Employer Credit Checks: Poverty Traps versus Labor Market Efficiency

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Views expressed are those of the authors and not of the Federal Reserve Bank of Kansas City or the Federal Reserve System.

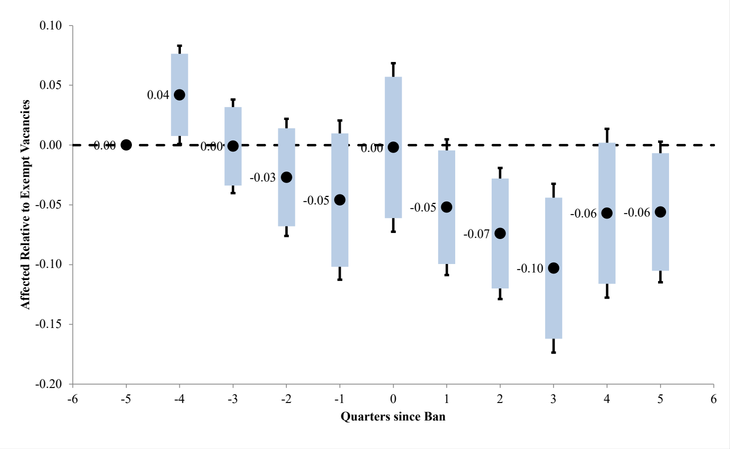
Pre-Employment Credit Screening (PECS)

- SHRM, 2009 study: 60% of HR reps check job applicants credit report
- Demos, 2012 survey: 1 in 7 low-mid income workers claim bad credit cost job offer
- PECS restrictions proposed, federal and state (eleven passed)
- Poverty trap concern:
  "We want people who have bad credit to get good jobs. Then they are able to pay their bills and get the bad credit report removed... the overuse of credit reports takes you down when you are down." Michael Barrett (D-Lexington, MA).

Some Effects of PECS Bans Are Measurable

- Local labor market: Cortes, Glover & Tasci (2022) find ↓ of $6 - 10\%$ in posted vacancies in affected occupations post ban.

CGT



Our Question

What are the aggregate and distributional welfare consequences of a policy that restricts pre-employment credit screening (PECS)?

Model Mechanism

- Model: Labor search with short term credit under adverse selection about worker type $i \in \{H, L\}$ which determines time preference and productivity (β_i, h_i).

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  - Lowers matching efficiency (job finding rates) for highly productive agents

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- Ban on PECS:
    - Eliminates labor demand channel for poverty trap (bad credit $\rightarrow$ longer unemployment spell $\rightarrow$ inability to improve credit)
    - Lowers matching efficiency (job finding rates) for highly productive agents
- Model accounts for interactions between labor and credit markets.

Population

The environment is populated by

- Unit measure of two types of workers indexed by $i \in \{H, L\}$, π_i fraction each.
- Markov type change: transition to other type with prob $1 - \rho$.
- Workers die at rate δ, replaced with unemployed newborns with $s = \pi_H$.
- Large number of identical potential employers (firms).
- Large number of identical lenders/credit scorers.

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  - Period utility: $\mathcal{U}(c_{1,t}, c_{2,t}, n_t) = c_{1,t} + \psi c_{2,t} + z(1 - n_t)$ where $\psi < 1$ is intra-period discount factor

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- Technology
  - Labor $n_t \in \{0, 1\}$ supplied in 1st sub-period
  - Production in 2nd sub-period: $y_t = h_i n_t$
  - Unemployed workers match with vacant firms via $M(u, v)$
  - Type specific productivity: $h_i \in \{h_L, h_H\}$
  - Lenders borrow (abroad) in 1st sub-period, pay gross interest rate R in 2nd

Information

- Record keeping technology:
  - Worker's adverse events (i.e. defaults) are observed
  - Summarized by "score" s_t (i.e. probability of being high type)
  - Score updated using observable events via Bayes Rule
  - Score observed firms unless law bans it

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- Labor Market
  - Firms do not observe type i (i.e. human capital h_i) *until* after worker is hired (PECS).
  - Type perfectly revealed once matched (simplifies bargaining) and helps us match low $cov_i(w, s)$ in the data.
  - Expected profits still depend on s ex-ante since:
    - High $s \rightarrow$ high expected surplus from match ($h_H > h_L$)
    - Also affects worker's threat point (higher job-finding rate if separated)

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- Credit Market
  - Lenders do not observe i or consumption (segmented)

Unemployed Worker's Timeline

An unemployed type i worker starts with score s and the period unfolds as:

- In first subperiod:
  - Do not work $n = 0$ so receive flow utility z
- In second subperiod:
  - Survive to next period with prob. $1 - \delta$
  - Search in labor submarket indexed by score s
    - Tightness $\theta(s) = \frac{v(s)}{u(s)}$ is ratio of vacancies posted in submarket s to job seekers
    - Prob. of matching with employer is $f\left(\theta(s)\right)$
  - Enter next period with score s (since there is no income/credit activity, there is no updating)
  - Transition to type $-i$ with prob. $1 - \rho$
  - Choose next period's productivity $h' \in \{\underline{h}, \overline{h}\}$ with cost $\phi(h' = \underline{h})$.

Employed Worker's Timeline

An employed worker starts with i, h with score s and the period unfolds as:

- In the first subperiod:
  - Nash bargain over wage w and work $n = 1$
  - Choose credit contract from available menu: $\{(Q_j, b_j\}_{j=1}^{J}$
    - Credit market contracts are endogenous, see paper for details.
  - Consume $c_1 = Q_j$
- In the second subperiod:
  - Receive w
  - Draw unobservable, iid expenditure (e.g. med) shock τ
  - Make default choice, $d \in \{0, 1\}$
    - Defaulters pay ϵ legal fees in $t + 1$
  - Consume $c_2 = w - (1 - d)(b + \tau)$
  - Survive to next period with prob. $1 - \delta$, remain employed with prob. $1 - \sigma$, and transition to other type with prob $1 - \rho$.
  - Choose next period's productivity $h' \in \{\underline{h}, \overline{h}\}$ with cost $\phi(h' = \underline{h})$.
  - Enter next period with updated score $s'_d(s)$

