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ABSTRACT

Dealer Pricing of Consumer Credit*

Interest rates on consumer lending are lower when funds are tied to purchase of a durable good than when they are made available on an unconditional basis. Further, dealers often choose to bear the financial cost of their customers' credit purchases. This paper interprets this phenomenon in terms of monopolistic price discrimination. We characterize consumers' intertemporal consumption decisions when their borrowing and lending rates are different not only from each other, but also from the internal rate of return of financing terms for a specific durable good purchase. A stylized model offers a closed-form characterization of purchase decisions as a function of the amount and timing of consumers' resources, of the spread between the borrowing and lending rates, and of the pricing of cash and credit purchases. We then study theoretical and empirical relationships between the structure of financial markets, the distribution of potential customers' current and future income, and incentives for durable-good dealers to price-discriminate by subsidizing their liquidity-constrained customers' installment-payment terms. Our empirical analysis takes advantage of a rich set of installment-credit and personal-loan data, which offer considerable support for the assumptions and implications of our theoretical perspective.

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1 Introduction

Installment-payment terms for durable good purchases are often quite attractive from a financial point of view. Even though the "zero" annual percentage rates routinely advertised by car dealers and department stores do not include processing fees and other transaction costs, credit is generally cheaper when explicitly tied to the purchase of a good or service than in the case of a general consumption loan. Relatively low interest rates are not surprising if the good purchased serves as collateral. While lenders do repossess housing, cars, and other valuable items, repossession is not economically appealing option in the case of appliances and consumer electronics. Low interest rates charged on installment payment of these and other items with low second-hand value may be rationalized if the loans that fund purchases of illiquid goods are likely to be repaid. Since such borrowing is only sensible if the item is actually used, moral hazard may in fact be less of a concern than in the case of non-finalized loans: lenders, for example, need not worry about borrowers gambling away the loan. Adverse selection is also a less severe problem if purchase of, say, household appliances is positively correlated with the consumers' own inclination to repay: it would not be surprising to find that purchases of fast motorcycles, guns, and other goods which are unlikely to feature such a correlation are not financed on particularly favorable terms.

More interestingly, favorable credit terms are often extended by the sellers of durable goods rather than by lending institutions (banks). When dealers find it profitable to offer (e.g.) "zero APR" financing, the amount credited by the bank to the seller's account is less than the cash price, because the customer's flow of installment payments is also lower than what would be required by the bank's cost of funds, transaction costs, and assessment of repayment probabilities. To explain this phenomenon, it is useful to note that durable good dealers typically have incentives to engage in monopolistic price discrimination. The groups of consumers attracted by cash and credit purchases are distinctly different when, as is realistic, borrowing rates are higher than lending rates on the financial market. Hence, sellers can set cash and credit terms so as to offer different prices to cash-rich and liquidity-constrained customers, in much the same way as lower prices are sometimes charged to consumers who own particularly old trade-ins, or take the time to clip coupons. Depending on the characteristics of the population of potential customers facing a seller, demand by consumers who find credit purchases attractive can be more price-sensitive than that by consumers who can readily pay cash. This mechanism can potentially explain not only the existence of dealer-subsidized consumer credit, but also its different prevalence across different regional and sectorial markets, and the possibility that dealers charge finders' fees to lending institutions—effectively increasing the borrowing rate for liquidity-constrained customers above the interest rate that lending institutions would be willing to extend for loans tied to durable purchases.

While these and other qualitative rationalizations of interest-rate differentials across different consumer-loan instruments appear interesting and realistic, formal analyses are scarce in the literature, as is empirical evidence. The topic was introduced and studied a long time ago by Juster and Shay (1964). Noting, as we do below, that interest rates are different on consumers' assets, liabilities, and durable purchases, Juster and Shay characterize qualitatively the implications of this state of affairs for consumer choices, and explore empirically survey data focusing in particular on the sensitivity of aggregate consumption to changes in macroeconomic monetary conditions. Attanasio (1995) also focuses on the importance of cash outlays for liquidity constrained consumers, who are prepared to pay higher interest rates in exchange for longer loan duration. Empirical relationships between borrowing opportunities and durable-good purchases have been studied by Brugiavini and Weber (1994) and Alessie, Devereux, and Weber (1997), who propose and study models where borrowing limits depend on the existing stock of durable goods, rather than on new purchases as would be implied by the mechanisms outlined above. Some of the issues that motivate our work have been addressed in specific instances, such as the use of credit cards as means of payments, and pricing of installment-loan purchases which make the lender jointly liable in case of seller default on the obligation to deliver goods. Customers who expect to pay the balance in full should always use their credit card, to take advantage of the float, rather than pay cash. Since transaction fees are levied on merchants, and card issuers often require that customers pay the same price as for cash transactions, a seller's choice of whether or not to accept credit (or debit) card in lieu of cash payment is less trivial. It depends on the quantity and quality (in willingness-to-pay terms) of additional sales generated by credit card acceptance (Murphy and Ott, 1977; Chakravorti and To, 1999). In the model of Iossa and Palumbo (2000), sellers also have incentives to stipulate joint-liability agreements with lenders if this increases their sales volume, because the additional financing costs entailed by the lender's joint liability are more than offset, from the perspective of buyers, by the fact that the installment loan will not need to be repaid in case of dealer default.

This paper proposes and solves a rather general intertemporal model of purchase decisions by consumers endowed with different, and differently timed, amounts of purchasing power. Our model's consumers are faced with different interest rates on positive assets and negative assets (consumption loans). The rate of return implicit in the comparison of cash and credit prices for the good under consideration is larger than the interest rate on the consumer's assets, but lower than that charged on his negative assets. We characterize the implications for purchase decisions of the resulting complex structure of intertemporal rates of transformation, we study how the distribution of purchasing power over time across the population of consumers affects the dealers' price-discrimination incentives, and we bring empirical analysis of a credit contract database to bear on the real-life relevance of the model's simple theoretical insights.

1.1 Motivating evidence

We begin by documenting the extent and character of interest rate heterogeneity across installment-payment loans. We provide both aggregate and firm-level evidence that installment credit rates are somewhat lower than those of alternative loans which are not linked to the purchase of a good. We focus on the case of the Italian consumer credit market, for which firm-level data are available. Our data set includes a random sample of more than 200,000 credit applications by more than 120,000 individuals, over the period 1995–1999, to the leading supplier of consumer credit in Italy. Alessie, Hochguertel, and Weber (2001) offer a detailed description of the data set, and empirical analysis of the time-series and cross-sectional impact of introduction of a law on usury rates in 1997. This law stipulates that no credit lender may charge interest rates (compound overall annual rates) that exceed 150% of benchmark rates for several types of loans, usually subdivided into size classes. The aggregated data from the Bank of Italy shows that recorded installment credit rates are consistently lower than those of personal loans (with the exception of small loans, which are not disaggregated in the case of personal loans). For example, in the first quarter of 1999 the interest rate for personal loans larger than ten million Italian Lira (5,200 Euro) is 17% compared to 11% for the case of installment credit.[1]

The firm-level evidence is summarized in Table 1. For the sample of customers that do pay for their own borrowing costs (rather than obtaining a subsidy from the dealer, on which see below), it is easy to calculate internal rates of return for two types of consumer credit: installment credit contracts and personal loan contracts.[2] Since the intended use of money borrowed is provided in the application form not only for installment but also for personal loans, we can group observations according to the type of item bought. The personal loans observations refer to purchases of only four good categories, and for these categories it is therefore possible to measure the interest rate surcharge entailed by customers dealing with the bank directly rather than through a dealer. Regressions of interest rates on various observables are of more general interest, however, and will be used in our more structural empirical work below. In preliminary regressions, not reported, we included all available contract and customer information as explanatory variables, finding that interest rate variability is mostly accounted for by time, region, and type of item purchased, plus a limited number

[1] The data is published quarterly by the Bank of Italy and the Italian Foreign Exchange Office. See Alessie et al. (2001) for further details.

[2] The data also contain information on revolving credit, but interest charges cannot be inferred from the data.

of contract characteristics (such as loan size).[3]

Since consumer credit is quite heterogenous across goods in a number of dimensions, we proceed to run regressions on subsamples by type of item bought. Table 1 reports the results: while the pattern of coefficient signs is broadly similar across good categories, the data strongly reject pooling of observations across items bought. The regressions are in the form

$$\text{internal rate of return} = \mu + \alpha \cdot [\text{personal loan}] + \beta \cdot X + \varepsilon$$

where [personal loan] is a dummy for a personal loan contract, and the vector X contains information about the size of the contract and a host of qualitative characteristics captured by dummies. We include contract characteristics, such as loan size, duration of the credit contract, and whether the contract provides insurance to cover payments due in the event of "income loss" (the cost of this insurance premium is, of course, included in the rate charged to the customer). Moreover, we control for region and time effects (the reference case is an installment payment contract issued in Lazio in the third quarter of 1995) and various interactions (see the note to Table 1). The error term ε does not have a structural interpretation, but for descriptive purposes it is comforting to find that the model yields very high R-squared values on the large cross-section of data we analyze.

In the modeling framework we propose, the personal-loan dummy should be associated with a higher borrowing rate ($\mathbf{b} > 0$). As is apparent in Table 1, this is the case for all durable-good types where the test is possible, and significantly so in 3 of the 4 cases. In order to interpret the magnitude of the coefficients, note that the included interactions of the personal loan dummy with contract characteristics and time dummies are quite significant, indicating that (for example) fixed costs of credit provision play a different role across personal and installment loans as well as across different good categories. The data, however, do indicate that the rate charged to customers on installment plans is substantially smaller than that charged on personal loans meant to finance the same purchase.

2 The consumer's problem

We proceed to set up and solve a simple formal model. In general, a consumer's decision to purchase a durable good depends on tastes, on prices, and on the funds available for that and other purposes. When financial markets are imperfect, current and future funds are not perfectly substitutable: hence, optimal choices depend not only on the total amount but also on the timing of the consumer's

[3] Variables that relate to the individual loan applicant are much less relevant, and not surprisingly so since creditworthiness does not affect the interest rate charged by the bank. Hence, individual characteristics become known (and may only affect whether credit is granted) after the terms of financing are decided.

resources, which interacts in interesting and complex ways with the relationship between the cash and credit prices of the good and with the intertemporal rates of transformation applicable to borrowing and lending contracts.

In order to model such issues in the simplest possible way, we consider a two-period representation of the consumer's tastes. Let C denote nondurable consumption in the current period, when the choice of whether to buy a specific durable good is made, and let A denote the funds available for future purchases. Utility is assumed to be increasing and concave in both current consumption and future resources and, of course, given levels of C and A should be associated with higher levels of utility when the durable good is available for use in the current and future periods. Suitable formal models can represent preferences by an intertemporally separable objective function $U(C,\delta)+V(A,\delta)$, with $\delta=1$ if the durable good is available and $\delta=0$ otherwise, such that

$$\begin{aligned} U(C,1)+V(A,1) &> U(C,0)+V(A,0), \\ \frac{\partial U(\cdot)}{\partial C} &> 0, \frac{\partial^2 U(\cdot)}{\partial C^2} < 0, \frac{\partial V(\cdot)}{\partial A} > 0, \frac{\partial^2 V(\cdot)}{\partial A^2} < 0 \end{aligned} \tag{1}$$

for all C and all A. Preferences in this form are assumed in, e.g., Spence's (1977) study of durable-good pricing when product quality is not directly observable. With little loss of generality, Spence assumes that $U(C,1)=U(C,0)$, and notes that specifications such as $V(A,1)=V(A,0)+k$ or $V(A,1)=V(A+k,0)$ for some constant k may be interesting special cases for characterization purposes.

Maximization of (1) is of course subject to budget constraints. We denote with W the consumer's current cash on hand; with Y the amount of purchasing power that will become available (with certainty) in the future; with r_a the rate of return on the consumer's assets; and with $r_b \geq r_a$ the interest rate charged on his borrowing (negative assets). Thus, when the durable is not purchased the budget constraint reads

$$A = Y + \begin{cases} (W-C)(1+r_a) & \text{if } C < W, \\ (W-C)(1+r_b) & \text{otherwise.} \end{cases} \tag{2}$$

When the durable good is purchased, the budget-constraint relationship between current and future resources and utility-function arguments is similar but, of course, needs to account for the durable's price by subtracting it from the consumer's resources.

To simplify notation, suppose the durable good may be either paid in cash, at price P_0, or fully financed, with no money down and a single installment payment P_1 in the future period. Payment plans with positive downpayments would have substantially similar implications as long as the financial structure of the payment plan (like the price of the durable) is taken as given by the consumer. Thus, if the consumer purchases the good on a cash basis then P_0 needs to be subtracted from W in the relevant version of budget constraint (2). If the good is purchased on credit instead, then P_1 is subtracted from Y. We assume that the internal rate of return of the durable good's financing terms is neither lower than the rate of return on consumers assets nor higher than the interest rate on general consumption loans,

$$1 + r_a \leq \frac{P_1}{P_0} \leq 1 + r_b, \tag{3}$$

i.e., we rule out the possibility that credit purchase is preferable to cash purchase, or vice versa, regardless of the consumer's intertemporal pattern of resources. This would be not only unrealistic, but also impossible to rationalize if consumer interest rates are viewed (as we do below) as the endogenous result of optimal behavior on the part of a durable-good dealers faced by a heterogeneous customer pool.

