



## 'The Poor Pay More': Another Case of Discrimination in the Consumer Credit Market?

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**Abstract** Within a theoretical framework the issue is explored whether income-dependent interest rates for unsecured consumer loans provide a case for discrimination. The analysis distinguishes between two types of pricing models and reveals how each type can provoke discrimination. A bank that seeks to realize on average the safe rate of return may give rise to statistical discrimination if it associates lower income households with higher risks without using careful screening procedures. A bank that seeks to maximize the rate of return over equity to be achieved from any individual client may give rise to profit-based discrimination if it uses the return over equity of higher income households as a benchmark, and if lower income households are locked into their market segment.

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### 1. Introduction

In statistics the term 'discrimination' has been used in a positive sense to denote a particular method which allows to separate members of a population according to well defined statistical criteria. This conception has to be carefully distinguished from a normative approach defining discrimination as unequal treatment of persons thus violating accepted principles like the availability of equal opportunities. In economics this issue of *improper* discrimination has been discussed under the perspective of unequal treatment of market participants leading to Pareto inefficient results. According to Gary Becker (1957/71) who focused on the labour market, discrimination in the market place is a result of prevailing prejudice and is therefore a 'matter

of taste'. This idea of taste-based discrimination has been extended to the credit market to denote a situation where lenders claim higher interest rates from members of protected groups in order to be compensated for the higher psychic costs in lending.<sup>1</sup> A further reason for improper discrimination has been emphasized by Arrow (1973) and Phelps (1972) which follows from a lender's desire to economize on screening costs by using race, gender, income and similar characteristics as indicators of creditworthiness instead of undertaking costly screening or monitoring. Unfortunately this type of discrimination is usually referred to as 'statistical' discrimination which obviously may lead to misinterpretations.

Both, statistical and taste-based discrimination may lead to inefficient results. As an example consider a lender claiming higher interest rates from a Hispanic borrower than from a borrower of North-American descent with the same (low) risk characteristics thus forgoing profits if the Hispanic loan applicant decides against the loan. The same is true if a lender falsely interprets lending to a low income household as highly risky and denies credit.

Profit-based discrimination finally constitutes a third example of improper discrimination which has been proposed by Yinger (1998) to describe a situation where a lender charges higher interest rates or fees from a member of a certain class with risk characteristics similar to other loan applicants in order to increase his profits. However, whether such a pricing behaviour really constitutes discrimination from an economic point of view is at issue. For example Becker (1957/71) denies that endeavours made by firms to maximize profits can ever be considered as discriminatory.

Discrimination in the market for financial services is increasingly becoming an issue in Germany, too. In 1998 a large bank started to charge income-dependent interest rates for unsecured consumer loans. In doing so three income classes were distinguished: Disposable incomes of €2500 and more, incomes between €2500 and 1500 and finally incomes less than €1500. A recent investigation undertaken by the Hamburg Consumer Advice Centre confirmed that after six years the same bank continues to follow this practice. Sending test persons to banks in Hamburg on 1 March and 9 March 2004 it was found that households earning €2500 and more had to pay an interest rate of 6.99% for a loan with a three months maturity, households earning less than €1500 were charged 10.99%. These test persons also detected two further banks in Hamburg with income-dependent interest rates. Other banks were found using more indirect ways of discriminating between households with different incomes. One way to do this is to offer lower inter-

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<sup>1</sup> Cf Peterson (1981); Becker (1993); Han (2001).

est rates to people with higher wealth or to induce lower income households to buy expensive insurances thus driving the effective interest rate up to 40%. A further lending practice that was revealed by this same investigation consisted of offering those households lower interest rates which are able to repay a loan of €10000 within 12 months implying a monthly payment of €800 which a lower income household will be unable to afford.<sup>2</sup> At first sight it may appear that a pricing behaviour like this can be justified with risk arguments. However, as the following sections will make evident, on closer scrutiny the relationship between income and risk is not that clear-cut. In particular it will be shown that lower income households are not necessarily riskier implying that income-dependent interest rates may indeed involve statistical and – depending on how profitability is measured – profit-based discrimination, too.

