Personal bankruptcy and wage garnishment*

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– Preliminary and incomplete –

Abstract

Bankruptcy legislation exhibits important welfare effects on the aggregate economy through effects on prices of and access to credit. In designing bankruptcy law, policy makers face a trade-off between insuring individuals against adverse shocks and providing incentives to repay debt. While the U.S. regime has a strong insurance component, many European systems are stricter in that they force delinquent households to repay (parts of) the outstanding debt through wage garnishment. This paper examines labor supply effects of the German garnishment regime and the resulting impact on credit prices. I conduct three policy experiments that reduce the burden of income garnishment. In all cases, the amount of credit in the economy declines and households save more. These effects come from a strong increase in credit prices since banks expect lower repayment. Being less indebted, households default less and bankruptcy rates drop by between 46% and 56%. I also show that removing the income cap and lowering garnishment rates significantly reduces adverse labor supply effects. When reducing the garnishment rate from 70% to 30%, disposable income of highly productive households with 60,000 EUR gross labor income increases by nearly 2/3 under garnishment. Removing wage garnishment all together would increase welfare by 1.5% on average. While these gains are quite substantial, young households suffer from restricted access to credit while households older than forty enjoy better insurance against adverse events.

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1 Introduction

Personal bankruptcy provides individuals with a powerful tool to insure against adverse events such as job loss, illness or divorce. Besides strongly influencing the capacity of individuals to react to dire situations, bankruptcy legislation is found to have a significant impact on the whole economy and aggregate welfare. These effects mainly arise from increases in credit prices because banks take the likelihood of default into account.

In Germany, around 100,000 people file for consumer bankruptcy every year. This translates to 2.5 households per thousand per year. On average, each filer defaults on $55,000$ EUR.[1] Bankrupts lose their liquid assets and are subject to severe wage garnishment. In practice, 70% of monthly net income exceeding $1,050$ EUR is garnished. Income in excess of $3,200$ EUR is fully garnished.[2] After six years of good conduct, the remaining debt can be forgiven and the household exits bankruptcy. During these six years, garnishment leads to a steep increase in the effective marginal tax rate. Increased rates create distortions that reduce the incentive to work during bankruptcy. These distortions are shown to make bankruptcy with garnishment less favorable than bankruptcy with a "Fresh Start", which has no claims towards future income.

In this paper, I explore the properties of a bankruptcy regime with labor income garnishment. I focus on the trade-off between insurance against adverse shocks and access to unsecured credit if loan prices incorporate the risk of default. Rea (1984) argues that while wage garnishment effectively reduces moral hazard, it also decreases the amount of insurance that bankruptcy offers to individuals and reduces the incentive to work in subsequent periods.[3] On the one hand, garnishment makes bankruptcy more costly to individuals. This reduces the value of using bankruptcy as insurance against adverse income or expenditure shocks. On the other hand, banks expect some repayment even in default and price loans more favorably under garnishment.[4] Cheaper loans mean households gain greater access to credit.

To quantify these effects and assess welfare implications, I set up a limited commitment model with equilibrium default and endogenous labor supply. The quantitative model is calibrated to match important facts of household income, debt, and bankruptcy filings. In

[1] See `https://www-genesis.destatis.de/genesis/online`, code 52411-0009 and 52411-0013.

[2] See §850c ZPO (civil process order).

[3] In a three period setting that ignores negative work incentives, Dye (1986) shows that optimal bankruptcy regimes garnish future income.

[4] Indeed, Lin and White (2001) find evidence of this mechanism. They show that in U.S. states where banks expect higher repayment (through lower exemption levels), consumers are more likely to gain access to loans.

order to assess the trade-off between insurance and access to credit, I compare the current garnishment regime to a "Fresh Start" bankruptcy regime without any wage garnishment and to relatively lenient regimes, where garnishment rates are lowered considerably. I answer the following questions: What are the individual labor supply effects of wage garnishment? How does garnishment affect loan prices and access to credit? Finally, can a welfare-superior bankruptcy regime be designed for Germany?

Most quantitative research has focused on models representing the "Fresh Start" bankruptcy system without claims towards future labor income (i.e. bankruptcy under Chapter 7 in the U.S.). Hence, papers in the tradition of Chatterjee, Corbae, Nakajima, and Ríos-Rull (2007) and Livshits, MacGee, and Tertilt (2007) do not consider for labor supply distortions. Besides wage garnishment, European bankruptcy regimes generally feature tighter rules as to the amount of debt that households can discard and the generosity of exemptions (Gerhardt, 2009).

There is some evidence that full commitment through garnishment might be welfare improving. Livshits, MacGee, and Tertilt (2007) argue that the benefits of insurance versus access to credit critically depend on the nature of income and expenditure risk. In a setup without unexpected expenditures, Chatterjee and Gordon (2012) find that the positive effects of increased access to credit outweigh the negative effects of reduced insurance. Under the authors' garnishment regime, households are forced to repay outstanding debt in full which leads to cheaper and larger lines of credit. Most European systems do not force households to fully repay and hence lie somewhere between "Fresh Start" regimes and full commitment regimes.

Besides potentially increasing commitment to repay, garnishment reduces the incentive to default and – once in bankruptcy – the incentive to supply labor. Indeed, Fay, Hurst, and White (2002) find that – controlling for adverse events – households are more likely to default if their financial gains are higher. Vice versa, stricter garnishment should reduce bankruptcy filings. Lower nonpayment risk lowers credit prices and increases access to credit (Lin and White, 2001). Dobbie and Song (2014) find strong evidence for labor supply reactions. They show significant negative effects of income seizure on future annual gross earnings. The authors analyze households in the U.S. that face higher effective marginal tax rates due to wage seizure by their creditors. Those households that enter bankruptcy protection (and hence are shielded from seizure) have significantly larger future gross wages. Dobbie and Song estimate the elasticity of earnings with respect to income seizure to be

0.94. Chen (2013) also finds negative employment effects of garnishment in a quantitative model with search in the labor market.[5]

Evaluating the current German garnishment regime's properties with respect to insurance and access to credit remains a quantitative question. I find that abolishing garnishment significantly reduces adverse labor supply effects for high wage individuals. Their disposable income in bankruptcy consequently increases by nearly 2/3. No garnishment comes at the expense of lower access to credit for low and high wage households since credit prices increase more strongly for large loans. Hence, the amount of credit in the economy decreases and households save more. This makes default less likely and reduces bankruptcy rates by between 46% and 56%.

To analyze the mechanisms at work and examine welfare effects, I set up a structural model of bankruptcy with wage garnishment and endogenous labor supply. The remainder of the paper is structured as follows: Section 2 presents the model framework. The calibration used to solve the model is discussed in section 3. Section 4 discusses the main features of the benchmark economy. The effects of relaxing the current garnishment regime are explored in section 5. Section 6 concludes.

2 Model

I set up a limited commitment model with equilibrium bankruptcy. The model abstracts from secured lending (e.g. mortgages or car loans) and focuses on unsecured credit such as credit card debt or overdraft loans. The economy is populated by a continuum of heterogeneous households in an overlapping generations framework. Each agent faces idiosyncratic risk in labor productivity and expenditure shocks. Households can work, consume, save (or borrow) and file for bankruptcy. Financial intermediaries operate competitively and offer loans dependent on household characteristics and loan size.

Wages and the risk-free interest rate are set exogenously. Since unsecured borrowing and lending only make up for a small fraction of capital in the economy this arguably is not a strong assumption. Effects of shifts in borrowing and lending behavior on the marginal product of labor or the aggregate capital stock are negligible. Indeed, when running their policy experiment, Chatterjee, Corbae, Nakajima, and Ríos-Rull (2007) conclude that general equilibrium effects do not create noticeable dynamics.

[5]Li and Sarte (2006) model garnishment under U.S. Chapter 13 as an income tax and find negative labor supply effects. Debt relief or risk dependent loan prices are not considered.

2.1 Bankruptcy Regime

According to the German bankruptcy code, households that file for bankruptcy do not have to repay their outstanding debt directly. Rather, for $T = 6$ years, a part $g(y)$ of labor income y is garnished to repay debtors. The remaining debt is rolled over to the next period at the interest rate $\bar{r}$. Upon exiting the period of good conduct after T periods, any outstanding debt is forgiven and households start the next period with zero net assets.[6] During the period of good conduct, households are not allowed to take extra credit but might repay early. More precisely, households are legally bound to save at least $g(y)$ during garnishment but might choose to save even more to reach zero net assets before the period of good conduct ends and thereby exit bankruptcy earlier.

