.3802***
	(0.0348)	(0.0353)
ln turnover	-0.3982***	-0.3961***
	(0.0105)	(0.0105)
Fixed assets/Total assets	-1.2612***	-1.2853***
	(0.0525)	(0.0526)
Ebit margin	-0.1780***	-0.1792***
	(0.0108)	(0.0108)
Cash/Total assets	-0.0039	0.0005
	(0.0621)	(0.0620)
No. banks	0.1894***	0.1902***
	(0.0084)	(0.0084)
Entry rates	1.3023***	1.3295***
	(0.3383)	(0.3375)
College	-0.3770***	-0.3707***
	(0.0414)	(0.0414)
ln Time	0.1659***	0.1617***
	(0.0216)	(0.0216)
constant	-0.5438**	-0.5543**
	(0.2196)	(0.2197)
N	157,018	157,018

TABLE: Determinants of start-ups' probability of exit: initial conditions, current conditions, and decay

	(1) Exit	(2) Exit	(3) Exit	(4) Exit
Stable funding/Total funding_0	-0.5911***		-0.5098***	
	(0.0638)		(0.1007)	
Decay Stable funding/Total funding_0			-0.0753	
			(0.0896)	
Δ Stable funding/Total funding_0	-0.6835***		-0.6623***	
	(0.0588)		(0.0622)	
LT Bank debt/Total funding_0		-0.4671***		-0.3979***
		(0.0726)		(0.1117)
Decay LT Bank debt/Total funding_0				-0.0602
				(0.1077)
Δ LT Bank debt/Total funding		-0.6050***		-0.5824***
		(0.0620)		(0.0648)
Credit lines/Total funding_0		-1.2564***		-1.1523***
		(0.1427)		(0.1962)
Decay Credit lines/Total funding_0				-0.0936
				(0.1494)
Δ Credit lines/Total funding		-1.3694***		-1.3427***
		(0.1512)		(0.1608)
ST Bank debt/Total funding_0	-0.1370**	-0.1079*	-0.1268	-0.1002
	(0.0557)	(0.0566)	(0.0839)	(0.0849)
Decay ST Bank debt/Total funding_			0.0087	0.0080
			(0.0789)	(0.0801)
Δ ST Bank debt/Total funding	-0.1785***	-0.1604***	-0.1207**	-0.1027*
	(0.0533)	(0.0534)	(0.0569)	(0.0569)
p-values under the null hypothesis $H_0 : \beta = \theta$				
Stable funding/Total funding	0.1007		0.1772	
LT bank debt/Total funding		0.0532		0.1422
Credit lines/Total funding		0.1509		0.3534
ST bank debt/Total funding	0.4451	0.3445	0.9506	0.9800
No. of observations	113,871	113,871	113,871	113,871

Table: Bank funding and the survival of start-ups

	(1) Stable funding/Total funding	(2) Exit
ln Duration	-0.0202***	
	(0.0043)	
Stable bank funding/Total funding		-5.4164***
		(1.6874)
ST Bank debt/Total funding	-0.5018***	-2.5531***
	(0.0040)	(0.8490)
Debt/Assets	0.2151***	1.4313***
	(0.0063)	(0.3659)
ln turnover	-0.0090***	-0.4422***
	(0.0016)	(0.0193)
Fixed assets/Total assets	0.1474***	-0.5554**
	(0.0074)	(0.2594)
Ebit margin	0.0098***	-0.1304***
	(0.0018)	(0.0197)
Cash/Total assets	0.0734***	0.3388**
	(0.0071)	(0.1422)
No. banks	0.0384***	0.3737***
	(0.0010)	(0.0650)
Entry rates	-0.0494	0.9391***
	(0.0388)	(0.3304)
College	0.0090	-0.3387***
	(0.0061)	(0.0457)
ln Time	-0.0057	0.1403***
	(0.0046)	(0.0227)
1st stage residuals		4.7607***
		(1.6869)
constant	0.2357***	0.1885
	(0.0316)	(0.3656)
Firm FE	Yes	No
No. of observations	154,632	154,632
Adj. R^2	0.381	

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Main conclusions

▶ Start-ups with more access to stable bank funding survive longer: certainty about access to funding has value.