Complementary to Yinger's argument, profit-based discrimination here will be explained with a segmentation of the consumer credit market forcing lower income borrowers to pay higher interest rates without being able to make a choice among more favourable alternatives. Income-dependent loan interest rates then constitute a discriminatory practice not only because they violate the principle of equal opportunities but also because they lead to Pareto inefficiency. In showing this, I will take a theoretical perspective thus providing a further contribution to the yet few numbers of theoretical approaches to discrimination.<sup>3</sup>

The remainder of the paper is organized as follows: In section 2 a frequently applied model of bank pricing behaviour is used in order to examine relationships between a borrower's income, average cost of lending and default risk. This model is based on the hypothesis that the bank under consideration seeks to earn at least as much over the long-run average as the interest rate of a safe alternative. It allows us to show that income-dependent loan interest rates may lead to statistical discrimination. In section 3 an alternative model of bank behaviour is proposed where the bank seeks to maximize the rate of return over equity from all financial services purchased by a single client. Under this assumption lower income households will have to pay more for their loans provided that due to cross-selling, the bank earns a higher rate of return over equity from wealthier households. Section 4 derives

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<sup>2</sup> This investigation is part of a project undertaken by the Federal Consumer Advice Centre with the aim to find out whether lower income households are exposed to discriminatory practices in various consumer markets. The Hamburg Consumer Advice Centre focused on financial services like deposits and unsecured consumer credits. Cf [www.vzbv.de](http://www.vzbv.de).

<sup>3</sup> Cf Peterson (1981); Tootell (1993); Ferguson and Peters (1995); Shaffer (1996); and above all Han (2001).

conditions under which the consumer credit market will be segmented leading to profit-based discrimination.

## 2. Lending conditions in a frequently used model of banking behaviour

### 2.1 *The Price-Building Hypothesis*

A frequently used pricing model is based on the assumption that a bank is only willing to grant a loan if the expected gross return from lending is at least as high as the interest rate of a safe alternative (Freixas and Rochet, 1999). This approach corresponds with the so-called ‘Marktzinsmethode’ which has been a widely used pricing model in the German banking sector since the early 1980s. In the following we apply this hypothesis to find out how income affects the interest rate for an unsecured consumer loan. To facilitate the analysis we neglect intertemporal aspects and consider a loan that has to be repaid after one period. The borrower plans to redeem the loan out of his future disposable income, i.e. that part of the income that is not needed to make one’s living. At the contracting date disposable income depends on yet unknown future states of the world. Of course whether this uncertainty implies a default risk for the lender depends at least formally on the borrower’s liability. Clearly, unlimited liability will never release him from the obligation to repay the loan. However, this obligation does not provide complete insurance to the bank. First, default at the repayment date incurs opportunity costs to the bank since it now has to wait longer for the reflux of funds and thus forgoes profitable opportunities. Second, repayment remains an uncertain event since the bank as a rule can never be sure that the borrower will really succeed in fulfilling his obligations.<sup>4</sup> We may hence conclude that independent of formal liability conditions the bank will be exposed to the risk of its borrower’s default.

We therefore model repayment of the loan as a random variable  $\tilde{x}$  which for convenience is supposed to be continuous. In the same way we model a borrower’s disposable income as a continuous random variable  $\tilde{y}$ , with realizations falling into the closed interval  $[\underline{y}, \bar{y}]$ , where  $\underline{y}(\bar{y})$  denotes the worst case (best case) level of disposable income. The bank knows the objective probability distribution given by the density  $f(y)$  and the distribution function  $\Pr(\tilde{y} \leq y) = F(y)$ , where  $F(\underline{y}) = 0$  and  $F(\bar{y}) = 1$ .

Realized repayments  $x$ , are equal to the contractually agreed amount

<sup>4</sup> This is in particular the case under certain consumer bankruptcy systems like Chapter 7 in the US which gives households the right to vote for a fresh start.

$L(1+i_L)$  if disposable income is sufficient to service debt, where  $L$  stands for the loan volume and  $i_L$  for the loan interest rate. If this is not the case, the bank receives the total of available incomes.<sup>5</sup> Realized repayments are then a piecewise determined variable given by

$$x = \begin{cases} L(1+i_L) & \text{if } y \geq L(1+i_L) \equiv \hat{y} \\ y & \text{if } y < L(1+i_L) \equiv \hat{y} \end{cases} \quad (2.1)$$

If the bank grants the same kind of loans to the same borrower very often under the same states of the world, it can expect to receive as an average repayment over this long run the mathematical expectation

$$\begin{aligned} E[\tilde{x}] &= \int_{\underline{y}}^{\hat{y}} yf(y)dy + \int_{\hat{y}}^{\bar{y}} L(1+i_L)f(y)dy \\ &= L(1+i_L) - \int_{\underline{y}}^{\hat{y}} F(y)dy \end{aligned} \quad (2.2)$$

where  $\int_{\underline{y}}^{\hat{y}} F(y)dy$  denotes the statistical expectation of default  $E[\tilde{D}]$ .