2.2 Households

Households derive utility from consumption c and disutility from hours worked h. Their lifetime utility is the expected discounted sum of one-period CRRA utility functions. For a household of type i and age $j = 1$ it can be written as

$$U\left(\{c_j^i, h_j^i\}_{j=1}^J\right) = \mathbb{E}\sum_{j=1}^{J} \beta^{j-1} u(c_j^i, h_j^i) = \mathbb{E}\sum_{j=1}^{J} \beta^{j-1} \left(\frac{(c_j^i)^{1-\sigma}}{1-\sigma} - \psi\frac{(h_j^i)^{1+\phi}}{1+\phi}\right), \quad \psi > 0 \qquad (1)$$

In each period, solvent households (i.e. those not in bankruptcy)

1. observe their idiosyncratic labor productivity p, expenditure shock κ and assets a
2. optimally choose whether to default ($d(a', s') = 0$) or not ($d(a', s') = 1$) and
3. choose consumption, savings (i.e. next period's asset holdings) and labor supply optimally.

The solvent households' state is thus fully represented by (a, s), with $s = \{j, p, \kappa\}$.[7] Households enter the model at age 21 ($j = 1$) and die with certainty at the age of 80 ($j = J = 60$).

For solvent households, the recursive formulation of the lifetime maximization problem given state (a, s) and conditional on not declaring bankruptcy ($d = 0$) is $V^S(a, s, 0)$ and reads

[6] Since only net asset are modeled, I abstract from seizing positive assets upon filing for bankruptcy to partially repay outstanding debt.

[7] Note that due to the OLG structure, age j enters the state space.

$$
\begin{aligned}
V^S(a,s,0) = \max_{c,h,a'} \Big[& u(c,h) + \beta \mathbb{E} \max \left\{ V^S(a',s',0), V^D(a',s',1) \right\} \Big] \\
\text{s.t.} \quad & c + q(a',s)a' = y + a - \kappa \\
& h \in (0,1), \; c > 0
\end{aligned}
\tag{2}
$$

The budget constraint in solvency simply states that expenditures cannot exceed labor income (y) plus initial wealth (a) minus the expenditure shock (κ). $q(\cdot)$ denotes the bond price households are offered for saving/borrowing. It will be discussed in detail in section 2.3.

Gross labor income comprises the wage rate w and the household's labor supply h. The household is subject to a progressive tax. I apply the labor income tax function proposed by Benabou (2002) such that net labor income reads

$$
y = \lambda_0 \left(wh \right)^{1-\lambda_1} \tag{3}
$$

The wage rate w is comprised by $w = p \cdot x(j)$, where labor productivity p is multiplied by an age dependent experience premium $x(j)$. The productivity component p of (log) wages represents the idiosyncratic wage risk a household faces. It consists of a persistent AR(1) process $z_{i,t}$ and transitory white noise $\varepsilon_{i,t}$. For household i at time t it reads:

$$
\begin{aligned}
\log \left(p_{i,t} \right) &= z_{i,t} + \varepsilon_{i,t} \\
z_{i,t} &= \varrho z_{i,t-1} + \eta_{i,t}
\end{aligned}
\tag{4}
$$

where $\varrho \in [0,1]$, $\varepsilon \sim \mathbb{N}(0, \sigma_\varepsilon^2)$ and $\eta \sim \mathbb{N}(0, \sigma_\eta^2)$.

Upon default, households enter the phase of good conduct and labor income is subject to garnishment for T periods. Upon deciding to file for bankruptcy ($d = 1$), $t = \{1, 2, ..., T\}$ keeps track of the household's time in bankruptcy.

The recursive formulation in default reads

$$
\begin{aligned}
V^D(a,s,t) = \max_{c,h,a'} & \left[u(c,h) - d\zeta + \beta \mathbb{E}\left(V^D(a',s',t')\right)\right] \\
\text{s.t.} \quad & c = [1-g(y)]\, y - g^* \\
& (1+\bar{r})^{-1}\, a' = a + g(y)y + g^* \\
& g^* \geq 0 \\
& t' = t+1
\end{aligned} \tag{5}
$$

When defaulting, agents incur a utility cost of ζ. Once in bankruptcy, households are not free to borrow but have to comply with wage garnishment. Hence, consumption can only be as large as labor income less the part that is seized. Additional repayment (i.e. $g^* > 0$) further reduces consumption. The total repayment $g(y) + g^*$ is used to pay down debt. The remainder is rolled over at rate $\bar{r}$.[8]

Allowing the aforementioned two ways of exiting bankruptcy, all outstanding debt is forgiven upon completion of the period of good conduct

$$V^D(a,s,T+1) \equiv V^S(0,s,0)$$

or early exit is allowed if all outstanding debt is repaid in full. Hence

$$V^D(a,s,t) \equiv V^S(a,s,0) \quad if \quad a \geq 0$$

With value functions from Equations 2 and 5 at hand the value function for solvent households in the beginning of each period - after observing the household state (a,s) but before deciding whether to default or not - can be expressed as

$$V(a,s) = \max_{d(a,s)\in\{0,1\}} \left(1-d(a,s)\right)\; V^S(a,s,0) + d(a,s)\; V^D(a,s,1) \tag{6}$$

For households in their t-th year of default, the value function is given in equation 5.

2.3 Financial intermediaries

Banks operate in a perfectly competitive market with free entry. Each bank can refinance or invest at the exogenous risk-free rate r outside the model economy. Upon emitting loans,

[8]Note that it is assumed that households are protected from expenditure shocks during bankruptcy. Since these are very rare and bankruptcy rates are around 0.25% per year, this assumption has no measurable implications.

banks face proportional transaction costs of γ. At each point in time, a schedule of one-period contracts is offered. Each contract is defined as quantity-price bundle $(a', q(a', s))$. Since current household states are observed by the financial intermediary, prices vary not only by loan size but also by household type.

Due to perfect competition, expected profits of offering any loan contract are zero, given any type of household. This condition is used to pin down the loan price as a function of loan size and household type. The expectations of next period's repayment rate $\tilde{\rho}$ are a function of the size of the loan a' and next period's state of the household s', given state s today. It is denoted by $\mathbb{E}\left[\widetilde{\rho}\left(a', s'\right) \mid s\right]$. Accordingly, the expectations of profits $\pi\left(a', q(\cdot)\right)$ can be written as

$$\mathbb{E}\left[\pi\left(a', q(a', s)\right) \mid s\right] = q(a', s)a' - \left(1 + r + \gamma \cdot \mathbf{I}_{a'<0}\right)^{-1} \mathbb{E}\left[\widetilde{\rho}\left(a', s'\right) \mid s\right] a' = 0 \qquad \forall s, \forall a' \quad (7)$$

Expected profits are (expected) revenue minus (expected) cost. In case of offering a savings contract ($a' \geq 0$), revenues are defined by the fist term: $q(\cdot)a'$. Costs are derived from the second term and amount to $a'/\left(1 + r\right)$. Here, the indicator function is equal to zero and $\mathbb{E}\left[\widetilde{\rho}\left(\cdot\right) \mid s\right] = 1$ since banks do not face default risk for savings contracts. Savings are therefore secure and paid the risk-free interest rate. Hence, $q(a', s) = \left(1 + r\right)^{-1}$ if $a' \geq 0$.

If banks provide loans, repayment might be lower: $\mathbb{E}\left[\widetilde{\rho}\left(a', s'\right) \mid s\right] \in [0, 1]$. Hence, revenues are uncertain and read $-\left(\mathbb{E}\left[\widetilde{\rho}\left(a', s'\right) \mid s\right] a'\right) / \left(1 + r + \gamma\right)$. Costs of offering a loan contract (a',$q(a', s)$) are simply the face value $-q(a', s)a'$.