The consumer's maximization problem is well defined but not standard, in that it features discrete choices and budget-constraint discontinuities. The impact on utility of current consumption and future purchasing power, however, is fully standard. Given the amounts of current and future resources available to fund the continuous variables C and A, the lending or borrowing choices that maximize utility in that respect are easily characterized by familiar Euler and slackness conditions over the two periods. The discrete choice of whether to purchase the durable good and whether to use current or future funds for that purpose, conversely, cannot be analyzed in terms of interior first-order conditions, and needs to be based on pairwise comparisons of utility levels achievable under each strategy.

We choose to illustrate the character of the solution in a simple special case where closed-form solutions are available. Taking $U(\cdot)$ and $V(\cdot)$ to be logarithmic in their first argument and representing the positive impact of the durable's services on utility by an additive constant k, the objective function reads

$$\max_{C,\delta} \log(C) + \log(A) + \delta k \tag{4}$$

and optimal allocation of available funds across current consumption and future uses requires

$$C(1 + r_a) \leq A \leq C(1 + r_b) : \tag{5}$$

the left-hand inequality holds as an equality if the consumer has positive assets (is lending), and the right-hand inequality sign holds with equality if the consumer borrows (has negative assets). If the lending and borrowing rates are not the same, it can be optimal for the Euler condition to be slack. When the pattern of interest rates and available resources is such as to imply that this is the case, the consumer is *liquidity constrained.*

As mentioned, current and future funds available for allocation to the continuous variables C and A depend through the budget constraint on whether the durable is purchased and, if so, on whether current or future funds are used to pay for it. Figure 1 displays this dependence graphically. The horizontal axis of the figure measures amounts of current cash-on-hand W, and the vertical axis measures amounts of funds Y that will be available in the future. If the durable is not purchased, then the consumer under consideration optimally chooses to lend some of the current funds at rate r_a if $Y < (1 + r_a) W$, and to borrow against some of the future funds at rate r_b if $Y > (1 + r_b) W$. When the intertemporal pattern of the consumer's resources falls in the cone from the origin between these two lines, the optimal constrained consumption pattern simply coincides with available resources and, if the durable is not purchased, utility only accrues from $C = W$ and $A = Y$.

The other lines plotted in the figure, whose slopes also coincide with the intertemporal rates of transformation associated with positive and negative assets, identify cones originating from P_1 on the vertical axis and from P_0 on the horizontal axis. If the consumer purchases the durable good on a credit basis, then the levels of C and A coincide with the amount of current and residual future funds if these lie within the cone originating from P_1, and reflect optimal borrowing or lending choices if they lie outside of it. It is similarly easy to characterize the implications for C and A of a decision to purchase the durable on a cash basis, referring to the cone originating from P_0 on the horizontal axis of the figure.

In order to establish optimality of cash, credit or no purchase, the utility levels achieved in those cases need to be compared with each other. The three utility levels depend univocally on the parameters of the problem (resources and prices) through the intertemporal allocation choices determined by slack Euler conditions like (5). Hence, such comparisons are conceptually easy and, as mentioned, they could be performed numerically for much more general preference specifications than that proposed in (4). One might for example allow for discounting of future utility, or for non-homothetic utility. Such generalizations would imply more complex relationships than those represented in Figure 1, where the borrowing, lending, and liquidity-constrained ranges would in general be delimited by non-linear upward-sloping lines. The qualitative character of the solution, however, does not depend on such details and, because of the discrete nature of the optimization problem, formal quantitative representations are already quite complex and intriguing for the simple objective function.

2.1 Character of the solution

We proceed to characterize the solution of the problem (4) with respect to durable purchase choices, in terms of indifference conditions between purchase and no-purchase choices. As is intuitive, and apparent in figures we discuss below, the current and future funds endowments that make the consumer indifferent to purchasing or not purchasing the durable identify a (weakly) downward-sloping locus in a figure like Figure 1: since the marginal utility of C and A is decreasing, the consumer needs to be rich enough (in terms of current and/or future funds) before the choice of diverting some of his or her purchasing power from C and A to the durable (which affords a given utility level k) becomes attractive. The endowment structures that make consumers indifferent to purchasing the good can never lie on an upward-sloping locus in the (W, Y) space.[4] Also intuitively, among consumers who do purchase the durable indifference between cash or credit purchase (use of current or future funds) is depicted by an upward-sloping locus in a figure like Figure 1: consumers need to be relatively well endowed with future funds for a credit purchase to be preferable. The shape of such loci depends in interesting ways on the relationship between the borrowing and lending rates on the one hand, and on the cash and credit price of the good on the other.

To organize the derivation of such indifference loci and to offer some intuition for their shape, it will be helpful to refer to Figure 2. This figure partitions the (W, Y) plane according to whether its points lie inside or outside the three cones plotted in Figure 1. Within each of the ten resulting regions, labeled with Roman numerals, the possible lending, borrowing, and purchase choices are restricted in interesting ways.

2.2 Computing the purchase-indifference locus

For example, if the consumer's endowment falls in region **X,** optimal assets are positive regardless of whether the durable good is purchased on a cash basis, or on credit, or not at all. It is then straightforward (if a little cumbersome) to characterize the optimal purchase decision. If the durable good is not purchased, then current consumption is

$$\begin{aligned} \arg\max_C \quad & [\log(C) + \log(Y + (W - C)(1 + r_a))] \\ = \; & \frac{1}{2}\left(W + \frac{Y}{1 + r_a}\right) \equiv C_{N,a}, \end{aligned}$$

while a cash purchase reduces current consumption to

$$\begin{aligned} \arg\max_C \quad & [\log(C) + \log(Y + (W - C - P_0)(1 + r_a))] \\ = \; & \frac{1}{2}\left(W - P_0 + \frac{Y}{1 + r_a}\right) \equiv C_{D,a} \end{aligned}$$

[4] Suppose instead the purchase-indifference locus were positively sloped. Consider a point (W^*, Y^*) on that locus and a point $(W^* + x, Y^*)$ to its right, where $x > 0$. The consumer would purchase the durable at (W^*, Y^*), but not at $(W^* + x, Y^*)$ despite the fact that overall resources have increased. This cannot be optimal.

and affords additional utility k. The choice is a matter of indifference for the consumer when

$$\begin{aligned} & \log(C_{D,a}) + \log\left(Y + (W - C_{D,a} - P_0)(1 + r_a)\right) + k \\ = \quad & \log(C_{N,a}) + \log\left(Y + (W - C_{N,a})(1 + r_a)\right), \end{aligned} \tag{6}$$

a quadratic equation in P_0 and $W + Y/\,(1 + r_a)$, the present value of funds discounted at the lending rate. The left-hand side of (6) is larger than the right-hand side (to imply that cash purchase is preferable to no purchase) if [5]

$$W + \frac{Y}{1 + r_a} > \frac{e^{\frac{1}{2}k}}{e^{\frac{1}{2}k} - 1} P_0, \tag{7}$$

namely if the consumer's endowment of current and future resources lies to the north-east of a downward sloping line in region **X**. It remains to be checked whether credit purchase might in turn be preferable to cash or no purchase. Quite intuitively, however, credit purchase cannot be strictly optimal for the consumer at any point in region **X**, where assets are positive regardless of whether and how the durable is purchased. In fact, when assets are positive, use of future rather than current funds can never increase the amount of future purchasing power A for any choice of C, and hence utility, since

$$Y + (W - C)(1 + r_a) - P_1 \leq Y + (W - C - P_0)(1 + r_a)$$

as long as $P_1 \geq (1 + r_a)\, P_0$ as assumed in (3).

Symmetric reasoning is applicable in region **I**, where assets are negative regardless of whether and how the durable is purchased. In that region, credit purchase is always at least weakly preferable to cash purchase, and preferable to no purchase if

$$W + \frac{Y}{1 + r_b} > \frac{e^{\frac{1}{2}k}}{e^{\frac{1}{2}k} - 1} \frac{P_1}{1 + r_b},$$

again a downward-sloping line in the plane depicted by the figures. The two indifference lines would coincide if the borrowing and lending rates were equal to each other and, by (3), to the internal rate of return of the durable's installment-credit plan. In such a perfect-capital-markets case, the solution would be easy and uninteresting: all the cones would collapse to lines in the figure, consumers would always be indifferent between cash and credit purchase, and only the present value

[5] The left-hand side is also larger if $W + \frac{Y}{1+r_a} < \frac{e^{\frac{1}{2}k}}{e^{\frac{1}{2}k}+1} P_0$, but such low wealth levels would imply negative current consumption in the relevant region:

$$C_{D,a} = \frac{1}{2}\left(W + \frac{Y}{1 + r_a} - P_0\right) < \frac{1}{2}\left(\frac{e^{\frac{1}{2}k}}{e^{\frac{1}{2}k} + 1} P_0 - P_0\right) = -\frac{1}{2}\left(\frac{1}{e^{\frac{1}{2}k} + 1} P_0\right) < 0.$$

of intertemporal resources would affect their choice of whether to purchase or not. When $r_a < r_b$, conversely, the indifference locus is a more steeply declining line in region **I** than in region **X**, and becomes interestingly nonlinear when the consumer's endowment lies outside of those regions.

Characterization of the purchase decision is also quite straightforward when the (W, Y) endowment of purchasing power lies in Region **IV**, i.e., within all three of the cones plotted in Figure 1. When the consumer has zero assets regardless of whether and how the good is purchased, a cash purchase is preferable to no purchase if

$$\log(W) + \log(Y) < \log(W - P_0) + \log(Y) + k, \tag{8}$$

i.e. if

$$W > P_0 \frac{e^k}{e^k - 1}, \tag{9}$$

and credit purchase is preferable to no purchase if

$$\log(W) + \log(Y) < \log(W) + \log(Y - P_1) + k,$$

i.e. if

$$Y > P_1 \frac{e^k}{e^k - 1}. \tag{10}$$

The parameters may be such that these conditions are automatically satisfied for all endowment patterns in region **IV**. The horizontal and vertical coordinates of all points in that region, in fact, are larger than those of the intersection point of the flatter boundary of the cone originating from P_1 on the vertical axis with the steeper boundary of the cone originating from P_0 on the horizontal axis, i.e., the solution of $P_1 + (1 + r_a) W = (W - P_0)(1 + r_b)$,

$$W = \frac{P_1 + P_0 (1 + r_b)}{r_b - r_a}, \tag{11}$$

on the horizontal axis and

$$Y = (P_1 + P_0 (1 + r_a)) \frac{1 + r_b}{r_b - r_a}. \tag{12}$$

If the right-hand sides of (9) and (10) are larger than those of (11) and (12), then purchase of the durable is always optimal in region **IV.** Otherwise, the purchase-indifference locus goes through that region, where it consists of a vertical and horizontal segment.

To complete the characterization of optimal choices in region **IV**, note that for a consumer who always has zero assets credit purchase is preferable to cash purchase if

$$\log(W - P_0) + \log(Y) + k < \log(W) + \log(Y - P_1) + k,$$

i.e., if $Y/W > P_1/P_0$. Thus, any portion of the upward-sloping cash/credit purchase indifference locus that lies in region **IV** is a straight line segment, with slope given by the installment plan's internal interest factor. We have already shown that all points in region **I** (**X**) lie above (below) that locus; we will discuss its shape in other regions of the (W, Y) plane in Section 2.3 below.

Indifference conditions in regions **II, III,** and **V-IX**, where purchasing the durable good is always associated with a discrete change in the consumer's asset position, can be derived by much the same reasoning as that applied to the regions—considered above—where assets are positive, negative, or zero regardless of purchase decisions. In all cases, indifference to purchase is characterized by comparisons of expressions in the form of (6), when the consumer smooths consumption by either borrowing or lending, or like (8), when the consumer is liquidity constrained.

Our functional form assumptions imply that all such indifference conditions define quadratic equations in the (W, Y) plane. Any modification would substantially complicate analytic solution. For example, applying a discount factor $\beta \neq 1$ to utility accruing from future purchasing power A would require solution of equations of order $1 + \beta$, rather than of quadratic equations. This and other extensions would not alter the qualitative character of the consumer's choices, and could in principle be studied by numerical methods. Even in our simple case, however, derivation and description of the solution are considerably complicated by the need to consider all the possible interactions between the discrete decision to purchase the durable good and the (also discrete) changes in the budget set implied by the possibility of switching from positive to negative asset positions, or vice versa, when a credit or cash purchase alters the intertemporal pattern of residual funds.