Firm's Timeline

For firm without a worker:

- Post vacancy in $s-$submarket of their choice at cost κ
- Fill job with probability $q(\theta(s))$ per vacancy

For firm with a type i worker

- Bargain over wage w_i and employ worker in first subperiod
- Receive output h_i and pay worker w_i in second subperiod.
- Retain worker with prob. $(1-\sigma)(1-\delta)$

Equilibrium

We now describe a steady-state equilibrium, which consists of:

- Value functions for workers $W_i(s), U_i(s)$ V
- Default choices for workers, $\tau_i^*(b, s)$ Default
- Credit contracts $\left\{(Q_i^*(s), b_i^*(s))\right\}_{i\in\{L,H\}}$ which maximize H-type utility s.t. lender and L-type participation, and incentive compatibility. Contract
- Firm value functions $J_i(s)$
- Market tightness $\theta^*(s)$ satisfies free entry
- Wages $w_i^*(s)$ satisfy Nash bargaining Firm Values and Labor Market Eq.
- Scoring functions $s'_d(s)$ satisfy Bayes' Rule score
- Stationary cross-sectional distributions $\mu_{i,n}^*(s)$ conditional on employment status $n \in \{0, 1\}$. LOM

Functional Forms, Fit

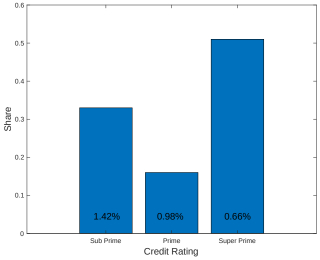
Monthly model. Exp. shocks τ: $F(\tau) = 1 - e^{-\gamma\tau}$. Matching function: $f(\theta) = \theta^{\alpha}$.

Table: Model Fit

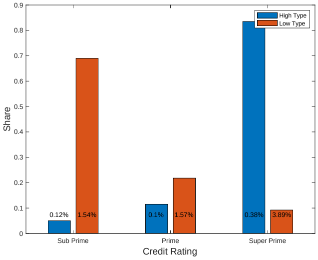
Moment	Data Value	Model Value
Super Prime CC Rate, top 49%	0.87%	0.84%
Prime CC Rate, $34 - 50$%	1.17%	1.19%
Sub-Prime CC Rate, $0 - 33$%	1.60%	1.61%
Debt to Labor Income	21.24%	21.23%
Delinq. Rate	0.95%	0.96%
Residual Earnings $50 - 10$	0.57	0.57
Monthly Job Finding Rate	45.0%	45.0%
Persistence of Super Prime Status	85%	87%

Note: Appendix 2 has definitions of model moments.

Cross-sectional distribution of scores



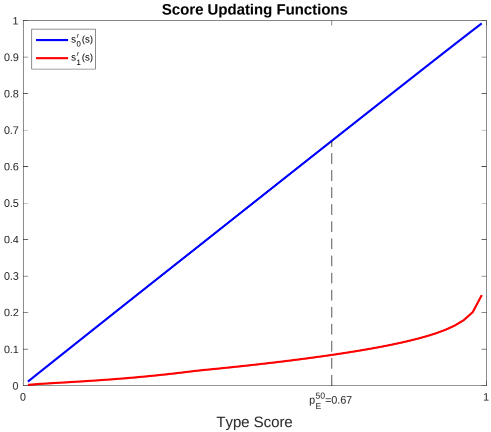
Unconditional Histogram



Type-Specific Histogram

- Unconditional shares from CFPB (on lhs) with default probabilities in black.
- Type conditional distribution (on rhs) is unobservable.
- Most low-type borrowers are subprime and vice versa.

Scoring Dynamics



- Score drops due to default.
- Little info from repayment in our calibration.

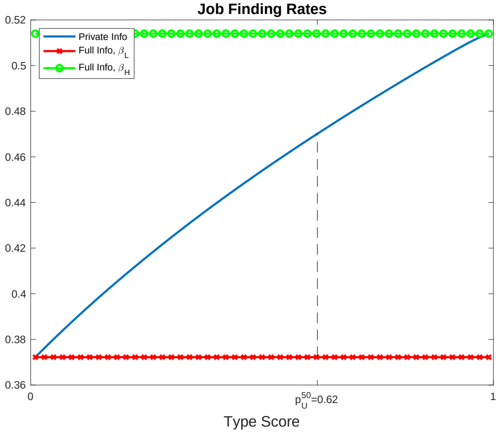
Covariance of Earnings and Scores

- Calibrated model features an untargeted $COV(w, s) > 0$.
- Occurs for two reasons
  - More productive workers have higher scores (COV Across Type)
  - Conditional on productivity, workers get larger share of surplus as score rises (COV Within Type)
- Covariance decomposition by type i:

$$COV(w, s) = COV\Big(\mathbb{E}[w|i], \mathbb{E}[s|i]\Big) + \mathbb{E}\Big[COV(w, s|i)\Big]$$

- Our calibration: Across accounts for 98.5% of Total Explanation
- While we do not have wage data, small within component is comparable to existing empirical evidence. Empirical Covariances
  - Herkenhoff, Phillips, Cohen-Cole (2017), Dobbie, et al (2019).

Job Finding Rate



- Job finding rates $f(\theta(s))$ are increasing in score.
- But (higher) lower than full info for (low) high types.

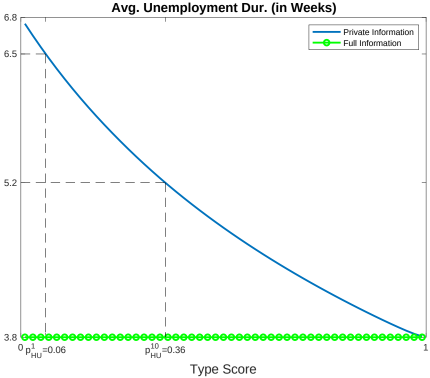
Wage Losses From Default

- Many models have reduced form wage loss from default (e.g. CCNR (2007) has 1.9%).
- This is endogenous in our model Defn

Table: EPDV Wage Losses, Amortized Over 10 Years

	Employed	Unemployed	Overall
High types (β_H)	1.32%	1.75%	1.34%
Low types (β_L)	0.31%	0.48%	0.32%
Overall	0.97%	1.25%	0.89%

Magnitude of Poverty Trap



- 10 day longer duration for bottom 10%, 19 days for 1%.
- Context: Card & Levine (2000) estimate one week longer unemployment duration from 13 week benefit extension.