Denote the risk-free loan price where loans are fully repaid (i.e. $\mathbb{E}\left[\widetilde{\rho}(\cdot) \mid s\right] = 1$) as $\bar{q} = \left(1 + r + \gamma\right)^{-1}$. Solving Equation 7 for $q(\cdot)$, one can then write

$$\begin{aligned} q(a', s) &= \bar{q} \cdot \mathbb{E}\left[\widetilde{\rho}\left(a', s'\right) \mid s\right] \\ &= \bar{q} \cdot \mathbb{E}\left[\widetilde{\rho}\left(a', s'\right)\left(1 - d\left(a', s'\right)\right) \mid s\right] + \bar{q} \cdot \mathbb{E}\left[\widetilde{\rho}\left(a', s'\right) d\left(a', s'\right) \mid s\right] \\ &= \bar{q}\left(1 - \mathbb{E}\left[d\left(a', s'\right) \mid s\right]\right) + \bar{q} \cdot \mathbb{E}\left[\widetilde{\rho}\left(a', s'\right) d\left(a', s'\right) \mid s\right] \qquad \forall s, \forall a' < 0 \end{aligned} \quad (8)$$

where the last step in Equation 8 uses the fact that repayment is full given no default occurs:

$$\mathbb{E}\left[\widetilde{\rho}\left(a', s'\right)\left(1 - d\left(a', s'\right)\right) \mid s\right] = \begin{cases} 1, & \text{if} \quad d(\cdot) = 0. \\ 0, & \text{if} \quad d(\cdot) = 1. \end{cases} \quad (9)$$

Finally, denoting the fraction that is repaid conditional on defaulting $\rho\left(a', s'\right) = \widetilde{\rho}\left(a', s'\right) d\left(a', s'\right)$ the full price schedule can be written as

$$q(a', s) = \begin{cases} (1+r)^{-1}, & \text{if } a' \geq 0. \\ \bar{q}\left(1 - \mathbb{E}\left[d\left(a', s'\right) \mid s\right]\right) + \bar{q} \cdot \mathbb{E}\left[\rho\left(a', s'\right) \mid s\right], & \text{if } a' < 0. \end{cases} \tag{10}$$

The fraction of recovered loans is the discounted sum of garnished incomes (and voluntary repayment g^*), normalized by the original loan size, here denoted by a'_0.[9]

$$E\left[\rho(a'_0, s_0) \mid s_0\right] = \frac{\sum_{i=1}^{\widetilde{T}} E\left[g(y_i)y_i + g_i^* \mid s_0\right] \cdot \bar{q}^i}{|a'_0|} \tag{11}$$
$$\text{with} \quad \widetilde{T} = \min\{T, J - j_0\}$$

Garnishment ends after $\widetilde{T}$ periods if either garnishment has been completed after T periods or if the household dies before.

2.4 Equilibrium

Given a bankruptcy code, a risk-free rate r and a wage process $w \cdot x(j)$, a financial market equilibrium is the set of value functions V^S and V^D, policy functions $c(\cdot)$, $a'(\cdot)$, $d(\cdot)$, $h(\cdot)$, a set of default probabilities $\mathbb{E}\left[d\left(\cdot\right) \mid s\right]$ and expected repayment rates $\mathbb{E}\left[\rho\left(\cdot\right) \mid s\right]$ and an asset pricing function $q(\cdot)$ such that:

1. Households maximize V, V^S and V^D, where $c(a, s)$, $a'(a, s)$, $d(a, s)$, $h(a, s)$ are the resulting optimal policy functions.

2. The bond price $q(a', s)$ is determined in a competitive market with free entry, taking as given the expected default and repayment rates $\mathbb{E}\left[d\left(a', s'\right) \mid s\right]$ and $\mathbb{E}\left[\rho\left(a', s'\right) \mid s\right]$.

3. The measure of households over states (a, s, t) is constant.

3 Calibration

In order to provide a useful framework for policy evaluation, the model is set up to reproduce important facts on income, debt and bankruptcy filings. Table 1 lists the parameters used to solve the model. Some parameters are directly specified while other are jointly chosen to match important data moments.

[9] In a slight abuse of notation, I introduce time indices into recursive formulation.

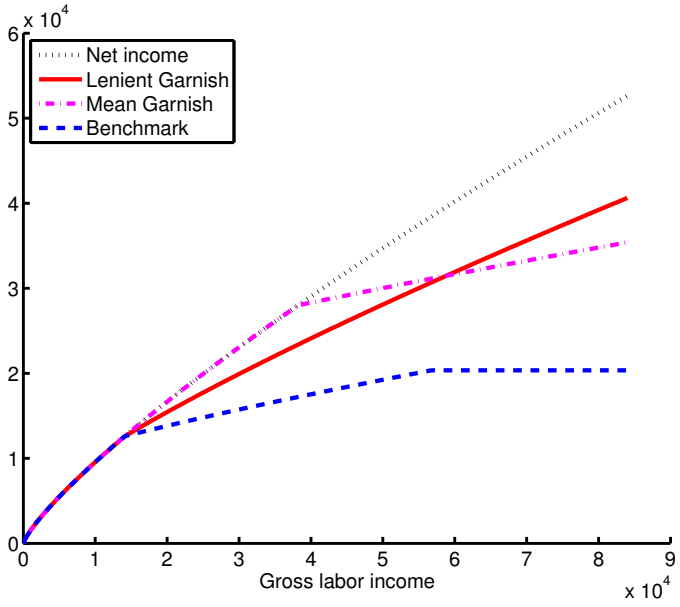

Figure 1: Net labor income and net labor income under garnishment
Benchmark: German insolvency law ("Pfändungsgrenzenbekanntmachung 2013")
Policy experiments according to section 5.

3.1 Direct specification

Preferences The period utility function is assumed to be additively separable in consumption and hours worked. Discounting and the CRRA parameter of consumption are set to standard values. To get the coefficient of labor supply, I use the Frisch elasticity of labor supply estimated in Hall (2009). One can argue that this is a conservative estimate, since Hall accounts for the external margin which I abstract from.[10]

Income process The idiosyncratic productivity component p of household (log) wages corresponds to the residual of regressing wages on observables such as age and education. For most purposes, it is assumed to follow a combination of a persistent AR(1) process $z_{i,t}$ and transitory white noise $\varepsilon_{i,t}$, as described in equation 4. Using GSOEP data (German Socioeconomic Panel), Bayer and Juessen (2012) estimate the AR(1) coefficient (ϱ) and the standard deviations of ε and η for the period 1984-2006. I report the results in Table 1.

Both components of the idiosyncratic wage process are discretized. The persistent component $z_{i,t}$ is approximated by a five state Markov chain using the Rouwenhorst method

[10]Households can decide whether to participate in the market or not. The Frisch elasticity of labor supply is then calculated conditional on participating and argued to capture labor supply responses to shifts in the wage rate.

for highly correlated processes described in Kopecky and Suen (2010). The white noise term $\varepsilon_{i,t}$ is discretized to take three possible values.

I estimate the age-dependent experience component $x(j)$ from data on monthly gross wages in Germany by age in the years 2006 and 2010.[11] The data bins are interpolated to yield yearly values using cubic splines. The mean $1/J \sum_{j\in\{1,..J\}} x(j) = 1$ is normalized to one. The experience profile is plotted in figure A.11.

Expenditure shocks In the current version of the model, I use estimates by Livshits, MacGee, and Tertilt (2007, Table 1) as a proxy. The authors calculate a discrete iid expenditure shock that takes two values besides zero. It captures marital disruptions as well as health shocks. These correspond to the main reasons for filing for bankruptcy. In Germany, unemployment accounts for 24 % of filings. Additionally, divorce and illness account for 14 % and 13 %, respectively.[12] Let $P(\kappa)$ denote the realization probabilities.

Wage garnishment Upon default, agents enter the period of good conduct for $T = 6$ years. During this period, a household faces wage garnishment of $\tau = 70\%$ for all labor income in excess of $\underline{y} = 12,600$ EUR. Above $\overline{y} = 38,448$ EUR, all additional income is garnished. Figure 1 depicts net labor income and net labor income after garnishment as a function of gross labor income.[13]

Financial intermediaries Banks are assumed to have access to outside financing at the risk-free interest rate. The risk-free interest rate is set to the yields of German government bonds around the 2011 value of 2%. The interest rate to roll over debt of bankruptcy is externally set to 10 %. It does not have large quantitative effects and could in future versions be used to represent monetary cost arising during bankruptcy.

[11] Source: German Federal Statistical Office: Verdienststrukturerhebung 2006 and 2010.

[12] `https://www.destatis.de/EN/FactsFigures/SocietyState/IncomeConsumptionLivingConditions/AssetsDebts/Tables/Overindebtedness.html`

[13] The policy experiments "Mean Garnish" and "Lenient Garnish" will be discussed in section 5.