In our problem, in fact, the durable purchase has discrete implications not only for the utility function but also for the budget constraint, since the timing of installment payments is fixed rather than a matter of choice (as would be the case if, instead, the consumer could choose the down-payment as a continuous variable, and effectively borrow any portion of the purchase price from the seller of the durable good). This feature captures important elements of reality, since not only the rate of interest but also the structure of installments is severely limited in most durable-good purchases, but has complex implications for optimal behavior. For example, the possibility that consumers who would have positive assets when the durable is not purchased may buy the durable on credit and carry a larger amount of positive assets into the next period needs to be considered. It may indeed be optimal, if not very intuitive, for consumers to do so: this is the case when the intertemporal endowment structure is such that the (discrete) first-period consumption compression implied by a cash purchase would yield lower utility than a smaller consumption decline in the first period, smoothed intertemporally by a larger positive asset position, and payment of the good on a credit basis. We discuss solution methods in the Appendix, where we characterize in closed form the subset of the (W, Y) space where cash purchase is preferable to no purchase, and that where credit purchase is preferable to no purchase. The intersection of these sets includes all intertemporal endowment patterns that make purchase optimal.

2.3 The cash-credit indifference locus

To complete characterization of the solution, the set of (W, Y) points for which purchase is preferable to no-purchase can be further partitioned according to whether cash or credit payment is optimal. The boundary of these subsets is an (upward-sloping) locus of points such that the choice of cash or credit terms is a matter of indifference. We have already characterized this locus in region **IV,** where the consumer has no assets in all cases and, quite intuitively, prefers credit to cash purchase when $Y/W > P_1/P_0$, i.e. when the financing terms of the durable purchase offer an attractive intertemporal rate of transformation for the assumed logarithmic specification of preferences. As mentioned above, in other regions (where the purchase is associated with a change in the consumer's asset position) complex considerations are relevant to the choice of whether to purchase on a cash or credit basis. We report in the Appendix the exact solution for the cash/credit indifference locus in all regions, which is continuous with slope lower than $1 + r_b$ and larger than $1 + r_a$. Intuitively, in all regions where the purchase implies a qualitative change in the consumer's asset position (which can be positive, negative, or zero) the slope of the cash-credit indifference locus is a weighted average of the applicable intertemporal marginal rates of substitution, which all lie between $1 + r_a$ and $1 + r_b$.

3 Characterization of consumer choices

We proceed to illustrate graphically the properties of the solution. In Figure 3, purchase-indifference loci are plotted for increasingly large values of k, the amount of utility afforded by purchase of the durable good. The sequence of k values considered in the Figure increases more than exponentially. When k is small, the consumer needs to be quite rich in order to find purchase attractive, because of decreasing marginal utility from C and A. Hence, in the figure the purchase indifference frontier shifts inwards as increasingly large values of k are considered. In the figure, the boundaries of the asset-position regions defined in Figure 2 are also plotted. Recall that these depend only on the borrowing and lending rates, and on the cash and credit prices, but are not affected by k. The cash-credit indifference locus is also independent of k. For the chosen parameter values it would lie only in region **IV**, if k were sufficiently small to make purchase of the durable less than optimal for some consumers who have no assets independent of their durable purchase decision. When k is larger, the cash-credit indifference lies in regions where purchase implies a qualitative change in the asset position.

If k is small, the purchase-indifference locus goes through region **IV**, where it has a horizontal and a vertical segment. In general, the nonlinearity of the purchase-indifference locus becomes more pronounced as the consumer's imperfect access to borrowing and lending opportunities becomes more relevant to the purchase decision. Intuitively, the indifference locus tends to become (and is, in region **IV**) horizontal when the consumer is liquidity constrained, because when future resources are too low to make a credit purchase appealing (and financial markets are not accessed) then an increase of current resources does not make such a purchase any more desirable. For a given degree of financial market imperfection, as represented by the difference between r_b and r_a in the model, the relevance of financial market access for durable purchase decisions depends on k.

Symmetrically, for a given k the nonlinearity of the purchase indifference frontier depends on the relationship between r_b and r_a. This is illustrated in Figure 4, where we plot purchase-indifference loci for increasingly large values of r_b, keeping k, r_a, and P_0 constant, and varying P_1 so that the internal rate of return of the installment-payment plan is always equal to the average of the borrowing and lending rates in the financial market ($P_1/P_0 = 1 + (r_a + r_b)/2$). The straight downward sloping line in the figure represents the case of perfect financial markets, i.e., $r_a = r_b$ which is equal to the internal rate of return of the installment plan. We do not plot the cones defining liquidity-constrained regions in the figure. It is not difficult to see, however, that regions where assets are zero (contingent on one or more of the possible choices open to the consumer) become larger as financial market access becomes more difficult. In the figure, financing terms for durable-good purchase become relatively more favorable compared to unconditional loan rates, and the nonlinear character of the consumer's choices becomes more and more pronounced.

Additional qualitative features of the solution are illustrated in Figure 5, where for a given k we keep P_0, r_a and r_b constant but vary P_1. Not surprisingly, as P_1 increases the purchase-indifference locus shifts outward, i.e., the consumer needs to be richer in order to find it optimal to purchase the durable good. Of course, this is more pronounced for configurations of the endowment that are relatively tilted towards the future: any change of the delayed-payment terms for the good (as long as the internal rate is larger than r_a) is irrelevant for consumers who have positive assets and buy the durable with cash, while consumers who are liquidity constrained or borrow can be induced to buy the good by a better financing deal.

4 Implications for dealer pricing of financial terms

The simple qualitative insights outlined in the introduction, and the more precise quantitative perspective offered by our modeling approach, can be brought to bear on various aspects of reality and of the data available to us.

Our formal, if simplified, characterization of consumer choices makes it possible to explore incentives by dealers to subsidize (or mark-up) their consumers' financing rates. We consider a dealer who has a specific durable good available for sale, normalize marginal cost to zero with no loss of generality, and define the objective of the dealer's pricing decisions as follows:

$$R(P_0,P_1) = P_0 D_0(P_0,P_1) + \frac{P_1}{1+r_f} D_1(P_0,P_1). \tag{13}$$

where $D_0(P_0,P_1)$ is the quantity purchased on a cash basis at price P_0, and $D_1(P_0,P_1)$ is the quantity purchased on a credit basis. For each customer who purchases the good on credit, the dealer receives from the bank the customer's installment payment P_1, discounted at rate r_f. In the model, as in reality, the bank handles the financial side of the durable purchase transaction, and the dealer faces no default risk.

Suppose the dealer is faced by a population of potential customers that behave like the one characterized in the previous section, and let their current and future financial resources be distributed according to the bivariate density function $f(W,Y)$. Let $Y = \chi(W;P_0,P_1,k,r_a,r_b)$ denote the upward-sloping cash-credit indifference locus of Figure 3, and let $Y = \pi(W;P_0,P_1,k,r_a,r_b)$ denote the downward-sloping line of indifference between purchasing and not purchasing the good in that and the other figures of the previous section. As shown above, the future-resource level Y identified by each of these loci depends on current resources W, as well as on the cash and credit prices and on the specification of tastes (parameterized by k in the model) and of the financial market environment (parameterized by r_a and r_b).

Let ω denote the current-resource coordinate of the two schedules' intersection point, implicitly defined by

$$\chi(\omega;P_0,P_1,k,r_a,r_b) = \pi(\omega;P_0,P_1,k,r_a,r_b).$$

Then, the quantity sold on a cash basis can be expressed as an integral over the appropriate region of the previous section's figures:

$$D_0 = \int_{\omega}^{\infty} \left[\int_{\pi(W;\ldots)}^{\chi(W;\ldots)} f(W,Y)\,dY \right] dW. \tag{14}$$

Similarly, the quantity sold on credit is given by:

$$D_1 = \int_{\omega}^{\infty} \left[\int_{\chi(W;...)}^{\infty} f(W,Y)dY \right] dW + \int_{0}^{\omega} \left[\int_{\pi(W;...)}^{\infty} f(W,Y)dY \right] dW. \tag{15}$$

The model features three distinct interest rates, $r_a < r_f < r_b$. Since "the bank" (or financial sector) is the counterpart of the consumers' deposit and borrowing relationships, the wedges $r_f - r_a > 0$ and $r_b - r_a > 0$ reflect intermediation costs and non-repayment risk, which may be left unmodeled for this paper's purposes. The wedge $r_b - r_f > 0$ between the interest rates charged by the bank on unrestrained consumer borrowing and on durable good installment payments reflects differential transaction costs and repayment behavior, through the selection effects outlined in the Introduction.

If the cash and credit prices are related according to $P_1 = (1 + r_f) P_0$, then the dealer's revenues are not affected by the proportion of cash and credit sales. Besides choosing the overall level of the item's price, however, the dealer can also choose to set the installment price as a different ratio of the cash price. In fact, it will be generally optimal for the dealer to do so, and exploit the opportunity to price-discriminate among customers. As long as

$$1 + r_a < \frac{P_1}{P_0} < 1 + r_b,$$

in fact, different sets of consumers are attracted by cash and credit purchases. Hence, a dealer faced with a population of potential customers that is heterogeneous across the two dimensions of the figures above (current and future purchasing power) should in general find it optimal to charge different prices to the subsets of that population that are attracted by cash and credit purchase terms.

The dealer's first-order conditions,

$$\left(\frac{\partial R(P_0, P_1)}{\partial P_0} = 0 \right) \Rightarrow D_0(P_0, P_1) + P_0 \frac{\partial D_0(P_0, P_1)}{\partial P_0} + \frac{P_1}{1 + r_f} \frac{\partial D_1(P_0, P_1)}{\partial P_0} = 0 \tag{16}$$

and

$$\left(\frac{\partial R(P_0, P_1)}{\partial P_1} = 0 \right) \Rightarrow \frac{D_1(P_0, P_1)}{1 + r_f} + \frac{P_1}{1 + r_f} \frac{\partial D_1(P_0, P_1)}{\partial P_1} + P_0 \frac{\partial D_0(P_0, P_1)}{\partial P_1} = 0, \tag{17}$$

can be rearranged to obtain two equations in the own- and cross-price elasticities of cash and credit demand,

$$\begin{aligned} \varepsilon_{0,P_0} &= -1 + \frac{P_1}{(1 + r_f) P_0} \frac{D_1(P_0, P_1)}{D_0(P_0, P_1)} \varepsilon_{1,P_0}, \\ \varepsilon_{1,P_1} &= -1 + \frac{(1 + r_f) P_0}{P_1} \frac{D_0(P_0, P_1)}{D_1(P_0, P_1)} \varepsilon_{0,P_1}, \end{aligned}$$

where ε_{0,P_0} denotes the elasticity of the cash quantity with respect to the cash price, and the other elasticities are defined similarly. Demand elasticities depend on the shape of the bivariate distribution of current and future purchasing power in the population, and on the wedge between borrowing and lending rates. In general, they are different across the two groups, and so are the optimal present-value prices charged by the dealer.

In order to characterize such relationships more precisely and discuss how they may bear on available empirical information, the relevant mechanisms can be illustrated with numerical computations based on a simple parameterized model. We suppose that the population's distribution of current and future resources is well approximated by a bivariate normal distribution over the relevant region (this distribution attaches positive probability to negative levels of W and Y, which however are irrelevant because they can never be associated with purchase decisions). We can then compute numerical counterparts to the demand expressions (14) and (15) for every pricing choice by the dealer, and determine the optimal one by numerically integrating the dealer's objective function (13) and performing a grid search over the relevant region of P_0 and P_1 ($1 + r_a \leq \frac{P_1}{P_0} \leq 1 + r_b$) for each set of parameter values. The algorithm also computes numerical counterparts of the first order conditions (16) and (17), and checks that they are satisfied at the maximum identified by the grid-search procedure.

Numerical solution of the dealer's optimization problem offers useful insights into the relationship between the market's structure and incentives to engage in price discrimination across groups of customers who are more or less inclined to use current rather than future resources. Of course, if it were the case that $r_a = r_b = r_f = \bar{r}$ then the terms of durable-good financing deals would be unable to discriminate among customers. In the face of this perfect-financial-markets configuration, if the dealer offered favorable financing terms ($P_1/P_0 < 1 + \bar{r}$) then *all* customers would take advantage of them, and the dealer's interest rate subsidy would be equivalent to a lower price. Even less interestingly, if the dealer tried to charge his credit customers more than the market interest rate ($P_1/P_0 > 1 + \bar{r}$) then no consumer would accept such unfavorable terms, and those who prefer to devote future resources to the durable purchase would simply borrow on the market and pay cash.

Quite intuitively, the scope for dealer price discrimination increases with the spread between the lending and borrowing rates on the financial market. Figure 6 reports the results of a sequence of numerical experiments where the spread $r_b - r_a$ between consumers' borrowing and lending rates (on the horizontal axis) increases, keeping such rates symmetrically above and below a given bank durable financing rate r_f. On the vertical axis, the Figure reports the ratio of the dealer's revenue-maximizing credit and cash prices. Since this is lower than $1+ r_f$, the dealer pays part of the interest charged by the bank.[6] In Figure 6, larger bid-ask spreads in the financial market are associated with more substantial subsidization of consumer credit rates by dealers, who are better able to discriminate among their customers (adjusting both P_0 and P_1) when a larger proportion of them is liquidity constrained.

