The Impact of Personal Bankruptcy Law on Entrepreneurship

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at Federal Reserve Bank of Atlanta
Personal bankruptcy and entrepreneurship

- Personal bankruptcy is important for small businesses:
  - 78% businesses are sole proprietorships in the U.S., 82% in Europe.
  - Most loans for small corporations are backed by personal guarantees.

- How does personal bankruptcy affect entrepreneurship
  
  **Insurance effect** debt discharge in the event of business failure;
  **Borrowing cost effect** intermediaries charge default premium.

- Questions (quantitatively):
  - How does personal bankruptcy law matter for
    1. Level of entrepreneurship (How many);
    2. Quality of entrepreneurs (Who becomes one);
    3. Entry/Exit;
    4. Output;
    5. Welfare.
### Personal bankruptcy laws and entrepreneurship

<table>
<thead>
<tr>
<th>income garnishment</th>
<th>US (Ch7)</th>
<th>Canada</th>
<th>UK</th>
<th>Germany</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>9m</td>
<td>3y</td>
<td>6y</td>
<td>8-10y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>income exemption</th>
<th>US (Ch7)</th>
<th>Canada</th>
<th>UK</th>
<th>Germany</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>$21,000</td>
<td>“reasonable needs”</td>
<td>$21,000</td>
<td>$20,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% garnisheed</th>
<th>US (Ch7)</th>
<th>Canada</th>
<th>UK</th>
<th>Germany</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>50%</td>
<td>30-50%</td>
<td>85%-100%</td>
<td>90-100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>asset exemption</th>
<th>US (Ch7)</th>
<th>Canada</th>
<th>UK</th>
<th>Germany</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td>very high</td>
<td>very high</td>
<td>high</td>
<td>low</td>
<td>very low</td>
<td>very low</td>
</tr>
</tbody>
</table>

Source: White (2007) *JEP*

<table>
<thead>
<tr>
<th>manager-owner / adult-population</th>
<th>US (Ch7)</th>
<th>Canada</th>
<th>UK</th>
<th>Germany</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.6%</td>
<td>9.7%</td>
<td>8.8%</td>
<td>7%</td>
<td>4.2%</td>
<td></td>
</tr>
</tbody>
</table>


1. Large differences in personal bankruptcy regimes and level of entrepreneurship across developed countries;
2. Positive correlation between the leniency of regime and the level of entrepreneurship;
3. Question: which aspect of bankruptcy regime matters more?
What I do

- Quantitative life-cycle model where households with different entrepreneurial abilities choose between work and entrepreneurship given a bankruptcy regime.
- Calibrate model to match key facts of US economy:
  - Entrepreneurs - level, return on assets
  - Bankruptcy - level, cause
- Counterfactuals: different bankruptcy regimes:
  1. Vary duration of punishments;
  2. Vary percentage of income garnisheed;
  3. Regimes resemble other countries’ personal bankruptcy law. i.e: What would happen to the U.S. if they adopted other countries’ personal bankruptcy law.
Features of the Model

1. Household heterogeneity in entrepreneurial ability:
   - higher ability – more likely to succeed, less likely to fail;
   - lower ability – less likely to succeed, more likely to fail.

2. Complete information:
   - intermediaries sees all available information;
   - interest rate is based on default probability;

3. Bankruptcy:
   - liquidation of business assets;
   - garnishment of post-bankruptcy incomes;
   - transaction cost;
   - exclusion from credit market;
   - cannot run a business.
Main Mechanism

1. More lenient regimes encourage risky (moderate ability) households to participate in entrepreneurship
   - insurance effect dominates.

2. Variation in bankruptcy regime has little impact on high ability households’ choices
   - less likely to fail, both insurance and borrowing cost effects are small.

3. More lenient regimes lead to smaller firms and more entry/exit.
   - Selection – smaller fraction of high ability entrepreneurs;
   - Entrepreneurs are more borrowing constrained.
Main Findings

- Insurance effect dominates borrowing cost effect for extensive margin of entrepreneurship;
- Post-bankruptcy punishment has larger impact than asset exemption;
- More lenient bankruptcy code leads to:
  1. a higher level of entrepreneurship;
  2. increased entry of moderate ability entrepreneurs;
  3. more entry/exit;
  4. lower average size of firms.
- More lenient regime lead to higher overall output;
- Welfare
  - Entrepreneurs prefer more lenient regimes;
  - Worker prefer less lenient regimes.
Literature


- Entrepreneurship and personal bankruptcy:

- Consumer Bankruptcy:
  - Livshits, MacGee and Tertilt (2007)
  - Chatterjee, Corbae, Nakajima & Ríos-Rull (2007)
  - Athreya (2008)

Literature abstract from 2 key points:
- differences in entrepreneurial abilities (span of control);
- variation in treatment of post-bankruptcy income.
Model Setup

J periods lived agents, with preference represented by:

\[
E_0 \sum_{j=1}^{J} \beta^{j-1} u(c_j)
\]