Table 1: Calibration

Externally determined parameters			**Var**	**Value**	**Source**
Discount factor			β	0.97	literature standard
Coefficient of risk aversion consumption			σ	2	literature standard
Frisch elasticity of labor supply			ϕ	0.7^{-1}	Hall, 2009
Autocorrelation, persistent process			ϱ	0.9347	Bayer et al., 2012
Std. deviation of shock, persistent process			σ_η	0.1809	Bayer et al., 2012
Std. deviation of shock, transitory process			σ_ε	0.2142	Bayer et al., 2012
Expenditure shocks (% of avg. income)			κ	[26.4 82.18]	Livshits et al., 2007
Realization probabilities (in %)			$P(\kappa)$	[7.104 0.46]	Livshits et al., 2007
Risk free interest rate			r	2%	ECB - long term bond rate
Roll over rate in bankruptcy			$\bar{r}$	10%	tbd
Level of labor income tax			λ_0	0.77908	Holter et al., 2014
Progressivity of labor income tax			λ_1	0.198354	Holter et al., 2014
Income exemption p.a.			$\underline{y}$	$12,600 EUR$	Bankruptcy law
Income cap p.a.			$\overline{y}$	$38,448 EUR$	Bankruptcy law
Marginal garnishment rate			τ	70%	Bankruptcy law
Jointly targeted moments	**Target**	**Model**	**Var**	**Value**	**Source**
Average bankruptcy filings per 1,000 HH	2.5	2.470	ζ	7.1814	Statistic of over-indebted HH
Average debt when filing	60,000	45,652	γ	0.79	Statistic of over-indebted HH
Average Labor Income	29,800 EUR	31.500 EUR	ψ	0.53	Statistic on Income & Expenditure

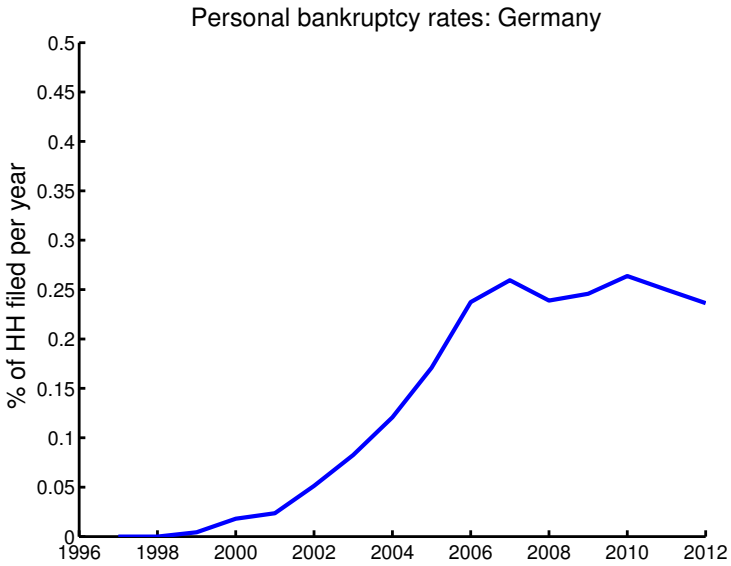

Figure 2: Annual bankruptcy filings per household, in %.
Source: German Federal Statistical Office

3.2 Matching moments

The current version of the model is able to match the key statistics of bankruptcy and debt well. Further moments are to be included in later versions. In order to compute aggregate statistics, the model is solved by backward iteration over the life cycle. The model economy is then simulated in a Monte-Carlo fashion with $N = 100,000$ random life-cycle draws of the wage process and expenditure shocks. The model moments are then aggregated from this sample. In order to match the model to the data, the following objective function is solved

$$\min_{\theta} \sum_{i} \omega_i \left(M_i(\theta) - D_i \right)^2 \tag{12}$$

Hence, optimal parameter values (θ) are chosen such that the sum of squared differences between the model moments $M_i(\theta)$ and data targets (D_i) is minimized. In the current version, $\theta = \{\zeta, \gamma, \psi\}$ and deviations are weighted equally (i.e. $\omega_i = 1 \ \forall i$).[14]

[14]Note that average labor income is normalized to 1. The calibration then targets normalized labor income, the debt-to-income ratio and bankruptcy filings per thousand which are all of the same order of magnitude.

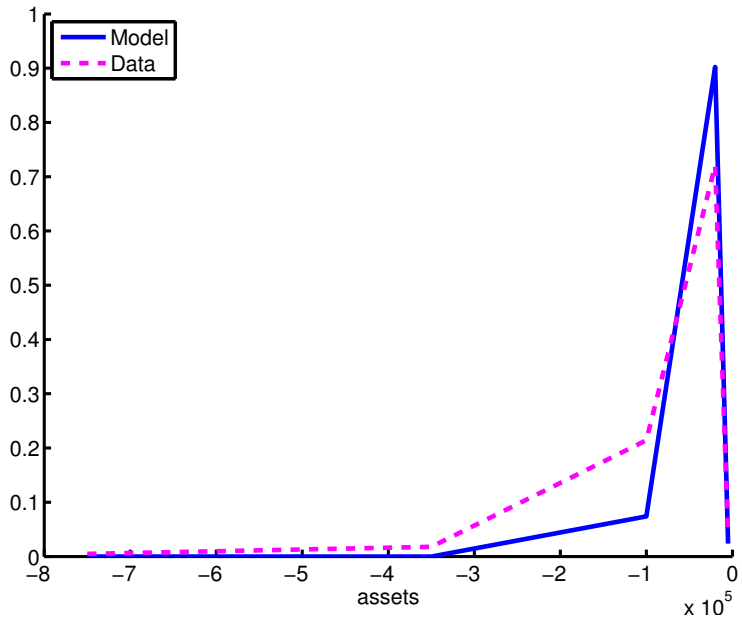

Figure 3: Distribution of defaulted debt, relative to average annual wage (29,800 EUR) *Source:* German Federal Statistical Office, 2012: Statistik zur Überschuldung privater Personen.

Bankruptcy statistics Figure 2 shows bankruptcy filings per household in Germany. After the introduction of personal bankruptcy legislation, German bankruptcy rates rose quickly and remained stable since. From 2006 to 2012, on average 2.5 per thousand German households filed for bankruptcy per year. The model hits this target very closely with a deviation of only -1.2%.

Defaulted debt The model is not fully able to capture the shape of cross sectional loan sizes when entering bankruptcy. Figure 3 contrasts the model outcome to the data. Matching the expenditure shock to German data might improve this statistic significantly. In addition to underestimating very small loan sizes, very high amounts of debt (four times average annual income, around $120,000$ EUR) are not captured. This is also the reason for the model to produce too low a mean of debt when filing. The model underestimates average debt when declaring bankruptcy by about 25%. Since only unsecured lending is modeled, very high debt holdings are hard to obtain. One might argue, though, that debt from other sources might be reported in the statistic. In practice, it might be hard to identify liabilities from failed businesses or liquidated mortgages that are carried over into

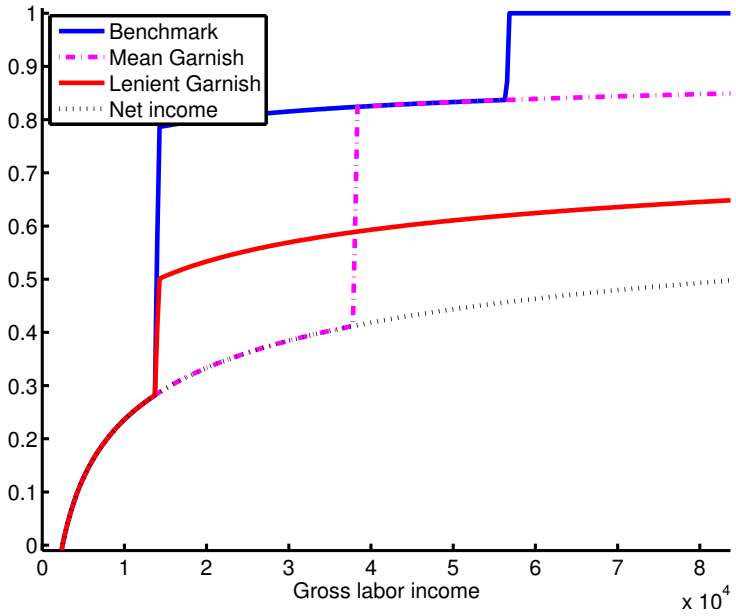

Figure 4: Marginal tax rates as function of gross income.

private bankruptcy. Hence, the data might overestimate debt from defaulting on unsecured loans.

The current spread between saving and (secure) lending is about $\gamma = 0.79$ percentage points. That means that households can save for 2% and borrow at 2.79% if the loan contract is completely risk free.