PECS Ban

We now imagine that vacancies cannot condition on type score.

- Credit market unchanged
- Post-match wages still depend on score:
  - Match surplus depends on score through credit
  - As does worker's threat point
- Now only one labor market tightness determined by free entry:

$$\kappa = R^{-1} q(\theta) \mathbb{E}[J_i(s)]$$

- Instead of, $\forall s$:

$$\kappa = R^{-1} q\Big(\theta(s)\Big) \mathbb{E}[J_i(s)|s]$$

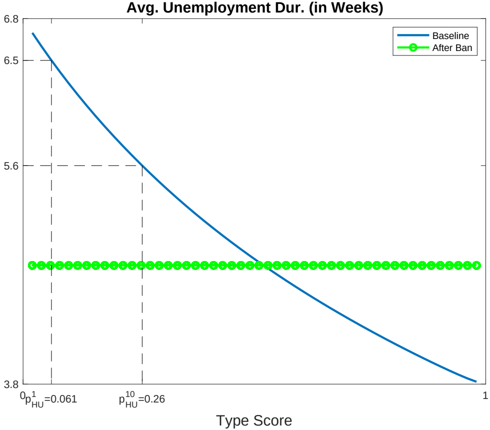
Aggregate Effects of Ban

Table: Labor and Credit Market Effects of Employer Credit Ban

Moment	Baseline	After Ban
Median Job Finding Rate	47.0%	45.7%
Average Labor Prod.	81.4	81.3
Default Rate	0.96%	1.16%
Average CC Rate	1.16%	1.24%
Average Debt to Income	21.34%	17.40%
Unemployment Rate	5.88%	5.80%

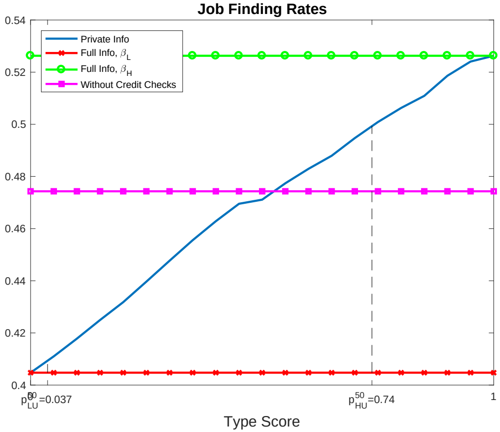
- Finding rate at median unemployed score falls.
  - Falls (rises) for high (low) productivity
- Higher finding rate for low productivity → less productive composition of labor force
- Less incentive to repay → higher default rates, less lending
- Unemp. falls: Wage changes imply higher profits on average generating higher average tightness. Wage/Profits

Poverty Trap Elimination



- Duration declines by 27% for bottom 20% of scores p_U^{20}
- Friedberg, et al. (2017) estimate 25% for financially distressed
- Nonetheless, increased duration for most β_H types $> p_{HU}^{20}$.

Reduced Matching Efficiency



- Most high types finding rates fall, most low types rise, both farther from efficient (FI).
- Average reduction in efficiency is 3.4%. EFF

Effect of Ban: Welfare

- How much would a person be willing to pay to implement the ban (+) or keep the ban from being implemented (-)?
- Reported in consumption equivalent units, averaged over scores by type and employment.

Table: Welfare Effects of Banning PECS

	High-Type	Low-Type	Ex Ante
Employed	-0.61%	0.38%	
Unemployed	-0.74%	3.70%	
Average	-0.62%	0.59%	-0.09%

- Linear utility $\rightarrow$ no losses from consumption volatility. Larger welfare losses with curvature.

Welfare decomposed

Concluding Remarks

- Important distributional effects of ban on PECS (i.e. constraining information across markets).
  - Target population - subprime unemployed - see big gains in finding rates and welfare.
  - However, prime and superprime employed see drops in finding rates and welfare.

- Repayment incentives weakened for all (default rates rise). Credit market screening (separation) weakened. Separation

- Large heterogeneity of welfare effects, even though ex-ante effect is small (-0.1%).

- Only 43% of workers favor the ban, though losers suffer little and winners gain big.

Appendix: Credit Score From Type Score

Our score is the probability that the household is high type. This can be related to realistic credit scores in equilibrium by:

$$\tilde{s}(s) = sG_0\left(\tau_H^*\left(b_H^*(s), \overline{h}, s\right)\right) + (1-s)G_0\left(\tau_L^*\left(b_L^*(s), \underline{h}, s\right)\right) \quad (1)$$

Which is the equilibrium probability of repayment.

Appendix: Definition of Model Averages

We use the stationary distribution to compute means. For variable x:

$$\bar{x} = \int_0^1 \sum_{i \in \{L,H\}} \sum_{\ell \in \{U,E\}} x_{i\ell}(s) d\mu^*_{i\ell}(s)$$

$$\bar{x}_i = \frac{\int_0^1 \sum_{\ell \in \{U,E\}} x_{i\ell}(s) d\mu^*_{i\ell}(s)}{\sum_\ell \mu^*_{i\ell}(1)}$$

$$\bar{x}_\ell = \frac{\int_0^1 \sum_{i \in \{U,E\}} x_{i\ell}(s) d\mu^*_{i\ell}(s)}{\sum_i \mu^*_{i\ell}(1)}$$

Appendix: Percentiles

We reference percentiles of the score distribution. For unconditional percentiles we use:

$$\mu^*(s) \equiv \sum_{i \in \{L,H\}} \sum_{\ell \in \{U,E\}} \mu^*_{i\ell}(s)$$

And to find the score p^x which is above fraction x of the population's score:

$$x = \mu^*(p^x)$$

Appendix: Consumption Equivalent Welfare

Denoting W^{nc} and U^{nc} as the value functions without employer credit checks, we define $\gamma_{i\ell}(s)$ by:

$$W_{ih_i^*}(s)[1+\gamma_{iE}(s)] = W_{ih_i^*}^{nc}(s)$$
$$U_{ih_i^*}(s)[1+\gamma_{iU}(s)] = U_{ih_i^*}^{nc}(s)$$

Note: $\gamma_{i\ell}(s) > 0 \rightarrow$ worker would pay to switch (gains from ban).