$\tilde{D}$  stands for default and is a random variable determined by:

$$\tilde{D} = L(1+i_L) - \tilde{y} \quad (2.3)$$

with the following realizations:

$$D = \begin{cases} 0 & \text{if } y \geq \hat{y} \equiv L(1+i_L) \\ L(1+i_L) - y & \text{if } y < \hat{y} \equiv L(1+i_L) \end{cases} \quad (2.4)$$

If we furthermore assume that the provision of loans incurs some fixed cost  $Q$ , then the expected net rate of return from lending  $\mu_L$ , is given by

<sup>5</sup> This has been found to be incentive compatible for both the lender and the borrower if monitoring ex post is costly, cf Townsend (1979), Diamond (1984), Williamson (1986).

$$\mu_L = i_L - \frac{E[\tilde{D}]}{L} - \frac{Q}{L} - i_F \quad (2.5)$$

where  $i_F$  denotes the refinancing rate.

The bank grants the loan whenever the expected rate of return from lending is at least as high as the rate of return from the safe alternative  $i$  which implies

$$i_L - \frac{E[\tilde{D}]}{L} - \frac{Q}{L} \geq i \quad (2.6)$$

The interest rate for consumer loans is then given by

$$i_L \geq i + \frac{E[\tilde{D}]}{L} + \frac{Q}{L} \quad (2.7)$$

If equation (2.7) holds with equality, the loan interest rate exceeds the rate of return from a safe alternative by average fixed costs and by the expected average default. The calculation of the expected average default as a part of the loan interest rate allows the bank to realize on average the safe interest rate. Arguably, if the borrower takes the same loan repeatedly, we may observe periods in which he repays according to the contract thus enabling the bank to earn more than the riskless rate, but we will also observe periods in which he defaults leaving the bank with less than the safe rate. Given that the same loan is extended very often under the same states of the world, good and bad cases will balance out,<sup>6</sup> and on average the bank will end up with no less and no more than the riskless interest rate.<sup>7</sup> Instead of considering a single borrower we could as well assume that the bank fixes the loan rate for a great number of borrowers who are identical and independent risks. Then the bank's pricing policy would imply that borrowers who repay the loan subsidize those who default.

The interest rate for consumer loans will exceed the safe rate by average fixed costs and the expected average default for mainly two reasons. First, the bank may be risk-averse thus calculating a risk premium.<sup>8</sup> Second, the bank may possess some market power following the fact that customers cannot switch their bank without a cost or are not willing to do so. The bank may

<sup>6</sup> This result follows from the central limit theorem.

<sup>7</sup> This result follows from the law of great numbers.

<sup>8</sup> This case will be considered in the next section.

exploit its market power to calculate a mark-up over average total costs the size of which is bounded above by the borrower's interest rate elasticity.<sup>9</sup>

## 2.2 *Reasons for income-dependent loan interest rates*

Bank managers often complain that lower income households are high average cost borrowers. They usually justify their argument with the experience that lower income households take lower loan volumes thus provoking higher average fixed costs associated with screening procedures, administrative activities and the like. Also lower incomes are frequently associated with a higher expected default. If we accept the hypothesis that lower income households on average take smaller loans, then, given expected average default and given the same total fixed costs for all borrowers independent of income, higher interest rates indeed appear to be justified for poorer households. However, as the following analysis will make evident, it is by no means clear how average expected default and income are correlated. This ambiguity will be shown to be independent of the bank's degree of risk-aversion.

### (a) *Risk-neutrality*

Under risk-neutrality the bank is exclusively interested in the rate of return from lending as an average over very many repetitions under the same states of the world or equivalently, over many identical and independent loans. This implies that the bank cares about its risk position only insofar as it affects the expected rate of return thus placing expected average default into the centre of analysis which, following (2.3) and (2.4), is given by

$$\frac{E[\widetilde{D}]}{L} = \frac{1}{L} \int_{\underline{y}}^{\hat{y}} [L(1+i_L) - y] f(y) dy = \frac{1}{L} \int_{\underline{y}}^{L(1+i_L)} F(y) dy \quad (2.8)$$

A higher level of worst case disposable income reduces expected average default. Analytically this result can be derived by considering two distinct worst case incomes  $\underline{y}$  and where  $a$  is supposed to be strictly positive. Given identical distribution functions and contractual repayments we obtain as a difference between the two expected defaults

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<sup>9</sup> Of course in a perfectly competitive market, free entry will eventually drive a positive mark-up down to zero.

$$\begin{aligned}
E[\widetilde{D}_y] - E[\widetilde{D}_{y+a}] &= \int_{\underline{y}}^{\hat{y}} F(y)dy - \int_{\underline{y+a}}^{\hat{y}} F(y)dy \\
&= \int_{\underline{y}}^{\underline{y+a}} F(y)dy + \int_{\underline{y+a}}^{\hat{y}} F(y)dy - \int_{\underline{y+a}}^{\hat{y}} F(y)dy > 0
\end{aligned} \tag{2.9}$$