Labor income In the benchmark case, households earn around $31,500$ EUR of gross labor income per year. This overestimates actual labor income by around 6%. It yields a utility weight of $\psi = 0.53$ in the calibration.

4 Benchmark case

In the benchmark economy described above, about 2.5 per thousand households file for bankruptcy. More than 80% of filers have outstanding loans of around $30,000$ EUR (about 1 times average annual labor income) and about 10% have more than $80,000$ EUR. The average debt amounts to around $45,000$ EUR when declaring bankruptcy.

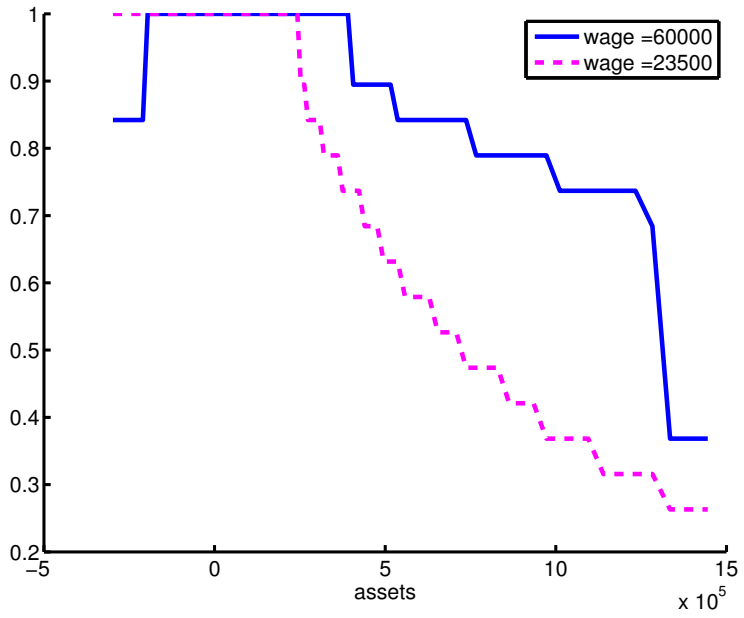

Figure 5: Optimal labor supply, age 50

4.1 The effect of endogenous labor on loan prices

Endogenous labor supply turns out to be a key margin along which households adapt when filing for bankruptcy. Figure 4 depicts the evolution of marginal tax rates as function of gross labor income. Due to the harsh garnishment regime that levies a marginal tax rate of 70% for net income above 12,600 EUR and 100% for net incomes above 38,500 EUR, high wage earners reduce their labor supply significantly. In contrast, low wage workers are affected by garnishment only weekly and hence do not react.

Figure 5 shows optimal labor supply for households of age 50 that earn 23,500 EUR and 60,000 EUR gross labor income if working full-time. Most importantly, a sharp drop in hours worked is observed for the high wage household at the amount of debt where debt levels become unsustainably high. At debt levels higher than this threshold, default becomes optimal for every household of that type. Hence, optimal labor supply reacts to the pending garnishment and drops in reaction to the marginal tax rate of 100%.

Without defaulting, the high wage household with 60,000 EUR gross labor income would earn a net wage of around 42,000 EUR. Hence, without adjusting labor supply, 3,500 EUR would exceed the garnishment income cap and be subject to full garnishment. In total, the household would pay 20,900 EUR of garnishment and end up with 21,100 EUR of disposable income at constant labor supply of 1.

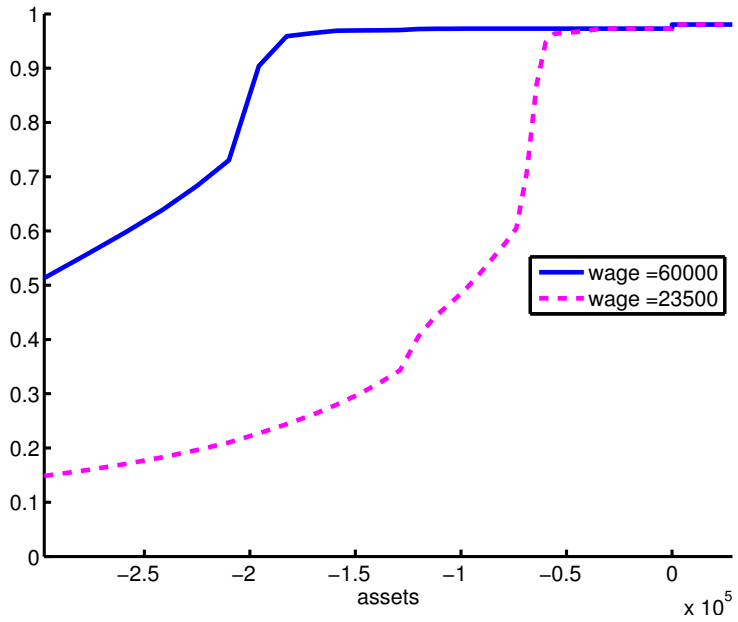

Figure 6: Equilibrium loan prices, age 50

Allowing the high wage individual to adapt labor supply, she only offers 83% of the full-time equivalent. Hence, her net labor income without garnishment would amount to 35,900 EUR, clearly avoiding the income cap. Total garnishment drops to 16,000 EUR and the household still has 19,900 EUR at its disposal.

The low wage earner has a net annual labor income of 18,900 EUR with full labor supply. After garnishment, 14,500 EUR are left while 4,400 EUR garnished. Garnishment for this individual is too low for him to reduce labor supply. Hence, the income effect dominates for low productivity households and labor supply is 1 even through garnishment.

The income effect also makes the low wage household reduce effort much faster as wealth increases. His opportunity cost of leisure are lower compared to high wage individuals.

4.2 Equilibrium loan price

Evading garnishment has a stark impact on loan prices, as documented in Figure 6. Using the notation from Equation 2, one can interpret the loan price as $q = 1/(1+r)$. Hence, $q \to 1$ means a low interest rate $r \to 0$, while $q \to 0$ means increasing interest rates $r \to \infty$.

Loan prices are (weakly) decreasing in loan size. At the threshold of sustainable debt, there is a sharp drop, though. This comes from the fact that banks know the incentives for

households to default and reduce working hours, avoiding high amounts of garnishment. Hence, expected repayment for these loans is very low.[15]

Comparing high and low wage earners, not surprisingly, the former have considerable higher access to credit. This manifest along two dimension: Firstly, credit prices only deteriorate at higher levels of debt and secondly, the plunge in loan prices is less pronounced for high income individuals. Regarding the first, higher disposable income simply allows higher repayment of loans without the necessity to default. Also, filing for bankruptcy is more costly for high wage households, relative to not filing, because of the distortions to labor income. As a result, default becomes optimal at much higher levels of debt. Secondly, if highly productive individuals file for bankruptcy, banks can recoup a larger fraction of the outstanding loans. That means expected losses are smaller which leads to a less pronounced drop in credit prices.

5 Policy experiments

In the current version of the paper, I analyze three different reforms to the bankruptcy code. (1) resembles "Fresh Start" regimes such as Ch. 7 in the U.S. The marginal garnishment rate is zero. (2) represents an intermediary case between the current German and U.S. legislation. Only income exceeding average income is subject to garnishment. Finally, (3) resembles income seizure in the U.S. if households do not file for bankruptcy. 30% of income is seized to repay outstanding debt.

In all three experiments, I remove the income cap during garnishment due to the distortionary effects on labor supply. These policy regimes are analyzed:

1. "No Garnishment": Under the reformed bankruptcy code, labor income is not subject to garnishment. During the period of good conduct, individuals are only prevented from increasing debt. After $T = 6$ years, all outstanding debt is forgiven and bankrupts have a "Fresh Start". Technically, I set $\underline{y} = \overline{y} = \infty,\ \tau = 0$.

2. "Mean income exemption": The income exemption in garnishment is increased to mean labor income, hence $\underline{y} = 29,800$ EUR, $\overline{y} = \infty$, $\tau = 70\%$.

3. "Lenient garnishment": Exempt income is kept constant, but upon entering garnishment, only 30% of net income is subject to garnishment. Thus, $\underline{y} = 12,600$ EUR, $\overline{y} = \infty$, $\tau = 30\%$.

[15] Banks can only expect high repayment in the case of a very unlikely high income realization that allows households to repay early.

