Conspicuous Consumption and the Visibility of Consumer Expenditures*

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Abstract

Individuals live in society, and many of their consumption decisions are observed by others. When making such decisions, individuals consider not only the direct effects of their choice on their welfare, but also the indirect (or *social*) effects resulting from society observing their choice. We detail the theoretical foundation and the construction of a new survey designed to quantify the relative "cultural" visibility of different consumer expenditures. We report and analyze the survey results, placing different consumption categories along a visibility scale. We apply our findings to explore the extent to which a simple "signaling by consuming" model à la Veblen can explain estimated total expenditure elasticities of demand in a cross-section of US households. We find mixed but suggestive evidence that our visibility survey could predict up to 20 percent of observed variation in elasticities across consumption categories.

JEL Classification: D12, Z13

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Since... appearance tyrannizes over truth and is lord of happiness, to appearance I must devote myself.

(Plato, *The Republic*, II)

1 Introduction

1.1 Motivation

We all live in society and depend on each other for achieving most of our personal goals.[1] These clearly include all goals that are directly related to our place in society and are only meaningful in a social context. For most of us, however, even mere physical survival depends on our ability to function in a social setting. We neither can nor want to live away from society.

Our ability to function in a social setting is in turn affected by what others think about us. And since others are unlikely to have perfect information about us, they are constantly watching us, updating their opinions and beliefs about who we are. Consequently, every aspect of our behavior that is observable by society may be interpreted as a signal.

In the signaling game we call life, when deciding upon a course of action, we consider not only the direct effects of our choice on our welfare, but also the indirect (or *social*) effects resulting from society observing our choice. Balancing these two effects, we may choose actions that are suboptimal in their direct effects, but, considering their value as a signal, are overall optimal (for the decision-making individual).

In the socio-cultural context most familiar to us – that of a consumer society with a consumer culture – many of the choices we make and the actions we take are consumption-related.[2] Indeed, consumption is so pervasive in our lives that both in everyday conversation and in the academic economics literature, individuals are often simply referred to as consumers. And as consumers, an important channel through which we can send signals to society is our consumption behavior. The main idea behind this paper is that, as some consumer expenditures are more visible to society than others, a "signaling by consuming" model might help us explain consumer expenditure patterns. Using such a model, we derive empirical predictions regarding total expenditure elasticities of demand, and we show that these depend on the visibility (or non-visibility) of the goods consumed. We construct a survey-based measure of the relative visibility of different consumption categories, and we apply it to explore how well our predictions fare with available data on household consumption. We find mixed but suggestive evidence that our survey-based measure could predict up to 20 percent of observed variation in elasticities across consumption categories.

[1] By *society* we simply mean the collection of individuals around us. In what follows, we use *society* interchangeably with *other people*.

[2] Schor (1998, p. 217) defines consumer society as "a society in which discretionary consumption has become a mass phenomenon, not just the province of the rich or even the middle classes." Ekins (1991) notes the large exposure of individuals to commercial advertisement, and cites "the possession and use of an increasing number and variety of goods and services" as a cultural aspiration and a perceived route to personal happiness, social status and national success.

1.2 Related Literature

The idea that consumption can be used as a signal is far from new. It is commonly associated with the American economist Thorstein Veblen who, in his 1899 classic *The Theory of the Leisure Class*, coined the term *conspicuous consumption* to describe consumption that is motivated by an attempt to advertise wealth. However, views exemplified by Plato's quote in the epitaph above, or, two millennia later, by Hobbes's assertion that "men are continually in competition for honour and dignity," had found their way into economic thought at least a century before Veblen.[3] Adam Smith observed that appearance, honor, and dignity considerations may affect consumption patterns ("a creditable day-labourer would be ashamed to appear in public without a linen shirt");[4] and Karl Marx referred to the signaling qualities of consumption in his often quoted statement that satisfaction with one's own house is determined by how big the surrounding houses are.[5]

More recent attempts to incorporate variations on this idea into a formal theoretical framework have resulted in a rich collection of models, accompanied by original linguistic constructs and new jargon. These include applications of Leibenstein's (1950) *bandwagon*, *snob*, and *Veblen effects*, Hirsch's (1976) *positional goods* (see Frank 1985a for an application, and Frank 1985b, 1999 for discussions and references), Ng's (1987) *diamond goods*, Congleton's (1989) *status games*, Ireland's (1994) market for status signals in the presence of *visible goods* (see also Ireland 1998, 2001), Pesendorfer's (1995) fashion cycles, Bagwell and Bernheim's (1996) *Veblen effects* as a potential equilibrium in a signaling model, and Piccione and Rubinstein's (2004) *luxury prices*.

Veblen's own linguistic construct, *conspicuous consumption*, has by now become so widely used in popular culture that it has an entry in the English dictionary (it is defined as "*lavish or wasteful spending thought to enhance social prestige*").[6] As consumers, many of us engage in it. As members of society, we often recognize it when we see it. Interestingly, though, as professional economists we have not yet offered a way to quantify it and to assess its empirical significance.

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[3] Hobbes is cited in Hirschman (1973, p. 634).

[4] Smith (1776). The more complete paragraph reads:

> Consumable commodities are either necessaries or luxuries. By necessaries I understand not only the commodities which are indispensably necessary for the support of life, but whatever the custom of the country renders it indecent for creditable people, even of the lowest order, to be without. A linen shirt, for example, is, strictly speaking, not a necessary of life... But in the present times, through the greater part of Europe, a creditable day-labourer would be ashamed to appear in public without a linen shirt, the want of which would be supposed to denote that disgraceful degree of poverty which, it is presumed, nobody can well fall into without extreme bad conduct.

[5] Marx (1849):

> A house may be large or small; as long as the neighboring houses are likewise small, it satisfies all social requirement for a residence. But let there arise next to the little house a palace, and the little house shrinks to a hut. The little house now makes it clear that its inmate has no social position at all to maintain, or but a very insignificant one...

[6] Merriam-Webster Online Dictionary, `www.m-w.com`.

To the best of our knowledge, recent attempts to remedy this situation are sparse and isolated. Such attempts typically find an original way to exploit a peculiarity in one narrow set of goods for estimating the extent to which signaling-by-consuming is present in a specific expenditure. One such example is Kooreman and Haan (2002) who look at used car markets in the Netherlands. Exploiting a new license plate format, which has no intrinsic value to car owners but is visible to all and therefore is useful as a signal, they find that it has significant effects on used car prices.

1.3 Quantifying Conspicuous Consumption

This paper attempts to develop a general approach to the problem of empirically measuring conspicuous consumption. It takes a first step in what we believe to be a promising direction by creating a new empirical resource: a Visibility Index (or *"Vindex"*). To construct it, we divide household expenditure in the US as reported in the Consumer Expenditure Survey (CEX) into thirty-one consumption categories, and we design and conduct a new survey to place each category along a visibility scale. The Vindex value of each category is its position on that scale. We argue that our Vindex measures how visible the related expenditure is to society.[7] We demonstrate, within a theoretical framework where conspicuous consumption signals total income, how our Vindex can be applied as a new resource in empirical work.

The idea behind our approach is simple. In congruence with the dictionary definition of the word *conspicuous* – "*obvious to the eye or mind; attracting attention*" – we assume that for any part of consumer expenditure to be counted as conspicuous consumption, it has to be visible, displayable, or otherwise knowable to people other than those directly engaged in its consumption.[8] Our Vindex is designed to rate consumables according to their conspicuousness potential.

The paper proceeds as follows. Section 2 outlines a simple model due to Ireland (1994), where the visibility (and non-visibility) of consumer expenditures play an important role in explaining consumer demand patterns. Section 3 applies the general model to a quasi-homothetic utility function and provides complete analytical solutions. These two sections together provide both the basic motivation and the underlying theoretical setup for our Vindex, which is constructed in Section 4. Being the main part of this paper, that section details the construction of the thirty-one consumption categories used by the main survey question; it shows how the theoretical framework from previous sections has been applied to construct that main question; and it reports the main findings of the survey, highlighting the construction of, and findings related to, the resulting Vindex. The section closes with a discussion of our findings and their relation to some of the literature on positional goods and on fashions. Section 5 demonstrates how our Vindex can be applied in empirical work. Looking at the special case of a Cobb-Douglas homothetic utility, it explores to what extent our Vindex helps explain observed cross-good variation in total expenditure elasticities. Section 6 concludes and discusses future work.

[7] As argued later in this paper, the visibility of each consumption expenditure is determined in the social and cultural context in which it is being consumed. It should not be thought of as an intrinsic, culturally-independent, feature of the goods consumed, although it is often related to their physical properties.

[8] Merriam-Webster Online Dictionary, `www.m-w.com`.

2 Model

2.1 Two Types of Utility

Our theoretical framework specifies the exact way in which others' opinions about us enter our utility function. It is an application of Ireland's (1994, 1998, 2001) idea of two different types of utility. The first type is familiar from most economic models, and refers to individuals' evaluation of their own satisfaction from consuming certain desirable goods. Ireland calls this type *private*, or *fundamental* utility. The other, less standard type of utility, refers to other people's evaluation of one's fundamental utility. Ireland calls this second type of utility *spectators' view* and identifies it with social status. The two types of utility together model a situation where along with the direct satisfaction (fundamental utility) one gets from consuming a certain bundle of goods and services, comes indirect satisfaction, through society's reactions to its evaluation of one's private utility.

As an example, direct satisfaction (fundamental utility) is derived from the taste and texture of a good meal, as well as from hunger satiation and other effects related to the nutritional content of the meal. At the same time, indirect satisfaction (such as social status) results from others' appreciation of, and social reactions to, one's consumption of good meals.

Since both direct and indirect satisfactions are important to individuals, they spend resources not only on consuming what they desire, but also on informing (or misinforming) society about it. In other words, while "doing well" is important to individuals, merely having others *believe* that one is doing well could be equally as important.

It should be pointed out that the social effects modeled through the notion of *spectators' view* (of one's private utility) differ fundamentally from the more familiar notion of externalities in consumption.[9] Hence, for example, our model abstracts from the potential social punishment of a smoker for the negative externality he or she inflicts upon others by contaminating the air everybody breathes. Congleton (1989, pp. 178, 183, 189) discusses "the possibility of the benign evolution of status-assigning mechanisms" (through "Hayek's (1973) notion of *kosmos*, a societal process of coordination and improvement"). He concludes that status-games "which create negative externalities may be replaced by games generating no externalities or, better still, by games generating positive externalities." This suggests that smoking may not be used as a status-gaining signal even if it is highly visible, and hence may not fit our model. We return to this point when we present our survey findings and our empirical results.

2.2 Consumers and the Consumer's Problem

In Ireland's model, it is common knowledge that consumers are identical to each other in all but their exogenous and only privately known incomes. Incomes are drawn from a continuous distribution with a publicly known lower bound of its support at a bottom income level b. This bottom income level could be thought of as subsistence income or as a minimum provided by the state.

[9] For a formal definition of externalities see Buchanan and Stubblebine (1962).

Consumers allocate their income between two kinds of consumption: consumption that is perfectly visible to society, denoted by v; and consumption that is perfectly non-visible to society, denoted by w. Since neither an individual's income y nor consumption of w is visible, the only observable difference between two individuals from the point of view of a third one – or of society as a whole – is their consumption of v.

As discussed above, consumers care both about their fundamental utility from consuming v and w, denoted $f(v, w)$, and about society's view of that utility, denoted $f(v, g(v))$, where $g(v)$ represents society's beliefs concerning the unobservable w based on the observable v. Specifically, they maximize the following convex combination (or weighted average) of the two:[10]

$$U = (1-a) f(v, w) + a f(v, g(v)). \qquad (0 < a < 1) \tag{1}$$

The weight a can be thought of as a measure of one's sensitivity to society's view, or to social status. When $a = 1$, consumers consume with the sole purpose of being seen consuming – not too far from Veblen's (1899) idea of consumption by the Leisure Class. At the other extreme, when $a = 0$ the model reduces to the standard model where social effects are assumed away.[11]

From the point of view of an individual consumer, both income type y and society's belief function $g(\cdot)$ are exogenous. With a standard budget constraint of the type

$$w + pv = y \tag{2}$$

the consumer's problem is therefore to choose an optimal level of v in the interval $\frac{y}{p} \geqslant v \geqslant 0$ to maximize (1) s.t. (2).

2.3 Equilibrium

Since preferences are identical across individuals and are public knowledge, society as a whole can solve the same maximization problem solved by individuals at every potential income level. It can then attempt to infer, for each individual, their y (or, equivalently, their w) based on their observed v. This feeds back into society's belief function $g(v)$. A fully separating equilibrium in this model is such that while individuals' behavior is optimal given $g(\cdot)$, society's (or spectators') inferences of the level of non-visible consumption w are correct:

$$g(v) = w. \tag{3}$$

The first order condition for an internal solution of the consumer's problem is given by

$$\begin{aligned} (1-a)\left[f_1(v, y-pv) - p f_2(v, y-pv)\right] & \\ + a\left[f_1(v, g(v)) + f_2(v, g(v))\, g'(v)\right] &= 0, \end{aligned} \tag{4}$$

[10] See Ireland (1994, 1998, 2001) for interpretations of such a weighted average. Ireland (1998) draws parallels with expected utility maximization where utilities are assessed across two different states of the world: a no-spectators state and a spectators-only state.