If higher income households dispose of a higher level of worst case incomes than lower income households, this would explain why poorer borrowers are considered as higher risks. However, we should not jump to conclusions because the loan volume, too, affects expected average default. To see its impact, we differentiate  $E[\widetilde{D}]$  with respect to  $L$  obtaining

$$\frac{\partial \left( \frac{E(\widetilde{D})}{L} \right)}{\partial L} = \frac{1}{L^2} \left[ L(1+i_L)F(L(1+i_L)) - \int_{\underline{y}}^{L(1+i_L)} F(y)dy \right] > 0 \tag{2.10}$$

The second term of (2.10) describes the area under the distribution function measured between  $\underline{y}$  and  $L(1+i_L)$ . The first term measures the rectangular which we obtain if we multiply  $L(1+i_L)$  by the value of the distribution function  $F(y)$  measured at this point. The first term is unambiguously larger than the second term implying that expected average default increases with loan size. If we assume that higher income households borrow higher volumes for the purchase of higher quality consumer goods then it is by no means certain that they pose lower risks than poorer households. Higher worst case incomes might be outweighed by the effect of loan size, and indeed the impact of loan size will become even more important if we turn to risk-aversion below.

Another reason for disparate expected default rates might ground in different probability distributions of disposable incomes. Taking a normal distribution as an example, reasons for this to happen are given by different incomes to be expected over the long run average,  $E[\widetilde{y}]$ , and by differences in the variance  $E[(\widetilde{y} - E[\widetilde{y}])^2]$  measuring disposable income risk. Arguably, higher income households may expect to realize larger incomes over the long-run average. The same does not necessarily apply to income risk. Notably the risk that incomes stay behind their long-run average depends on job security, on borrower's health but also on the riskiness of invested wealth. Many scenarios are possible, and except for very low income households with poorly qualified jobs and very wealthy borrowers no unanimous conclusion can be drawn. Rather, we are in need of additional arguments referring to the borrower's profession, the branch he is working in, the structure of his wealth, and the like.

(b) *Risk-aversion*

In order to understand the meaning of risk-aversion, it is worthwhile to recall the central message behind the statistical expectation of default.  $E[\tilde{D}]$  denotes the size of default which a bank can expect to realize as an average of very many repetitions of the same loan contract under the same states of the world, or – equivalently – as an average over many borrowers with identical and independent risks. Hence expected default is a perfect guideline for a bank's lending policy only if these conditions are met. If this is not the case, then the bank faces the risk that average default deviates from its statistical expectation and that therefore the bank earns less than the safe rate of return, and this even on average. A bank which is concerned about this danger and seeks protection, is called risk-averse. One way to achieve this, is to calculate a risk premium which is determined by the bank's subjective degree of risk-aversion  $\rho$ , and the semi-variance  $V$ , given by

$$V = \int_{L(1+i_L)-E[\tilde{D}]}^{L(1+i_L)-y} (L(1+i_L) - y - E[\tilde{D}])^2 f(y) dy \quad (2.11)$$

Given the subjective degree of risk-aversion, the semi-variance can take very high values if the number of repetitions of the contract or the number of independent and identical risks is rather limited. Furthermore a bank which minimizes risk by charging correspondingly high risk premia will always be ready to bear successively higher risks if they are compensated by successively higher expected rate of returns. This behaviour is plausible only under the assumption of perfect capital markets where banks are not exposed to the risk of insolvency. Otherwise it is more plausible to assume that a bank seeks to limit the size of tolerated risk. This in turn implies that banks are not willing to extend any loan irrespective of its size, and indeed German banks usually pose an upper bound to the loan volume which they justify with risk arguments.

One way to explain credit lines is by fixing an upper bound to the probability that realized default exceeds its statistical expectation, leading to the value-at-risk. A direct way to explain this is to assume that the bank expects to grant the loan to one and the same client  $n$  times. If  $n$  is sufficiently high thus that the law of great number holds, then the bank can rely its decisions on the expected default. However, if  $n$  is significantly lower, then the bank might feel the necessity to impose an upper bound to the volume of default to be achieved as an average over these  $n$  times. Assuming both identical loan volumes and probability distributions, the average default is equivalent to default given by a single loan. Under this assumption we obtain

a value-at-risk measure, given by

$$\Pr(\tilde{D} - E[\tilde{D}] > V^{\max}) \leq \alpha, \\ \alpha \geq 0, V^{\max} \geq 0 \quad (2.12)$$

where  $V^{\max}$  denotes the maximum deviation of default from its statistical expectation which the bank is willing to accept. Since any such positive deviation implies a loss to the lender,  $V^{\max}$  can be interpreted as the maximum loss which the bank is willing to tolerate, with  $\alpha$  as the maximum loss probability. The degree of risk-aversion is reflected in both the size of tolerated maximum loss and in the maximum loss probability.