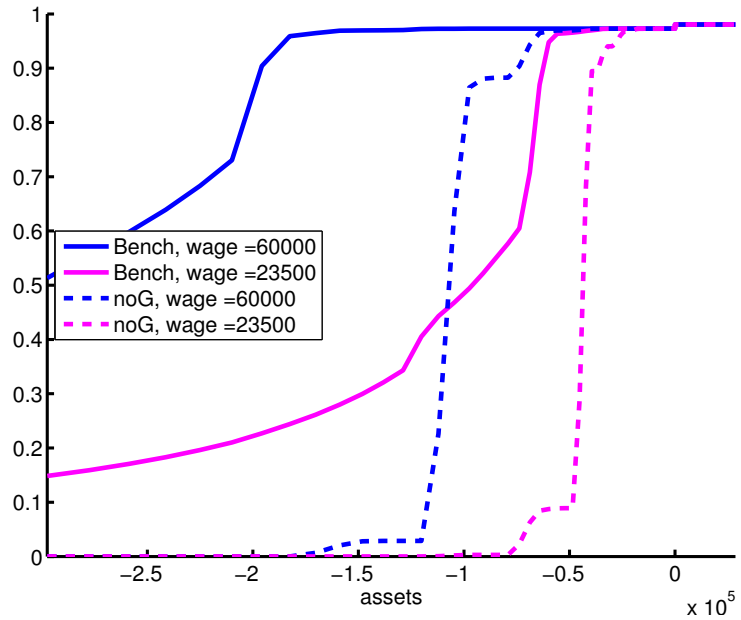

Figure 7: Equilibrium loan prices, age 50, benchmark vs. "No Garnishment"

5.1 Outcomes

Changing the garnishment legislation has a direct impact on effective marginal tax rates during bankruptcy. The different cases are plotted in Figure 4.[16] The effect of removing the income cap and lowering the effective marginal tax rate on labor income in cases 1 and 3 result in labor supply showing no distortions during bankruptcy. Despite removing the income cap, the marginal garnishment rate of 70% under "mean garnishment" yields comparable distortions to the benchmark. All labor supply policy functions are plotted in figures A.12 - A.14.

No Garnishment The effects of moving from the current German bankruptcy law to a regime without any garnishment is summarized in table 2. Most importantly, bankruptcies drop to 1.08 per $1,000$ households. This might seem counterintuitive but can be explained by the reaction of loan prices and how households adapt borrowing behavior.

Credit prices react in two ways, apparent from figure 7:

1. Loan prices increase (q decreases) at lower levels of debt.

2. Prices rise (q drops) more steeply.

[16] Marginal rates under "no garnishment" are equal to those of net income.

Firstly, abolishing garnishment increases the incentives to default at any given debt level. This leads households to prefer default at lower levels of debt and banks react by offering higher credit prices due to higher expected losses (c.f. 1). Secondly, there is no way for households to pledge future labor income as securities for banks. Credit prices deteriorate quickly as soon as default is optimal since banks loose all of the outstanding loans (c.f. 2). This effect is more pronounced for high income households. These were affected by garnishment most and hence change default behavior most radically.

In equilibrium, worsened access to credit reduces the likelihood of households being indebted. The fraction of households with negative assets drops by 12.5%. Since credit prices become very expensive at relatively low loan sizes less households hold large amounts of debt. Instead, individuals save more precautionarily, leading to additional savings of $7,500$ EUR on average.

Lower lending and higher savings yield less households holding debt levels that put them on the edge of bankruptcy. Hence, adverse income or expenditure shocks create less defaults under "No Garnishment." Furthermore, average debt upon declaring bankruptcy is reduced by $15,000$ EUR. Lower credit and increased savings thus overcompensate the effect of a more lenient bankruptcy procedure that would increase default in the absence of price adjustments.

Table 2: Model outcomes, benchmark vs. "No Garnishment"

	Benchmark	No Garnishment
Bankruptcy filings per 1,000 HH	2.470	1.08
Fraction of HH in debt (in %)	40	35
Average savings (EUR)	$28,500$	$36,000$
Average debt when filing (EUR)	$45,652$	$31,000$
Average Labor Income (EUR)	$31,530$	$31,510$

Mean income exemption Since mainly low income households default, increasing the income exemption to mean annual labor income effectively removes garnishment for most bankrupts. Hence, the results are very close to those of "No Garnishment." Bankruptcies drop to 1.15 per $1,000$ households, 4.5 percentage points less individuals are in debt and the economy saves $7,000$ EUR more on average. Mean debt when entering bankruptcy drops to $31,500$ EUR. The credit price is very similar to the previous case as shown in figure A.15.

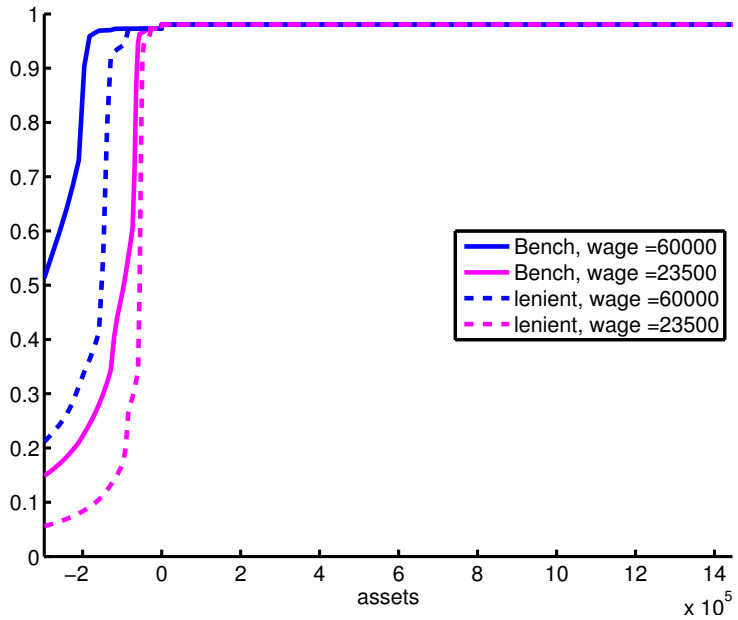

Figure 8: Equilibrium loan prices, age 50, benchmark vs. "Lenient Garnishment"

Lenient Garnishment In the final policy experiment, the bankruptcy rate drops to 1.33. Not only in terms of bankruptcy rates this case strikes a balance between the benchmark economy and the previous policy experiments. The fraction of indebted households reduces by 3 percentage points, savings moderately increase by 5,000 EUR on average and mean outstanding loans when entering bankruptcy are 35,000 EUR.

As apparent in figure 8, credit prices exhibit the same underlying shape as in the benchmark economy but drop more quickly. This is due to the lower garnishment rate that lets banks expect higher losses from delinquent debtors.

Coming back to the example of a high wage individual in section 4.1, "Lenient Garnishment" has a weaker impact on disposable labor income during bankruptcy than the current German regime. Since labor supply is considerably less distorted, the household earns a net wage of 42,000 EUR from which 9,000 EUR are garnished under the new regime. Hence, 33,000 EUR remain at the household's disposal (compared to 19,900 EUR in the benchmark case).

5.2 Welfare

All possible reforms face the trade off between higher punishment (e.g. through wage garnishment) allowing greater access to credit versus greater leniency and thus better

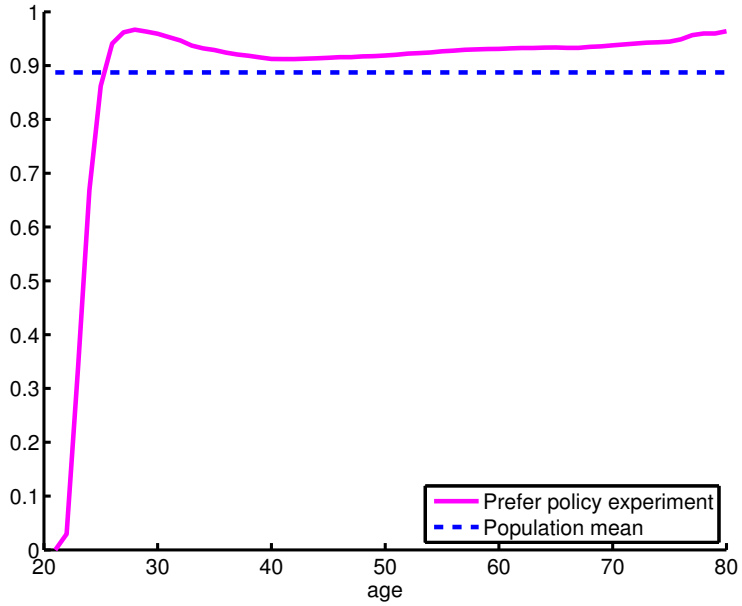

Figure 9: Fraction of individuals preferring "No Garnishment" to the benchmark, by age.

insurance against adverse events. Higher insurance comes at the price of lower access to credit. In the case of Germany, the current system is mainly harsh for high-income individuals and – as previously discussed – creates serious labor market distortions.