This result is intuitive, but not obvious, and robust to other parameter configurations. We have also experimented with other perturbations of the financial market's structural feature. An intuitive insight is illustrated in Figure 7: as r_f increases while r_b and r_a remain constant, the dealer becomes increasingly less inclined to subsidize customers' interest charges. It is not difficult to see why, since any given financing rate entails larger subsidies on the part of the dealer. We see in the Figure that the relationship is not linear, and the pass-through from bank rates into dealer financing terms is less than one for one. In reality, the degree of financial market imperfection works through both of the channels illustrated in Figures 6 and 7, and the resulting relationship between various liquidity-constraint indicators and the incidence of dealer-subsidized credit may be quite complex. A prediction of the model, however, is that dealer-subsidized credit should be more prevalent in market segments where large interest rate spreads imply strong segmentation of the potential customer population. Of course, the character of the distribution of current and future resources across the customer population also affects the scope for price discrimination (in the limit case of no variation across the population in the relevant respects, the dealer could not possibly discriminate among them). Numerical experimentation confirms that, indeed, the spread and correlation parameters of the distribution play an important, if quite complex role in determining the difference between the dealer's financing terms and the bank's financing rate for given values of the latter, of r_b, and of r_a.

4.1 Empirical evidence

In the Italian markets from which our data set is drawn, as in the model, dealers can choose to absorb interest payments and offer attractive financial terms to those among their customers who are inclined to purchase on credit. The installment-purchase data available to us, and already analyzed above, contain information on the characteristics of both the individual and of the good purchased (but no information as to the identity of the dealer), as well as an indication of whether the dealer pays interest, or not. In the latter case, financial charges can be computed as the internal rate of return of the consumers' repayment obligations. When dealers pay *all* interest, the banks' interest charges are not observable. In practice, and presumably as a reflection of institutional details, dealers almost always do offer "zero" interest rates when they subsidize their customers' credit purchases. Very

[6] If it were higher, the dealer actually would find it optimal to charge a higher interest rate on installment plans than the bank's required rate of return. In reality, dealers are indeed sometimes in a position to charge fees, because banks rely on them to contact customers and ensure that the credit is indeed disbursed towards a durable-good purchase.

few (less than 1.5%) of the contracts in the sample see dealers paying only a portion of the bank's interest charges, and most (74%) of such contracts relate to motorcycle purchases. We decided to drop all partially subsidized installment plans from the sample, and analyze the likelihood of complete subsidization. To model this discrete rather than continuous variation in interest subsidies, we run semi-structural probit models, aiming to predict the probability that the dealer subsidizes credit: the left-hand side variable of the probit regressions reported below takes value one when the dealer pays the installment plan's financial charges, zero when the consumer pays them.

In our theoretical model, incentives for dealers to subsidize installment payment plans depend in complex ways on the distribution of potential customers' current and future purchasing power, and on the structure of their lending and borrowing opportunities. In preliminary regressions we found that the likelihood of a given contract receiving a dealer subsidy is empirically related to all contract and most customer characteristics. The empirical association of dealer-subsidized installment plans with the latter (such as age, marital status, and especially income) cannot be given a structural interpretation, however. While financial institutions do reserve the right to refuse credit to individual consumers on the basis of the information reported on the application form, dealers are unable to price-discriminate across individuals when, as is the case in the reality from which our data are drawn, the terms of installment payment plans for small durable purchases are posted along with the cash price on the dealer's premises. Hence, the empirical relevance of individual characteristics presumably reflects selection of the overall distribution of such characteristics into the subset of installment purchases, within each good category, that dealers choose to subsidize.

In Tables 2 and 3 we report the results of two types of semi-structural probit regressions, focusing on variation of some relevant variables at the regional level as an exogenous shifter. We report results on subsamples by item purchased. Pooled regressions yielded much worse results, indicating that focusing on homogeneous groups of observations does improve the fit of theory and data. Even within groups, however, the data are very imperfectly represented by the stylized model proposed and solved above. For example, more or less luxurious items within a given category are certainly characterized by different willingness-to-pay parameters (represented by k in the model—see Figure 3). In general, this affects a dealer's incentive to price discriminate for given values of other parameters, and can make it difficult or impossible to detect their effect. We address this problem controlling for observable characteristics of each installment plan, such as the amount of the loan. Even though the coefficients of such variables have no structural interpretation, controlling for them can highlight the relationship between financial market imperfections and price discrimination incentives illustrated in Figure 6 and 7. Accordingly, the probit specification includes demographics, contract characteristics and time dummies. The regressions reported in Table 2 make no attempt to control for the income distribution, but use all the Findomestic data, and can exploit time variation in interest rates across the years 1996-1998. Conversely, the regression reported in Table 3 controls for income growth at the regional level over the 1995-98 period, but is restricted to the 1996 cross-section.

The variables of structural interest in Table 2 are meant to capture the effect shown in Figures 6 and 7. As illustrated in Figure 6, a larger spread between borrowing and lending rates is predicted by the model to lead to more subsidization by dealers. Spreads between bank lending and deposit rates are computed on the basis of time-series data disaggregated across regions (see the Table for source and definitions). While available rates are not directly comparable to the consumer credit interest rates observed in our data set, spreads between them should be qualitatively related to relevant variation in financial-market development across regions and over time. We also know (see Figure 7) that higher financial charges reduce the dealer's incentive to subsidize installment purchases. The rate charged on installment purchases, r_f, is only observable in our data set for observations where the customer pays. For observations where dealers pay interest, we impute the (unobservable) financial charge on the basis of regressions of the type reported in Table 1. In doing so, of course, we neglect the possibility that contracts are selected into the subsidized subsample on the basis of variation in the underlying rate charged by the financial institution (r_f in the model). Such selection, however, has in principle ambiguous effects on the measurement of the effects of interest.[7]

Our modeling perspective predicts that, *ceteris paribus,* larger interest rate spreads on the financial market should increase dealers' propensity to absorb their customers' installment-credit financial charges, while higher financial charges should have the opposite effect. This is borne out by the data for white goods, telephony, household appliances, and brown goods (consumer electronics). The interest rate differential is significant only for the latter two categories, but since these are the most numerous and arguably most homogenous groups in the data set, the result do offer empirical support for the theory. Besides variables meant to capture the structural effects of Figures 6 and 7, many others have highly significant marginal effects, and may satisfactorily control for heterogeneity of item characteristics within each of the broad categories (larger loans are more likely to be subsidized by the dealer) and of credit-transaction details (loan duration, insurance against income loss, whether installment payments are charged directly to a bank account, and the existence of a data link between the dealer and the credit provider). Some individual characteristics are also signifi-

[7] We also experimented with inserting the level of regionally disaggregated interest rates, which are sharply declining over time during the sample period. The results were not easily interpretable, and not suprisingly so in light of the fact that the pattern of market penetration by our data source in the various regions and over time is arguably an important source of variation in the relevant interest rates.

cant, presumably reflecting their prevalence in customer populations whose borrowing is optimally subsidized by price-discriminating dealers: older customers, singles, tenants, and mortgage holders are less likely to receive dealer interest subsidies. Time dummies are also included (and significant) as controls for other, non-structural sources of heterogeneity. We do not report them in the table, but it may be worth mentioning that no overall trends in the incidence of dealer-subsidized credit are apparent: for example, while installment-credit purchases of "brown" goods are increasingly subsidized over time, the opposite is the case for "telephony" items.

It is also interesting to seek empirical implementation of the model's predictions as to the role of future and current income distribution in determining price-discrimination incentives. The available sample of installment contracts only includes individuals who do decide to purchase a durable item, and to do so on an installment-credit basis. Since the distribution of all actual and potential customers is relevant in the model, we need to use a representative sample in order to capture the relevant effects. A suitable measure of income growth at the regional level (see the notes to Table 3 for details) can be retrieved from the panel component of the Survey of Household Income and Wealth.[8] Merging it into the first complete yearly cross-section of contracts in our data set, and estimating the probit model reported in Table 3, we find that current and prospective income growth variation across regions (computed from 1995-98 panel data) does play a significant role in determining the likelihood of dealer-subsidized credit in 1996. The sign of this variable's marginal effect cannot be readily interpreted, because the characteristics of the income-distribution time pattern facing dealers affects their price-discrimination incentives in complex and nonlinear ways. Still, the empirical relevance of our modeling perspective is supported by its significance, and by the fact that the structurally interesting variables introduced in Table 2 survive its inclusion.[9] In Table 3, especially for the more numerous and homogenous subsamples, the interest rate on installment payments still tends to have a negative and significant effect on dealers' propensity to absorb financial charges, while the interest rate spread proxy is less significant than in Table 2's repeated cross-section data set.

5 Concluding comments

We have motivated, proposed, and solved a model of interrelated purchase and borrowing decisions when, on the one hand, wedges between borrowing and lending rates in the financial market make

[8] The SHIW is a survey of the Italian population fielded every 2-3 years: see Brandolini and Cannari (1994) for a description of the early waves, D'Alessio and Faiella (2000) for an introduction to the recently released 1998 wave.

[9] We experimented with inclusion of other moments of the regions' current and future income distribution, as sampled in the SHIW panel component. Since such statistics vary only across regions, however, including them tends to make it impossible to obtain sensible results as regards the more structurally interesting financial rate variables, which also only vary by region.

consumers' willingness to pay depend on the relative as well as the absolute size of current and future funds; and, on the other hand, installment-payment plans towards purchase of a specific item is available at relatively favorable rates. Further, we have rationalized in terms of price-discrimination incentives the behavior of dealers who choose to bear the financial cost of their customers' credit purchases. Since wedges between borrowing and lending rates segment the population of potential customers into groups who are more or less inclined to borrow, any relationship between such inclinations and the overall willingness to pay induces dealers endowed with monopoly power to charge different present-value prices to the two groups.

While the model proposed is very simple, its closed-form solution and numerical experiments offer intriguing insights into subtle aspects of real-life market interactions. Interest in the phenomena we identify and model may go beyond the specific application to purchase-conditional borrowing, in that they offer formal analysis of (and empirical support for) price-discriminating behavior. Under shelter of monopoly power, sellers do often sell identical items at different prices to self-selected pools of customers. Such behavior, however, is typically quite difficult to characterise precisely and pin down empirically.

Empirical analysis of a rich set of installment-credit and personal-loan data offers considerable support for the assumptions and implications of the proposed theoretical perspective. In particular, we have offered some evidence that heterogeneity across geographic, market-segment, and time dimensions of the structure of borrowing, lending, and installment-plan interest rates has non-trivial implications for the incidence of dealer-subsidized credit in our data.

Such heterogeneity is taken as exogenous in our work, but may be endogenous to higher-level economic interactions. In the reality we model and study empirically, imperfections of the market for unconditional credit increase the scope for consumer-credit dealer subsidies. Competition among dealers, and among banks and specialized credit institutions, can in principle play a very important role in determining the scope of financial market imperfections and their incidence on different consumer groups. Aggregate financial market development indicators might hide important interactions between more detailed imperfections in unconditional and conditional credit markets, and the modeling perspective we propose may also have interesting implications for the pattern of durable and nondurable expenditure by individual consumers. For example, consumers with fast-increasing income patterns may not find it optimal to borrow in order to finance current nondurable consumption (especially when such borrowing is expensive and/or severely constrained). They should, however, be inclined to tilt their consumption bundles towards the kinds of durable goods that feature favorable financing arrangements. The resulting interaction between durable stocks and expenditure flows on the one hand, and financial market imperfections on the other, appears interestingly different from that featured in Alessie, Devereux, Weber (1997) and other related contributions. It might be possible in further work to study such phenomena combining detailed information on the characteristics of customer who do apply for credit (and may or may not be offered a subsidy by dealers) with the information on financial market access and durable expenditure patterns available in representative data sets, such as the Bank of Italy survey studied here and by Alessie, Hochguertel, Weber (2001) and Bertola, Guiso, Pistaferri (2001).

Appendices

A Exact solution: purchase indifference

In this Appendix we list algebraic formulae defining the combinations of current and future resources that make a consumer indifferent between purchasing or not purchasing the durable good. We omit details of the derivation, which are in general quite similar to those discussed in the text for regions I, IV, X and always lead to quadratic equations. The sign of the root in the solution is always uniquely determined by considering restrictions on the possible values of W and Y in each of the regions. Again taking such restrictions into account, the slope of the indifference locus can be shown to be weakly negative in all regions considered here. The indifference locus is continuous at the boundaries of the regions: values at all boundary points are reported in Tables at the end of this Appendix section. It is also continuously differentiable, unless indifference between cash and credit purchase also happens to obtain when a boundary is crossed by the purchase-indifference locus.

A.1 Region II

As is clear from inspection of Figure 2, in this region the consumer has no assets (is liquidity-constrained) if the durable good is purchased on credit, and has negative assets (borrows) otherwise.