- Each period households can choose between
  1. work in corporate sector for wage: income depends on labor productivity shock \( \epsilon_j \) and deterministic average life-cycle profile, \( \bar{y}_j \)
     
     \[
     y^i_j = \epsilon^i_j \bar{y}_j \quad \text{where} \quad \epsilon^i_j = z^i_j \eta^i_j
     \]
     
     \( z^i_j \): persistent shock \( \eta^i_j \): transitory shock
  2. operate own business: return is \( F(k, \theta^i_j) = \theta^i_j k^\alpha + (1 - \delta)k \)
     - Stochastic business productivity shock \( \theta^i_j \);
     - **Distribution of \( \theta \) depends on permanent ability level \( \rho \);**
1. Borrowing and saving via one-period non-contingent bond, denoted \( d \). \( d > 0 \) denotes borrowing, \( d < 0 \) denotes saving;

2. Perfect competitive intermediaries make zero expected profit on each loan;

3. Intermediation cost: fraction \( \tau \) per unit loan;

4. No information asymmetry: intermediary sees age \( j \), labor shock \( \epsilon \), ability level \( \rho \), total borrowing \( d' \) and total capital \( k' \).
Bankruptcy

Households have option to declare bankruptcy $b \in \{0, 1\}$

**Income garnishment:** current and $G$ periods following, at rate $\gamma$ above exemption level $\bar{w}$;

**Liquidation of assets:** business assets above exemption level $\bar{x}$ are seized by creditors for liquidation, liquidation cost is $\zeta$;

**Transaction cost:** lose fraction $\lambda$ of consumption during bankruptcy and garnisheeing period;

**Exclusion from entrepreneurship:** cannot run a business during bankruptcy and garnisheeing periods;

**Exclusion from credit market:** bankrupts cannot borrow during the bankruptcy and garnisheeing periods.
Loan Pricing

Given that the expected profits on each loan is zero, the discounted bond is priced according to:

$$q^d(S^i_j) = [1 - \phi(S^i_j)]\bar{q}^d + \phi(S^i_j)E[\frac{\Gamma(S^i_j)}{d'}|b = 1]\bar{q}^d$$

(price of loan = prob of not default × risk free rate +
Prob of default × rate of recovery × risk free rate)

$S^i_j = (d', k', \epsilon, \rho, j)$

$\phi$ is the endogenous probability of defaulting in next period

$\bar{q}^d = \frac{1}{1+r+\tau}$ is the risk free lending rate

$\Gamma$ is the expected amount of recovery from a bankrupt household.
# Benchmark Parameterizations

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic</strong></td>
<td>$J = 57$, 45 periods working and 12 periods of retirement</td>
<td>Average life span of 77</td>
</tr>
<tr>
<td><strong>Preference</strong></td>
<td>CRRA, $\beta = 0.96$, $\sigma = 2$</td>
<td>Livshits, MacGee &amp; Tertilt (2007)</td>
</tr>
<tr>
<td><strong>Labor income</strong></td>
<td>$z$ follows AR(1) with $\rho_z = 0.99$, and $\sigma_\xi = 0.007$, transitory</td>
<td>Livshits, MacGee &amp; Tertilt (2007)</td>
</tr>
<tr>
<td></td>
<td>shock: $\sigma_\eta = 0.043$</td>
<td></td>
</tr>
<tr>
<td><strong>Intermediation</strong></td>
<td>$r = 4%$, $\tau = 3%$</td>
<td>Livshits, MacGee &amp; Tertilt (2007)</td>
</tr>
<tr>
<td><strong>Depreciation</strong></td>
<td>$\delta = 8%$</td>
<td>Meh &amp; Terajima (2008)</td>
</tr>
</tbody>
</table>
### Calibration

<table>
<thead>
<tr>
<th>Moments</th>
<th>Source</th>
<th>Data</th>
<th>Benchmark</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraction of Entrepreneurs</td>
<td>GEM Survey</td>
<td>10.6%</td>
<td>10.71%</td>
<td>$\alpha = 0.641$ return to scale</td>
</tr>
<tr>
<td>Overall annual bankruptcy rate</td>
<td>PSID, Bankruptcy.com</td>
<td>0.378%</td>
<td>0.391%</td>
<td>$\lambda = 15%$ transaction cost</td>
</tr>
<tr>
<td>(job loss + business failure)</td>
<td></td>
<td></td>
<td></td>
<td>$\gamma = 43.3%$ % garnishment</td>
</tr>
<tr>
<td>Fraction of Entrepreneurs declare</td>
<td>PSID, Bankruptcy.com</td>
<td>1.66%</td>
<td>1.69%</td>
<td>$\lambda$ transaction cost</td>
</tr>
<tr>
<td>bankruptcy</td>
<td>GEM</td>
<td></td>
<td></td>
<td>$\gamma$ % garnishment</td>
</tr>
<tr>
<td>Mean of ROA</td>
<td>Herranz, Krasa and Villamil (2009)</td>
<td>1.30</td>
<td>1.313</td>
<td>$\theta$ productivity</td>
</tr>
<tr>
<td>StDev of ROA</td>
<td></td>
<td>1.575</td>
<td>1.612</td>
<td>$\alpha$ return to scale</td>
</tr>
</tbody>
</table>
Results