Contract Determination: Cross Subsidizing

For high s, "cross-subsidizing" contracts.
Properties:

- Optimal contract never distorts b_L
  - $MRS_L = MRT_L +$ linearity $\rightarrow b_L$ ind. of Q_L
- Cross-subsidizing: fix b_L, choose $Q_L \geq$ LCS value
- Increasing Q_L trade off:
  - Reduces Q_H relative to $R^{-1} G\left(\tau_H^*(b_H, s)\right) b_H$
  - Allows higher value of b_H (less distortion)
- Survives cream-skimming due to withdrawal round of game

Moral Hazard Interpretation

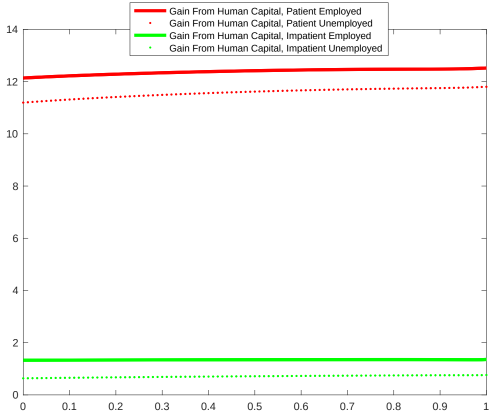
- End of period, worker decides whether to invest in human capital for next period.
- Investing costs ϕ utils, delivers h_H human capital instead of $h_L < h_H$ at the beginning of next period.
- H types choose h_H and L types choose h_L provided:

$$\begin{aligned} -\phi + \beta_H\,(1-\delta)W_H(s) &\geq \beta_H\,(1-\delta)W_H^d(s;h_{-L}) \\ &\iff \beta_H\,(1-\delta)\left[W_H(s) - W_H^d(s;h_{-L})\right] \geq \phi \end{aligned}$$

$$\begin{aligned} \beta_L\,(1-\delta)W_L(s) &\geq -\phi + \beta_L\,(1-\delta)W_L^d(s;h_{-H}) \\ &\iff \beta_L\,(1-\delta)\left[W_L^d(s;h_{-H}) - W_L(s)\right] \leq \phi \end{aligned}$$

Back

Gains From Investing in Human Capital



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What Are Effects of PECS Ban?

- Quarterly vacancy data from Conference Board Help Wanted Online Index.
- Panel regression, c county, o occupation, t quarter, $v_{c,o,t}$ vacancies

$$\log \text{vacancies}_{c,o,t} = \sum_{k=-4}^{5} \beta_k^o \text{BAN}_{c,o,t-k} + \text{FE}_t + \text{FE}_{c,o} + \varepsilon_{c,o,t},$$

- $Ban_{c,o,t-k} = 1$ in the period k quarters before county c implements a PECS ban.
  - $\hat{\beta}^o_{t-k} = 0$ for both exempt and nonexempt (i.e. no pretrends)
- $Ban_{c,o,t+k} = 1$ in the period k quarters after county c implements an PECS ban in the affected occupation.
  - $\hat{\beta}^o_{t+k} = 0$ for exempt, $\hat{\beta}^o_{t+k} < 0$ for non exempt (i.e. fall in vacancies for occupations affected by ban)

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Inefficiency Summary Statistic

We define inefficiency as:

$$\mathcal{E} = \mathbb{E}_{HU}\left[\left|f\left(\theta(s)\right) - f_H^{FI}\right|\right] + \mathbb{E}_{LU}\left[\left|f(\left(\theta(s)\right) - f_L^{FI}\right|\right]$$

- Since Hosios condition holds, full info implies $\mathcal{E}^{FI} = 0$.
- For the baseline calibration, $\mathcal{E}^{B} = 2.72\%$.
  - Average finding rate is 2.72% above/below efficient.
- For the no-check equilibrium, $\mathcal{E}^{NC} = 6.1\%$.
  - Ban makes labor market 2.3 times less efficient than baseline case. EFFRETURN

Some Relevant Literature

- Equilibrium Existence with Adverse Selection (AS): Netzer and Scheuer (2014, IER), Guerrieri, et. al. (2010, ECMTA).
- With AS, reputation in one market can help incentivize another market.
  - Cole and Kehoe (1998, IER) Exogenous utility loss in labor market can incentivize sovereigns not to default.
  - Chatterjee, et. al. (2008, JET) Endogenous reputation costs in insurance market can help incentivize households not to default.
- AS in credit markets with default: Athreya, et. al. (2012, AEJ:Macro), Chatterjee, et al (2017), Livshits, et al (2016, RESTUD), Narajabad (2012, RED).
- Empirical evidence. Labor demand: Cortes, et al (2017). Labor supply: Herkenhoff, et. al. (2016, 2017)

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Worker Decisions

Second subperiod default choice (d) given b, τ:

$$\max_{d \in \{0,1\}} \beta_i(1-\delta)\Big[V_i(s'_d(s)) - \psi d\epsilon\Big] - (1-d)(b+\tau) \qquad (2)$$

where

$$V_i\big(s'_d\big) = \Big[(1-\sigma)W_i\big(s'_d\big) + \sigma U_i\big(s'_d\big)\Big]. \qquad (3)$$

This implies a (strategic) default decision rule:

$$d = 1 \leftrightarrow \tau > \tau_i^*(b,s) = \beta_i(1-\delta)\Big[\psi\epsilon + V_i(s'_0(s)) - V_i(s'_1(s))\Big] - b \qquad (4)$$

For given $V_i\big(s'_d\big)$ and b, higher $\beta \rightarrow$ higher τ^* (lower default prob)
For given $V_i\big(s'_d\big)$ and β, higher $b \rightarrow$ lower τ^* (higher default prob)