In this section, I employ two welfare measures to assess the desirability of a policy reform. First, the fraction of households in favor of the reform is calculated. Second, a consumption equivalence variation (CEV) measure is used. I discuss welfare effects for the "No Garnishment" reform where no income is seized upon default, whatsoever. This reform marks the most extreme shift in bankruptcy legislation among the scenarios considered. Access to credit deteriorates considerably (see section 5.1) but individuals gain the opportunity of easily discharging their debt.[17]

As a first welfare measure, I simply ask which individuals would prefer the new versus the old regime. A solvent individual with assets a and household state s prefers the policy shift, if

$$\widetilde{V}(a,s) > V(a,s) \tag{13}$$

where $\widetilde{V}(\cdot)$ indicates the value function under the new regime.

[17]Future versions of the paper will also discuss the welfare effects of the other two reforms.

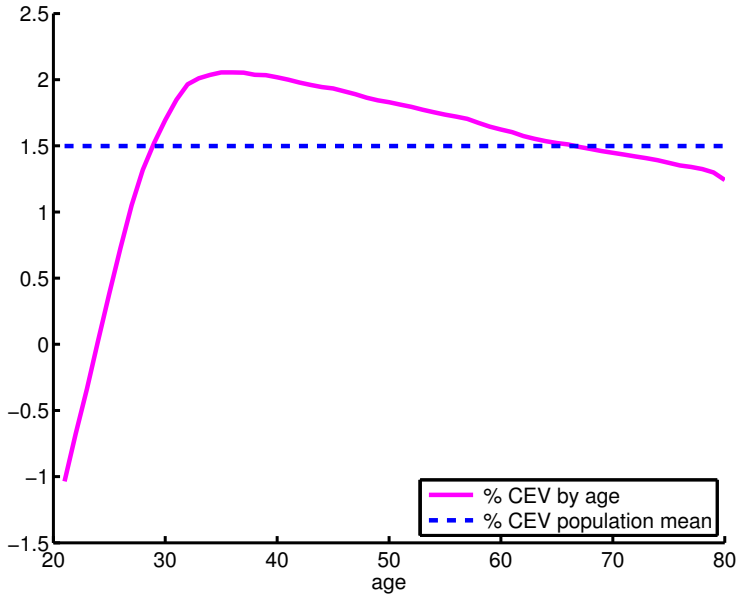

Figure 10: CEV of "No Garnishment" relative to the benchmark in %, by age.

Figure 9 plots the fraction of individuals that prefer "No Garnishment" over the current German garnishment system, by age. It is notable that – on average – 87% of the population prefer a bankruptcy system without garnishment. The only ones that clearly suffer a welfare loss are very young households.

Young households are worse off due to this reform since it forces them to forgo consumption in order to start building up assets. Under the garnishment regime, young households had much larger credit lines since garnishment made them less likely to exercise default. Additionally, they could at least partly pledge future income as collateral. Smoothing consumption over the life cycle, young households would only start paying these loans back when wages increase due to the experience premium.

Once reaching a certain age, the overwhelming majority of households prefers abolishing wage garnishment. Since these households are net-savers, credit prices do not impact their welfare directly. Only when very bad shocks realize, debt becomes relevant. Under the new regime, they have an improved option of insurance, since bankruptcy is much less painful. Hence, "No Garnishment" reduces the negative effect of adverse shocks considerably and households prefer it over the current garnishment regime.

As a second welfare measure, CEV is employed. More formally, I determine the factor ξ that consumption in the benchmark case needs to be increased annually to make a household indifferent between the benchmark and the reform:

$$V_\xi(a,s) = \mathbb{E}\sum_{i=j}^{J} \beta^{i-j} u(c_i(1+\xi), h_i) = \widetilde{V}(a,s) \tag{14}$$

This means, any $\xi > 0$ implies that households prefer the reform. Figure 10 depicts the CEV measure over the life cycle and as a population mean. All households are equally weighted to construct this measure.

On average, the economy would benefit from welfare increases equivalent to permanently increasing consumption by 1.5%. These gains are quite substantial but unevenly distributed with respect to the individual age. Young people suffer quite a strong loss while people at the age of 30 experience a 2% welfare increase. Looking at different income groups separately only changes the magnitude of the findings. While low income households incur higher losses during early years, low income households in their prime age also have greater gains.

6 Conclusion

This paper sets up a quantitative model of consumer bankruptcy and endogenous labor supply in a regime with wage garnishment. It is able to match key statistics concerning bankruptcy and debt, but underestimates debt of delinquent households. It clearly shows the negative effects of the German garnishment regime on labor supply – especially of highly productive agents with high wages. Since households evade garnishment by strongly reducing labor supply banks only recoup a small fraction of defaulted loans. Hence, banks expect low repayment upon default. This yields a steep drop in credit prices around debt levels that are not sustainable for households.

Three policy experiments are conducted to reduce the burden of income garnishment. In all cases, the amount of credit in the economy declines and default rates drop by 46% to 56%. This comes from a strong increase in credit prices since banks expect lower repayment. Households react by borrowing less and saving more, making them less likely to default.

It is shown that removing the income cap and lowering garnishment rates significantly reduces adverse labor supply effects. When reducing the garnishment rate from 70% to 30%, disposable income of highly productive households with $60,000$ EUR gross labor income increases by nearly 2/3 under garnishment. This comes at the expense of lower access to credit for low and high wage households.

On average, the economy would highly profit from abolishing wage garnishment. Removing garnishment increases welfare by 1.5% as measured by CEV. While these gains are

quite substantial, young households suffer from restricted access to credit while households in their prime age enjoy better insurance against adverse events.

References

Bayer, Christian and Falko Juessen (2012). "The life-cycle and the business-cycle of wage risk — Cross-country comparisons." In: *Economics Letters* 117.3, pp. 831–833.

Benabou, Roland (Mar. 2002). "Tax and Education Policy in a Heterogeneous-Agent Economy: What Levels of Redistribution Maximize Growth and Efficiency?" In: *Econometrica* 70.2, pp. 481–517.

Chatterjee, Satyajit, Dean Corbae, Makoto Nakajima, and José-Víctor Ríos-Rull (Nov. 2007). "A Quantitative Theory of Unsecured Consumer Credit with Risk of Default." In: *Econometrica* 75.6, pp. 1525–1589.

Chatterjee, Satyajit and Grey Gordon (2012). "Dealing with consumer default: Bankruptcy vs garnishment." In: *Journal of Monetary Economics* 59.S.

Chen, Daphne (2013). "The Impact of Personal Bankruptcy on Labor Supply Decisions." In:

Dobbie, Will and Jae Song (Sept. 2014). *Debt Relief and Debtor Outcomes: Measuring the Effects of Consumer Bankruptcy Protection*. NBER Working Papers 20520. National Bureau of Economic Research, Inc.

Dye, Ronald A (1986). "An economic analysis of bankruptcy statutes." In: *Economic Inquiry* 24.3, pp. 417–428.

Fay, Scott, Erik Hurst, and Michelle J. White (June 2002). "The Household Bankruptcy Decision." In: *American Economic Review* 92.3, pp. 706–718.

Gerhardt, Maria (July 2009). *Consumer Bankruptcy Regimes and Credit Default in the US and Europe: A comparative study.* Tech. rep. 318. Centre for European Policy Studies.

Hall, Robert E. (2009). "Reconciling Cyclical Movements in the Marginal Value of Time and the Marginal Product of Labor." English. In: *Journal of Political Economy* 117.2, pp. 281–323.

Holter, Hans A., Dirk Krueger, and Serhiy Stepanchuk (Nov. 2014). *How Does Tax Progressivity and Household Heterogeneity Affect Laffer Curves?* NBER Working Papers 20688. National Bureau of Economic Research, Inc.

Kopecky, Karen and Richard Suen (July 2010). "Finite State Markov-chain Approximations to Highly Persistent Processes." In: *Review of Economic Dynamics* 13.3, pp. 701–714.

Li, Wenli and Pierre-Daniel Sarte (2006). "U.S. consumer bankruptcy choice: The importance of general equilibrium effects." In: *Journal of Monetary Economics* 53.3, pp. 613–631.