1. More lenient regime encourages moderate ability households to participate in entrepreneurship;

2. Variation in post-bankruptcy garnishment much more important than variation in asset exemption.

3. More lenient bankruptcy code leads to:
   1. a higher level of entrepreneurship;
   2. increased entry of moderate ability entrepreneurs;
   3. more entry/exit;
   4. lower average size of firms.
Variation in Length of Garnishment

Increase in G:
- ↓ entrepreneurs, ↑ firm size, ↑ productivity, ↓ entry/exit

% of garnishment=43.3%  asset exemption=0.9($50,000)  income exemption=0

<table>
<thead>
<tr>
<th>G</th>
<th>1</th>
<th>3</th>
<th>6</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Entrepreneurs</td>
<td>10.71</td>
<td>9.63</td>
<td>8.47</td>
<td>7.32</td>
</tr>
<tr>
<td>Average size</td>
<td>15.23</td>
<td>16.04</td>
<td>17.47</td>
<td>19.21</td>
</tr>
<tr>
<td>Ave productivity</td>
<td>1</td>
<td>1.03</td>
<td>1.05</td>
<td>1.07</td>
</tr>
<tr>
<td>Entry/Exit %</td>
<td>5.21</td>
<td>4.92</td>
<td>4.09</td>
<td>3.55</td>
</tr>
</tbody>
</table>

% Entrepreneurs/\rho_1 0 0 0 0
% Entrepreneurs/\rho_2 0 0 0 0
% Entrepreneurs/\rho_3 0.025 0.004 0 0
% Entrepreneurs/\rho_4 21.97 16.2 11.5 4.7
% Entrepreneurs/\rho_5 62.9 61.4 61.7 63.8
1. More lenient regime $\Rightarrow$ more entrepreneurs $\Rightarrow$ higher output
   - Risk-averse household run business only if
     \[ E[(1 - \phi)(\theta k^\alpha + (1 - \delta)k)] - \frac{k}{q_d} > E(w) \]
     i.e: expected return from operating a business must be much higher than expected wage income.

2. More lenient regime: drop in average firm size not enough to offset the increase in level of entrepreneurship.
   - extensive margin: more entrepreneurs;
   - intensive margin: smaller firms
     - moderate ability households operate smaller firms;
     - entrepreneurs are more borrowing constrained.
   - extensive margin effect larger than intensive margin effect.
Benchmark and Counterfactuals

<table>
<thead>
<tr>
<th>Regimes</th>
<th>1 (US)</th>
<th>2 (CA)</th>
<th>3 (UK)</th>
<th>4 (GE)</th>
<th>5 (FR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>% entrepreneurs</td>
<td>10.71%</td>
<td>9.75%</td>
<td>9.1%</td>
<td>7.32%</td>
<td>6.43%</td>
</tr>
<tr>
<td>average size</td>
<td>15.23</td>
<td>16.07</td>
<td>17.23</td>
<td>18.43</td>
<td>19.78</td>
</tr>
<tr>
<td>% entry/exit</td>
<td>10.42%</td>
<td>9.94%</td>
<td>8.64%</td>
<td>7.54%</td>
<td>6.98%</td>
</tr>
</tbody>
</table>

**DATA**

<table>
<thead>
<tr>
<th>% manager-owner</th>
<th>10.6%</th>
<th>9.7%</th>
<th>8.8%</th>
<th>7%</th>
<th>4.22%</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 20 employees</td>
<td>88%</td>
<td>86.7%</td>
<td>N.A</td>
<td>N.A</td>
<td>82%</td>
</tr>
<tr>
<td>with zero-employees</td>
<td>77.3%</td>
<td>58.2%</td>
<td>69.3%</td>
<td>N.A</td>
<td>N.A</td>
</tr>
<tr>
<td>entry/exit rate</td>
<td>12%/10%</td>
<td>11%/10.5%</td>
<td>N.A</td>
<td>6%/6%*</td>
<td>11%/7.5%</td>
</tr>
</tbody>
</table>
Welfare

From less lenient to more lenient regimes:

- Overall welfare decreases;
- Pure worker type prefer less lenient regime
  - care more about borrowing cost effect;
- HH more likely to become entrepreneur prefer more lenient regime
  - care more about insurance;
Conclusion

- Personal bankruptcy law is an important determinate of a country’s entrepreneurial sector:
  1. Percentage of population being entrepreneurs;
  2. Aggregate and sector productivities;
  3. Entrepreneurial firm size distribution;
  4. Entry/Exit

- Main mechanism is insurance effect (impact on the extensive margin)
  - Borrowing cost effect quantitatively small;

- Variation in regime have different effect on households with different abilities:
  1. High ability households are less affected;
  2. Moderate ability households care more about insurance effect;
  3. Low ability households prefer less lenient regimes.