Costs of Default

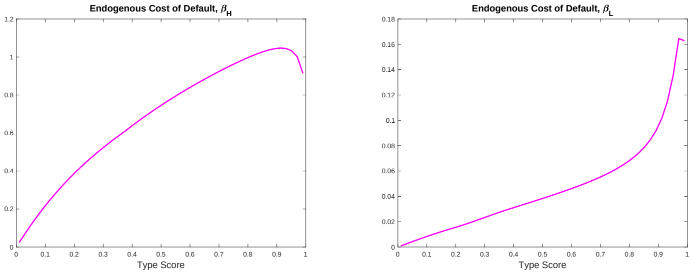
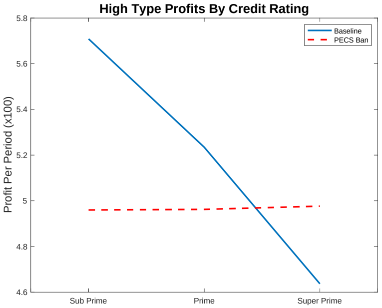


Figure: Endogenous Costs of Default (Relative to Exogenous)

Endogenous costs $V_i\left(s_0'(s)\right) - V_i\left(s_1'(s)\right)$ vary with s.
Level and shape depends on β_i since $\beta_L < \beta_H$. back

Firm Profit Effects



Lender Profits

- Lender's expected discounted profit on contract (Q, b) for a given s and borrower type i:

$$P_i(s; Q, b) = -Q + R^{-1} F\big(\tau_i^*(b, s)\big)\, b \tag{5}$$

- Lender gives worker credit Q at beginning of month in return for payment b at end of month provided she does not default (which happens with probability $F(\tau_i^*)$).
- Since low types more likely to default, $\tau_L^* < \tau_H^*$ which means lender charges workers who are more likely to default a higher interest rate.

Credit Contract Determination

Netzer and Scheuer: for $k \approx 0$, unique SPE solves:

$$\max_{Q_H, b_H, Q_L, b_L} Q_H + \psi \int_0^{\tau_H^*(b;s)} F(\tau) d\tau, \text{s.t.}:$$

$$sP_H(Q_H, b_H; s) + (1-s)P_L(Q_L, b_L; s) \geq 0 \tag{6}$$

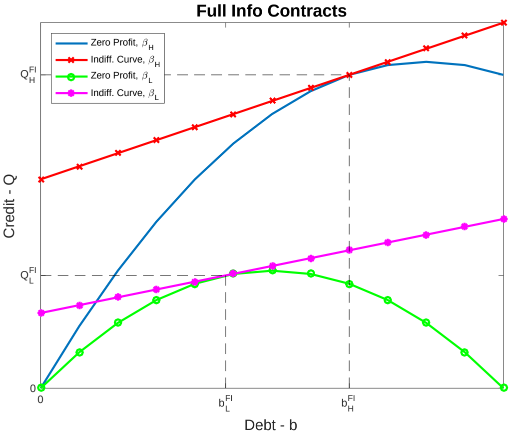
$$Q_L + \psi \int_0^{\tau_L^*(b_L;s)} F(\tau) d\tau \geq Q_H + \psi \int_0^{\tau_L^*(b_H;s)} F(\tau) d\tau \tag{7}$$

$$Q_H + \psi \int_0^{\tau_H^*(b_H;s)} F(\tau) d\tau \geq Q_L + \psi \int_0^{\tau_H^*(b_L;s)} F(\tau) d\tau \tag{8}$$

$$\begin{aligned} Q_L \quad + \quad & \psi \int_0^{\tau_L^*(b_L;s)} F(\tau) d\tau \\ \geq \quad & \max_b R^{-1} F\left(\tau_L^*(b;s)\right) b_L + \psi \int_0^{\tau_L^*(b;s)} F(\tau) d\tau \end{aligned} \tag{9}$$

Condition (6) is lender participation. (7) and (8) are IC's, (9) says high-risk must get at least LCS utility. back

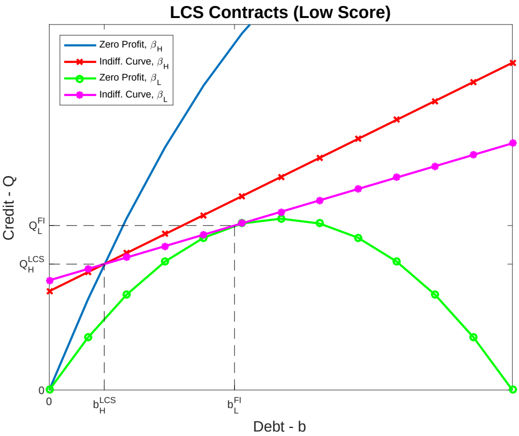
Credit Contract Determination: Full Info



High types get more credit at lower rates than low

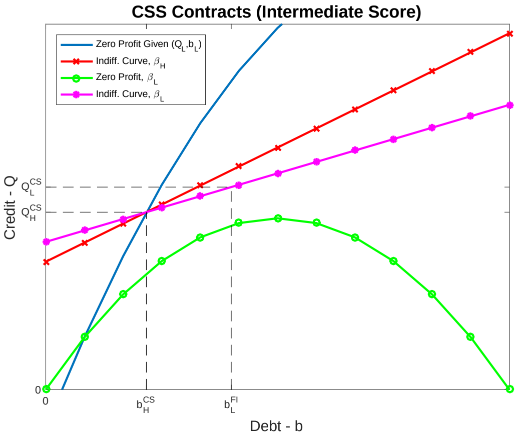
$\rightarrow$ Full info allocation not incentive compatible

Contract Determination: Least Cost Separating



LCS contract (10,11,13 bind): tight constraint on H borrowing. Optimal for low scores ($s < 0.3$ i.e. mostly L borrowers).

Contract Determination: Cross Subsidized Separating



Survives cream skimming due to withdrawal round of game.
Increases credit to L and reduces distortion on H (10,11 bind).
Optimal for intermediate scores ($0.3 \leq s \leq 0.4$ in calibration).