Lin, Emily Y. and Michelle J. White (2001). "Bankruptcy and the Market for Mortgage and Home Improvement Loans." In: *Journal of Urban Economics* 50.1, pp. 138–162.

Livshits, Igor, James MacGee, and Michèle Tertilt (Mar. 2007). "Consumer Bankruptcy: A Fresh Start." In: *American Economic Review* 97.1, pp. 402–418.

Rea, Samuel A (1984). "Arm-Breaking, Consumer Credit and Personal Bankruptcy." In: *Economic Inquiry* 22.2, pp. 188–208.

A Additional figures

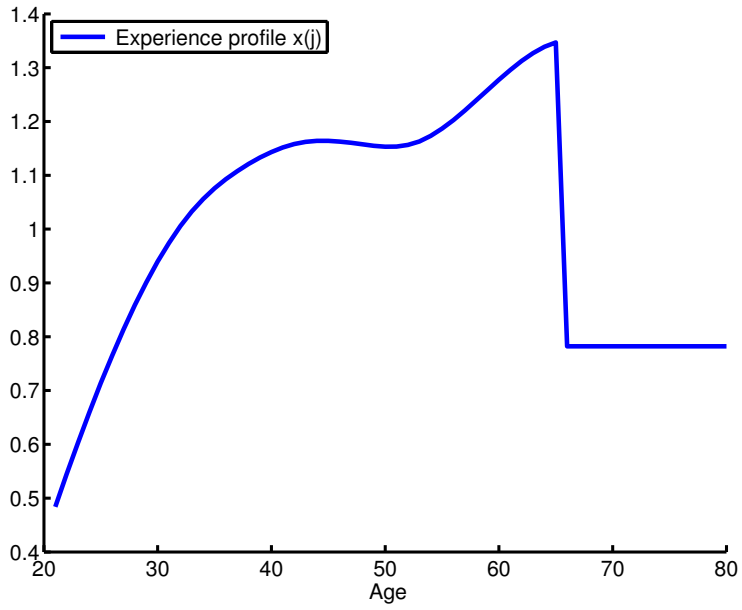

Figure A.11: Experience profile in monthly wages.
Source: German Federal Statistical Office: Verdienststrukturerhebung 2006 and 2010.

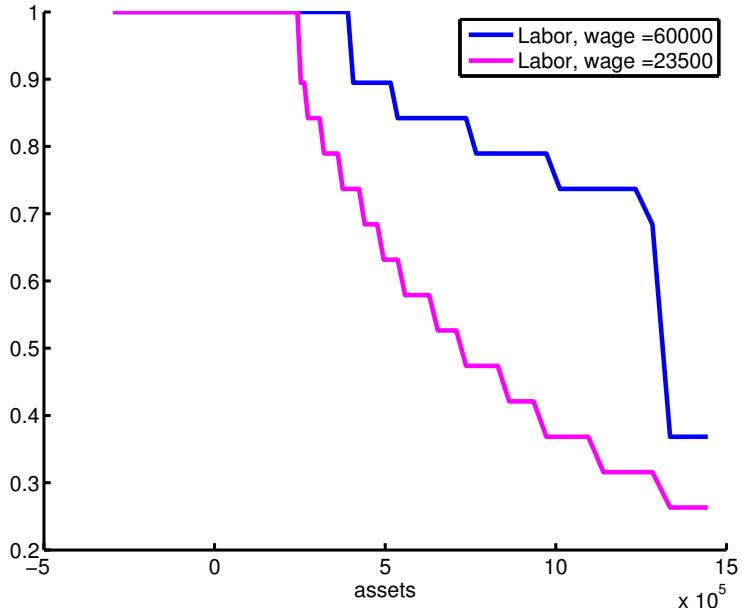

Figure A.12: Optimal labor supply, age 50. "No Garnishment"

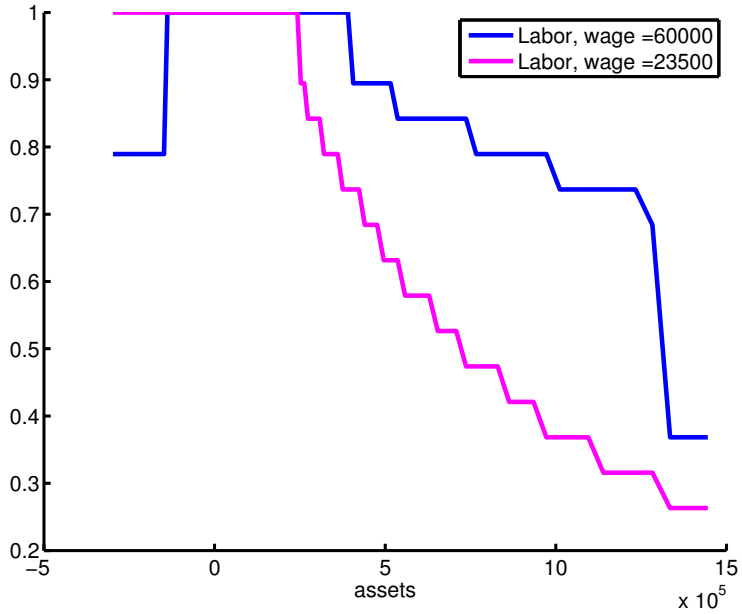

Figure A.13: Optimal labor supply, age 50. "Mean Garnishment"

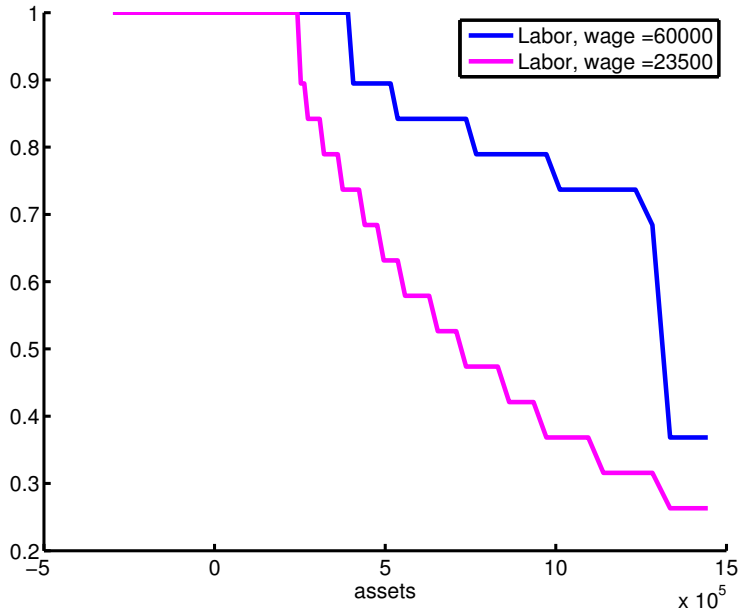

Figure A.14: Optimal labor supply, age 50. "Lenient Garnishment"

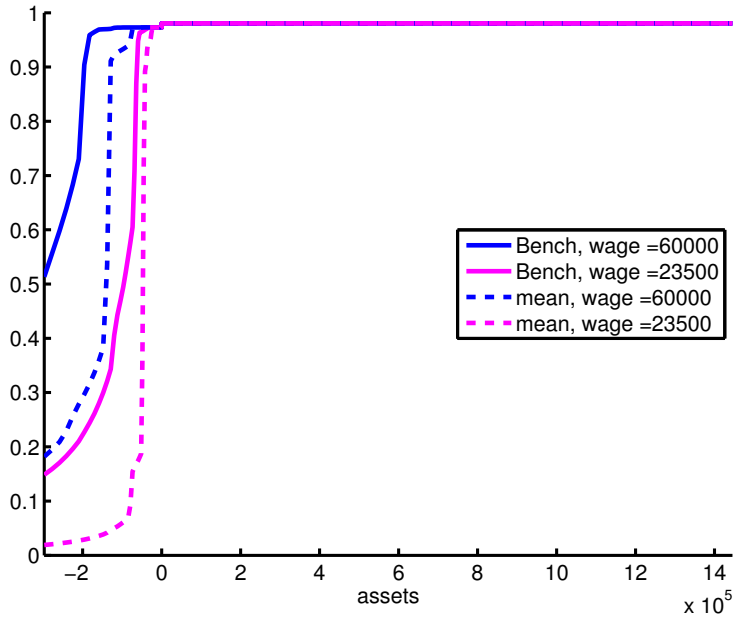

Figure A.15: Equilibrium loan prices, age 50, benchmark vs. "Mean Income Exemption"