

Household Debt Overhang and Human Capital Investment

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Motivation

- Human capital is inseparable from the household at default (Hart and Moore, 1994).
- Different from labor supply, human capital investment allows households to generate incremental income after default by utilizing their acquired knowledge and skills.
- The preserved value of human capital investment after default thus makes it more resilient to "debt overhang" compared with labor supply.

Key Takeaways

- Individual incentives to acquire labor skills is hump-shaped with respect to the level of household leverage
 - Decreasing marginal utility*
 - At a high level of household leverage, a larger fraction of its income accrues to creditors and its overall level of consumption declines. In this case, the marginal utility of consumption rises and the benefit of increasing human capital in order to raise consumption grows.
 - Effort in skills acquisition is *increasing* in household leverage
 - Debt overhang*
 - A transfer of wealth from households to lenders
 - Effort in skills acquisition is *decreasing* in household leverage
- Labor supply exhibits a similar hump-shape with respect to household leverage – reflecting the interplay of decreasing marginal utility and debt overhang, yet with notable differences.
 - Labor supply generates transitory income, thus no additional benefits accrue to the household once it is used to pay creditors.
 - Compared to skills acquisition, labor supply faces greater wealth transfer from households to lenders, making it more susceptible to debt overhang.
 - This distinction results in an earlier and more pronounced decline in the supply of labor as households approach default – that is, labor supply begins to drop at a much lower level of household leverage, and it drops at a faster rate than skills acquisition.
- When skills depreciate quickly, that is, when the payoffs of skills acquisition are concentrated in the shorter term, leaving little value in the future – just like the case of transitory income from labor supply, the pattern of skills acquisition with household leverage converges to that of labor supply. In such a case, the two actions resemble each other in terms of their low resilience to debt overhang.
- Importantly, labor supply and human capital investment are inter-temporally linked.
 - A "back-propagation" effect: the sharp decay of labor supply feeds back into households' skills acquisition
 - Because skills acquisition increases households marginal productivity, this effort is only valuable if households anticipate supplying labor in the future
 - As such, we find that when labor supply is expected to collapse at high levels of leverage, it brings down households' incentive to acquire labor skills in the first place

Model

- A household's life-time utility from consumption, skills acquisition, and labor supply, $\{C_t, a_t, l_t\} \geq 0$, is given by

$$\mathbb{E} \left[\int_0^{\infty} e^{-\delta t} u(C_t, a_t, l_t) dt \right],$$

- Different from risk-neutral corporations (thanks to diversification), a typical household is assumed to be risk-averse. For tractability, we assume logarithmic consumption preferences and quadratic cost of skills acquisition and labor supply such that per-period utility is given by:

$$u(C, a, l) = \log C - g(a, l), \quad \text{where} \quad g(a, l) = \theta_a \frac{a^2}{2} + \theta_l \frac{l^2}{2} + \theta_{al} al.$$

- Denote $K_t \geq 0$ as the hourly labor income per-period. The dynamics of K are given by the (controlled) geometric Brownian motion (GBM) process:

$$dK_t = K_t[(a_t - \rho)dt + \sigma dB_t],$$

- The total wages W_t are the product of hourly income and the number of working hours:

$$W_t = l_t K_t.$$

- Initially, households have complete access to credit markets, and can borrow and save at the risk-free rate $r > 0$ in order to smooth consumption. Household savings S_t evolve according to:

$$dS_t = (rS_t - C_t + W_t)dt \text{ if } t \leq \tau,$$

$$S_t = 0 \text{ if } t > \tau.$$

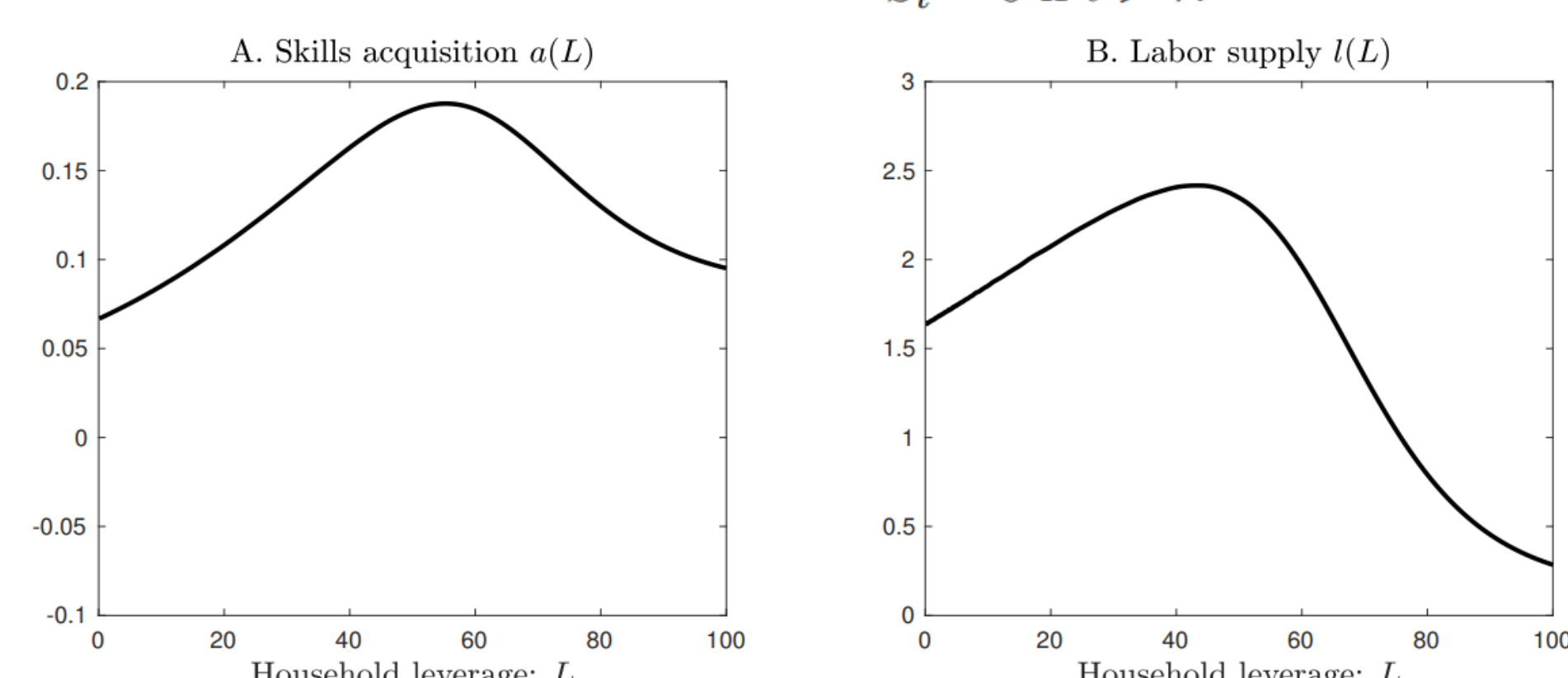


Figure I: Effort in skill acquisition and household scaled value function. Parameter values are $\delta = 0.05, r = 0.06, \theta_a = 300, \theta_l = 3, \theta_{al} = 0, \rho = 0.1, \sigma = 0.3$.