Contract Determination: Pooling

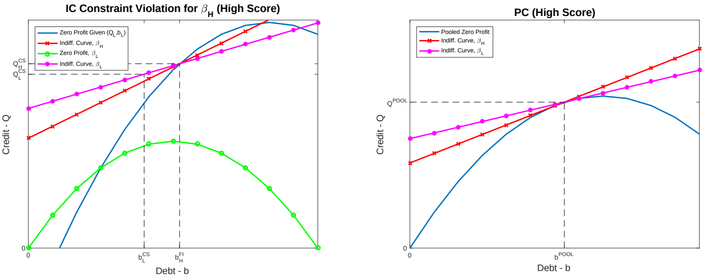


Figure: Incentive Compatibility of Cross Subsidized Separating Contract

CSS contract may be too generous to L borrower, causing H IC (12) to bind along with (10,11) $\rightarrow$ pooling. Holds for $s > 0.4$ in calibration (almost all H borrowers are in pooling contracts). back

Score Updating

The Bayesian updating function is given by:

$$s_d'(s) = \frac{\rho F_d\left(\tau_H^*(s, b_H^*(s))\right)s + (1-\rho)F_d\left(\tau_L^*(s, b_L^*(s))\right)(1-s)}{F_d\left(\tau_H^*(s, b_H^*(s))\right)s + F_d\left(\tau_L^*(s, b_L^*(s))\right)(1-s)},$$

where $F_0(\tau) = F(\tau)$ and $F_1(\tau) = 1 - F(\tau)$

- $s_0'(s) \geq s_1'(s)$ (score updates higher upon repayment than default)
- Credit score given by

$$\Pr(d = 0|s) = F_0\left(\tau_H^*(s, b_H^*(s))\right)s + F_0\left(\tau_L^*(s, b_L^*(s))\right)(1-s).$$

back

Stationary Distributions $\mu_{i,n}(s)$

- Maps current number of people of type i and employment status n with score below s into future number using equilibrium contracts, default decisions, and shocks.
- Suppose $\rho = 1$ (messier otherwise), then for employed we have:

$$
\begin{aligned}
\mu'_{i,1}(s') &= (1-\delta)\int_0^{s'} f\left(\theta(s)\right) d\mu_{i,0}(s) \\
+ &\quad (1-\delta)(1-\sigma)\int_0^1 \Big\{ \mathbb{I}_{\{s'_0(s)\leq s'\}} F_0\left(\tau_i^*(s, b_i^*(s))\right) \\
+ &\quad \mathbb{I}_{\{s'_1(s)\leq s'\}} F_1\left(\tau_i^*(s, b_i^*(s))\right) \Big\} d\mu_{i,1}(s)
\end{aligned}
$$

- Similar for unemployed (see paper) Back

Definition of Wage Loss From Default

- Take employed of type i with score s
- Calculate expected discounted sum of future wages for $s'_0(s)$ and $s'_1(s)$ using R to discount Eqn
- Amortize difference over 120 periods (10 yr)
- Report as % of average wage Back

Calculating Wage Loss From Default

Present value of wages for employed ($n = 1$) and unemployed ($n = 0$)

$$\mathcal{W}_i^1(s) = w_i^*(s) + (1-\delta)R^{-1}\mathbb{E}\Big[(1-\sigma)\mathcal{W}_i^1(s') + \sigma\mathcal{W}_i^0(s')|s\Big]$$

$$\mathcal{W}_i^0(s) = 0 + (1-\delta)R^{-1}\Big[f\big(\theta(s)\big)\mathcal{W}_i^1(s) + \big[1 - f\big(\theta(s)\big)\big]\mathcal{W}_i^0(s)\Big]$$

And use these to calculate present value of losses from default for $n \in \{0, 1\}$:

$$LOSS_i^n(s) = (1-\delta)R^{-1}\Big[\mathcal{W}_i^n\big(s_0'(s)\big) - \mathcal{W}_i^n\big(s_1'(s)\big)\Big] \tag{10}$$

Amortize using R and report averages. Back

Worker Indirect Utility

- Given cutoff default rule on contract (Q, b), after integrating by parts indirect utility given by:

$$W_i(s; Q, b) = Q + \psi \int_0^{\tau_i^*(b,s)} F(\tau) d\tau + \psi w + \beta_i (1-\delta)\left[V_i(s_1') - \psi \epsilon \right] \quad (11)$$

which is increasing in Q and decreasing in b.

- Can show single-crossing property on MRS with $MRS_H > MRS_L$ (i.e. slopes of type indifference curves).

- Evaluating at $Q_i^*(s), b_i^*(s)$ gives $W_i(s)$.

Firm Value and Wage Determination

- Firms know i and h, but s still relevant since it affects outside option when bargaining:

$$J_i(s;w) = h_i^* - w + R^{-1}(1-\sigma)(1-\delta)\mathbb{E}\Big[J_i\big(s_d'(s);w_i^*(s_d'(s));\big)|i,s\Big]$$

- Given full info and linearity in wages, Nash Bargaining (with worker weight λ) yields:

$$w_i^*(s) = \text{argmax}_w \Big[W_i(s;w) - U_i(s)\Big]^{\lambda} J_i(s;w)^{1-\lambda} \qquad (12)$$

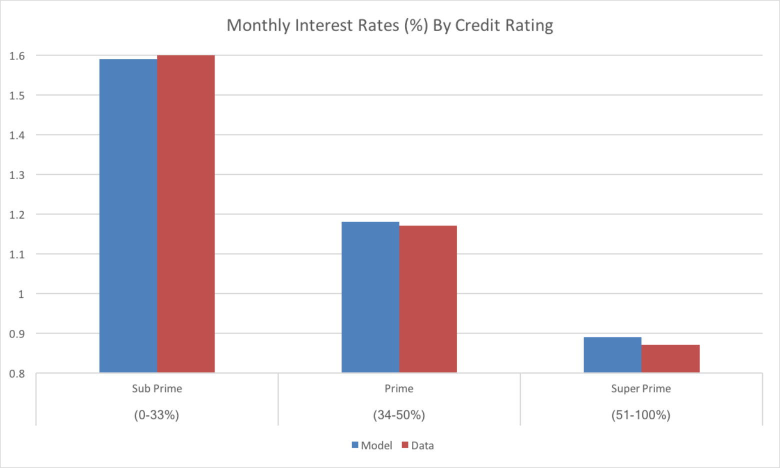
- Free entry $\forall s \in [0,1]$ pins down $\theta^*(s)$:

$$\kappa = q\big(\theta^*(s)\big)R^{-1}\Big\{sJ_H\big(s;w_H^*(s)\big) + (1-s)J_L\big(s;w_L^*(s)\big)\Big\}$$