[11] Ireland (2001) suggests that a could either relate to the importance of achieving status within a social group, or to the degree of ignorance of the group as to the individual's true income type. Other interpretations are welcome.

where f_1 and f_2 denote the partial derivatives w.r.t. the first and second arguments of $f(\cdot,\cdot)$. These two conditions for a fully separating equilibrium, (3) and (4), combined with the budget constraint (2), can be rewritten as the first order and first degree differential equation

$$g'(v) = \frac{1}{a}\left((1-a)\,p - \frac{f_1(v, g(v))}{f_2(v, g(v))}\right). \tag{5}$$

Ireland (1994) proves that a fully separating equilibrium exists if a few assumptions on the first and second derivatives of $f(\cdot,\cdot)$ hold.[12] Looking at the second order condition for maximization and carefully dealing with the possibility of corner solutions, he shows that the function $g(v)$ that solves (5) is indeed the unique differentiable belief function in such equilibrium. He observes that while in general such $g(v)$ may not have a simple form as a finite number of known functions, solutions are reasonably straightforward for $f(\cdot,\cdot)$ either homothetic or quasi-linear (both classes satisfy the conditions set in his proof).

Ireland solves a quasi-linear example ($f(v,w) = v + \log(1+w)$), which he finds convenient for studying theoretical issues in optimal tax policy. In the present paper, on the other hand, we aim at keeping to a minimum any postulated differences in preferences (or in tastes) towards v and w; this allows us to derive cross-good differences in consumption patterns from differences in visibility alone. For this purpose, in the next section we depart from Ireland's analysis and move on to analyze a case where v and w enter the fundamental utility function in a more symmetrical way.

3 A Quasi-homothetic Fundamental Utility

To solve (5) and complete the analysis we need to specify a functional form for $f(\cdot,\cdot)$. This section assumes the quasi-homothetic fundamental utility of the form:

$$f(v,w) = \beta_v \log(v - \gamma_v) + \beta_w \log(w - \gamma_w). \tag{6}$$

This functional form, popular in the literature, enjoys several advantages.[13] Among those, of particular importance to us is the fact that it does not assume any a-priori difference between the way v and w affect utility. Moreover, while generalizing the more specialized log-Cobb-Douglas homothetic model, this quasi-homothetic case can still be analytically solved within the framework of our model. We use the worked-out solution as the theoretical basis underlying the design of our visibility survey (described in Section 4), and derive empirical predictions that can be later assessed in face of the data.

3.1 The No-Social-Effects Benchmark

Before solving (5) with the fundamental utility given by (6) for the general case, it is useful to look at the special case where social effects do not exist (or are assumed away). This is the case $a = 0$ in (1) , in which our model reduces to the standard model where the fundamental utility (6) is the only component in the consumer's utility: $U(v,w) = f(v,w)$.

[12] We restate the relevant proposition from Ireland (1994) in Appendix B.

[13] Deaton and Muellbauer (1980, pp. 64-67, 144-145) assess and criticize the quasi-homothetic model and the related linear expenditure system, from both theoretical and empirical points of view.

Defining $\beta \equiv \frac{\beta_v}{\beta_w}$, the first order condition of the consumer's problem is the familiar

$$\frac{w-\gamma_w}{v-\gamma_v} = \frac{p}{\beta},$$

and the resulting demand functions are just the popular linear expenditure system with two goods:

$$v-\gamma_v = \frac{\beta}{1+\beta}\frac{1}{p}\left(y-\gamma_w-p\gamma_v\right) \qquad (a=0) \tag{7}$$

and

$$w-\gamma_w = \frac{1}{1+\beta}\left(y-\gamma_w-p\gamma_v\right). \qquad (a=0) \tag{8}$$

3.2 Social Effects

To solve the general case where social effects do exist ($a > 0$), we substitute the partial derivatives f_1 and f_2 of (6) into (5), to get:

$$g'(v) = \frac{1}{a}\left((1-a)\,p - \beta\frac{g(v)-\gamma_w}{v-\gamma_v}\right). \tag{9}$$

The general solution to this differential equation is (see Appendix A)

$$g(v)-\gamma_w = \frac{1-a}{\beta+a}p\left(v-\gamma_v\right) + C\left(v-\gamma_v\right)^{-\frac{1}{a}\beta}, \tag{10}$$

where C is an arbitrary constant, to be pinned down shortly by a boundary condition. Appendix B shows that this quasi-homothetic case satisfies the necessary assumptions for Ireland's (1994) existence and uniqueness proof to apply. This formally completes our solution.

The Shape of the Engel Curve

Using (2) and (3), we can now rewrite (10) as an implicit demand function, or, treating p as a parameter, as an inverse Engel curve $y(v)$:

$$y-\gamma_w-p\gamma_v = \frac{1+\beta}{a+\beta}p\left(v-\gamma_v\right) + C\left(v-\gamma_v\right)^{-\frac{1}{a}\beta}. \qquad (a>0) \tag{11}$$

It is instructive to compare (11) with a no-social-effects inverse Engel curve, easily obtained by inverting (7). Whereas the relation between y and v in the no-social-effects benchmark is linear, the right hand side of (11) is the sum of two terms: a linear term, and a nonlinear term. Looking at each of these separately, it is seen that the introduction of social interaction into the model affects the inverse Engel curve in two ways. First, the coefficient of the linear term now depends on the size of the parameter a. This means that even if, as shown below, the nonlinear term vanishes (leaving (11) a linear relation), social effects change the slope of the inverse Engel curve. Second, in addition to this quantitative effect, the presence of the

nonlinear term on the right hand side of (11) means a qualitative change: while the quasi-homothetic demand system (6) with no social effects leads to linear Engel curves, social effects lead to curvature. We further discuss these points and illustrate them graphically later in this section.

To pin down the (transformed) constant of integration C, we use a boundary condition that reflects the maximizing behavior of the lowest income type b.[14] We observe that in a fully separating equilibrium, utility-maximizing individuals of the lowest income type behave exactly as they would had society not existed. The reason is that since in equilibrium society knows each individual's type, and since no matter what the lowest type does, he or she will never be thought to be of a worse type than b, deviating from the allocation (v, w) that maximizes fundamental utility $f(v, w)$ will be suboptimal. The lowest income type is thus in this sense special: while other income types could be taken to be of lower types were they not spending resources on signaling, the lowest type has nothing to lose. Such lack of spending on signals by the lowest type is a common result in signaling models with fully separating equilibria.

It follows that at the lowest possible income, the demand for v is the same whether $a = 0$ or $a > 0$, which in turn means that at $y = b$ both (7) and (11) should hold. This is only possible if

$$C = \left(\frac{1}{a}\beta + 1\right)^{-1} \left(p\left(\frac{1}{\beta} + 1\right)\right)^{-\frac{1}{a}\beta} (b - \gamma_w - p\gamma_v)^{\frac{1}{a}\beta+1}. \tag{12}$$

It is seen that as long as the lowest income type lives above subsistence level (that is, as long as $b > \gamma_w + p\gamma_v$), C given by (12) is positive.[15]

Having pinned down C, we can go back and interpret the inverse Engel curve $y(v)$ given by (11). Taking first derivative we get

$$\frac{dy}{dv} = \frac{1+\beta}{a+\beta}p - \frac{1}{a}\beta C (v - \gamma_v)^{-\frac{1}{a}\beta-1}, \tag{13}$$

which, using (12) and some algebra, is positive as long as

$$v > \frac{\beta}{1+\beta}\frac{b - \gamma_w}{p}. \tag{14}$$

Since (14) is satisfied for the lowest type (to verify this, just substitute $y = b$ into (7)), it follows that it is satisfied for all types.[16] Furthermore, as v grows, the second term on the right hand side of (13) vanishes and the slope of the inverse Engel curve – and therefore that of the Engel curve too – approaches a positive constant. In other words, $v(y)$ (which we

[14] This boundary condition is referred to as *initial condition* in Ireland (1994). See discussions there.

[15] It can be shown that although the non-negative limit, $\lim_{a\to 0} C$, depends on the model parameters, the limit (as a shrinks) of the nonlinear term in (11) is zero for all income types: $\lim_{a\to 0}\left(C(v - \gamma_v)^{-\frac{1}{a}\beta}\right) = 0$. This implies that for $a = 0$, (11) simplifies to (7).

[16] The argument goes as follows: if (14) is satisfied for a certain income type, then, for that type, (13) is positive. In other words, for that type, $\frac{dv}{dy} > 0$. But this in turn means that (14) is satisfied for an infinitesimally higher income type.

By the same argument (and by the continuity of y), if (14) is satisfied for for the lowest income type, it is satisfied for all types.

cannot write in explicit form) is strictly increasing, with a slope that is never lower than a (strictly) positive known lower bound.

Looking at (11), it follows that since the (positive) nonlinear term on the right hand side vanishes polynomially in $(v - \gamma_v)$, and since, as discussed above, $\frac{dv}{dy}$ is never lower than a (strictly) positive constant, then this nonlinear term vanishes at least polynomially in y. At high enough levels of y, this vanishing term becomes negligible compared to the other (linearly increasing) term, which means that the Engel curve is asymptotically linear. Dropping the vanishing nonlinear term, we can invert what is left from (11) to get a linear-term-only benchmark, or an explicit Engel curve for hypothetical individuals with infinitely high income:

$$v - \gamma_v = \frac{a + \beta}{1 + \beta} \frac{1}{p} \left(y - \gamma_w - p\gamma_v \right). \qquad (y \to \infty;\ a > 0) \tag{15}$$

Comparing (15) to the no-social-effects Engel curve (7), we learn that social effects cause high-income individuals to tilt their consumption from non-visible w to visible v. Defining the upper limit of the tilt as the difference between the share $\frac{pv}{y}$ at infinitely high income with and without social effects, we see that the larger a is, the larger is this upper limit.[17] In the extreme case where $a = 1$ and society's view of one's fundamental utility is all that matters, infinitely high income individuals would spend all of the difference $y - \gamma_w$ on visible consumption. As the importance of society's view goes down (that is, as a shrinks), the linear-term-only benchmark (15) converges to the no-social-effects Engel curve (7), and the tilt vanishes.

Although we cannot invert (11) to get an explicit Engel curve $v(y)$ for income levels less than infinite, Figure 1 shows what such an Engel curve would look like for one choice of the model's parameters. In choosing parameter values we have tried to keep things as simple as possible while keeping the parameters within what we thought was a reasonable range.

Specifically, we set $\gamma_v = \gamma_w = 0$ and $p = 1$ for simplicity; $a = 0.5$ so that society's view is as important as one's fundamental utility; $\beta = 0.5$ so that without social effects the infinitely rich would consume twice as much w as v, while with social effects this ratio would be exactly reversed; and $b = 6,000$, which is very close to the bottom percentile of total annual household expenditure in US$ in the 1997 CEX data we use in later sections.

[Figure 1 about here.]

The short-dashed line represents the no-social-effects Engel curve (7). The long-dashed line represents the social effects linear-term-only benchmark (15). The solid line represents the actual (social effects) Engel curve (11). The Figure illustrates the points emphasized in the discussion above, showing that while the lowest income types allocate their expenditures as if no social effects were present, higher income types consume more v than they would otherwise. The nonlinearity of the expenditure-tilt towards v is evident, with the curvature

[17] Formally, we define the upper limit of the tilt at $a = a_1$ as

$$\lim_{y \to \infty} \left(\left. \frac{pv(y;a)}{y} \right|_{a=a_1} - \left. \frac{pv(y;a)}{y} \right|_{a=0} \right).$$

Substituting (15) into this definition results in $\frac{a}{1+\beta}$.

of the Engel curve vanishing as the latter converges to the infinitely high-income linear benchmark.

4 The Survey Instrument

Applying the model from Sections 2 and 3 to available data on consumption expenditures requires bridging the gap between a model with only two kinds of consumption – v and w – and a real world where households spend on countless goods and services. Questions like whether or not a binary division of all consumer expenditure into perfect visibles and perfect non-visibles is justifiable and, if so, which consumables belong in each group, can only be answered in an empirical context. Prior to asking any such questions, however, the exact empirical meaning of visibility should be made explicit, and a method should be established for rating the visibility of different consumables.

In our model, visible consumption v includes all household expenditures that are directly observable, or otherwise knowable to society. Notice that words like *visible* and *observable* in this context do not necessarily mean that v is, literally, observable with the naked eye. For our purposes, consumption is considered visible as long as it is the case that in the cultural context in which it is consumed, society has direct means to correctly assess the expenditures involved. If, for example, name-dropping the names of schools attended by one's children early in every conversation is a common social practice (and assuming that people rarely lie about such things), then expenditures on school education might be fairly visible.

In other words, visibility is not a physical, but rather a *cultural* feature. Furthermore, visibility is not a feature that is built into consumables in isolation from, and independently of, the socio-cultural context in which they are consumed. The prevailing norms, values, customs, beliefs, and laws may all be part of this socio-cultural context. What is visible in one society at one time and place could be non-visible in other societies or in the same society at other times.