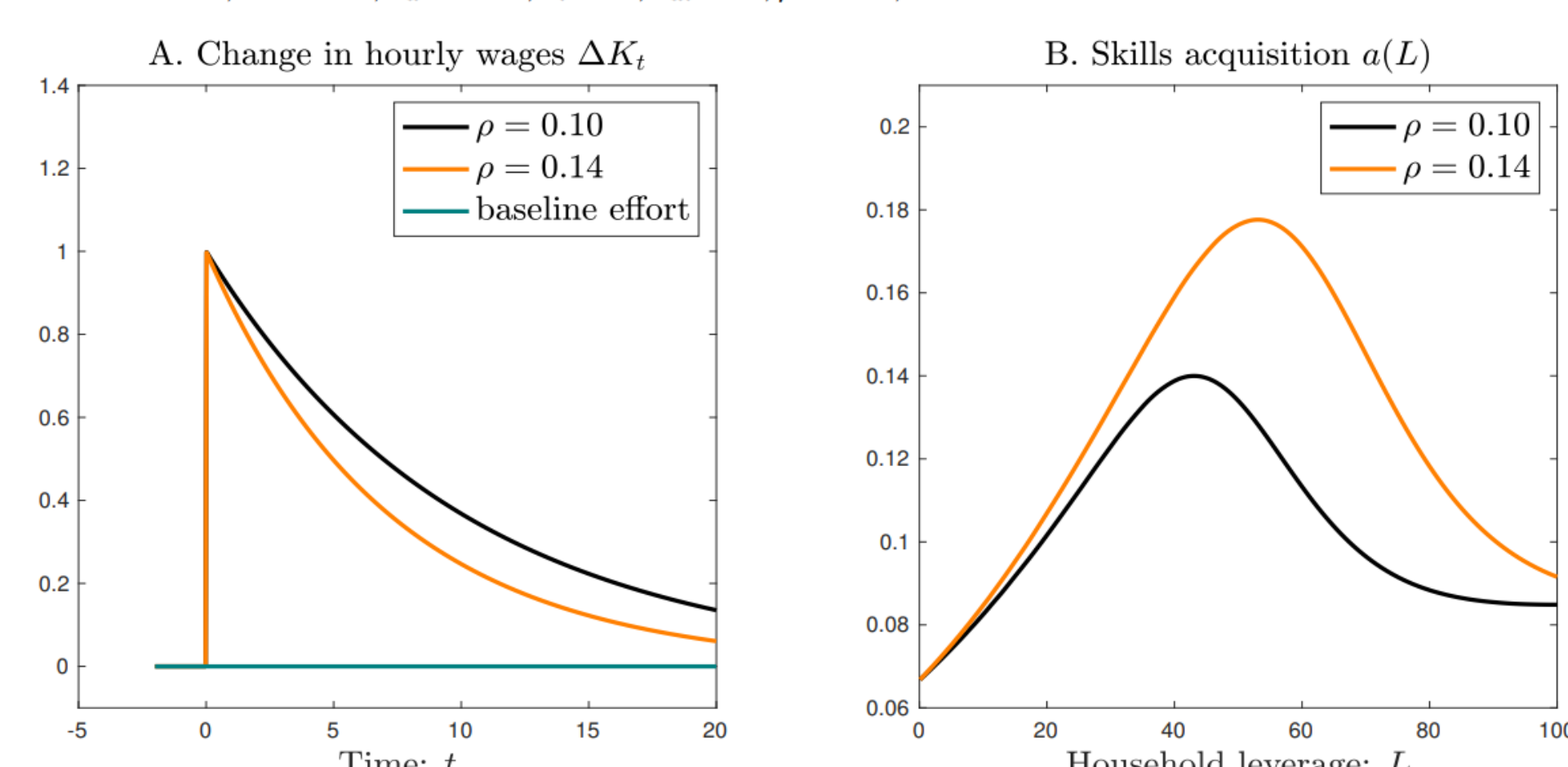


Figure III: Comparative statics with respect to depreciation rate of labor skills parameter ρ and to hourly wage volatility σ . Other parameter values are $\delta = 0.05, r = 0.06, \theta_a = 300, \theta_l = 3, \theta_{al} = 0, \sigma = 0.3$.

Data and Variable Construction

- The 1979 National Longitudinal Survey of Youth (NLSY79) and the restricted-use NLSY Geocode files
 - Tracts 12,685 American youth aged between 14-22 years old in 1979
 - Annually from 1979-1994 and Biennially from 1996-2014
 - Family background, education and employment history, job training information, household balanced sheet, and geographical information
 - Main sample: 50,697 observations on 6,729 respondents from the survey year of 1991 to 2014.
- Training: whether an individual requested and participated in training that is paid by employer or government
- Total leverage: ratio of total debt to total asset
 - Total debt: mortgage debt, auto loan, credit card debt, etc.
 - Total asset: market value of house and cars, amount of saving, amount of financial asset (e.g. stock, bonds), etc.
- Control variables: age, gender, ethnic group, wage, family income, education, parent's education, industry, occupation, region of residence