The endowments that make the consumer indifferent between a cash purchase and no purchase lie on the locus:

$$Y = \left(P_0 \frac{e^{\frac{k}{2}}}{e^{\frac{k}{2}} - 1} - W \right) (1 + r_b).$$

The endowments that make the consumer indifferent between a credit purchase and no purchase lie on the locus:

$$Y = W(1 + r_b)(2e^k - 1) - 2\sqrt{W^2(1 + r_b)^2(e^{2k} - e^k) - e^k(1 + r_b)WP_1}.$$

A.2 Region III

The asset position of the consumer depending on whether the durable is purchased and, if so, on a cash or credit basis can again be inferred easily from Figure 2 in this and all other regions. The endowments that make the consumer indifferent between a cash purchase and no purchase lie on the locus:

$$Y = (1 + r_b) \left(P_0 + W(\frac{2}{e^k} - 1) + \frac{2}{e^k} \sqrt{W (e^k P_0 + (1 - e^k)W)} \right),$$

and those that generate indifference towards a credit purchase are defined by

$$Y = P_1 \frac{e^k}{e^k - 1}.$$

A.3 Region V

The endowments in this region that make the consumer indifferent to purchasing the good with cash are described by the same relationship as in Region I or II. Indifference to credit purchase occurs when

$$Y = \frac{\left[(1+r_a)W\left[1-e^k\right] + e^k P_1\right](1+r_b) + e^{\frac{k}{2}}\sqrt{(1+r_a)(1+r_b)((r_b-r_a)W+P_1)}}{e^k(1+r_b)-(1+r_a)}.$$

A.4 Region VI

The endowments in this region that make the consumer indifferent to purchasing the good with cash are described by the same relationship as in Region III.

The endowments that make the consumer indifferent between a credit purchase and no purchase lie on the locus:

$$Y = \left(P_1 + W(1+r_a)(\frac{2}{e^k}-1) + \frac{2}{e^k}\sqrt{W(1+r_a)\left(P_1 e^k + (1+r_a)W(1-e^k)\right)}\right).$$

A.5 Region VII

The endowments in this region that make the consumer indifferent to purchasing the good with cash are described by the same relationship as in Region IV. The endowments in this region that make the consumer indifferent to purchasing the good with credit are described by the same relationship as in Region VI.

A.6 Region VIII

The endowments that make the consumer indifferent between a cash purchase and no purchase lie on the locus:

$$Y = \frac{(1+r_b)\left((1+r_a)\left[W-(W-P_0)e^k\right] + e^{\frac{k}{2}}\sqrt{(1+r_a)(1+r_b)}\left(\left(\frac{r_a-r_b}{1+r_b}\right)W+P_0\right)\right)}{(1+r_a)e^k-(1+r_b)}.$$

The endowments that make the consumer indifferent between a credit purchase and no purchase lie on the locus:

$$Y = P_1\frac{e^{\frac{k}{2}}}{e^{\frac{k}{2}}-1} - W(1+r_a).$$

A.7 Region IX

The endowments that make the consumer indifferent between a cash purchase and no purchase lie on the locus:

$$Y = (1+r_a)\left(2e^k(W-P_0) - W - 2\sqrt{(W-P_0)e^k((W-P_0)e^k-W)}\right).$$

The endowments in this region that make the consumer indifferent to purchasing the good with credit are described by the same relationship as in Region VIII.

A.8 Region X

The endowments that make the consumer indifferent between a cash purchase and no purchase lie on the locus:

$$Y = \left(P_0 \frac{e^{\frac{k}{2}}}{e^{\frac{k}{2}} - 1} - W \right) (1 + r_a) \, .$$

The endowments in this region that make the consumer indifferent to purchasing the good with credit are described by the same relationship as in Region VIII.

A.9 Continuity

The following tables report the values of the indifference locus at all points where it crosses the boundaries of two regions. In all cases, the value is the same whether it is computed with the above analytic expressions for either one of the regions. The first table reports the intersection points for the cash purchase-no purchase indifference locus. The second table reports the intersection points for the credit purchase-no purchase indifference locus.

Table: Continuity Purchase Indifference I

Intersection	*Cash purchase - no purchase indifference: Values of W*
Region I-II	$\frac{1}{2}\frac{P_0 e^{\frac{1}{2}k}(1+r_b)-P_1(e^{\frac{1}{2}k}-1)}{(e^{\frac{1}{2}k}-1)(1+r_b)}$
Region II-III	$\frac{1}{2}P_0\frac{e^{\frac{1}{2}k}}{e^{\frac{1}{2}k}-1}$
Region II-V	$\frac{P_0 e^{\frac{1}{2}k}(1+r_b)-P_1(e^{\frac{1}{2}k}-1)}{(2+r_b+r_a)(e^{\frac{1}{2}k}-1)}$
Region II-VI	$\frac{P_1}{r_b-r_a}$ only if $k = 2\log 2\frac{P_1}{2P_1-P_0(r_b-r_a)}$
Region III-IV	$P_0\frac{e^k}{e^k-1}$
Region III-VI	$\frac{e^k(2+r_b+r_a)(P_0(1+r_b)-P_1)+2P_1(1+r_b)}{4(e^k-1)(1+r_a)(1+r_b)+e^k(r_b-r_a)^2} + \frac{2\sqrt{\left((1+r_a)(1+r_b)e^k P_0^2+P_1P_0e^k(r_b-r_a)+P_1^2(1-e^k)\right)(1+r_b)^2}}{4(e^k-1)(1+r_a)(1+r_b)+e^k(r_b-r_a)^2}$
Region III-VII	$P_0\frac{e^k}{e^k-1}$ only if $k = \log\frac{P_1+P_0(1+r_b)}{P_0(1+r_a)+P_1}$
Region IV-VII	$P_0\frac{e^k}{e^k-1}$
Region V-VI	$\frac{1}{2}P_0\frac{e^{\frac{1}{2}k}}{e^{\frac{1}{2}k}-1}$
Region VI-VIII	$\frac{e^k(2+r_a+r_b)+2\sqrt{e^k(1+r_a)(1+r_b)}}{4(e^k-1)(1+r_a)(1+r_b)+e^k(r_b-r_a)^2}(1+r_b)P_0$
Region VI-IX	$\frac{P_0(1+r_b)}{r_b-r_a}$ only if $k = \log\frac{1+r_b}{1+r_a}$
Region VI-VII	$P_0\frac{e^k}{e^k-1}$
Region VII-IX	$P_0\frac{e^k}{e^k-1}$
Region VIII-IX	$\frac{-4e^k(1+r_a)(1+r_b)+(1+r_a)(1+r_b)+(1+r_b)^2-2\sqrt{e^k(r_a+1)^3(1+r_b)}}{4(1-e^k)(1+r_a)(1+r_b)+(r_b-r_a)^2}P_0$
Region IX-X	$\frac{1}{2}P_0\frac{2e^{\frac{1}{2}k}-1}{e^{\frac{1}{2}k}-1}$

Table: Continuity Purchase Indifference II

Intersection	*Credit purchase - no purchase indifference: Values of W* if not otherwise noted
Region I-II	$\frac{1}{2}\frac{P_1}{(1+r_b)\left(e^{\frac{1}{2}k}-1\right)}$
Region II-III	$e^k\frac{P_1}{(1+r_b)(e^k-1)}$
Region II-V	$\frac{\left(-2-(r_a+r_b)-2\sqrt{e^k(1+r_a)(1+r_b)}\right)P_1}{(r_a-r_b)^2-4(e^k-1)(1+r_a)(1+r_b)}$
Region II-VI	$\frac{P_1}{r_b-r_a}$ only if $k = \log\frac{1+r_b}{1+r_a}$
Region III-IV	$Y = P_1\frac{e^k}{e^k-1}$
Region III-VI	$\frac{P_1}{(e^k-1)(1+r_a)}$
Region III-VII	$\frac{P_1}{(e^k-1)(1+r_a)}$ only if $k = \log\frac{P_1(1+r_b)+P_0(1+r_b)(1+r_a)}{P_1(1+r_a)+P_0(1+r_b)(1+r_a)}$
Region IV-VII	$\frac{P_1}{(e^k-1)(1+r_a)}$
Region V-VI	$\frac{\left(e^k(2+r_a+r_b)+2\sqrt{e^k(1+r_a)(1+r_b)}\right)P_1}{4(e^k-1)(1+r_b)(1+r_a)+e^k(r_b-r_a)^2}$
Region VI-VIII	$\frac{1}{2}P_1\frac{e^{\frac{1}{2}k}}{(e^{\frac{1}{2}k}-1)(1+r_a)}$
Region VI-IX	$\frac{P_0(1+r_b)}{r_b-r_a}$ only if $k = 2\log 2P_0\frac{(1+r_a)(1+r_b)}{2P_0(1+r_a)(1+r_b)-P_1(r_b-r_a)}$
Region VI-VII	$\frac{e^k(2+r_b+r_a)(P_1+P_0(1+r_b))-2(1+r_a)(1+r_b)P_0}{4(e^k-1)(1+r_a)(1+r_b)+e^k(r_a-r_b)^2} + \frac{2\sqrt{-(1+r_a)(1+r_b)\left((e^k-1)P_0^2(1+r_a)(1+r_b)-e^kP_0P_1(r_b-r_a)-P_1^2e^k\right)}}{4(e^k-1)(1+r_a)(1+r_b)+e^k(r_a-r_b)^2}$
Region VII-IX	$\frac{1}{2}P_1\frac{e^{\frac{1}{2}k}}{\left(e^{\frac{1}{2}k}-1\right)(1+r_a)}$
Region VIII-IX	$\frac{P_0(e^{\frac{1}{2}k}-1)(1+r_b)+P_1e^{\frac{1}{2}k}}{2(e^{\frac{1}{2}k}-1)+(r_b-r_a)(e^{\frac{1}{2}k}-1)}$
Region IX-X	$\frac{1}{2}\left(P_0+\frac{e^{\frac{1}{2}k}}{(e^{\frac{1}{2}k}-1)(1+r_a)}P_1\right)$

B Exact solution: cash-credit indifference

In this Appendix we list algebraic formulae defining the combinations of current and future resources that make a consumer indifferent between purchasing the durable good with cash or with installment credit. Recall from the discussion in the text that cash purchase is never optimal in region I whereas credit purchase cannot be optimal in region X. We omit details of the derivation, which are in general quite similar to those discussed in the text for region IV. The sign of the root in the solution is always uniquely determined by considering that the cash-credit indifference locus has to be upward sloping.

This can be shown by an argument similar to the one used to prove the weakly negative slope of the purchase indifference locus. Suppose the cash-credit indifference locus were negatively sloped. Then it would separate the $W-Y$ space in two regions one of which would be further away from the origin than the other.

i) Imagine a pair (W_0, Y_0) for which it is optimal to purchase the durable with cash. Then the pair must lie above the negatively sloped frontier. Otherwise, a sufficiently large increase of present resources W induces a change from cash to credit purchase. This, however can never be optimal. Hence, the region where cash purchase is optimal must be the region further away from the region.

ii) Imagine a pair (W_0, Y_0) for which it is optimal to purchase the durable on credit. Then the pair must lie above the negatively sloped frontier. Otherwise, it would be possible that an increase of future resources Y induces a change of credit to cash purchase. This, however, can never be optimal.

Now, i) implies that in the region above the cash-credit indifference locus cash purchase is optimal, and ii) implies that in this region credit purchase is optimal. By contradiction, the cash-credit indifference locus cannot be downward sloping.

The indifference locus is continuous and continuously differentiable at the boundaries of the regions. Its values at all boundary points are reported in a Table at the end of this Appendix.