This section attempts to measure the visibility of different household expenditures in one society, at one point in time: the United States, today.[18] We report and analyze the results of a new national telephone survey we conducted during May to August 2004, in which we asked people about different items consumed in their society.[19] As in other surveys of this type, all we could hope to measure was people's *perceptions* of the visibility of different consumables. However, since the aspect of visibility we were trying to capture was, as discussed above, cultural rather than physical, it can be argued that people's perceptions are likely to carry considerable weight.

[18] Arguably, the US being extremely diverse culturally and socially, many more than one society exists in it at any point in time. We return to this point when discussing our empirical results. We also revisit this point in work currently in progress, in which we look at our survey results by demographics.

[19] The survey was implemented using the computer-assisted telephone interviewing (CATI) facility at Princeton University's Survey Research Center. Interviews were conducted by a group of hired students who were trained and supervised by the author.

4.1 Sample and Demographics

We used random digit dialing (RDD) to get a random sample of the population over age 18 in Continental US (excluding Alaska and Hawaii).[20] Our response rate is estimated at about 10 percent of working residential numbers (with no language barrier), and is low even compared with other telephone surveys.[21] We completed 183 interviews, with mean duration of 14 minutes.

Table 1 reports demographic characteristics of our respondents. Since the findings from our survey (and especially the resulting Vindex) are most naturally applied to CEX data, the Table also reports *consumer unit* (CU) and *reference person* demographics from the 2002 CEX, as reported in BLS (2002). The last column of the Table reports comparable population and household characteristics from the 2000 US Census, reproduced from Census (2000).

[Table 1 about here.]

Appendix C discusses issues that should be borne in mind when comparing the Visibility survey column to the CEX and Census columns.

Discussion

An important issue in applying our "signaling by consuming" model to the real world relates to the identity of our model's agents. While our model refers to signal-senders as *individuals*, and to signal-interpreters as *society*, empirical applications need to be more explicit. Determining the identity of the signal-sending side requires an insight into the way household consumption decisions are made. Surveying the vast literature studying this subject is beyond the scope of this paper; however, if it is not the CEX's reference person alone who controls signal-sending decisions, then the reference person's demographics reported in Table 1 might not be the relevant demographics to compare to.[22]

Furthermore, regarding the receiving side of the signaling model, a question arises as to whose opinions those signals are meant to influence. Our model simplifies things by assuming all individuals to be identical in knowledge and beliefs (and *society* is just the representative agent). In reality, however, some ambiguity exists as to whom exactly consumers hope to impress by sending consumption signals. If they hope to impress people from other demographic groups, then it has to be decided whether the relevant visibility measure should be based on their own visibility perceptions or on those of those other demographic groups. Examples include a consumer's attempt to impress members of demographic groups that might be considered more socially desirable than her or his own, or, similarly, attempts to impress members of the opposite sex. In such cases, even if it is the CEX's reference person who alone makes consumption decisions on the signal-sending side, it could still be the case

[20] Our sample was provided by Survey Sampling International (SSI). For details on RDD, visit their website at `www.surveysampling.com`.

[21] Conducting an opinion survey and using the same facility at Princeton University's Survey Research Center a year earlier, Blinder and Krueger (2004) had a higher response rate of 26 percent. They state, however, that the available evidence does not suggest that such low response rates lead to major statistical biases, and refer readers to Keeter *et al.* (2000) for discussion.

[22] See Appendix C for the CEX definition of a reference person.

that the demographics of the relevant survey respondents should not be expected to match those of the CEX's reference person.

Similar arguments can be made regarding a comparison between our survey respondents and the Census population.

In work currently in progress we analyze our survey findings by demographics. While we find some interesting differences in visibility perceptions across demographic groups (for example, clothes are more visible to women than to men), it seems that overall and for most consumption categories there is a fair agreement in the US population as to what is more and what is less visible. We hope that a reasonable consistency of perceptions across demographic groups will serve to relieve us from the present need to decide whose perceptions are the most relevant.

As reported in Table 1, our sample of households closely matches (in first moments) the CEX and Census columns in both household size and number of children in the household. Total household income, on the other hand, is higher for our sample's households, even taking into account time differences in collecting the different data sets (but notice the lower response-rate to the income question). As to personal characteristics, our respondents are of roughly the same age as the average CEX reference person, but they are less black, more female, and more educated than both CEX reference persons and the Census population.

4.2 Consumption Categories

Our survey was aimed at rating different consumption items by their visibility. However, while consumption items are countless, each survey-respondent could only be asked a limited number of questions. That meant that we had to group all consumption into a manageable number of consumption categories. At the same time, for our survey to produce meaningful results, each of these categories had to be as homogenous as possible in terms of the visibility of the consumption items it consisted of.

To make our survey results as useful and applicable as possible, we aimed at maximal compatibility with available micro data on consumer expenditures. The most detailed and comprehensive such data for the US is the raw CEX data, where household expenditures are reported by several hundred UCC (universal classification code) titles. These include titles like "Gasoline," "Living Room Chairs," "Boys Shirts," and "Vehicle Air Conditioner Repair." Although this classification system never aimed at ranking consumption items by their visibility, the UCC list is detailed enough to make it unlikely to include consumption items of obvious different visibility under the same UCC title.

Our aim was to categorize these several hundred UCC titles into consumption categories that are at the same time small enough to remain reasonably homogenous in terms of their composition, yet large enough to keep their number manageable. As a starting point we chose Harris and Sabelhaus (2000), who collapse the UCC spending titles into forty-seven categories. These are listed in Appendix D. As they are cross-referenced with comparable National Income and Product Account (NIPA) values, they enjoy the advantages of maintaining some level of standardization and facilitating comparisons between micro-level and macro-level analyses and results. We refer to these categories as H&S.

The H&S categories had to be adapted to our purposes for two reasons. First, they are highly varied in empirical importance (measured as average share of total household expenditure). It would have been wasteful and costly to ask respondents about categories that almost no household spends any money on. Second, they are highly varied both in the number of UCC titles grouped into each category, and, more relevant to our purpose, in the homogeneity (in terms of visibility) of these. Attempting to cure these two problems, we followed the following procedure.

We chose 1999 as a benchmark year, and looked at mean household consumption for each of that year's UCC codes.[23] Next, we went over the H&S categories, looking at the UCC titles each of them is composed of. For categories that seemed to include different items that we thought were likely to differ in their visibility, we divided the category into two sub-categories (a supposedly more visible one, and less visible one). This happened twice: the category "Clothing and Shoes" was divided into the sub-category "clothing and shoes, not including underwear, undergarments, and nightwear," and the complementary sub-category "underwear, undergarments, nightwear and sleeping garments;" and the category "Telephone and Telegraph" was divided into the sub-categories "home telephone services, not including mobile phones," and "mobile phone services." On the other hand, categories that were not very significant empirically and seemed close enough to other small categories, were further collapsed into one super-category. Thus, for example, the categories "Electricity," "Gas," and "Water and Other Sanitary Services" were collapsed into the super-category "home utilities such as electricity, gas, and water; and garbage collection."

Additionally, we edited the titles of all categories, sub-categories, and super-categories to reflect the relative empirical importance (or relative size) of the UCC items each category was composed of. This can be seen in the last example. Similarly, in this last example the title of the super-category replaces "other sanitary services" with the explicit "garbage collection," reflecting the empirical significance of that latter UCC item compared with other sanitary service UCC items.

Finally, empirically insignificant H&S categories that did not seem to naturally fit into a super-category were omitted. Thus the category "Bridge, Tunnel, Ferry, and Road Tolls" was dropped.

The result is thirty-one new consumption categories, each of which has a descriptive title that emphasizes the important UCC items included in that category. Together these categories cover more than 95 percent of consumption reported by the CEX. Table 2 lists the thirty-one categories with their titles.

[Table 2 about here.]

It is worth restating the obvious and pointing out that this list of thirty-one categories is still a compromise (if, we hope, a useful one). We were never fully satisfied with the categories `Ot1` (computers, games, video, audio, musical and sports equipment), `Ot2` (cable TV, pets and veterinarians, sports, movies, concerts), and, to a lesser extent, `Bks` (books, magazines, toys, hobbies), as they seem to group together too many UCC items of possibly different visibilities. Similarly, `Med`, which groups together all health-related expenditures, is probably

[23] Other years seemed to produce similar results.

not very visibility-homogenous.[24] We could of course divide these into smaller subcategories, at the price of making the questionnaire longer and consequently losing observations.

On the other hand, two of our our thirty-one categories – `Und` (undergarments and nightwear) and `Cel` (mobile phone services) – are not empirically significant enough to warrant their own categories. Still, as discussed above, we chose to subdivide the more general H&S categories "Clothing and Shoes" (into `Clo` and `Und`) and "Telephone and Telegraph" (into `Tel` and `Cel`) for two main reasons. First, we thought it likely that both cellphones and clothes play a special cultural role in our society. Since we believed both to be relevant to conspicuous consumption, we found closely looking at them of particular research interest.

Second, we thought that these subdivided categories would be a good test for whether or not our methods, and particularly the resulting Vindex, made any sense. This was especially true for clothes: apart from their possibly different visibility (and hence their possibly different cultural and social roles), undergarments and nightwear can be argued to be consumed for the same reasons all clothing is consumed. Hence, subdividing all clothing into `Clo` and `Und` creates two categories that are likely to be as similar as possible to each other in all but their visibility and what it entails. Furthermore, while one expects undergarments and nightwear to be non-visible, the rest of clothing is expected to be found at the other extreme of the visibility scale. As will be seen below, this prediction was confirmed by the survey results.

Since the categories `Und` and `Cel` are empirically insignificant compared to other categories, they are ignored by some of the empirical analysis that follows. When this is the case, we refer to the remaining consumption categories as "the twenty-nine empirically significant consumption categories," or simply as "the twenty-nine categories."

Even in the absence of underwear and cellphones, the remaining twenty-nine categories vary substantially in size. This is both expected and, in many ways, inevitable. The housing category (`Hom`), by far the largest, alone accounts for roughly one quarter of total expenditure in a typical sample of US households. But as we could think of no obvious way in which it could be further divided and yet remain easily understood by telephone surveyees, we accepted it as a category of immense size. The variance in the sizes of the different categories did not seem to affect their perceived visibility (or at least not in an obvious way), as shown later when we present our empirical results.

In Appendix E we comment further on consumption categories, and explain how the housing category (`Hom`) was constructed.

4.3 Main Survey Question

In order to create a measure of how visible each of the above thirty-one consumption categories is, we constructed a telephone survey questionnaire where the main question read:

> Imagine that you meet a new person who lives in a household similar to yours. Imagine that their household is not different from other similar households, except

[24] The problem with categories that are not homogenous is that we know nothing about the thought process through which our respondents rate the visibility of a category. If, as might be the case, they tend to rate a category's visibility by the perceived visibility of the most (or the least) visible item in that category, the resulting Vindex could be sensitive to small perturbations in the category titles.

> that they like to, and do, spend more than average on [title of category].
>
> Would you notice this about them, and if so, for how long would you have to have known them, to notice it? Would you notice it almost immediately upon meeting them for the first time, a short while after, a while after, only a long while after, or never?

Replies to this question were coded 1 (Almost Immediately) to 5 (Never). The question was repeated thirty-one times for each survey-respondent, with [title of category] replaced by each of the category titles listed in Table 2. The order in which the categories appeared was randomly selected for each respondent.

The above main survey question was selected from a few possibilities that had been considered and tested in an early pilot study. The rest of this subsection discusses the rationale behind the chosen wording of the question.

Remember that the equilibrium we study in Sections 2 and 3 is a fully separating one. In such an equilibrium, the signal each household sends through its visible consumption v is sufficient for its income type y and its non-visible consumption w to be fully worked out by society and become public knowledge. In other words, in equilibrium both v and w are known to society. This suggests that simply asking people how much they know about – or how well they can estimate – different expenditures by other households might be too naïve a way to tell visible from non-visible consumption, since in equilibrium people are expected to be informed about both.

Things get still more complicated when we remind ourselves that in reality, households differ in more than just their income type. This in turn suggests that respondents' ability to estimate other households' consumption patterns might be affected by many household characteristics not even considered by our model.