Empirical Results

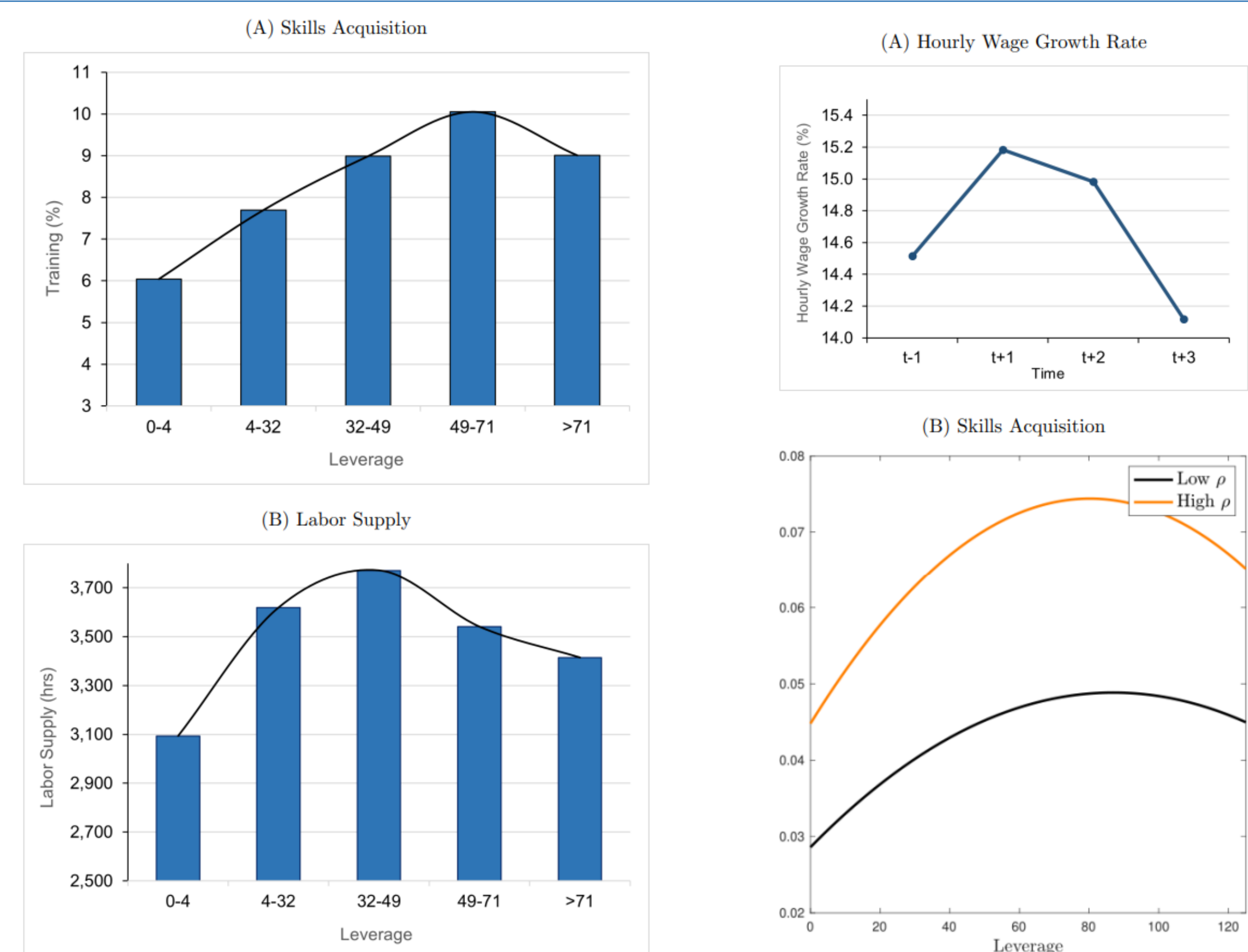


Figure 2: Skills acquisition and labor supply over leverage

Figure 4: Heterogeneity with respect to the degree of skills depreciation

Table 2: Baseline regressions of household leverage and labor skills acquisition

Dep. Var.	Linear Probability Regression					Poisson Linear Regression				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Leverage (β_1)	0.0985*** (12.36)	0.0617*** (7.10)	0.0613*** (7.02)	0.0604*** (6.89)	0.0606*** (7.04)	0.0533*** (11.71)	0.0432*** (7.17)	0.0336*** (7.13)	0.0336*** (6.99)	0.0377*** (6.71)
Leverage ²	-0.0614*** (-10.00)	-0.0374*** (-5.65)	-0.0367*** (-5.54)	-0.0362*** (-5.44)	-0.0444*** (-6.18)					
XLeverage (β_2)						-0.103*** (-8.74)	-0.0632*** (-5.16)	-0.0622*** (-5.07)	-0.0612*** (-4.97)	-0.0777*** (-5.77)
ln(Age)	0.0170 (0.91)	0.0153 (0.81)	0.0125 (0.66)	-0.0125 (-0.56)	-0.0106*** (-0.91)					
Male	-0.0998*** (-3.21)	-0.0993*** (-3.20)	-0.0101*** (-3.24)	-0.0106*** (-3.15)	-0.0106*** (-3.25)					
White	-0.000720 (-0.23)	-0.000163 (-0.05)	-0.000711 (-0.22)	-0.00517 (-1.24)	-0.000480 (-0.15)					
WageIncome	0.0416*** (4.30)	0.0409*** (4.20)	0.0396*** (4.03)	0.0540*** (4.96)	0.0422*** (4.77)					
TotalNetFamilyIncome	-0.0185*** (-3.17)	-0.0184*** (-3.14)	-0.0184*** (-3.16)	-0.0288*** (-3.69)	-0.0184*** (-3.00)					
MaritalStatus	0.00214 (0.67)	0.00214 (0.67)	0.00216 (0.67)	0.00282 (0.78)	0.00255 (0.83)					
College	0.0187*** (6.23)	0.0186*** (6.20)	0.0182*** (6.08)	0.0191*** (5.58)	0.0188*** (6.23)					
FatherEdu	0.00142*** (2.91)	0.00141*** (2.88)	0.00146*** (2.97)	0.00156*** (2.77)	0.00142*** (2.97)					
MotherEdu	-0.000299 (-0.58)	-0.000324 (-0.63)	-0.000358 (-0.69)	-0.000960 (-1.55)	-0.000296 (-0.57)					
EmployerSize	0.00645*** (5.70)	0.00657*** (5.78)	0.00633*** (5.53)	0.00750*** (6.04)	0.00652*** (5.69)					
Switching point	80.26%	82.60%	83.36%	83.32%	78.48%					