B.1 Region II, III

In Region III the frontier is characterized by indifference between buying the durable cash and borrowing, versus buying the durable credit and depleting assets, i.e.,

$$\frac{1}{4(1+r_b)}(Y + (W - P_0)(1+r_b))^2 e^k = W(Y - P_1)e^k$$

which yields

$$Y = (W + P_0)(1+r_b) - 2\sqrt{W(1+r_b)(P_0(1+r_b) - P_1)}.$$

B.2 Region V, VI, VIII

In Regions V, VI, and VIII the frontier implies indifference between buying the durable cash and borrowing, versus buying the durable credit and lending. This yields

$$Y = \frac{(P_1 - P_0(1+r_a))(1+r_b) + \sqrt{(1+r_b)(1+r_a)(W(r_b - r_a) - P_0(1+r_b) + P_1)}}{r_b - r_a}$$

B.3 Region VII, IX

In Region VII and IX the frontier is characterized by indifference between buying the durable cash and borrowing, versus buying the durable credit and lending, which results in:

$$Y = (1 + r_a)(W - P_0) + (P_1 - (1 + r_a)P_0) + 2\sqrt{(P_1 - (1 + r_a)P_0)(W - P_0)(1 + r_a)} \, .$$

B.4 Continuity

Table: Continuity Cash-Credit Indifference

Intersection	Cash-Credit Frontier: Values of W
Region II-III	$\frac{1}{4}\frac{(1+r_b)P_0^2}{(1+r_b)P_0-P_1}$
Region III-IV	$P_0^2\frac{1+r_b}{P_0(1+r_b)-P_1}$
Region V-II	$\frac{-(P_1-(1+r_b)P_0)}{1+r_a-2\sqrt{(1+r_a)(1+r_b)}+(1+r_b)}$
Region V-III	$\frac{P_1}{r_b-r_a}$ only if $\frac{P_1}{P_0} = \frac{1}{2}((1+r_b)+\sqrt{(1+r_b)(1+r_a)})$
Region V-VI	$\frac{(1+r_b)[P_0(1+r_a)-P_1]+\sqrt{((1+r_b)(1+r_a))}[P_0(1+r_b)-P_1]}{\left(\sqrt{((1+r_b)(1+r_a))}-(1+r_b)\right)(r_b-r_a)}$
Region VI-III	$\frac{\left(1+r_a+\sqrt{((1+r_b)(1+r_a))}\right)(P_0(1+r_b)-P_1)}{\left(\sqrt{((1+r_b)(1+r_a))}-(1+r_a)\right)(r_b-r_a)}$
Region VI-IV	$\frac{P_1+P_0(1+r_b)}{r_b-r_a}$ only if $\frac{P_1}{P_0} = \sqrt{((1+r_b)(1+r_a))}$
Region VI-VII	$\frac{(1+r_b)(2P_0(1+r_a)-P_0(1+r_b)-P_1)+(P_0(1+r_b)-P_1)\sqrt{((1+r_b)(1+r_a))}}{\left(\sqrt{((1+r_b)(1+r_a))}-(1+r_b)\right)(r_b-r_a)}$
Region VII-IV	$\frac{P_1}{P_1-P_0(1+r_a)}P_0$
Region VIII-VI	$\frac{(1+r_b)[P_0(1+r_a)-P_1]+\sqrt{((1+r_b)(1+r_a))}[P_0(1+r_b)-P_1]}{\left(\sqrt{((1+r_b)(1+r_a))}-(1+r_a)\right)(r_b-r_a)}$
Region VIII-IX	$\frac{((1+r_b)-2(1+r_a))P_0+\frac{2}{(r_b-r_a)}(P_1-(1+r_a)P_0)\left((1+r_a)+\sqrt{(1+r_a)(1+r_b)}\right)+P_1}{(r_b-r_a)}$
Region VIII-VII	$P_0\frac{1+r_b}{r_b-r_a}$ only if $\frac{P_1}{P_0} = 2\frac{(1+r_a)(1+r_b)}{1+r_b+\sqrt{((1+r_b)(1+r_a))}}$
Region IX-VII	$\frac{1}{4}\frac{P_1^2}{(1+r_a)(P_1-P_0(1+r_a))}$

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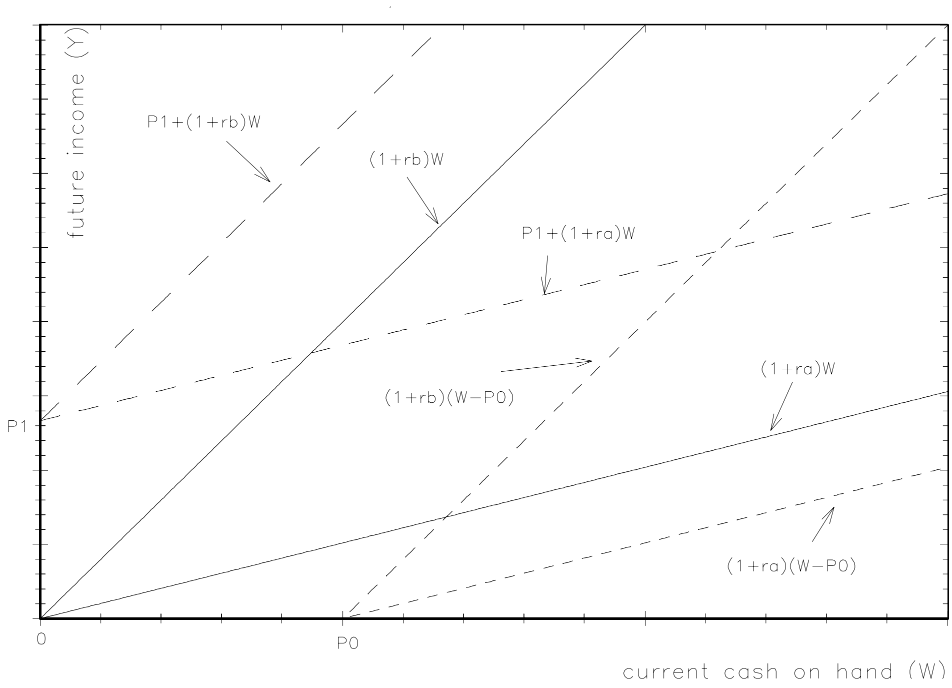

Figure 1: A graphical representation of the Euler conditions for choice of C and A, conditional on whether the good is purchased with cash, on an installment loan basis, or not at all.

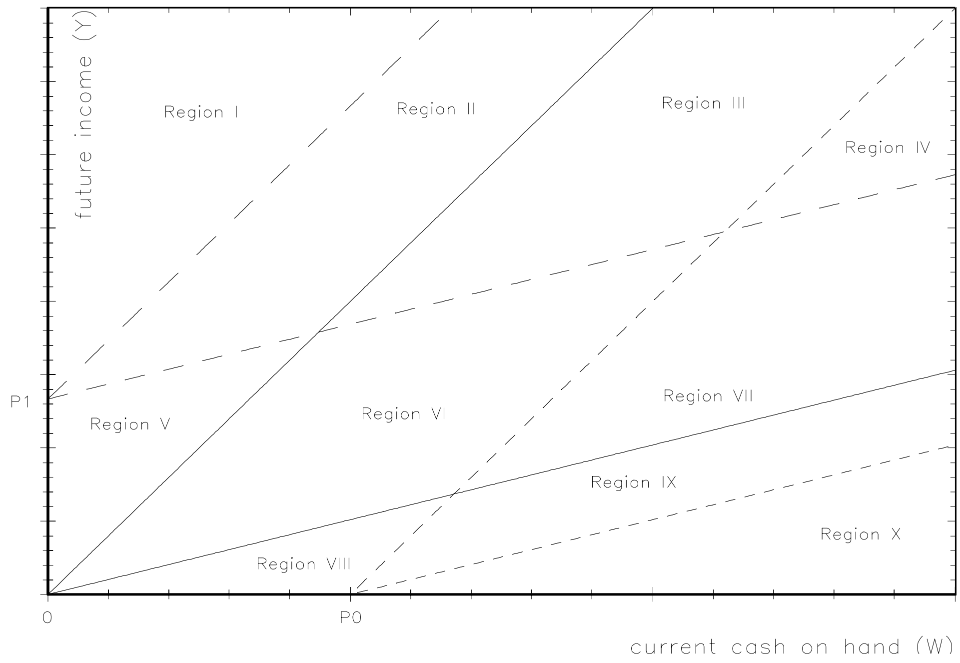

Figure 2: Partition of the {current funds, future funds} plane according to whether the durable goods is purchased with cash, credit, or not at all, and to whether the resulting intertemporal choices entail positive assets, negative assets, or a binding liquidity contraint.

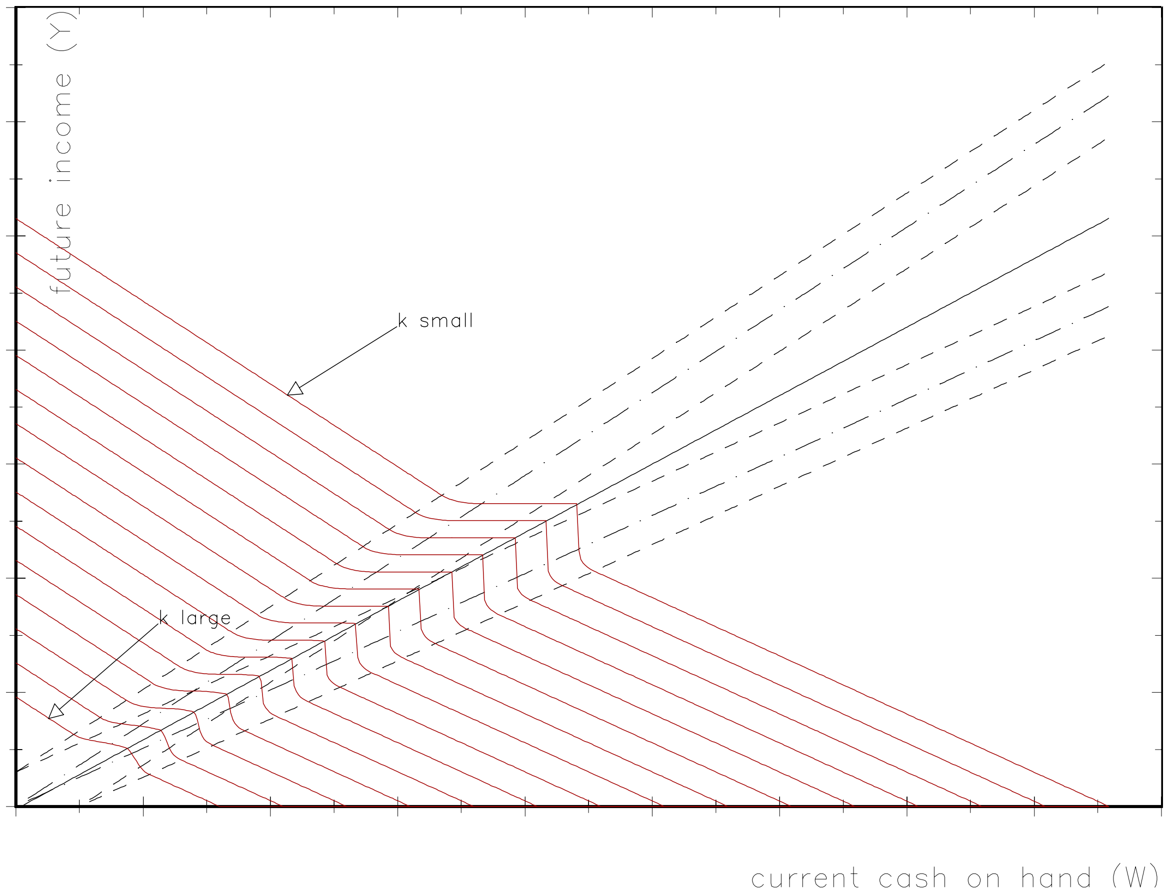

Figure 3: Consumer purchase decisions: implications of different utility levels from durable purchase.

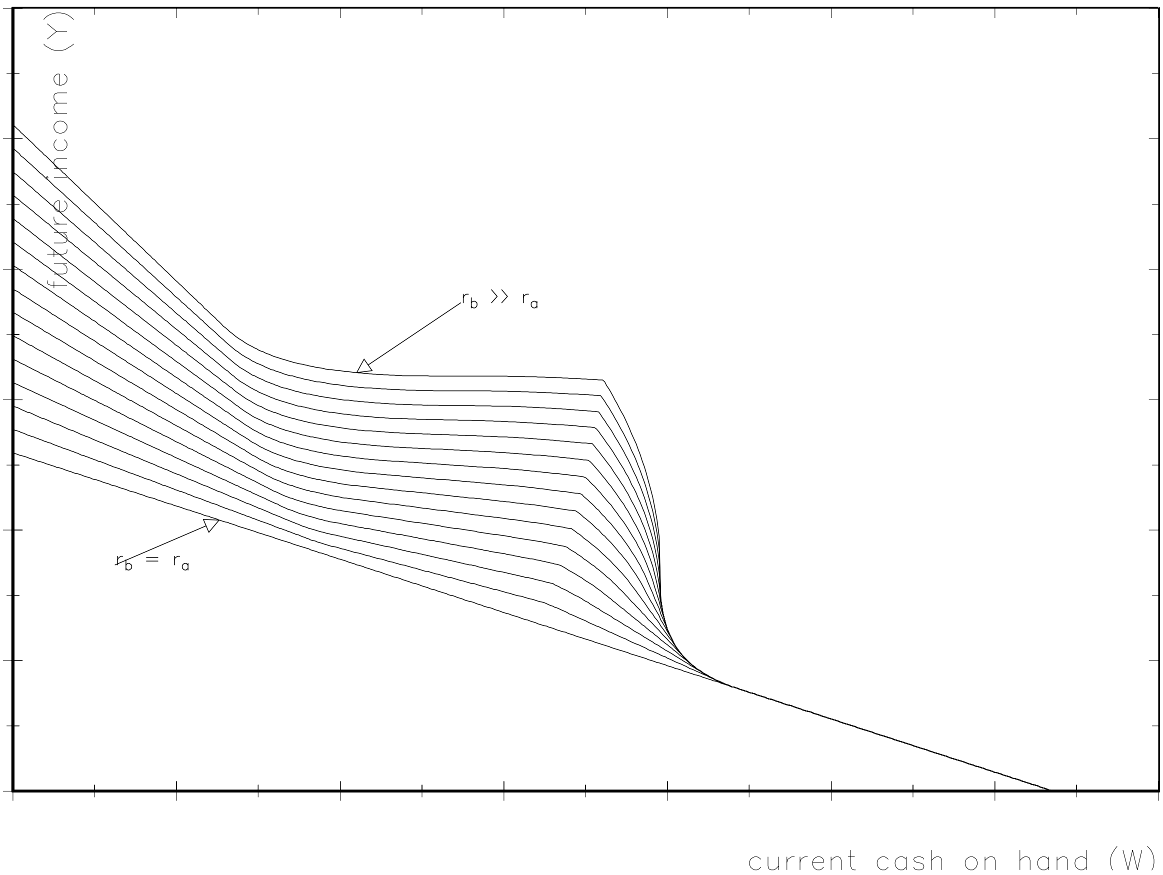

Figure 4: Consumer purchase decisions: implications of different borrowing rates; internal rate of return set equal to the average of lending and borrowing rate.