A third concern is that even a respondent's own household's expenditure is harder to know or estimate for some consumption categories than for others. One could imagine that when making educated guesses about different expenditures by other households, respondents might be affected by their knowledge, or lack of it, of the relevant expenditures in their own household. Consequently, an attempt to measure how much a respondent knows about a certain expenditure by other households might result in a measure of how informed people are about certain expenditures in their own household, rather than a measure of how visible those expenditures are.[25]

Our findings during the pilot phase of the survey seemed to confirm all three concerns. We found that when asked how well they can guess or estimate how much other households spend on a certain consumption category, many respondents construct their reply in two steps. First, they try to estimate how much their own household spends on the relevant category. Then they use the resulting estimate as a benchmark on which they base their estimate of

[25] Frank (1985b, p. 152; 1999, p. 177) argues that since "the things we see most often are most readily available in memory," people remember visible consumption better than they do non-visible consumption ("information is more vivid in one case than in the other"). While the very visibility of certain consumption categories might help people to more vividly remember (or estimate) their own spending on these categories, we point out that factors that are not directly related to visibility might be at least as important. Examples include whether the relevant expenditure is typically planned in advance or unplanned, how frequent it is, and whether it is a regular periodic fee or pay (such as rent) backed by a written contract.

the relevant expenditure by the other household. In this process, it seems that not only observable cross-household differences in the consumption patterns of the relevant category are taken into account to correct the estimate, but also many other observable differences between the households. Among these can be counted household characteristics that are assumed away by our model, such as household size, and ages of household members.[26]

Formally, a household's expenditure on category i, z_i, can be modeled as

$$z_i = \widetilde{f}_i(X) + \epsilon_i, \tag{16}$$

where X is a vector of household characteristics, and ϵ_i is an error term associated with category i. This error term can be thought of as driven by random and unobservable peculiar tastes. While our formal model in Sections 2 and 3 assumes that the only component of X in which households differ is income y, and that ϵ_i is always identically zero, our main survey question is designed to remain as valid a measure of visibility as possible in a more complex empirical reality. In reality, the empirical variance of ϵ_i, as well as the predictive power of each of the components of X (as expressed by $\widetilde{f}_i(\cdot)$), differ a lot across consumption categories. For example, while household size and composition are good predictors of expenditures on education and food, expenditure on alcohol is highly variable and is probably largely a matter of tastes.[27]

With this reduced form model in mind, our survey attempts to measure how visible z_i is. But since (16) is category-specific, testing respondents on their knowledge of other households' z_i will measure the visibility of z_i combined with the above mentioned factors – people's ability to estimate the parameters of $\widetilde{f}_i(\cdot)$ for that category, their knowledge of X, how predictive each component of X is, and the variance of ϵ_i. Our question, on the other hand, is designed to measure the visibility of z_i by canceling out as many of these contaminating factors as we can. For this reason we ask people to imagine a household similar to theirs that is not different from other similar households, except for an exogenous shock to the taste for, and the expenditure on, only one consumption category. We ask them about their likely knowledge of only this exogenous shock. The wording we use asks them about their likely knowledge of the *difference* in the consumption of each category between the average household similar to theirs and a household that is exogenously "hit"with an above-average taste for that category. In the context of (16), this translates to asking respondents about their knowledge of ξ_i, defined as

$$\begin{aligned} \xi_i &\equiv z_i - E[z_i|X] \\ &= \left(\widetilde{f}_i(X) + \epsilon_i\right) - \left(\widetilde{f}_i(X) + E[\epsilon_i|X]\right) \\ &= \epsilon_i - E[\epsilon_i|X], \end{aligned} \tag{17}$$

[26]Total household income – the only household characteristic we explicitly model – seemed to have been instrumental in respondents' estimates of other households' consumption patterns. Although not directly observable, income seemed to have been assessed based on visible consumption – as predicted by our model.

[27]Notice that the reduced form model in (16) is general enough to allow for the possibility that some of the household characteristics in X are endogenously determined and are affected by tastes (or ϵ). For example, household size can be endogenously selected and hence affected by tastes.

where $E[\epsilon_i|X]$ is the expected value of ϵ_i given X. Since, by construction, $E[\xi_i|X] = 0$, asking about the likely knowledge of ξ_i of other households might be as clean a measure of visibility as one can get.

The question asks respondents how quickly they would notice such an exogenous shock to tastes, that causes the relevant household to deviate from the typical equilibrium behavior expected by society. We implicitly assume that the more visible a category is, the quicker such an exogenous shock would be noticed by new acquaintances.

This final phrasing of the question produced results that did not substantially differ from results based on alternatives explored during the pilot phase. It did however seem to make the main question more easily understood by the respondents, to make the interviews run smoother and quicker, and to produce smaller standard errors.

4.4 Benchmark Results

This subsection reports benchmark results, based on the full unweighted sample of 183 completed interviews.

Table 3 presents the sample distribution of replies (and non-replies) for each of the thirty-one consumption categories. It can be seen for example that while the category `Clo` ("clothing and shoes, not including underwear, undergarments, and nightwear") usually gets the responses "Almost immediately" and "A short while after", the response to the category `Und` ("underwear, undergarments, nightwear and sleeping garments") is "Never" for more than three quarters of the respondents. This is hardly surprising, and could be read as one indication that our survey indeed captures a measure of the visibility or non-visibility of expenditures.[28]

[Table 3 about here.]

The two rightmost columns ("Don't know" and "Refused") show that none of the categories suffer from a non-response problem. Finally, the bottom row shows that overall – across all respondents and all categories – responses are distributed fairly uniformly between the five response options.[29] This suggests that extreme visibility levels were not in general more likely to be assigned to consumption categories than other visibility levels. We return to this point below.

Next, Table 4 reports three proposed methods of calculating visibility-indices and visibility-rankings based on the survey results from Table 3. The first column lists the categories,

[28] On the other hand, it could be argued that respondents simply felt uncomfortable to admit that they would notice large expenditures on undergarments. While this could potentially contaminate our findings, the fact that none of the 183 respondents refused to answer this question, and that only one of them asnwered "Don't know," provides no evidence that this indeed was the case.

[29] The first response option is somewhat of an exception. In the first few questionnaires, the first response option was "Immediately". As we noticed that this response was less prevalent than the others, we hypothesized that it was a framing issue (it is possible that even highly visible consumption categories are not noticed immediately). We changed it to "Almost Immediately", hoping to smooth the overall distribution away from the second response option towards the first one. However, this new wording did not seem to affect the distribution in any meaningful way. As can be seen in Table 3, the first response option still gets only 12.6 percent of all responses. We therefore pulled results from those first few questionnaires together with the rest.

ordered by the ranking corresponding to the first proposed index (Normalized Mean). The rest of the columns report, for each of the three proposed indices, the index values, their standard errors (in parentheses), and the corresponding rankings [in brackets].

[Table 4 about here.]

The first proposed index – Normalized Mean – assigns five equidistant values from 0 to 1 to the five response options, and calculates, for each category, its mean value over all respondents.[30] The potential range of the resulting index is 0 (least visible) to 1 (most visible). An intuitive objection to such an index is that it "linearizes" a scale of responses that is not necessarily linear. An intuitive defense is that while it is trivial to calculate, simple to grasp, and rather efficient in using all available information, the resulting ranking is almost identical to the two alternative methods below that do not assume a linear response scale.

These two alternative methods – "Response 1 or 2," and "Response 4 or 5" – calculate, for each consumption category, the fraction of respondents who chose one of the two extreme responses on either end of the response scale. "Response 1 or 2" reports the fraction of respondents who replied either "Almost immediately" or "A short while after". "Response 4 or 5," on the other hand, reports the difference between unity and the fraction of respondents who replied either "A long while after" or "Never". This standardization results in two comparable indices that are, like the Normalized Mean index above, increasing in visibility.

Since each one of these two indices is constructed by counting extreme responses, if presented alone one could suspect that what they measured was simply the statistical variance of responses for each category. However, looking at these two indices together and comparing between the visibility rankings based on each – as well as comparing these to the ranking based on the Normalized Mean index – shows quite clearly that this is not the case. The statistical correlations of either the indices or the rankings across methods range from 0.95 to 0.99. In the rest of the paper, the Vindex that we refer to is the Normalized Mean index. This choice does not affect our main results.

4.5 Discussion: Consumption and Visibility

The results in Table 4 look promising. Not only do all the three methods discussed above result in similar outcomes, but it also seems that they measure a real and previously unexplored feature of the different consumption categories. Each of the three indices covers a substantial segment of the theoretically feasible range $[0, 1]$, which suggests that the surveyed population perceives some goods to be substantially more visible than others.

Looking at the findings, category by category, it is interesting to note that the category ranked by our survey as the most visible is tobacco products (`Cig`).[31] Roughly 11 percent of the respondents said that it would take them a long while (or longer) to notice an atypically

[30] The assignment is as follows: 1 = Almost immediately; .75 = A short while after; .5 = A while After; .25 = A long while after; and 0 = Never.

[31] The fact that expenditures on tobacco products can often be smelled long after the actual act of consumption is over may be counted as yet another kind of visibility.

high expenditure on this category by the household of a new person they met, while roughly 81 percent said that they would notice it almost immediately or after a short while. Probably less surprising are the two next most visible categories: clothing excluding undergarments and nightwear (`Clo`), and cars (`Car`).

The other end of the visibility scale is still less surprising. Atypically large expenditures on undergarments and nightwear (`Und`), as well as on various insurance policies (`HIn` and `LIn` which include home, fire, property, and life insurance) are thought by at least 89 percent of the respondents to be noticed either after a long while or never. For any of these categories, only about 5 percent or less of the respondents think that they would be noticed almost immediately or after a short while. These findings are in line with common sense and suggest that some consumer expenditures are believed to be close to perfect non-visibility.[32]

While our model simplifies matters by assuming the visibility of each consumption item to be either 0 or 1, reality as revealed by our survey suggests otherwise. Table 4 shows that all consumption categories fall somewhere between the theoretical extremes of being either pure v or pure w. Indeed, the visibility of many categories seems rather far from both extremes. This is seen graphically in Figure 2, which shows the distribution, along the visibility scale, of both the categories and the related expenditures (weighted by size). Each spike in the Figure represents one of the twenty-nine empirically significant consumption categories. The horizontal axis shows where on the visibility scale each category falls, using the point estimates of our Vindex (as reported in the second column of Table 4).[33] The vertical axis shows, for an example year (in this case, 1997), how empirically important each category is. Specifically, the height of each spike corresponds to the size of the relevant expenditure as a percentage of total household expenditure. It is based on 3,924 households for which full-year expenditure data exist in the 1997:1-1997:4 CEX extracts downloaded from Harris and Sabelhaus (2000).

[Figure 2 about here.]

The histogram at the background of the Figure groups the spikes into 7 bars, thus providing another measure of the empirical distribution of consumer expenditures along the visibility scale. Finally, the Figure shows that there is no strong correlation between a category's size and its visibility (for the data shown in the Figure, statistical correlation is less than 0.04). This lack of correlation rules out the possibility that it is mainly relative size that our Vindex captures. Similar such figures for other years look roughly the same.

As previously mentioned, by far the largest category is expenditure on rent or purchase of housing (`Hom`), with roughly 27 percent of total expenditure. The visibility of housing falls somewhere in the middle of the scale. It is more visible than expenditures on medical care (`Med`), which are in turn more visible than home utilities and telephone (`Utl` and `Tel`), in turn more visible than various insurances (`CIn`, `HIn`, and `LIn`). On the other hand, the cost

[32]To the extent that `Clo` came out at the very top and `Und` at the very bottom of the visibility ranking, and subject to the caveats discussed above, our methods pass the informal test of common sense mentioned in subsection 4.2 (on page 15).

[33]Since the horizontal position of the bars is only based on the point estimates (with no indication of confidence intervals), Figure 2 should only be interpreted in conjunction with Table 4, which reports the relevant standard errors.

of housing is less visible than expenditure on food consumed at home (FdH, with 11 percent of total expenditure), which is in turn less visible than dining out and spending on some recreational activities (FdO and Ot2), which are less visible than cars and clothes (Car and Clo).

Visibility and the Literature on Positionality and on Fashion

Since spending on housing is so important, it has received special attention in the literature. That it is somewhat visible – more visible than approximately 29 percent of total expenditure and less visible than the rest 44 percent – can be interpreted in many ways. One possible reading is that it provides some, if not definite, empirical evidence in favor of the narratives told by Karl Marx and, more recently, Robert Frank.[34] In addition to the idea that large expenditures on housing are used as a signal for gaining social status, it is suggested by these narratives that one's evaluation of the "adequacy" of one's own living space involves comparing it with "mental images" of the living spaces of others (Frank 1999, p. 131).[35] To the extent that some visibility of the relevant expenditures is necessary for these narratives to be plausible, our findings do not flatly reject the hypothesis that housing is a positional (or status) good.

While our survey respondents are quicker to notice the cost of housing than related expenditures such as utilities, they are still quicker to notice some of the insides of the house, such as home furnishings and appliances (Fur), and food consumed at home (FdH).[36] Two possible explanations are either that our respondents talk more about these latter expenditures than about their rent or mortgage (which makes them more visible *culturally*); or that when visiting a new acquaintance's house, respondents are more aware of the cost of household items than of the cost of the house itself (a more *visual* aspect of visibility).

Other than housing, Frank (1999, p. 160) lists "cars... clothing, furniture, wine, jewelry, sports equipment, and a host of other goods" as positional goods, for which "favorable evaluations are inherently context dependent." Here our findings provide much stronger evidence, as the above six listed items rank at the very top of the visibility scale. Right behind cigarettes (Cig), these six items are significant components of the next six (or eight) most visible consumption categories (Clo, Car, Jwl, Fur, Ot1, and AlH or AlO). Expenditure on cars – a sizable 9 percent of total household expenditure in 1997 – is especially interesting. In Frank's narrative, spending on bigger, nicer, and newer cars is a substantial part of what he refers to as expenditures "driven by forces similar to those that govern military arms races." According to our survey, while spending on related expenditures like car maintenance and gasoline (CMn and Gas) is only somewhat visible, and on car insurance (CIn) is not visible at all, spending on the purchase of new and used motor vehicles (Car) is second only to

[34] See footnote 5 (on page 3) for the relevant quote from Marx (1849). Frank's (1999) Chapter 9, titled *Why Context and Position Are So Important*, opens with that quote, and further discusses why housing is a positional good.