▶ The above conclusion does not derive from banks giving stable funding to start-ups that are better in ways we do not observe.

▶ The conclusion holds for stable funding obtained at birth, when it is more difficult for banks to identify winners.

▶ The importance of accessing stable funding at birth does not vanishes as the firm gets older.

▶ Bank monitoring of their debtors is not the main driver of these results: we do not find similar results for the effect of short-term loans.

Table: Bank funding and start-ups' probability of exit: restricted sample

	(1) Exit	(2) Exit	(3) Exit	(4) Exit
Stable funding/Total funding_0	-0.5496***		-0.5024***	
	(0.0703)		(0.1112)	
Decay Stable funding/Total funding_0			-0.0283	
			(0.0990)	
Δ Stable funding/Total funding_0	-0.6360***		-0.5982***	
	(0.0649)		(0.0686)	
LT Bank debt/Total funding_0		-0.4376***		-0.4041***
		(0.0792)		(0.1227)
Decay LT Bank debt/Total funding_0				-0.0080
				(0.1183)
Δ LT Bank debt/Total funding		-0.5830***		-0.5435***
		(0.0683)		(0.0713)
Credit lines/Total funding_0		-1.0942***		-1.0482***
		(0.1568)		(0.2160)
Decay Credit lines/Total funding_0				-0.0250
				(0.1653)
Δ Credit lines/Total funding		-1.1667***		-1.1160***
		(0.1662)		(0.1771)
ST Bank debt/Total funding_0	-0.1334**	-0.1065*	-0.1234	-0.0999
	(0.0615)	(0.0624)	(0.0927)	(0.0937)
Decay ST Bank debt/Total funding_0			0.0178	0.0186
			(0.0872)	(0.0883)
Δ ST Bank debt/Total funding	-0.1614***	-0.1489**	-0.0948	-0.0821
	(0.0592)	(0.0592)	(0.0632)	(0.0633)
	p-values under the null hypothesis $H_0 : \beta = \theta$			
Stable funding/Total funding	0.1618		0.4428	
LT bank debt/Total funding		0.0585		0.3120
Credit lines/Total funding		0.4050		0.7654
ST bank debt/Total funding	0.6423	0.4891	0.7935	0.8712
No. of observations	90,760	90,760	90,760	90,760

TABLE: Determinants of start-ups' probability of exit: accounting for unobserved heterogeneity

	(1) Exit	(2) Exit	(3) Exit	(4) Exit
Stable funding/Total funding_0	-0.6239*** (0.0675)		-0.5342*** (0.1068)	
Decay Stable funding/Total funding_0			-0.1238 (0.0967)	
Δ Stable funding/Total funding_0	-0.7026*** (0.0610)		-0.7069*** (0.0669)	
LT Bank debt/Total funding_0		-0.4880*** (0.0765)		-0.4070*** (0.1185)
Decay LT Bank debt/Total funding_0				-0.0935 (0.1170)
Δ LT Bank debt/Total funding		-0.6254*** (0.0643)		-0.6257*** (0.0697)
Credit lines/Total funding_0		-1.3225*** (0.1490)		-1.2425*** (0.2078)
Decay Credit lines/Total funding_0				-0.1351 (0.1584)
Δ Credit lines/Total funding		-1.4105*** (0.1564)		-1.4212*** (0.1709)
ST Bank debt/Total funding_0	-0.1431** (0.0586)	-0.1108* (0.0597)	-0.1276 (0.0896)	-0.0963 (0.0908)
Decay ST Bank debt/Total funding_0			0.0071 (0.0853)	0.0095 (0.0867)
Δ ST Bank debt/Total funding	-0.1919*** (0.0554)	-0.1736*** (0.0555)	-0.1407** (0.0616)	-0.1211** (0.0617)
p-values under the null hypothesis $H_0 : \beta = \theta$				
Stable funding/Total funding	0.1865		0.1503	
LT bank debt/Total funding		0.0677		0.1020
Credit lines/Total funding		0.2949		0.4081
ST bank debt/Total funding	0.3968	0.2869	0.9014	0.8165
LR gamma variance (*p*-value)	0.0011	0.0007	0.0000	0.0000
No. of observations	113,871	113,871	113,871	113,871