F stat of ($\beta_1 + \beta_2 = 0$)						27.52***	9.05***	8.43***	8.10***	15.82***
State FE	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO
Year FE	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO
Industry FE	NO	YES	YES	NO	NO	NO	YES	YES	NO	NO
Occupation FE	NO	YES	YES	NO	NO	NO	YES	YES	NO	NO
State*Year FE	NO	NO	YES	YES	NO	NO	NO	YES	YES	NO
Industry*Occupation FE	NO	NO	YES	YES	NO	NO	NO	YES	YES	YES
County*Year FE	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES
Observations	50,697	50,697	50,697	50,697	50,697	50,697	50,697	50,697	50,697	50,697
R-squared	0.003	0.028	0.043	0.045	0.247	0.002	0.028	0.043	0.045	0.247

Table 5: Instrumental variable analyses

Panel A: First stage			Panel B: Second stage			
Dep. Var.	Leverage		Dep. Var.	Training		
	(1)	(2)		(1)	(2)	(3)
SLTV	0.178*** (3.428)	0.002 (0.022)	Instrumental Leverage	0.437** (2.571)	0.399** (2.337)	0.418** (2.2)
SLTV ²	0.230*** (3.359)	0.371*** (4.086)	Instrumented Leverage ²	-0.456** (-2.402)	-0.409** (-2.140)	-0.419** (-1.974)
ln(Age)	-0.270*** (-5.312)	-0.277*** (-4.346)	ln(Age)			
Male	-0.038*** (-6.119)	-0.045*** (-5.203)	Male			
White	-0.029*** (-4.019)	-0.034*** (-3.459)	White			
WageIncome	0.07*** (3.907)	0.07*** (3.909)	WageIncome			
TotalNetFamilyIncome	-0.142*** (-13.815)	-0.197*** (-15.089)	TotalNetFamilyIncome			
MaritalStatus	0.04*** (5.905)	0.04*** (1.553)	MaritalStatus			
College	0.024*** (3.522)	0.027*** (3.094)	College			
FatherEdu	-0.001 (-1.612)	-0.001 (-0.973)	FatherEdu			
MotherEdu	-0.007*** (-2.188)	-0.008*** (-2.014)	MotherEdu			
EmployerSize	-0.001** (-2.168)	-0.008*** (-3.851)	EmployerSize			
Cragg-Donald Wald F Stat		14.658				
Industry*Occupation FE	YES	YES	Industry * Occupation FE	NO	YES	YES
Cohort FE	YES	YES	Cohort FE	YES	YES	YES
County*Year FE	YES	YES	County*Year FE	YES	YES	YES
Observations	17,149	17,149	Observations	17,149	17,149	17,149