[35] Frank (1985a) develops a formal model where the utility from consumption of positional goods depends both on the amount consumed and on how this amount ranks relative to amounts consumed by the rest of society. Following Hirsch (1976), he defines positional goods as "those things whose value depends relatively strongly on how they compare with things owned by others" (p. 101).

[36] Preliminary findings from work currently in progress may suggest that the above is true for women more than for men.

spending on tobacco. In summary, these findings suggest that Frank's narratives might be an empirically important factor in understanding consumption patterns. We revisit the vehicle-related categories in the next section.

Finally, our findings provide evidence related to economists' work on fashion. In a section titled "Fashions and Fads," Stigler and Becker (1977, p. 88) state:

> The areas in which the rivalry of fashion takes place are characterized by public exposure and reasonably short life. An unexposed good... cannot be judged as to its fashionableness, and fashions in a good whose efficient life is long would be expensive. Hence fashion generally concentrates on the cheaper classes of garments and reading matter, and there is more fashion in furniture than in housing.

Our finding that furniture is more visible than housing offers evidence supporting the "public exposure" argument. As to garments, Pesendorfer (1995) describes a model of fashion cycles, along with anecdotal evidence and historical examples from the clothing industry. To the extent that fashionableness requires visibility, our findings explain the existence of fashions and fads in most clothings (`Clo`) but undergarments and nightwear (`Und`). Becker (1991) discusses fashions in reading matter, as well as in "successful restaurants, plays, sporting events, and other activities" (p. 1109).[37] The categories containing these expenditure items – `Bks`, `FdO`, and `Ot2` – are indeed relatively visible, ranking 10 to 12 in our visibility survey.

5 Application: Visibility and Elasticities

5.1 Theoretical Results

In Sections 2 and 3 we analyzed a model with only two consumption categories: a perfectly visible good v (visibility = 1), and a perfectly non-visible good w (visibility = 0). We assumed that the lower bound b of the income distribution was common knowledge, and we analyzed consumers' behavior in a fully separating equilibrium. We showed that the bottom-income types allocate their total expenditure between v and w to maximize their fundamental utility, behaving as if society did not exist. Other income types – having more to lose *socially* – do take social effects into account, and tilt their expenditure away from w and towards v. We showed that at very high incomes, the tilt – defined as the share of total expenditure that "moves" from w to v as social effects are introduced – approaches the constant $\frac{a}{1+\beta}$.

[37] Becker (1991, p. 1113-1114) provides an example of fashion in books and its relation to cultural visibility and to signaling by consuming:

> Stephen Hawking's *A Brief History of Time* was on the *New York Times* best-seller list for over 100 weeks and sold more than 1.1 million hardcover copies. Yet I doubt if 1 percent of those who bought the book could understand it. Its main value to purchasers has been as a display on coffee tables and as a source of pride in conversations at parties.

Since the concept of *total expenditure elasticity* has played an important role in both the theoretical and the empirical literature, it is interesting to explore the implications of our social-effects model on these elasticities. For this purpose, in this section we focus on the special Cobb-Douglas homothetic case, where the no-social-effects elasticities are constant, at the convenient benchmark of unity ($e_v = e_w = 1$). In Appendix F we derive the formulas for the two elasticities, in the presence of social effects, for the quasi-homothetic utility from Section 3. We show that in the special homothetic case, the expressions simplify to

$$\begin{aligned} e_v &= a\left((1+\beta)\frac{pv}{y} - \beta\right)^{-1} \\ e_w &= \frac{y}{w}\left(1 - \frac{pv}{y}e_v\right), \end{aligned}$$

which are reproduced here from (A-10) and (A-11) in Appendix F.

Using the inverse Engel curve (11) with $\gamma_v \equiv \gamma_w \equiv 0$, it is rather straightforward to show that $e_v > 1$ and $e_w < 1$ (both asymptote towards unity as y grows). In other words, while in the homothetic Cobb-Douglas model without social effects all total expenditure elasticities are unity, introducing social effects turns visibles into *luxuries* and non-visibles into *necessities*.[38] Furthermore, as e_w is not restricted to non-negative values, the introduction of social effects allows for non-visibles to be *inferior goods* at low incomes, in a model where inferior goods are otherwise ruled out.

[Figure 3 about here.]

Figure 3 depicts e_v and e_w as functions of visible expenditure in the range \$5,000 – \$15,000, for the same choice of model parameters as in Figure 1 (see discussion on page 10).[39] While in the absence of social effects both e_v and e_w coincide with the dashed line, the Figure shows how in the presence of social effects these elasticities diverge from unity (in opposite directions). As discussed above, the effect is more pronounced for low visible expenditures (low-income types), and declines as these expenditures go up.[40]

5.2 Hypotheses

If the above result regarding the effect of social-status-seeking on total expenditure elasticities carries over to a more general model, with an array of more than two consumption categories and with degrees of visibility in the continuous interval $[0, 1]$, then such a model might predict

[38] Deaton and Muellbauer (1980, p. 19) define luxuries as "goods that take up a larger share of the budget of better-off households and vice versa for necessities." It can be shown that the above definition is equivalent to defining luxuries (necessities) as goods with total expenditure elasticity above (below) unity.

[39] As discussed in Section 3, the inverse Engel curve $y(v)$ given by (11) on page 8 cannot be inverted analytically to produce an explicit Engel curve $v(y)$. For this reason, Figure 3 depicts e_v and e_w as functions of v (rather than as functions of y). As shown in Figure 1, for the parameter values and the range of v depicted in Figure 3, $v(y)$ is approximately linear, and $e_v(y)$ and $e_w(y)$ should look qualitatively similar to $e_v(v)$ and $e_w(v)$.

[40] At low visible expenditures (low income types) outside the range shown in the Figure, e_v increases to high values while e_w falls below zero to high negative values.

a positive statistical correlation between the elasticity and the visibility of the different expenditures. Within a given social group, this correlation is predicted to be stronger at lower incomes.[41] Specifically, if in reality – as in the homothetic case of our two-good model – visibility implies luxuriousness (or high total expenditure elasticity), then we might find correlation between the elasticities and the Vindex values of our twenty-nine consumption categories.

Notice that if the homothetic model approximates reality fairly closely so that in the lack of social effects all goods are neither luxuries nor necessities, then in the presence of social effects, within each social group, the correlation between luxuriousness (or elasticity) and visibility should be fairly high for low incomes, and should asymptotically approach zero for high incomes. In a more general (and realistic) model, other factors – neither social nor cultural – may exist that make some goods necessities and others luxuries even in the hypothetical case of complete social isolation.[42] If our results carry over to such a reality, however, then social effects could still "push" visibles' elasticities upwards (and vice versa for non-visibles) on top of, and in addition to, any other possible factors at work. Assuming that such other factors are not strongly *negatively* correlated with the cultural visibility measured by our survey, some positive correlation between luxuriousness and visibility is still expected.[43]

The rest of this section carries out a simple exercise to test these hypotheses. Specifically, we use CEX data to explore how much of the variation in luxuriousness (or elasticity) across our twenty-nine consumption categories can be explained by visibility in a simple linear regression setup. We further explore, at the national level, to what extent any such explanatory power is higher at lower incomes than at higher incomes.

Before we do that, however, it should be emphasized that while our model is explicit about the causal direction flowing from visibility to luxuriousness, all that our exercise can hope to show is empirical correlation between the two. One could always argue that the variation in luxuriousness found in the data is caused by any number of a-social and a-cultural factors (biological or physical factors make good candidates, as well as the above-mentioned non-linear budget constraints). Furthermore, if such (a-social) luxuriousness of some goods is in turn the very reason they become – possibly only in the very long run – culturally visible, then causality can run in the other direction as well, from luxuriousness to visibility.

[41] By *social group* we mean that part of society that is relevant for the *spectators' view* component of one's utility. In the context of our model, the social group an individual belongs to determines the relevant bottom income type b that individual refers to when solving the consumer problem.

[42] Non-linear budget constraints are a common example: when goods that can only be consumed in discrete amounts or in amounts exceeding a certain minimum are present, necessities and luxuries may exist in the no-social-effects homothetic model. The no-social-effects case of our quasi-homothetic model is, naturally, another example (assuming a non-socio-cultural interpretation of the γ's).

[43] It could be argued that such other factors will in the long run become *positively* correlated with cultural visibility. A comment about the direction of causality follows shortly.

5.3 Empirical Results

Figure 4 shows (normalized) nonparametric estimates of expenditure shares as function of total household expenditure for our twenty-nine consumption categories.[44] The estimates are based on 1997:1-1997:4 CEX extracts downloaded from Harris and Sabelhaus (2000). They are obtained using Fan's (1992) locally weighted regression (with quartic kernel) calculated at 30 total annual expenditure points between \$3,000 and \$100,000. This interval covers 98.6 percent of the sample of 3,924 households for which full-year expenditure data exist. The plots are normalized to a common scale across categories by dividing each category's estimated share function by its mean value over the whole range.

[Figure 4 about here.]

Eyeballing Figure 4, it seems that if our theoretical results carry over to a richer model with multiple consumption categories and varying degrees of visibility, then introducing social effects into a simple homothetic model could potentially substantially improve the fit of such a model to the data. It has by now become common wisdom in the empirical literature that since share estimates of the type presented in Figure 4 are anything but flat horizontal lines, a standard (no-social-effects) homothetic model does not go very far in explaining household demand patterns. However, as was discussed in Section 3 regarding Engel curves (and in the last two subsections regarding elasticities), and assuming the whole nation to be the relevant social group, in the presence of social effects the homothetic model predicts the estimated curves in Figure 4 to only asymptotically approach a flat line. Indeed, it could be argued that some of them do.

While almost none of the twenty-nine curves seems very close to a flat line, a number of categories (possibly `FdH`, `Cig`, `Lry`, `Hom`, `Utl`, `Tel`, and `Bus`) could potentially match our model as non-visibles: as shares of total expenditure, they are all substantially higher for bottom income households than for high income households, and the elasticities of some of them seem to asymptotically approach unity. Similarly, a number of categories (possibly `FdO`, `AlO`, `Clo`, `Htl`, `Fur`, `HIn`, `Car`, `CMn`, `Air`, `Bks`, `Ot1`, and `Edu`) might potentially match our model as visibles, as their shares start low at low incomes, increase at higher incomes, and often seem to approach a constant. Overall, however, any agreement between a category's degree of visibility implied by such eyeballing and the degree of visibility suggested by our visibility survey seems nonsystematic and coincidental.

As to some of the other categories, a fair amount of imagination is necessary to visually fit them into *any* simple model. It is apparent that at best, our model can explain only some of the variation seen in the twenty-nine plots. The question is how much.

To answer this question in a more systematic and methodical way than eyeballing, we move on to quantitative methods. The measure whose cross-good variation we focus on and try to explain – luxuriousness, or total expenditure elasticity – is estimated nonparametrically in the following way. Using Fan's (1992) locally weighted regressions and the data Figure 4 is based on, we estimate each of the twenty-nine expenditures as a function of total household expenditure, both in logs, at 30 total expenditure points. Total expenditure elasticity at each

[44] The reader is reminded that Table 2 lists the full category-titles.

such point is just the slope of the relevant regression. Weighting each such local elasticity by the (weighted) number of households it represents, we obtain average elasticity for each consumption category.[45]

Figure 5 shows the correlation between visibility and elasticity for our twenty-nine consumption categories. The visibility measure on the horizontal axis is our Vindex, as reported in the second column of Table 4. The elasticities on the vertical axis are the average elasticities described above. Each consumption category is shown as a circle with an area proportional to the size of the category. The dashed line shows best linear fit, weighted by size.

[Figure 5 about here.]

Figure 5 shows that our empirical measures of visibility and luxuriousness are indeed positively correlated. The Figure is otherwise informative in that it suggests which of the consumption categories may or may not fit well into our *luxuriousness by visibility* story. One example of a good fit is the family of vehicle-related categories mentioned in the last section. Within this family, visibility and luxuriousness are strongly positively correlated: while expenditures on the purchase of vehicles (`Car`) are both highly visible and highly luxurious, the related (and complementary) expenditures on vehicle maintenance, gasoline, and insurance (`CMn`, `Gas`, and `CIn`) are both substantially less visible and substantially less luxurious. On the other hand, said expenditures on car insurance (`CIn`) – as well as those on homeowner insurance (`HIn`) and on life insurance (`LIn`) – are seen to have average elasticities that are substantially higher than those of many other expenditures that are significantly more visible. This might result from the fact that insurance schemes are, by their very nature, complementary to other expenditures (against the loss of which they insure). Such explanation is ruled out in our two-good model, where complementarity between visibles and non-visibles is a theoretical impossibility.

Finally, expenditures on cigarettes (`Cig`) – at the bottom-right corner of the Figure – seem to fit our model perversely. This suggests that our simple signaling model does not capture well the intricate social and cultural aspects of smoking in the American society.[46]

Table 5 reports the results of weighted OLS regressions using the same data and procedures used in Figure 5. It is important to note that these results are based on only 25 to 29 observations, where large-sample theory is still only a rough approximation. While this means that any conclusions drawn from the Table are rather speculative, it also means that

[45] We take each locally weighted regression to represent the households that lie in an interval centered at the estimation point, whose length is equal to the distance between two such points.