If the bank is *extremely* risk-averse, both  $V^{\max}$  and  $\alpha$  will be zero. In this case (2.12) changes to

$$\Pr(\tilde{D} - E[\tilde{D}] > 0) = 0 \quad (2.13)$$

Under this assumption the bank tolerates no deviation at all. With  $\tilde{D} = L(1 + i_L) - \tilde{y}$ , equation (2.13) can be reformulated to become

$$\Pr(\tilde{y} \leq L(1 + i_L) - E[\tilde{D}]) = F(L(1 + i_L) - E[\tilde{D}]) = 0 \quad (2.14)$$

Recalling that  $F(\underline{y}) = 0$ , we obtain

$$L(1 + i_L) - E[\tilde{D}] = \underline{y} \quad (2.15)$$

yielding as maximum loan supply

$$L^{\max} = \frac{\underline{y} + E[\tilde{D}]}{1 + i_L} \quad (2.16)$$

The maximum loan volume increases with the size of worst case disposable incomes and the statistical expectation of default which is borne by the borrower himself.

A *slightly* less risk-averse bank seeks to avoid deviations of realized default from its statistical expectation with some positive probability  $\alpha$  leading to

$$L^{\max} = \frac{F^{-1}(\alpha) + E[\tilde{D}]}{1 + i_L} \quad (2.17)$$

where  $F^{-1}(\alpha)$  denotes the inverse of the monotone distribution function at point  $\alpha$ .

A significantly less risk-averse bank is even willing to accept some loss, and this with a positive probability leading to

$$L^{\max} = \frac{F^{-1}(\alpha) + V^{\max} + E[\tilde{D}]}{1 + i_L} \quad (2.18)$$

Obviously the maximum loan volume and the loan interest rate are negatively correlated. Recalling that the loan interest rate is given by (2.7) and taking a positive mark-up  $m$  into account, we obtain as an interest rate associated with a binding credit line:

$$i_L = i + \frac{E[\tilde{D}]}{L^{\max}} + \frac{Q}{L^{\max}} + m \quad (2.19)$$

Substituting (2.19) into (2.16), (2.17), (2.18), we get the following maximum loan volumes each depending on the degree of risk-aversion:

$$L^{\max} = \frac{y - Q}{1 + i + m} \quad (2.20)$$

$$L^{\max} = \frac{F^{-1}(\alpha) - Q}{1 + i + m} \quad (2.21)$$

$$L^{\max} = \frac{F^{-1}(\alpha) + V^{\max} - Q}{1 + i + m} \quad (2.22)$$

In all three cases the maximum loan volume decreases with an increasing value of the safe interest rate, a higher mark-up and higher average fixed costs. Obviously expected default plays no role. The reason is that borrowers are already charged for this by correspondingly higher interest rates.

In order to evaluate implications of a binding credit line for the interest rate we start with an extremely risk-averse bank. Assume that higher income

households possess higher worst case incomes. Given the loan volume, this leads to a lower expected average default. However, since  $L^{\max}$  and  $\bar{y}$  are positively correlated, the total effect of higher worst case incomes on the loan interest rate now becomes ambiguous. Hence provided that households have exhausted their credit lines, it is by no means clear that higher worst case incomes imply a lower expected average default. In the absence of fixed costs, this result implies that higher worst case incomes may lead to higher and not lower interest rates. Turning to a significantly less risk-averse bank and assuming that banks tolerate a higher maximum loss and a higher loss probability if they lend to higher income households, these borrowers will unambiguously provide a higher expected average default.

### *2.3 Do income-dependent loan interest rates give rise to statistical discrimination?*

Following the definition given by Arrow (1973) and Phelps (1972) statistical discrimination is given if a lender uses a variable as an indicator of risk which does not necessarily reveal the borrower's true expected default, at least not without careful screening. Banks frequently associate lower income households with a higher expected default. However, our analysis casts severe doubts on the unambiguity of such a relationship. One reason is that the expected default does not only depend on (worst case) disposable incomes but also on the loan size. Given worst case incomes, expected default is positively correlated with loan size. Moreover it appears worth mentioning that the size of worst case incomes also depends on how wealth has been invested. If higher income households possess a higher portion of risky assets, they may end up with rather low worst case incomes. Finally consider the pricing policy of the German bank mentioned in the introduction relying on crisp income classes. What about a household earning €1450 compared to one earning €1550? Does this difference in income really justify different worst case incomes?