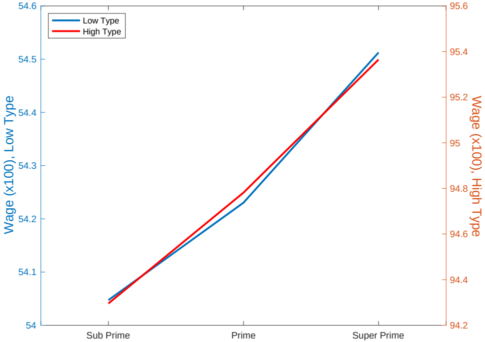
- Back

Model Fit: Interest Rates

Back



Understanding Decomposition In Calibrated Model



- Total covariance:
  - Avg. Prime earnings 20.4% higher than Sub Prime
  - Avg. Super Prime 34.4% higher than Prime
- Within covariance:
  - Cond. on type, Super prime earnings 1% > subprime.
- Within covariance is 1.5% of total Back

Empirical Total Covariance

- 2016 Survey of Consumer Finances asks credit questions:
  - Q1: Have you been late on payments in past year?
  - Q2: Have you been more than 60 day late?
  - Q3: Have you been turned down for credit in past year?

- Cross-sectional regression of person-j residual earnings on adverse credit events

$$y_j = \beta_1 Q1_j + \beta_2 Q2_j + \beta_3 Q3_j + \text{controls}_j + \varepsilon_j$$

- Controls include tenure, tenure^2, and fixed effects for education, occupation, industry, race, and sex

Empirical Covariance Decomposition

- Large negative cov. between adverse credit and resid. earnings (s.e. in parenthesis) More Specifications

$$y_j = \underset{(5.2)}{-13.6} Q1_j \underset{(7.4)}{-12.7} Q2_j \underset{(4.7)}{-10.4} Q3_j + \text{controls}_j + \underset{R^2=0.33}{\varepsilon_j}$$

- Sum of coeff. proxy for large difference in credit score
  - Total covariance of 36.7%

- Herkenhoff, Phillips, & Cohen-Cole (2016) find approx 1% rise in individual earnings following bankruptcy removal
  - Large increase in credit score
  - Small increase in individual's earnings

- Suggests Within is small share of Total covariance
  - Large total covariance, small within → large across Back

Empirical Total Covariance

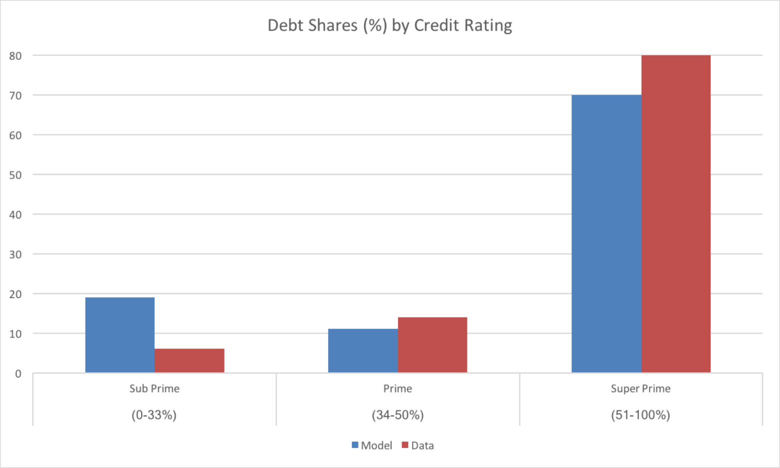
- Large and negative association between adverse credit event and resid. earnings

	Specification			
	(0)	(1)	(2)	(3)
Q1		-20.3	-14.7	-13.6
		(4.9)	(2.8)	(2.6)
Q2			-13.9	-12.7
			(1.9)	(1.7)
Q3				-10.4
				(2.2)
R^2	0.330	0.332	0.333	0.333

All regressions include age, age^2 and FE for education, occupation, industry, race, and sex. Absolute value of robust t-statistics in parenthesis. $N = 4451$.

Back

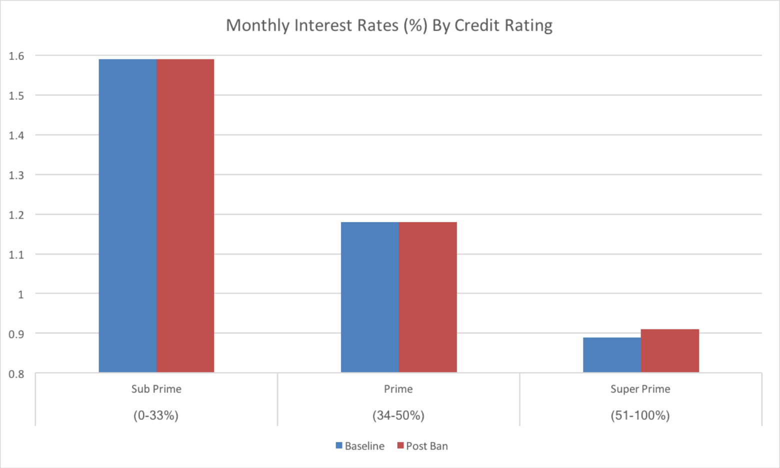
Untargeted Moments: Debt Shares



- Pooling contracts for high s deliver realistic debt shares (LCS would generate counterfactually low shares).