[46] Remember that our model assumes away the negative externalities inflicted on society by smokers. It could be argued that by and large today, smokers in the US prefer others *not* notice that they smoke. Accordingly, while smoking an expensive brand is likely to be perceived as more prestigious than smoking a cheap brand, forgoing this expenditure altogether (by not smoking) might be perceived as more prestigious than both. This could be seen as an instance of Congleton's (1989, p. 176) "institutional arrangements ... which promote games generating positive externalities and discourage those which do not," and explain the finding that in spite of being the most visible expenditure in our data, smoking is not used by high income households to advertise their welfare. See discussion in the last paragraph of subsection 2.1 (page 5). An alternative explanation is that smoking is currently viewed as a signal of having a self-control problem.

one should not expect to find the high t-statistics one might be used to when dealing with large data sets.

[Table 5 about here.]

Column (1) of Table 5 reports results of the regression represented by the dashed line in Figure 5. It shows that overall – for the whole population of households and for all consumption categories – the positive correlation between visibility and luxuriousness is fairly significant both economically and statistically. The reported R^2 shows that our visibility survey predicts 12 percent of the variation in luxuriousness, and the t-statistic of the Vindex coefficient shows that the result is significant at the 7 percent level. Column (2) shows the effects of dropping the expenditure on cigarettes (`Cig`, roughly 0.8 percent of total household expenditure in our sample) out of the regression: the R^2 goes up by 4 percentage points to 16 percent, and the Vindex coefficient becomes significant at the 4 percent level.

Columns (3)-(6) repeat the same regressions for two sub-groups of the national sample: the bottom and top halves in terms of total household expenditure. The divide is made based on the weighted number of households represented by each of the 30 estimated local elasticities described above.[47] The reported results suggest that our *luxuriousness by visibility* story only applies to the top half of households: while the results in columns (3) and (4) are nil, the results in columns (5) and (6) are highly significant both economically and statistically. Column (5) shows that for the top half of US households, our Vindex explains 20 percent of the cross-good variation in elasticities, and the result is significant at the 2 percent level. Column (6) shows that the explanatory power of our model (as reported by the R^2) rises to 25 percent and the significance level to above the 1 percent, once cigarettes are dropped out.

That our model's prediction of the positive correlation between visibility and elasticity only holds in the data for the top half of households may be interpreted in several ways.[48] One interpretation suggests that the social effects captured by our model are only economically significant at higher (either absolute, or relative) income levels, and that the relevant social group with which individuals compare themselves might *not* be the whole nation.[49] [50]

Finally, the regressions reported in columns (7) and (8) exclude the three largest categories: housing, food for home consumption, and cars (`Hom`, `FdH`, and `Car`). Together, these three categories account for almost one half of total expenditure, and, as is clearly shown in Figure 5, play a substantial role in the positive correlation between luxuriousness and visibility. Furthermore, as suggested by the Figure, once housing, food at home, and cars are

[47] In terms of total household expenditure, the cutoff level is roughly $30,000.

[48] To some (though probably small) extent, this could be a mechanical outcome of the fact that higher-income households seem to be over-represented in our visibility survey (see Table 1).

[49] Our discussion abstracts from issues related to the differences between total income and total expenditure. We implicitly assume that for practical purposes the latter approximates the former reasonably closely.

[50] For example, it could be that when allocating consumption between visibles and non-visibles, the relevant bottom income b one takes into account is *not* the national bottom income level, but the (supposedly publicly known) bottom income level among one's colleagues, neighbors, friends, members of a religious organization, etc. Alternatively, the relevant b could be the bottom income in one's demographic group such as gender or race. As membership in these latter is highly visible (both in reality and in our data), in work currently in progress we explore such possibilities.

left out, regression results depend crucially on whether or not the expenditure on cigarettes – a conspicuous outlier – is included. In column (7) both the Vindex coefficient and its explanatory power drop to about one-half of their size in column (1), and statistical significance disappears. Column (8), on the other hand, retains the predictive power of column (2) ($R^2 = 0.15$), and, although the Vindex coefficient shrinks, it remains statistically significant at the 6 percent level. This suggests that, cigarettes aside, the visibility-luxuriousness correlation is not just a peculiarity of the three largest consumption categories.

6 Conclusion

In their *De Gustibus Non Est Disputandum* paper, Stigler and Becker (1977) take tastes to be practically "the same for all men." With this assumption in mind, seeking an explanation of economic phenomena, "the economist continues to search for differences in prices or incomes to explain any differences or changes in behavior." They further argue that "assumptions of differences in tastes... along with assumptions of unstable tastes... give the appearance of considered judgement, yet really have only been *ad hoc* arguments that disguise analytical failures."

In the present paper we attempted to assume about *goods* what Stigler and Becker assume about people: individuals have the same tastes *for all goods*. With all goods identical in the way they enter individuals' utility function, we searched for differences in measurable (cultural) features of the different goods to explain observed differences in expenditure patterns. We set $\gamma_v = \gamma_w = 0$ in the quasi-homothetic utility function to minimize relying on what Stigler and Becker refer to as "*ad hoc* assumptions concerning tastes." We showed that such assumptions were unnecessary for deriving curved Engel curves or for the existence of luxuries and necessities.

In our empirical section, we found strong statistical correlation between visibility and luxuriousness for only the top income-half of US households. Veblen might have been right that "[n]o class of society, not even the most abjectly poor, forgoes all customary conspicuous consumption."[51] The evidence presented in this paper, however, only supports Veblen's descriptions of the better-off (if not necessarily more leisurely) class. This means that our attempt to mold content into utility theory by starting from a purposively simplistic utility function and deriving explanations for observed phenomena from measurable differences between goods is far from being a completed project.

The robustness of our findings has yet to be investigated. In the future we plan to increase the number of survey-respondents to allow for an analysis of survey findings by demographics and for the construction of different Vindices for different demographic groups. It would be

[51] Veblen (1899, p. 85):

> No class of society, not even the most abjectly poor, forgoes all customary conspicuous consumption. The last items of this category of consumption are not given up except under stress of the direst necessity. Very much of squalor and discomfort will be endured before the last trinket or the last pretence of pecuniary decency is put away. There is no class and no country that has yielded so abjectly before the pressure of physical want as to deny themselves all gratification of this higher or spiritual need.

interesting to explore questions such as: Do different "visibility-cultures" exist? (e.g. White vs. Black; Latino Culture;) Do we outgrow the need to signal or, alternatively, the ability to recognize signals? (young vs. old;) Do women see other things than men do? Do people in certain geographical regions "mind their own business" more, or seem to care less about what others think? (e.g. East Coast vs. West Coast; rural vs. urban populations.) Likewise, it would be interesting to run similar surveys in different countries. This would allow us to explore the cross-country variation both in the cultural visibility of expenditures and in the extent to which our *luxuriousness by visibility* story fits the data.

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Appendix A

In this Appendix we solve the ordinary differential equation (5) for the quasi-homothetic preferences given by (6). As shown in Section 3, substitution of the partial derivatives f_1 and f_2 results in the first order and first degree differential equation (9) which is copied below for ease of reference:

$$g'(v) = \frac{1}{a}\left((1-a)\,p - \beta\frac{g(v)-\gamma_w}{v-\gamma_v}\right).$$

The rest of this Appendix follows a standard mathematical procedure to provide a step-by-step solution of this equation.

First, to make it a homogenous equation (which can be expressed as $g'(v) = \Phi(g(v)/v)$), we use the change of variables

$$\widetilde{v} \equiv v - \gamma_v$$

and define the new function

$$\widetilde{g}(v) \equiv g(v+\gamma_v) - \gamma_w,$$

and we use them to express (9) as

$$\widetilde{g}'(\widetilde{v}) = \frac{1}{a}\left((1-a)\,p - \beta\frac{\widetilde{g}(\widetilde{v})}{\widetilde{v}}\right). \tag{A-1}$$

This is a first order and first degree homogenous differential equation, and can be solved as follows. Define the function $\widetilde{h}(\widetilde{v})$:

$$\widetilde{h}(\widetilde{v}) \equiv \frac{\widetilde{g}(\widetilde{v})}{\widetilde{v}},$$

which implies

$$\widetilde{h}(\widetilde{v})\,\widetilde{v} = \widetilde{g}(\widetilde{v}). \tag{A-2}$$

Since (A-2) is, by definition, an identity for all v, the first derivatives of both sides (w.r.t. $\widetilde{v}$) are also an identity:

$$\widetilde{h}'(\widetilde{v})\,\widetilde{v} + \widetilde{h}(\widetilde{v}) = \widetilde{g}'(\widetilde{v}). \tag{A-3}$$

We can use (A-2) and (A-3) to express (A-1) as

$$\widetilde{h}'(\widetilde{v})\,\widetilde{v} + \widetilde{h}(\widetilde{v}) = \frac{1}{a}\left((1-a)\,p - \beta\widetilde{h}(\widetilde{v})\right),$$

or

$$\begin{aligned}\widetilde{h}'(\widetilde{v}) &= \frac{\frac{1}{a}\left((1-a)\,p - \beta\widetilde{h}(\widetilde{v})\right) - \widetilde{h}(\widetilde{v})}{\widetilde{v}} \\ &= \frac{\frac{1}{a}\left((1-a)\,p - (\beta+a)\,\widetilde{h}(\widetilde{v})\right)}{\widetilde{v}},\end{aligned} \tag{A-4}$$

which can now be solved by separation of variables to get

$$\log \widetilde{v} + \widetilde{C} = -\frac{a}{\beta + a} \log \left(\frac{1}{a} \left((1-a)\, p - (\beta + a)\, \widetilde{h}\left(\widetilde{v}\right) \right) \right), \tag{A-5}$$

with $\widetilde{C}$ the constant of integration. We can now express (A-5) as

$$\log \left(e^{\widetilde{C}} \widetilde{v} \right) = \log \left(\frac{1}{a} \left((1-a)\, p - (\beta + a)\, \widetilde{h}\left(\widetilde{v}\right) \right) \right)^{-\frac{a}{\beta + a}},$$

which is equivalent to

$$e^{\widetilde{C}} \widetilde{v} = \left(\frac{1}{a} \left((1-a)\, p - (\beta + a)\, \widetilde{h}\left(\widetilde{v}\right) \right) \right)^{-\frac{a}{\beta + a}}.$$

Using (A-2) to eliminate $\widetilde{h}$, we get:

$$\left(e^{\widetilde{C}} \widetilde{v} \right)^{-\frac{\beta + a}{a}} = \frac{1}{a} \left((1-a)\, p - (\beta + a)\, \frac{\widetilde{g}\left(\widetilde{v}\right)}{\widetilde{v}} \right),$$

and solving for $\widetilde{g}\left(\widetilde{v}\right)$ we get

$$\widetilde{g}\left(\widetilde{v}\right) = \frac{1-a}{\beta + a} p \widetilde{v} - \frac{a}{\beta + a} \left(e^{\widetilde{C}} \right)^{-\frac{\beta + a}{a}} \widetilde{v}^{-\frac{1}{a}\beta}. \tag{A-6}$$

Since $\widetilde{C}$ is an arbitrary constant, the coefficient of the second term on the right hand side of (A-6) is again an arbitrary constant, call it C:[52]

$$\widetilde{g}\left(\widetilde{v}\right) = \frac{1-a}{\beta + a} p \widetilde{v} + C \widetilde{v}^{-\frac{1}{a}\beta}.$$

Finally, we switch back to our original v and $g\left(v\right)$ to get (10), copied below (from page 8) for ease of reference:

$$g\left(v\right) - \gamma_w = \frac{1-a}{\beta + a} p \left(v - \gamma_v \right) + C \left(v - \gamma_v \right)^{-\frac{1}{a}\beta}.$$

This completes our solution.

Appendix B

For completeness, we restate below Ireland's (1994, p. 95) Proposition 1, and make the trivial statement that the quasi-homothetic function (6) satisfies its assumptions.

[52] Although it may appear from its construction that C must be positive, it is easy to verify that a negative C also solves the equation.

Proposition 1 *(Existence).* A unique differentiable function $g(v)$ exists which gives correct inferences to spectators when individuals choose their consumption bundles to maximise their utility

$$U^y = (1-a) f(v, y-pv) + a f(v, g(v)),$$

given inferences $g(v)$, if the following assumptions hold:

A1. $f(v,w)$ is increasing, and twice differentiable in v and w, concave, strictly concave in w and has a non-negative cross-derivative. Thus $f_1 > 0$, $f_2 > 0$, $f_{11} \leqslant 0$, $f_{22} < 0$, $f_{12} \geqslant 0$.

A2. In the absence of status effects, the lowest income type would buy some good W. Thus $p > f_1(b/p, 0)/f_2(b/p, 0)$.

It is trivial to see that the quasi-homothetic function $f(v,w)$ in (6) satisfies Ireland's assumption *A1* for $v \geqslant \gamma_v$ and $w \geqslant \gamma_w$. As to assumption *A2*, while the mathematical inequality is not defined if $\gamma_w > 0$ (since choosing $w < \gamma_w$ is not in the consumer's feasible set of choices), this assumption is satisfied in its verbal formulation for the very same reason for which the mathematical formulation is not defined. This suffices for the proof to apply, since the purpose of *A2* is to guarantee that the lowest income type does not spend all their income on v, which is implied in the case $\gamma_w > 0$. In the special case $\gamma_w = 0$ both the verbal and the mathematical formulations of *A2* are satisfied.