How income and loan size are correlated is also not clear. In case of a positive correlation wealthier households would indeed pose higher expected defaults. But again we are left with doubts concerning the existence of such a clear-cut correlation, and indeed, why should it automatically be the case that a household earning €1550 demands a higher loan volume than a household earning €1450?

The reader might argue that our results crucially depend on the assumption that information between banks and borrowers is symmetric. Indeed Malmquist, Phillips-Patrick and Rossi (1997) state that lower income house-

holds as a rule are opaque loan-applicants meaning that their willingness and ability to repay is harder to verify. We think, however, that our assumption of information symmetry irrespective of borrowers' incomes is valid because like in most countries we have in Germany credit registries (for example the 'Schufa') which provides banks with reliable information about any loan applicant's credit history at negligible cost.

In summary we are left with a strong impression that without further clarification the relationship between income and risk remains ambiguous and we therefore cannot rule out the possibility that income-dependent interest rates (or credit lines) may involve statistical discrimination in the sense of Arrow and Phelps.

Statistical discrimination is frequently viewed as profit-based because the bank is capable of economizing on screening costs (Ladd, 1998). However, there exists, a further reason for profit-based discrimination which will be explained in the next section. It is closely related to the way how a bank measures profitability.

### 3. The overall value of a customer for a bank as a guideline for the determination of the loan interest rate

Banks do not only grant loans but supply a large variety of financial services. An alternative model of bank behaviour is therefore based on the expected net return over equity to be obtainable from the entirety of financial services sold to any individual customer. This corresponds with the view that a bank seeks to maximize the firm's value and in doing so evaluates each customer according to his individual contribution to this objective.

Assume that the bank under consideration supplies consumer loans ( $L$ ), mortgages ( $H$ ), financial investments ( $I$ ) and payment transactions ( $Z$ ). Considering some client  $j$ , the bank's expected profit from all these services is given by

$$E[\tilde{\Pi}_j] = E[\tilde{\Pi}_j^L] + E[\tilde{\Pi}_j^H] + E[\tilde{\Pi}_j^I] + E[\tilde{\Pi}_j^Z] \quad (3.1)$$

Dividing (3.1) by equity  $W$ , we obtain as the total expected rate of return over equity obtainable from customer  $j$

$$\begin{aligned}\mu_j &= \mu_j^L + \mu_j^H + \mu_j^I + \mu_j^Z \\ \mu_j^i &= \frac{E[\Pi_j^i]}{W} \\ i &= H, I, L, Z\end{aligned}\tag{3.2}$$

To simplify matters we divide a bank's customers into two groups, namely high and low income households, to be denoted by the suffix  $R$  and  $P$ , respectively. Let us further assume that – due to cross-selling potentials – the bank believes to earn higher profits from higher income households, which implies that  $\mu_R > \mu_P$ , given that the bank charges the same prices from both groups. Cross-selling potentials will in particular be absent with respect to low income customers since these households do not have much wealth and will not be able to buy real estate and a broad variety of financial instruments. Assuming furthermore that the bank is risk-neutral, then  $\mu_R$  will serve as a benchmark rate of return. In this case a household will only be accepted as a customer if the bank may expect to earn  $\mu_R$  from him. If price differentiation poses no alternative, lower return customers will be denied access. On the other hand access can be maintained if low income households pay higher prices for financial services thus becoming as profitable as high income households. For simplicity assume that the only financial services which low income households demand are consumer loans. In order to receive them, the following condition has to be met:

$$\mu_P^L = \mu_R\tag{3.3}$$

$\mu_P^L$  is given by

$$\mu_P^L = (i_L - i_F) \frac{L_P}{W} - \frac{E[\tilde{D}_P]}{W} - \frac{Q}{W}\tag{3.4}$$

where  $i_F$  denotes the refinancing cost per unit of loan. This implies that the bank will charge low income households an interest rate for consumer loans amounting to

$$i_L = i_F + \frac{E[\tilde{D}_P]}{L_P} + \frac{Q}{L_P} + m\tag{3.5}$$

where the mark-up is now given by

$$m = \frac{\mu_R}{\frac{L_P}{W}} \quad (3.6)$$

Hence in order to make low income households as valuable as high income households, the bank would have to calculate a mark-up over average costs which compensates for the profitability gap. This mark-up increases with the overall return over equity to be achieved from high income households and with a decreasing ratio between the loan volume and the bank's equity. It is noteworthy that now a low loan volume compared to the bank's equity will drive the interest rate up. However, the reason for this result does not ground in average cost but in a higher mark-up. The bank obviously draws its bargaining power from the expectation to have more profitable alternatives. It will therefore be rather indifferent as to whether a low income household accepts the loan supply or not.