Back

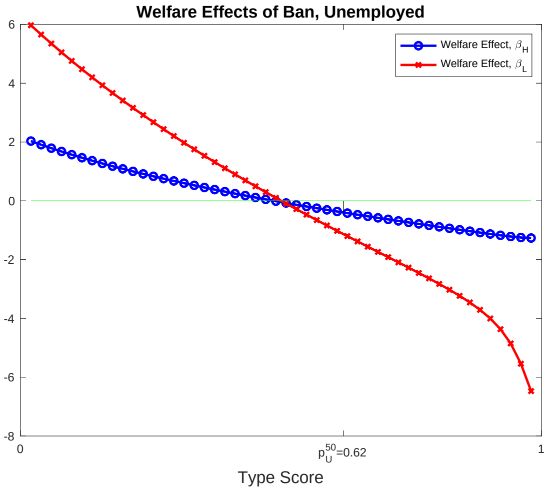
Effect of Ban: Interest Rates



With Ban, future score less important, weakening punishment (raising default incentives).

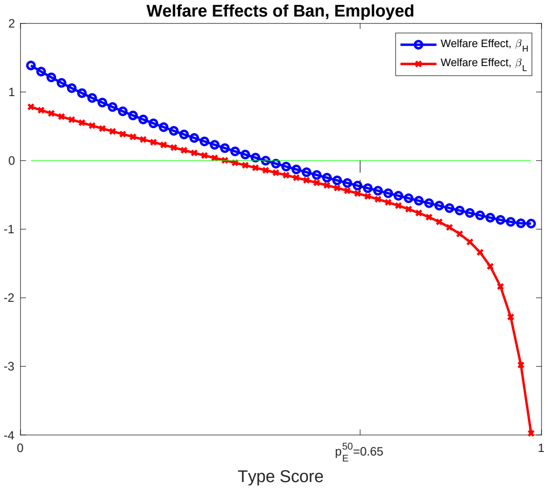
Consistent with Cortes, et al: $\uparrow$ delinq. post ban. Back

Effect of Ban: Welfare of Unemployed



Low-score β_L gains big relative to high-score β_H loss.
Median unemployed loses.

Effect of Ban: Welfare of Employed



Median employed loses. Back

Existence of Private Info Benchmark Equilibrium

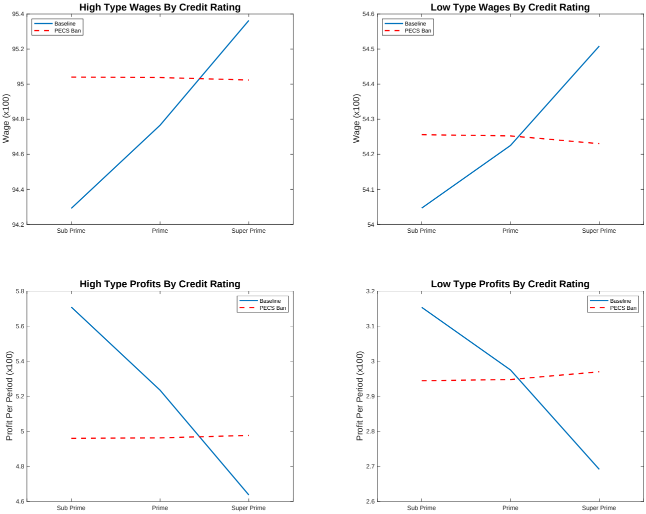
Theorem

Under certain additional assumptions (see paper), there exists a private information steady-state Markov equilibrium.

- We define a continuous operator over a Lipschitz space of functions that maps into the same space with the same Lipschitz constants and apply Schauder's fixed point theorem.
- In practice need sufficiently large variance of expenditure shocks so that slope of scoring function doesn't explode.

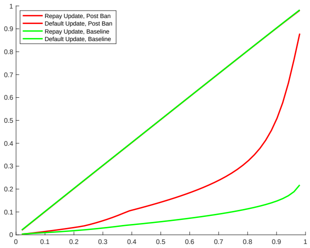
back

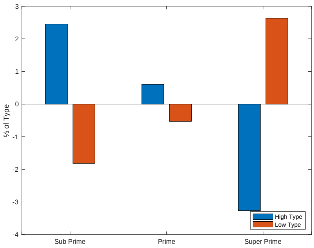
Wage/Profits Effects of Ban Across Ratings



Unemp. falls: lower threat point for high-score workers return

Slower Separation Through Scores





- Default is less informative of type after labor market ban (credit market punishment weakened).
- Less separation of types by credit rating: rise in share of subprime high types, fall in share of super prime high types.

Return

Value Functions

- Unemployed workers have value:

$$U_i(s) = z + (1-\delta)\beta_i \Big[f(\theta(s))\mathcal{W}_i(s) + \Big(1 - f(\theta(s))\Big)\mathcal{U}_i(s) \Big]$$

where

$$\begin{aligned} \mathcal{W}_i(s) &= \rho W_i^*(s) + (1-\rho) W_{-i}^*(s), \\ \mathcal{U}_i(s) &= \rho U_i^*(s) + (1-\rho) U_{-i}^*(s). \end{aligned}$$

- Employed workers have value:

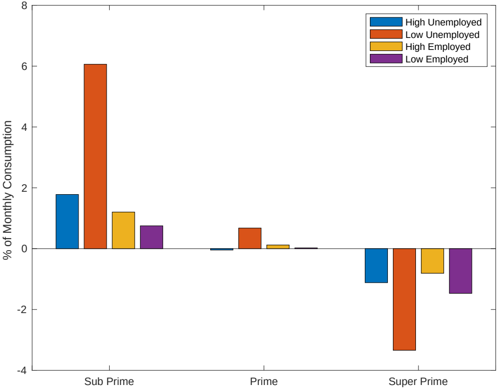
$$\begin{aligned} & W_i(Q,b,w,s) = Q + \psi w \\ + \quad & \psi \int_0^\infty \max_d \Big[\beta_i(1-\delta)\Big(V_i(s'_d) - d\psi\epsilon \Big) - (1-d)(b+\tau) \Big] dF(\tau), \end{aligned}$$

where

$$V_i(s'_d) = \Big[(1-\sigma)\mathcal{W}_i(s'_d) + \sigma \mathcal{U}_i(s'_d) \Big].$$

back

Effect of Ban: Welfare



More Welfare
Return