This completes the analysis in Section 3 in terms of proving existence and uniqueness of the analyzed equilibrium.[53]

Appendix C

Inter-column Comparability Issues in Table 1

When comparing our survey respondents' demographics to the numbers reported in the CEX and Census columns in Table 1, a few points should be borne in mind. First, as of the time of writing, the most recent published CEX data are from 2002, and the most recent Census is from 2000, while our visibility survey was conducted in 2004. However, as the reported demographics typically change only slowly across time, they should be closely comparable.[54] Second, a CU is defined differently from a household by the CEX, and while the CEX column reports CU characteristics, the Visibility survey and the Census columns report household

[53] On page 98 of his paper, Ireland reminds the reader that "the existence of full separation does require that any amount of V can be purchased. If a minimum amount was required, or if V could only be purchased in discrete quantities, then the existence of partial pooling equilibria would be likely, and a separating equilibrium less likely." This point should be borne in mind when assessing the empirical plausibility of the model.

[54] While total household income is somewhat less stable, its trend is known to have followed personal income, and can be estimated.

characteristics.[55] Third, in cases where our visibility survey's total household income brackets did not exactly match those reported in BLS (2002), CEX brackets were approximated.

While the above three points do not introduce major comparability problems, the following one is more substantial. Since our visibility survey is aimed at a representative sample of the adult US population, we attempted to randomly select one eligible respondent from each household contacted.[56] Unweighted by household size, the resulting observations form not a random sample of the adult population but rather of the household population, with each household represented by a member of their choosing. Table 1 compares the characteristics of that member to those of the person defined by the CEX as reference person. A reference person is roughly defined as "the person or one of the persons who owns or rents the home." To the extent that the demographics of such a reference person (or household head) systematically differ from those of a randomly chosen adult household member, one should not expect the relevant rows and columns in the table to match exactly.

The above potential issues are to some extent alleviated by the observation that many of the demographic characteristics reported in the CEX column seem to match fairly closely those reported in the Census column. In other words, the CEX column seems to be reasonably representative of the general (adult) population in the US.

Appendix D

Harris and Sabelhaus's (2000) 47 Expenditure Categories

001. Food Off-Premise
002. Food On-Premise
003. Food Furnished Employees
004. Tobacco Products
005. Alcohol Off-Premise
006. Alcohol On-Premise
007. Clothing and Shoes
008. Clothing Services
009. Jewelry and Watches
010. Toilet Articles and Preparations
011. Barbershops, Beauty Parlors, Health Clubs
012. Tenant-Occupied Nonfarm Dwellings–Rent

[55] The CEX defines a CU as:

> A consumer unit comprises either: (1) all members of a particular household who are related by blood, marriage, adoption, or other legal arrangements; (2) a person living alone or sharing a household with others or living as a roomer in a private home or lodging house or in permanent living quarters in a hotel or motel, but who is financially independent; or (3) two or more persons living together who use their income to make joint expenditures.

[56] This was done by asking "Could I speak to the person who has the next birthday and is over 18 years old?". We suspect, however, that this attempt at randomization was only partially successful due to either misunderstandings or eagerness to continue the interview on both sides of the telephone line.

013. Other Rented Lodging
014. Furniture and Durable Household Equipment
015. Nondurable Household Supplies and Equipment
016. Electricity
017. Gas
018. Water and Other Sanitary Services
019. Fuel Oil and Coal
020. Telephone and Telegraph
021. Domestic Service, Other Household Operation
022. Drug Preparations
023. Opthalmic Products and Orthopedic Appliances
024. Physicians, Dentists, Other Medical Professionals
025. Hospitals
026. Nursing Homes
027. Health Insurance
028. Business Services
029. Expense of Handling Life Insurance
030. New and Used Motor Vehicles
031. Tires, Tubes, Accesories, and Other Parts
032. Repair, Greasing, Washing, Parking, Storage, Rental
033. Gasoline and Oil
034. Bridge, Tunnel, Ferry, and Road Tolls
035. Auto Insurance
036. Mass Transit Systems
037. Taxicab, Railway, Bus, and Other Travel Expenses
038. Airline Fares
039. Books and Maps
040. Magazines, Newspapers, Other Nondurable Toys, etc.
041. Recreation and Sports Equipment
042. Other Recreation Services
043. Pari-Mutuel Net Receipts
044. Higher Education
045. Nursery, Elementary, and Secondary Education
046. Other Education Services
047. Religious and Welfare Activities

Appendix E

Further Comments on Consumption Categories

Payments to the Government

Some UCC titles, such as "Personal Property Taxes" or "State and Local Vehicle Registration," which report payments to the government, are not traditionally considered part of

household consumption and are not included in H&S's consumption categories. We have examined the possibility of treating them as consumption here, since they could be thought of as expenses attached to the purchase and ownership of property and vehicles, with possibly interesting visibility (or non-visibility) effects. However, as they sum up to less than 1 percent of total expenditure, they were left out.

Expenditures on housing

Household expenditure on living quarters is by far the most empirically important category, and deserves special care. While the expenditure on rented housing is a relatively straightforward and easily understood category that reports a monthly payment, calculating the equivalent monthly expenditure for owned dwellings is more subtle. One potential approach, not taken in this paper, would have been to treat the purchase and maintenance of dwellings as any other consumption category, adding together UCC items such as "Owned Housing Mortgage Principal," "Housing Additions and Alterations," etc. Instead, this paper follows H&S's approach, which is to adjust the UCC "Rental Equivalence of Owned Home" to be comparable to the costs attached to rented dwellings, and add them all together in one category.

Appendix F

Total Expenditure Elasticities with Social Effects

In this Appendix we derive the total expenditure elasticities e_v and e_w when social effects are present.

We start with equation (11) from Section 3, which we copy below:

$$y - \gamma_w - p\gamma_v = \frac{1+\beta}{a+\beta} p\left(v - \gamma_v\right) + C\left(v - \gamma_v\right)^{-\frac{1}{a}\beta}. \qquad (a > 0)$$

Expressed in differentials, it becomes

$$dy = \left(\frac{1+\beta}{a+\beta} p - \frac{\beta}{a} C\left(v - \gamma_v\right)^{-\frac{\beta}{a}-1}\right) dv. \qquad \text{(A-7)}$$

Using (11) to eliminate C, and a bit of algebra to simplify, we can rewrite (A-7) as

$$dy = \frac{p}{a}\left((1+\beta) - \beta \frac{y - \gamma_w - p\gamma_v}{p\left(v - \gamma_v\right)}\right) dv. \qquad \text{(A-8)}$$

To derive e_v, we just substitute (A-8) into its definition:

$$e_v \equiv \frac{y}{v}\frac{dv}{dy} = a\frac{y}{pv}\left((1+\beta) - \beta \frac{y - \gamma_w - p\gamma_v}{p\left(v - \gamma_v\right)}\right)^{-1}. \qquad \text{(A-9)}$$

To derive e_w we use the budget constraint (2) to get

$$e_w \equiv \frac{y}{w}\frac{dw}{dy} = \frac{y}{w}\left(1 - \frac{pv}{y}e_v\right). \tag{A-10}$$

Finally, we note that in the special homothetic benchmark (where $\gamma_v = \gamma_w = 0$), e_v simplifies to

$$e_v = a\left((1+\beta)\frac{pv}{y} - \beta\right)^{-1}. \tag{A-11}$$

Table 1: Respondent Demographics

	Visibility survey				CEX[a]	Census
	Obs.[b]	Value	Min	Max	Value	Value
Mean values:						
Age	180	49.1	18	89	48.1	
Household size[c]	183	2.8	1	8	2.5	2.6
Children under 18 in household	183	0.7	0	4	0.7	0.7
Percent distribution:						
Female	183	65.6			49	50.9
Black	177	7.3			12	12.3
Education:[d]	180					
Elementary (0-8)		2.8			6	7.5
High school (9-12)		23.9			38	40.7
College (13 or more)		73.3			56	51.7
College (13-16)		51.7				42.8
Graduate school (17 or more)		21.7				8.9
Total household income:	151					
Less than $20,000		14.6			28	22.1
$20,000 to $40,000		18.5			25	25.3
$40,000 to $60,000		18.5			17	19.7
$60,000 or more		48.3			30	32.9

Sources: author's visibility survey; BLS (2002); Census (2000).

[a]Values are reproduced or approximated from BLS (2002). See important comments in subsection 4.1 and in Appendix C.

[b]Number of respondents reporting demographic characteristic (out of a total of 183 respondents).

[c]Top-coded at 8 (in visibility survey).

[d]In Census: educational attainment of population 25 years and over.

Table 2: Consumption Categories (used in main survey question)

FdH	food and nonalcoholic beverages at grocery, specialty and convenience stores.
FdO	dining out at restaurants, drive-thrus, etc, excl. alcohol; incl. food at school.
Cig	tobacco products like cigarettes, cigars, and pipe tobacco.
AlH	alcoholic beverages for home use.
AlO	alcoholic beverages at restaurants, bars, cafeterias, cafes, etc.
Clo	clothing and shoes, not including underwear, undergarments, and nightwear.
Und	underwear, undergarments, nightwear and sleeping garments.
Lry	laundry and dry cleaning.
Jwl	jewelry and watches.
Brb	barbershops, beauty parlors, hair dressers, health clubs, etc.
Hom	rent, or mortgage, or purchase, of their housing.
Htl	lodging away from home on trips, and housing for someone away at school.
Fur	home furnishings and household items, like furniture, appliances, tools, linen.
Utl	home utilities such as electricity, gas, and water; garbage collection.
Tel	home telephone services, not including mobile phones.
Cel	mobile phone services.
HIn	homeowners insurance, fire insurance, and property insurance.
Med	medical care, incl. health insurance, drugs, dentists, doctors, hospitals, etc.
Fee	legal fees, accounting fees, and occupational expenses like tools and licenses.
LIn	life insurance, endowment, annuities, and other death-benefits insurance.
Car	the purchase of new and used motor vehicles such as cars, trucks, and vans.
CMn	vehicle maintenance, mechanical and electrical repair and replacement.
Gas	gasoline and diesel fuel for motor vehicles.
CIn	vehicle insurance, like insurance for cars, trucks, and vans.
Bus	public transportation, both local and long distance, like busses and trains.
Air	airline fares for out-of-town trips.
Bks	books incl. school books, newspapers and magazines, toys, games, and hobbies.
Ot1	computers, games, TVs, video, audio, musical and sports equipment, tapes, CDs.
Ot2	cable TV, pets and veterinarians, sports, country clubs, movies, and concerts.
Edu	education, from nursery to college, like tuition and other school expenses.
Cha	contributions to churches or other religious organizations, and other charities.

Table 3: Distribution of Replies to Main Survey Question

Category	Almost immediately	A short while	A while	A long while	Never	Don't know	Refused
FdH (food home)	9.3	26.2	33.9	18.0	11.5	1.1	0.0
FdO (food out)	12.6	41.5	24.0	11.5	9.3	1.1	0.0
Cig (cigarettes)	43.7	37.2	7.1	3.8	7.7	0.5	0.0
AlH (alcohol home)	24.6	32.8	20.2	13.1	9.3	0.0	0.0
AlO (alcohol out)	21.9	29.5	25.7	12.6	10.4	0.0	0.0
Clo (clothing)	29.5	41.0	13.1	10.4	4.9	1.1	0.0
Und (underwear)	1.6	2.7	3.8	14.8	76.5	0.5	0.0
Lry (laundry)	5.5	18.0	16.9	20.8	38.3	0.5	0.0
Jwl (jewelry)	35.0	32.8	12.0	11.5	8.7	0.0	0.0
Brb (barbers etc)	18.0	37.7	22.4	12.6	8.7	0.5	0.0
Hom (rent/home)	11.5	21.9	20.8	19.7	24.6	0.5	1.1
Htl (hotels etc)	7.1	22.4	31.1	22.4	16.9	0.0	0.0
Fur (furniture)	23.5	41.5	20.8	9.8	3.8	0.0	0.5
Utl (home utilities)	6.0	8.7	16.4	20.2	48.6	0.0	0.0
Tel (home phone)	4.4	10.4	15.3	23.5	44.8	1.1	0.5
Cel (cell phone)	12.6	23.5	18.0	18.0	27.3	0.5	0.0
HIn (home insur.)	1.6	3.3	6.6	21.9	66.7	0.0	0.0
Med (health care)	4.4	14.2	21.9	31.7	27.3	0.5	0.0
Fee (legal fees)	1.1	9.8	18.0	30.6	39.3	0.5	0.5
LIn (life insur.)	2.2	1.6	6.0	25.7	63.9	0.5	0.0
Car (cars)	26.8	39.3	20.8	8.7	3.8	0.0	0.5
CMn (car repair)	3.8	20.8	27.9	29.0	18.0	0.0	0.5
Gas (gasoline)	6.6	22.4	21.3	18.6	29.5	1.6	0.0
CIn (car insur.)	1.1	8.7	8.7	22.4	59.0	0.0	0.0
Bus (public trans.)	6.0	25.7	26.8	17.5	20.8	2.7	0.5
Air (air travel)	5.5	29.0	30.1	16.9	18.0	0.0	0.5
Bks (books etc)	14.2	31.1	30.6	14.8	8.2	0.0	1.1
Ot1 (recreation 1)	20.8	43.2	23.0	6.6	6.0	0.5	0.0
Ot2 (recreation 2)	14.8	38.3	25.7	12.6	8.2	0.0	0.5
Edu (education)	11.5	30.6	28.4	14.2	13.7	1.6	0.0
Cha (charities)	4.4	13.7	20.2	27.9	33.3	0.0	0.5
Total	12.6	24.5	19.9	17.5	24.7	0.5	0.2

Source: author's visibility survey (183 respondents).