Higher interest rates for loans will of course not leave the risk position of low income households untouched because expected default will increase, too, implying that the number of failing households will increase. This, however, is not a consequence of lower incomes but follows from the bank's interest rate policy.

#### **4. Do income-dependent loan interest rates reveal profit-based discrimination?**

According to the General Equilibrium Model profit maximization turns out as one of the sufficient conditions for the realization of Pareto-efficiency. Given perfect competition and perfect information in factor and commodity markets, firms that maximize profits neither waste scarce resources nor leave them idle. This together with the assumption of utility maximizing households leads the economy into a general equilibrium in which firms receive no more than a compensation for their costs. However, in reality markets are far from being perfect, and imperfections may allow lenders to earn an extra profit at the expense of borrowers thus provoking Pareto-inefficiency. According to industrial economics this result is closely related to market power following from increasing returns to scale or more generally, from prohibitively high entry costs for newcomers. It is important to note at this point that market power on the part of suppliers means that consumers do not have favourable alternatives and are thus locked into a particular contractual relation or market segment such that they can only decide between refraining from buying a good or paying the high price.

In section 3 we have introduced a model that allows a bank to maximize profits and which implies that to this end the ‘poor have to pay more’. Does this provide a case of profit-based discrimination? In order to answer this question I take up the industrial economists’ point of view, namely that market power may involve profit maximization at the expense of consumers, and I call this profit-based discrimination if only a particular group, here lower income borrowers are affected. I furthermore show that free entry to the consumer loan market for newcomers might not be sufficient to avoid profit-based discrimination.

In defining discrimination two principles can be distinguished (Yinger, 1998, p. 25). According to the unequal treatment principle, any lender who applies different rules to people in protected groups, is practicing discrimination. According to the so-called adverse impact principle, discrimination occurs if this has adverse effects. As emphasized by Yinger this last view is held by those economists who state ‘... that business practices that are profitable, and for which there is no equally profitable substitute without an adverse impact’, should not be called discrimination (Yinger, 1998, p. 26). However, this view ignores that the profitability of such an action might be realized at the expense of certain groups. Stated differently, in order to evaluate whether a business practice is discriminatory, it is not sufficient to study the effects for the lender. Rather, it has to be examined to what extent this business practice involves a redistribution of income to the disadvantage of some borrowers who are unable to avoid this. This is exactly what the following analysis tries to achieve.

We consider a consumer credit market where a large number of banks offer consumer loans which in the eyes of the borrowers, and – initially – in the eyes of the lenders, too, are viewed as identical.<sup>10</sup> Assuming furthermore that initially the market is perfectly competitive implying zero switching costs and complete transparency, the initial equilibrium is characterized by a unique long-run equilibrium interest rate,  $i_L^*$  which covers banks’ total average costs and which has to be paid by all borrowers irrespective of their income situation.

Now assume that one of the banking institutions which we call bank C henceforth, starts charging income-dependent interest rates for consumer loans, where for simplicity only two classes are distinguished. Households earning at least €2500 are considered as wealthy clients with ample cross-selling potentials whereas households earning less than €2500 are considered as less profitable. These poorer households have to pay an interest rate

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<sup>10</sup> In particular we assume that borrowers pose identical risks.

$i_L^P > i_L^*$ , whereas the more wealthy households pay an interest rate  $i_L^R \leq i_L^*$ . In order to analyse implications we consider the following cases:

1. No other bank imitates bank C.
2. All other banks imitate bank C, where new lenders face unbearably high access costs.
3. All other banks imitate bank C, where access to the credit market is free to new lenders.
4. Only a fraction of banks imitate bank C, where they all choose the same income classes and interest rates.
5. All other banks imitate bank C differing with respect to income classes and interest rates.

Furthermore we make the following assumptions:

6. Consumer loans are supplied by a large number of banks of equal size.
7. Initially the structure of consumer loans with respect to borrowers' income status is the same for all banks.
8. All borrowers pose identical and independent risks.
9. Switching banks implies that all previously demanded financial services are now purchased from the new bank.

We start considering the case where no other bank follows suit and  $i_L^R = i_L^*$ . Absent any switching costs, bank C's poorer customers will move to other banks thus avoiding to be charged a higher interest rate. Since bank C holds only a small market share, its competitors will probably not notice the gain in demand and will therefore leave the loan interest rate at its initial level  $i_L^*$ . Hence bank C's lower income clients are capable of avoiding paying higher interest rates by approaching another bank. The situation changes, however, if costs exist that make switching unbearably costly. In this case lower income borrowers get locked into their contractual relationship with bank C which means that they are unable to avoid paying higher interest rates.