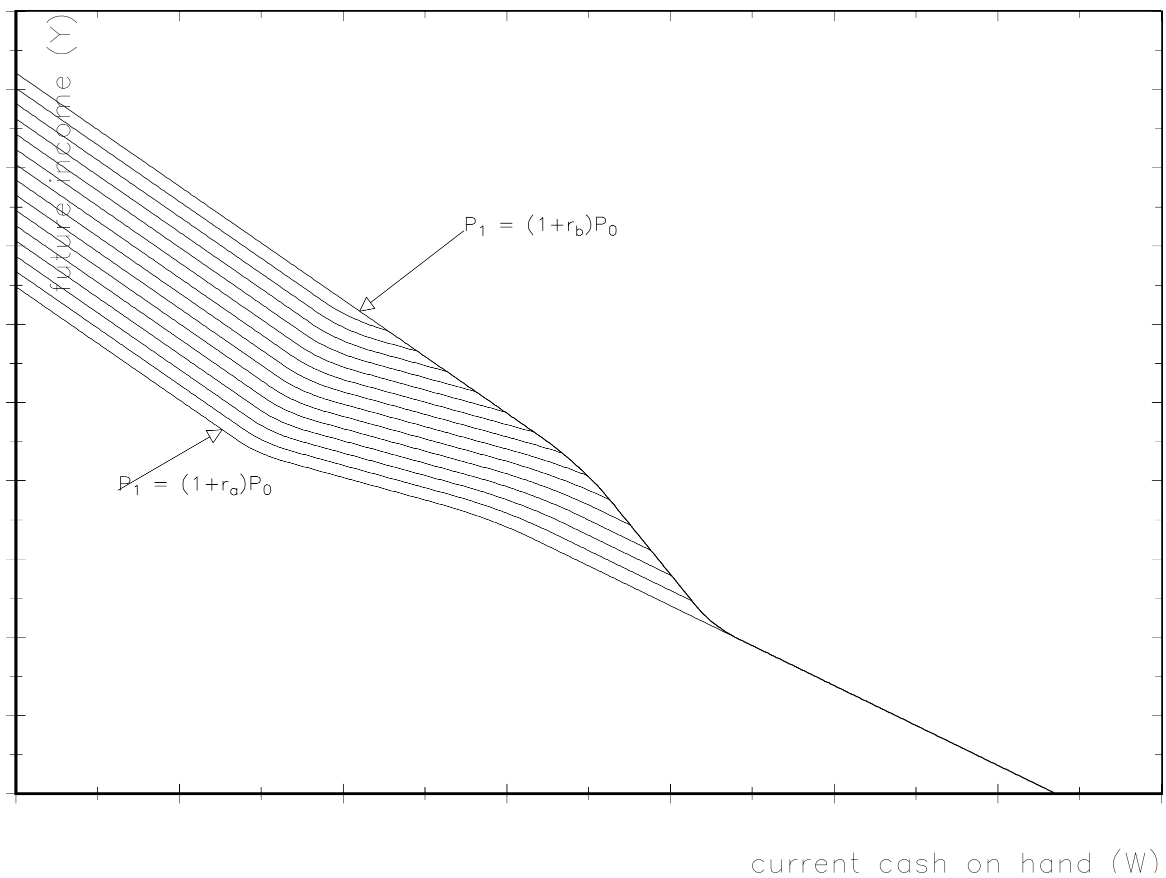

Figure 5: Consumer purchase decisions: implications of different installment-credit interest rates.

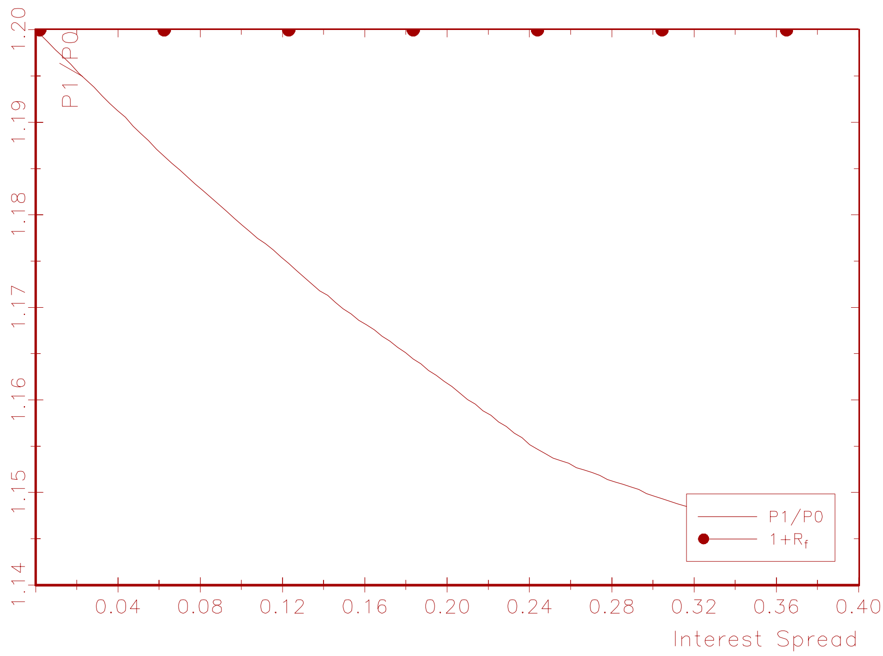

Figure 6: Interest factor charged to customers by price-discriminating dealer, as a function of the spread between the customers' unconditional borrowing and lending rates.

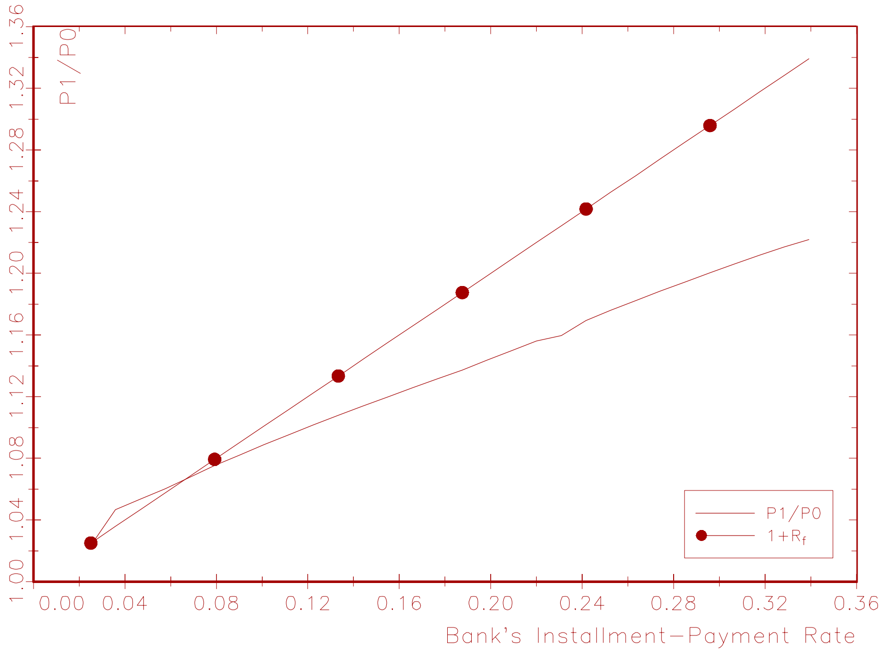

Figure 7: Interest factor charged to customers by price-discriminating dealer, as a function of the bank's required rate on installment payment plans.

Table 1: Internal rates of return, installment credit and personal loans, by item purchased

item	**furniture**		**motorcycles**		**(used) cars**		**new cars**		**white goods**		**hh appliances**		**brown goods**		**computers**		**telephony**	
# observations	8239		5553		5061		6884		4420		8466		16163		3741		17982	
Adj. R-squared	0.5612		0.6778		0.7444		0.6175		0.4549		0.3860		0.4423		0.4165		0.5058	
	coeff.	***t-value***	**coeff.**	***t-value***	**coeff.**	***t-value***	**coeff.**	***t-value***	**coeff.**	***t-value***	**coeff.**	***t-value***	**coeff.**	***t-value***	**coeff.**	***t-value***	**coeff.**	***t-value***
contract characteristics																		
log(loan size in LIT)	-0.0223	-26.31	-0.0067	-5.84	-0.0173	-18.99	-0.0036	-4.74	0.0058	2.34	0.0008	0.57	-0.0068	-7.24	-0.0151	-7.83	0.0022	1.91
duration in months	-0.0003	-5.35	-0.0001	-0.75	0.0000	0.66	-0.0001	-2.59	-0.0014	-4.28	-0.0002	-1.26	0.0002	1.41	-0.0010	-5.84	-0.0008	-5.41
insurance*	0.0396	7.94	0.0406	9.25	0.0409	6.37	0.0102	1.67	0.1087	12.55	0.1120	19.15	0.1174	28.64	0.1018	7.84	0.1140	27.30
repayment via bank*	-0.0079	-6.54	-0.0029	-2.16	-0.0087	-9.51	-0.0029	-5.38	-0.0083	-3.40	-0.0091	-4.67	-0.0059	-4.74	-0.0077	-3.81	-0.0060	-5.10
personal loan																		
personal loan [PL]	0.0398	0.84	0.2701	2.71	0.3514	9.98	0.2916	8.85	-	-	-	-	-	-	-	-	-	-
PL x log loan size	-0.0025	-0.84	-0.0173	-2.74	-0.0191	-8.83	-0.0160	-8.07	-	-	-	-	-	-	-	-	-	-
PL x insurance	-0.0269	-5.05	0.0191	1.19	-0.0193	-3.77	-0.0291	-5.80	-	-	-	-	-	-	-	-	-	-
PL x quarter dummy	-0.0011	-2.19	-0.0016	-1.54	-0.0024	-4.15	-0.0027	-6.69	-	-	-	-	-	-	-	-	-	-
regions																		
Piemonte/Vald'Aosta	0.0053	0.54	-0.0164	-1.44	-0.0131	-1.46	0.0242	2.99	0.0398	2.74	0.0518	4.80	0.0628	8.91	0.0398	1.90	0.0391	4.32
Lombardia/Liguria	-0.0138	-1.93	-0.0022	-0.33	-0.0249	-3.18	0.0019	0.34	-0.0308	-2.56	-0.0113	-1.37	0.0108	1.71	-0.0071	-0.41	0.0113	1.51
Trentino/Veneto/Friuli	-0.0221	-2.24	-0.0363	-2.99	-0.0281	-0.97	-0.0236	-2.13	-0.0102	-0.74	-0.0028	-0.24	0.0143	1.83	-0.0363	-1.13	-0.0005	-0.04
EmiliaRomagna	-0.0359	-4.15	-0.0043	-0.34	-0.0427	-4.15	0.0009	0.09	0.0093	0.57	-0.0002	-0.02	-0.0003	-0.04	-0.0435	-1.78	0.0190	2.03
Toscana	-0.0107	-1.22	-0.0110	-1.41	-0.0257	-3.12	-0.0019	-0.35	-0.0078	-0.56	0.0048	0.47	-0.0032	-0.43	0.0442	1.62	-0.0059	-0.61
Umbria/Marche	-0.0366	-2.08	-0.0312	-2.66	-0.0278	-1.79	0.0090	0.60	-0.0377	-1.66	-0.0212	-1.28	0.0126	1.09	0.0155	1.43	-0.0035	-0.22
Abruzzo/Molise	-0.0237	-1.85	-0.0110	-0.90	-0.0336	-1.88	0.0030	0.58	-0.0119	-0.78	-0.0065	-0.41	0.0186	1.98	-0.0108	-0.29	0.0317	2.55
Campania	-0.0032	-0.38	-0.0186	-2.97	-0.0081	-0.99	-0.0171	-3.23	-0.0114	-0.88	-0.0239	-2.35	0.0088	1.40	0.0152	0.76	-0.0088	-1.43
Puglia/Basil./Calabria	0.0065	0.84	-0.0267	-3.99	-0.0292	-3.63	-0.0271	-5.18	-0.0107	-0.90	-0.0070	-0.84	0.0059	0.92	0.0130	0.62	-0.0037	-0.58
Sicilia	-0.0094	-1.26	-0.0277	-4.89	-0.0420	-5.69	-0.0283	-6.15	0.0110	0.93	0.0114	1.35	-0.0012	-0.17	-0.0093	-0.37	0.0080	1.21
Sardegna	-0.0169	-1.64	-0.0181	-1.59	-0.0426	-3.48	-0.0065	-1.02	0.0063	0.36	0.0077	0.45	0.0178	1.59	-0.0158	-0.69	0.0003	0.02
intercept	0.6329	49.15	0.4021	23.39	0.5520	36.64	0.2682	21.15	0.2687	8.02	0.3075	16.31	0.4070	30.17	0.5490	17.11	0.2908	18.21

Source: Findomestic Banca, authors' calculations.