Switching costs thus provide one reason for the rise of profit-based discrimination, though not the only one. To prove this, we again consider a situation where no other bank follows suit and access costs to new lenders are unbearably high. But now  $i_L^R < i_L^*$ , and switching costs are zero. Like before lower income households will move to other banks. In addition all non-imitating banks will lose their more wealthy customers to bank C. For the moment assume that bank C is capable of servicing all wealthy customers.

Recalling the assumption of equal size and structure of the initial consumer credit portfolio, each individual bank will experience a gain in poorer customers that will by far be outweighed by the loss of rich clients implying that non-imitating banks will suffer a significant decline in their total demand for loans. Given the initial long-run competitive equilibrium, non-imitating banks will not be willing to respond to this by lowering interest rates because then – according to their calculation – they would suffer a loss. Obviously the only way to get out of this situation is to mimic bank C's policy which leads to a segmentation of the consumer credit market. In order to get a loan, poorer households will have to pay higher interest rates than richer borrowers without possessing any favourable alternative. If bank C is unable to service all new wealthy customers, then it will either resort to credit rationing or increase interest rates for higher income borrowers, too. In both cases market segmentation will not occur. In particular lower income households will continue to pay the initial equilibrium interest rate. Under credit rationing a fraction of higher income households will profit from lower than the equilibrium interest rates.

Assume now that all banks mimic bank C choosing the same classification criteria. If access for new lenders is unbearably costly, market segmentation will follow thus that lower income households are again unable to avoid higher interest rates unless they decide not to take debt at all. If access is free to new lenders, and if these new lenders specialize on granting loans to lower income borrowers, this will raise loan supply. If the interest rate for consumer loans to lower income household declines, those banks seeking to realize a certain benchmark rate of return over equity will withdraw from the market. The resulting excess demand in the lower income loan market will drive interest rates upwards again, until they reach the initial level which implies that it is not possible to avoid segmentation by newcomers.

We now consider the case where only a fraction of banks imitate bank C, and for the moment we assume that they charge the same interest rates for the same income classes with  $i_L^R < i_L^*$ . Assume that this fraction is sufficiently high implying that the entire number of switching higher income borrowers will be serviced. Again the group of non-imitating banks will experience a gain in lower income and a loss of higher income borrowers. If these banks stick to their policy, and if the number of moving poorer borrowers equals the number of moving higher income borrowers, then non-imitating banks will not experience any change of their total loan demand and will thus not feel inclined to change the interest rate. Again market segmentation will occur which now implies that poorer customers continue to pay the initial competitive interest rate, whereas wealthy borrowers profit from an even lower interest rate. Moreover, some specialization has taken place in the

banking sector: We observe banks with rich customers only as well as banks with exclusively poorer clients.

finally consider a situation where all banks follow bank C's policy, though with different income classes. For illustrative purposes assume that there are two types of banks, namely C-banks and S-banks. C-banks charge  $i_P^C$  from borrowers earning less than €2500 and  $i_R^C$  from borrowers earning at least €2500, where  $i_P^C > i_R^C$ . S-banks by contrast charge  $i_P^S$  from borrowers earning less than €1500 and earning at least €1500, where for simplicity we assume  $i_R^C = i_R^S$  and  $i_P^C = i_P^S$ . Obviously households earning between €1500 and 2500 can avoid paying higher interest rates by borrowing from S-banks, whereas the poorest households face no favourable alternatives.

In summary we can say that profit-based discrimination provides neither an exception nor the rule. It can be observed in particular if switching costs for lower income borrowers are high, and if we have a large number of imitating banking institutions. Moreover it is remarkable that free entry does not help to avoid segmentation in all circumstances. It is finally interesting to observe that the probability for profit-based discrimination is highest for the poorest households.

## 5. Conclusion

The German banking sector is currently undergoing fundamental changes. The impending privatisation of public banks, a significant equity gap and a comparatively low profitability has induced German banking institutions to undertake great endeavours in order to improve on their situation. Economizing on costs by exhausting rationalization potentials usually worsens the situation of lower income customers. A recent example is given by an empirical investigation by the Hamburg Consumer Advice Centre revealing that banks indeed tend to vary interest rates for unsecured consumer loans according to households' incomes both directly and indirectly. In this article the issue has been analysed to what extent these pricing policies provide a case of discrimination. In the economic literature mainly three kinds of discrimination have been discussed, namely taste-based discrimination, statistical discrimination and profit-based discrimination. The investigation in this article provides significant theoretical reasoning underlying both statistical and profit-based discrimination. In this respect market segmentation in the sense that lower income households find themselves locked into their market plays an important role. The finding that new entry may not be enough to avoid this effect indicates a need for regulation.

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