Note: Time dummies, their interaction with insurance and the interaction of the region dummies with time and insurance, respectively, are included in the regression, but not reported.

Items purchased are classified as follows: furniture includes all sorts of home furnishing, such as living and bedrooms and (modular) kitchens; motorcycles includes motorcycles and scooters; (used) cars includes cars, motorhomes, and caravans: they may or may not be second-hand; new cars includes cars, motorhomes, and caravans that are classified as being new; white goods include fridges, freezers, washing machines, dishwashers; household appliances are those not classified as white or brown goods; brown goods are consumer electronics like TV sets, VCRs, radios, cameras, etc. excluding home computers; computers and telephony cannot further be subdivided.

*: dummy variable

-: not enough observations for personal loans to estimate the coefficients.

Table 2: Probit for dealer subsidies, by item purchased, 1996-98

item	**furniture**		**motorcycles**		**(used) cars**		**new cars**		**white goods**		**hh appliances**		**brown goods**		**computers**		**telephony**	
# observations	13003		12365		4437		6186		7373		13141		24641		4900		22352	
log-likelihood	-6889.51		-6262.54		-1017.69		-1045.52		-3806.35		-6871.05		-12400.6		-1628.59		-8675.41	
	marginal effect	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***
applicant's characteristics																		
age	-0.0006	-0.96	-0.0004	-0.54	0.0006	2.36	-0.0001	-1.15	-0.0014	-2.68	-0.0013	-2.57	-0.0004	-1.36	-0.0006	-1.38	-0.0003	-1.50
# children*																		
1 child	-0.0034	-0.32	0.0604	3.05	0.0096	0.94	0.0028	0.56	0.0024	0.11	0.0057	0.50	-0.0101	-0.95	-0.0250	-2.40	-0.0085	-1.27
2 children	0.0194	1.18	0.0826	5.55	0.0186	1.75	-0.0044	-1.03	0.0019	0.13	-0.0062	-0.39	-0.0142	-1.09	-0.0262	-2.19	-0.0125	-1.54
3 or more	0.0051	0.22	0.0539	2.98	0.0124	0.73	0.0057	0.53	-0.0139	-0.75	-0.0343	-2.04	-0.0566	-4.01	-0.0216	-1.75	-0.0274	-3.85
marital status*																		
couple	0.0357	1.93	0.0504	2.20	-0.0082	-0.67	0.0031	0.73	0.0118	0.51	0.0307	1.92	0.0514	4.45	0.0303	2.94	0.0208	2.60
divorced	-0.0174	-0.84	-0.0414	-1.49	-0.0056	-0.34	-0.0108	-1.26	0.0531	1.11	-0.0487	-1.90	0.0536	2.68	0.0374	1.53	0.0077	0.63
widowed	-0.0353	-1.21	0.0057	0.15	-0.0353	-2.58	-0.0061	-0.74	-0.0100	-0.30	-0.0115	-0.44	0.0234	1.10	-0.0035	-0.11	-0.0210	-1.59
residential status*																		
owner w mortgage	-0.0728	-4.23	-0.0419	-1.09	0.0021	0.12	-0.0048	-0.53	-0.0285	-0.98	-0.0208	-0.52	-0.0344	-1.39	-0.0360	-2.47	-0.0191	-1.46
tenant	-0.1033	-7.51	-0.0838	-5.20	-0.0206	-2.96	-0.0056	-1.24	-0.0428	-2.44	-0.0464	-3.01	-0.0256	-1.75	0.0098	0.99	-0.0088	-0.95
lives with relatives	-0.0235	-1.36	-0.0301	-1.24	-0.0181	-1.89	-0.0069	-1.68	-0.0320	-1.17	-0.0195	-1.19	-0.0126	-1.14	-0.0071	-0.82	-0.0124	-1.52
contract characteristics																		
log(loan size in LIT)	0.0248	1.62	0.1453	4.83	-0.0232	-1.55	0.0263	9.27	0.3150	12.80	0.1430	11.19	0.1678	14.66	0.0577	7.94	0.1301	14.56
duration in months	-0.0075	-4.16	-0.0337	-13.89	-0.0009	-2.17	-0.0027	-15.39	-0.0584	-7.91	-0.0390	-9.77	-0.0488	-8.68	-0.0255	-8.75	-0.0404	-10.87
insurance*	-0.4467	-20.72	-0.6392	-15.59	-0.0413	-1.91	0.0075	2.00	-0.4196	-18.79	-0.3860	-17.85	-0.3733	-30.52	-0.0732	-5.82	-0.2127	-19.28
repayment via bank*	0.1518	11.01	0.0677	4.26	0.0734	6.89	-0.0011	-0.10	0.1408	8.63	0.1427	8.94	0.0816	7.87	0.0127	1.86	0.0685	7.24
transmission of application*																		
fax	-0.1127	-2.71	-0.1013	-3.52	-0.0848	-3.38	-0.0015	-0.16	-0.2163	-3.92	-0.0418	-1.05	-0.1948	-4.64	-0.0691	-8.08	-0.0879	-6.09
phone	-0.1610	-4.98	-0.0940	-3.19	-0.0878	-5.25	-0.0094	-1.08	-0.1577	-3.63	-0.0932	-3.28	-0.1606	-6.27	-0.0847	-6.73	-0.0952	-6.46
other	-0.0601	-0.75	-0.1282	-2.86	-0.0311	-1.63	-**	-	-0.0784	-0.87	0.0743	1.23	-0.1164	-1.99	-0.0371	-1.62	-0.0308	-0.91
financial market																		
rdiff (rate spread)	**-0.0174**	**-1.05**	**-0.0206**	**-1.16**	**-0.0216**	**-2.76**	**-0.0106**	**-5.93**	**0.0231**	**1.50**	**0.0323**	**2.85**	**0.0409**	**2.78**	**-0.0111**	**-1.55**	**0.0128**	**1.33**
rf	**-2.4314**	**-2.11**	**-2.8066**	**-2.57**	**1.3132**	**1.30**	**0.1459**	**0.55**	**-0.7631**	**-0.74**	**-1.6481**	**-2.13**	**-1.8272**	**-1.50**	**-0.9154**	**-2.52**	**-1.6722**	**-3.48**

Source: Findomestic Banca, authors' calculations.

Note: see Table 1. Standard errors are adjusted for variables varying only across regions and time.

Financial market variables: **rdiff** is the spread between the banking sector's borrowing and lending rate indicators from Banca d'Italia, *Sintesi delle note sull'andamento dell'economia delle regioni italiane*, 1997-98-99-2000, Tav.aD6 (we use the last yearly observation). These indicators are based on sampling of large deposit and lending rates (only deposits over 20 million LIT and loans or lines of credit over 150 million LIT are considered), hence far from comparable in levels to observed consumer lending rates.

rf is estimated, at the regional level, from our data base (see text for detail).

Quarterly time dummies are also included (not shown).

*: (set of) dummy variable(s); reference groups for dummy sets are: no children, single (never married), outright home owner, remote-online technology

**: variable dropped because of collinearity.

***: variable dropped because predicts perfectly.

Table 3: Probit for dealer subsidies, by item purchased, 1996 controlling for 1995-98 income growth

item	**furniture**		**motorcycles**		**(used) cars**		**new cars**		**white goods**		**hh appliances**		**brown goods**		**computers**		**telephony**	
# observations	2283		3417		984		6186		1536		2615		5800		534		3642	
log-likelihood	-995.05		-1500.10		-134.97		-1045.52		-543.64		-1103.55		-2086.54		-132.90		-968.50	
	marginal effect	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***	**marginal effect**	***t-value***
applicant's characteristics																		
age	-0.0020	-1.63	-0.0017	-1.65	-0.0003	-2.57	0.0007	1.01	-0.0030	-4.61	-0.0005	-0.40	-0.0009	-1.34	-0.0001	-0.93	-0.0002	-0.93
# children*																		
1 child	0.0319	1.19	0.1098	3.51	-0.0008	-0.43	0.0717	1.65	-0.0497	-1.40	0.0288	0.99	0.0060	0.53	-0.0021	-0.49	0.0155	2.15
2 children	0.0688	1.96	0.0862	3.76	-0.0030	-0.92	0.0084	0.21	-0.0296	-1.39	-0.0260	-0.83	-0.0181	-1.55	0.0038	0.58	-0.0037	-0.43
3 or more	0.0735	1.27	0.0906	2.93	0.0064	1.12	0.0365	0.48	-0.0323	-0.64	-0.0440	-1.04	-0.0269	-2.02	-0.0008	-0.13	-0.0072	-0.74
marital status*																		
couple	-0.0413	-1.10	0.0140	0.32	0.0032	0.96	0.0127	0.52	0.0424	0.92	0.0195	0.51	0.0219	1.21	0.0051	0.63	-0.0007	-0.09
divorced	-0.0366	-0.98	-0.0224	-0.37	0.0409	2.64	0.0084	0.19	0.0604	0.95	-0.0639	-1.09	0.0290	0.90	0.0256	1.36	-0.0063	-0.35
widowed	-0.0979	-1.73	-0.0303	-0.35	0.0018	0.17	0.0172	0.32	-0.0322	-0.42	0.0101	0.22	0.0005	0.01	-***	-	-0.0136	-0.80
residential status*																		
owner w mortgage	-0.0283	-0.54	-0.0504	-0.68	-0.0040	-0.99	-0.0856	-1.09	-0.0001	0.00	-0.0226	-0.43	-0.0028	-0.08	-0.0052	-1.63	0.0078	0.32
tenant	-0.0606	-2.63	-0.1101	-6.77	-0.0016	-0.52	-0.0465	-1.61	-0.0342	-1.32	-0.0164	-1.08	-0.0259	-1.48	0.0000	-0.01	-0.0142	-1.80
lives with relatives	-0.0456	-0.93	-0.0700	-3.77	-0.0082	-3.43	0.0001	0.00	0.0272	0.98	-0.0163	-0.51	-0.0203	-1.35	0.0015	0.25	-0.0159	-2.20
contract characteristics																		
log(loan size in LIT)	0.0303	1.24	0.2443	4.38	-0.0175	-6.87	0.1009	6.52	0.2532	5.53	0.1746	8.60	0.1268	12.25	0.0127	3.36	0.0726	8.82
duration in months	-0.0141	-7.23	-0.0325	-7.75	-0.0007	-3.27	-0.0114	-13.34	-0.1259	-8.17	-0.0700	-9.66	-0.0733	-10.74	-0.0076	-5.32	-0.0335	-10.12
insurance*	-0.4619	-18.28	-0.7406	-7.56	-0.0062	-2.96	-***	-	-0.3951	-5.76	-0.2697	-8.17	-0.2743	-23.26	-0.0180	-3.54	-0.1558	-9.89
repayment via bank*	0.1676	5.95	0.1327	4.53	0.0214	3.90	0.0388	1.11	0.0803	1.94	0.1507	8.97	0.0347	2.52	0.0013	0.43	0.0142	1.44
transmission of application*																		
fax**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
phone	-0.1208	-2.98	-0.1269	-3.46	-0.0236	-1.89	0.0345	0.67	-0.1323	-2.30	-0.0701	-2.43	-0.0976	-4.43	-0.0347	-9.18	-0.0361	-2.16
other	-0.0813	-1.04	-0.2870	-3.36	0.0077	0.49	-0.1318	-0.83	0.1314	1.74	0.1489	1.38	-0.0616	-2.23	-0.0048	-1.24	-0.0114	-0.63
income growth	**0.6649**	**1.28**	**0.1552**	**0.39**	**0.0889**	**4.12**	**-****	**-**	**-0.5566**	**-1.95**	**-0.6569**	**-2.95**	**-0.5585**	**-2.64**	**0.0030**	**0.09**	**-0.2506**	**-1.97**
financial market																		
rdiff (rate spread)	**0.0241**	**0.54**	**-0.0245**	**-0.70**	**-0.0009**	**-0.72**	**-0.0612**	**-5.15**	**-0.0080**	**-0.31**	**0.0035**	**0.20**	**0.0156**	**0.98**	**0.0002**	**0.16**	**-0.0067**	**-0.70**
rf	**-5.4077**	**-1.98**	**-2.7801**	**-2.46**	**0.1988**	**1.60**	**0.2100**	**0.28**	**-1.7328**	**-2.73**	**-1.7958**	**-3.12**	**-1.3546**	**-2.19**	**-0.1193**	**-1.89**	**-0.7304**	**-2.10**

Source: Findomestic Banca, authors' calculations.

Note: See Tables 1 and 2. Standard errors are adjusted for variables varying only across regions.
Definition of income growth measure: average, by region (defined as in Table 1), of 1998-95 log personal income differences from the 1998 SHIW panel sample.
The 1995/1998 SHIW panel component includes 2,669 households. To remove outliers, observations in the top and bottom percentile of the initial and final personal income distributions are excluded from the computation.
Definition of financial market variables: see Table 2.

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