Table 4: Visibility Indices and Rankings

Category	Normalized Mean			Response 1 or 2			Response 4 or 5		
	Index	(S.E.)	[Rank]	Index	(S.E.)	[Rank]	Index	(S.E.)	[Rank]
Cig (cigarettes)	0.77	(0.02)	[1]	0.81	(0.03)	[1]	0.89	(0.02)	[1]
Clo (clothing)	0.70	(0.02)	[2]	0.70	(0.03)	[2]	0.85	(0.03)	[5]
Car (cars)	0.69	(0.02)	[3]	0.66	(0.04)	[4]	0.87	(0.02)	[2]
Jwl (jewelry)	0.68	(0.02)	[4]	0.68	(0.03)	[3]	0.80	(0.03)	[6]
Fur (furniture)	0.68	(0.02)	[5]	0.65	(0.04)	[5]	0.86	(0.03)	[4]
Ot1 (recreation 1)	0.67	(0.02)	[6]	0.64	(0.04)	[6]	0.87	(0.02)	[3]
AlH (alcohol home)	0.63	(0.02)	[7]	0.57	(0.04)	[7]	0.78	(0.03)	[10]
Brb (barbers etc)	0.61	(0.02)	[8]	0.56	(0.04)	[8]	0.79	(0.03)	[9]
AlO (alcohol out)	0.60	(0.02)	[9]	0.51	(0.04)	[11]	0.77	(0.03)	[11]
Ot2 (recreation 2)	0.60	(0.02)	[10]	0.53	(0.04)	[10]	0.79	(0.03)	[8]
FdO (food out)	0.59	(0.02)	[11]	0.54	(0.04)	[9]	0.79	(0.03)	[7]
Bks (books etc)	0.57	(0.02)	[12]	0.45	(0.04)	[12]	0.77	(0.03)	[12]
Edu (education)	0.53	(0.02)	[13]	0.42	(0.04)	[13]	0.72	(0.03)	[13]
FdH (food home)	0.51	(0.02)	[14]	0.36	(0.04)	[15]	0.70	(0.03)	[14]
Air (air travel)	0.47	(0.02)	[15]	0.34	(0.04)	[16]	0.65	(0.04)	[15]
Htl (hotels etc)	0.45	(0.02)	[16]	0.30	(0.03)	[19]	0.61	(0.04)	[17]
Bus (public trans.)	0.44	(0.02)	[17]	0.32	(0.03)	[18]	0.62	(0.04)	[16]
Cel (cell phone)	0.44	(0.03)	[18]	0.36	(0.04)	[14]	0.55	(0.04)	[19]
Hom (rent/home)	0.44	(0.03)	[19]	0.33	(0.03)	[17]	0.56	(0.04)	[18]
CMn (car repair)	0.41	(0.02)	[20]	0.25	(0.03)	[21]	0.53	(0.04)	[20]
Gas (gasoline)	0.39	(0.02)	[21]	0.29	(0.03)	[20]	0.52	(0.04)	[21]
Med (health care)	0.34	(0.02)	[22]	0.19	(0.03)	[23]	0.41	(0.04)	[22]
Lry (laundry)	0.33	(0.02)	[23]	0.23	(0.03)	[22]	0.41	(0.04)	[23]
Cha (charities)	0.32	(0.02)	[24]	0.18	(0.03)	[24]	0.39	(0.04)	[24]
Tel (home phone)	0.26	(0.02)	[25]	0.15	(0.03)	[25]	0.32	(0.03)	[25]
Utl (home utilities)	0.26	(0.02)	[26]	0.15	(0.03)	[26]	0.31	(0.03)	[26]
Fee (legal fees)	0.25	(0.02)	[27]	0.11	(0.02)	[27]	0.30	(0.03)	[27]
CIn (car insur.)	0.18	(0.02)	[28]	0.10	(0.02)	[28]	0.19	(0.03)	[28]
LIn (life insur.)	0.13	(0.02)	[29]	0.04	(0.01)	[31]	0.10	(0.02)	[30]
HIn (home insur.)	0.13	(0.02)	[30]	0.05	(0.02)	[29]	0.11	(0.02)	[29]
Und (underwear)	0.09	(0.02)	[31]	0.04	(0.02)	[30]	0.09	(0.02)	[31]

Source: author's visibility survey.

Table 5: Elasticity and Visibility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Vindex	1.746	1.979	0.300	0.450	2.836	3.134	0.806	1.150
	(1.95)*	(2.22)**	(0.30)	(0.44)	(2.64)**	(2.95)***	(1.28)	(2.00)*
Const.	0.561	0.469	1.347	1.289	-0.033	-0.150	1.273	1.156
	(1.27)	(1.07)	(2.76)**	(2.60)**	(0.06)	(0.29)	(4.25)***	(4.27)***
Household expenditure	All households		Bottom half		Top half		All households	
Consumption categories	All	No `Cig`	All	No `Cig`	All	No `Cig`	No `Hom`, `FdH`, `Car`	No `Hom`, `FdH`, `Car`, `Cig`
Obs.	29	28	29	28	29	28	26	25
R^2	0.12	0.16	0.00	0.01	0.20	0.25	0.06	0.15

Notes: All regressions are OLS, weighted by size of consumption category. Dependent variable: average total expenditure elasticity (see estimation procedure and details in text), using 1997:1-1997:4 CEX extracts from Harris and Sabelhaus (2000). Regressor: Vindex (second column of Table 4), based on author's visibility survey; see Table 4 for standard errors. Absolute value of t-statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

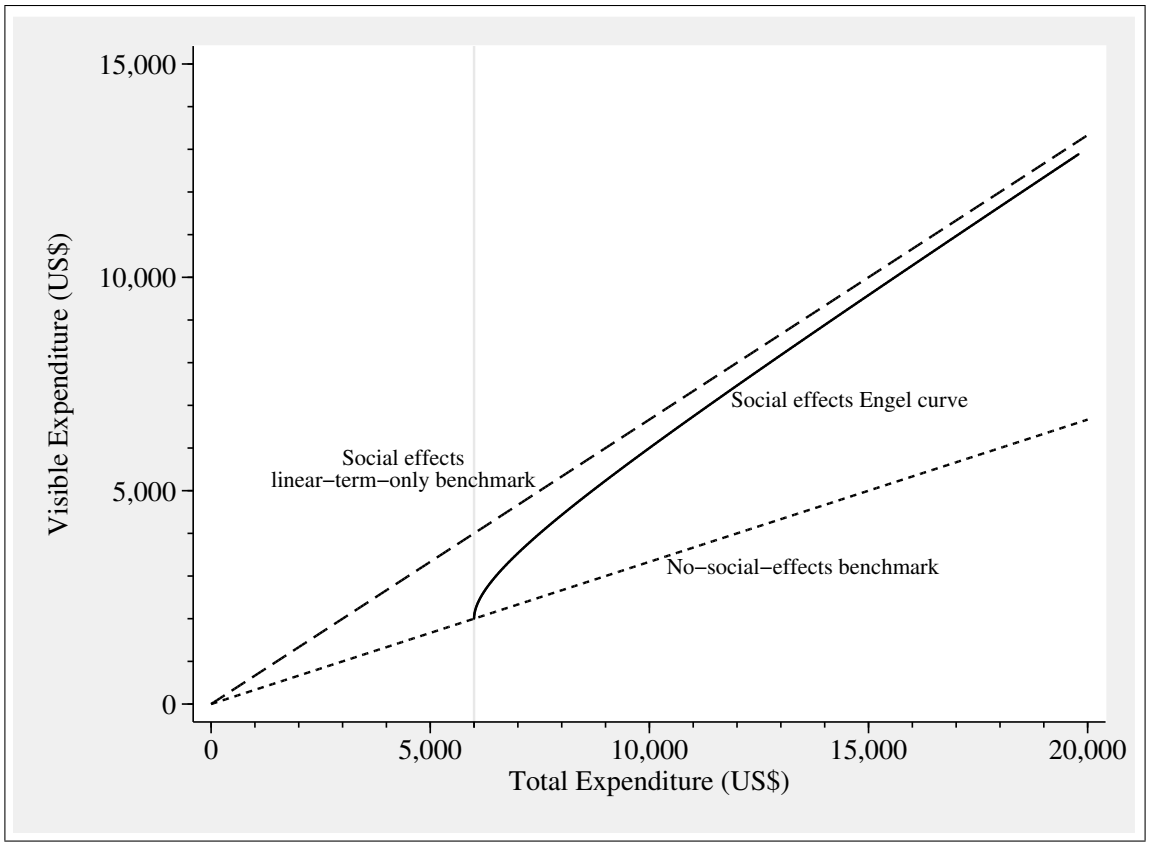
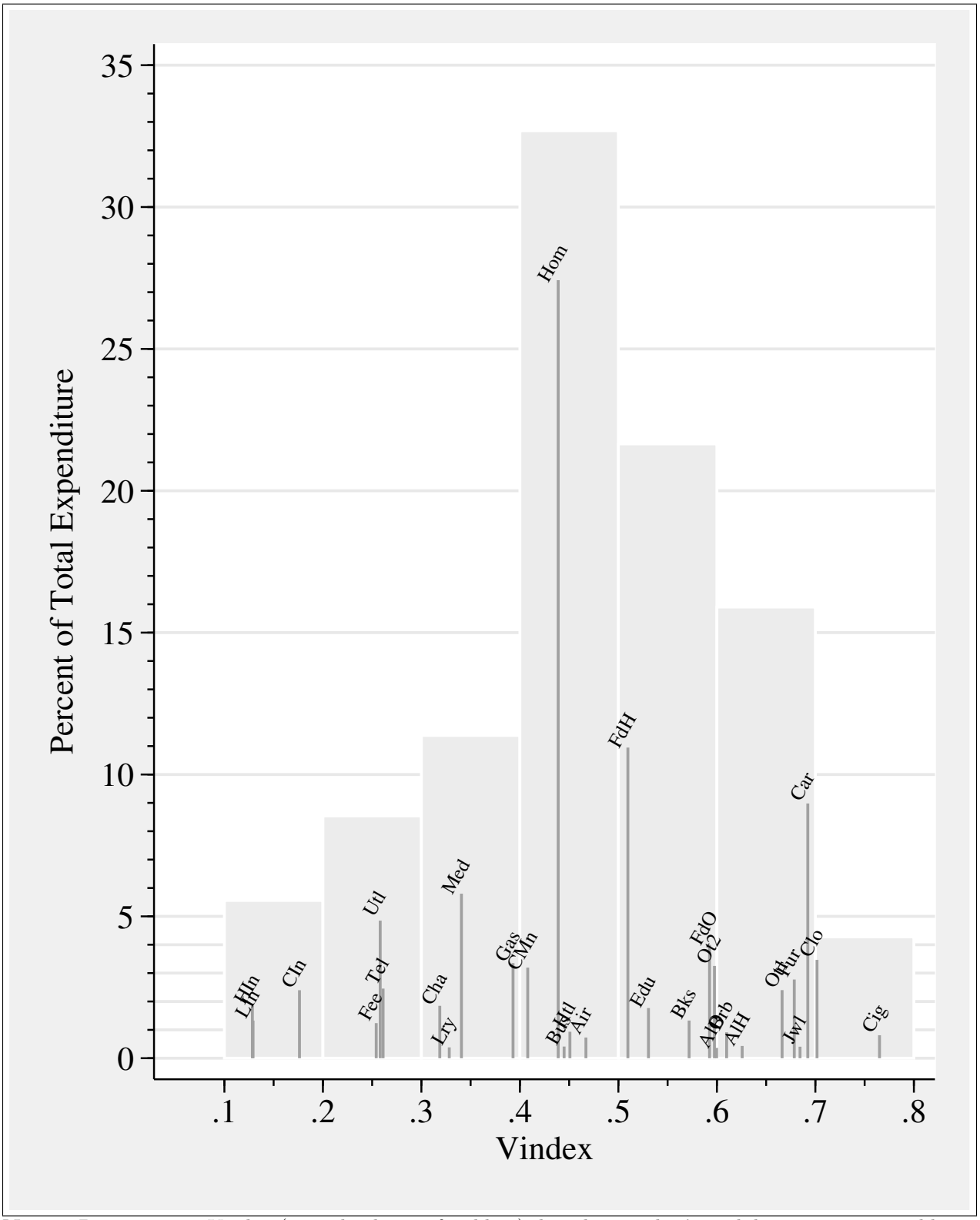


Figure 1: The Engel curve for visibles $v(y)$



Notes: Data: x-axis: Vindex (second column of Table 4), based on author's visibility survey; see Table 4 for standard errors. y-axis: 1997:1-1997:4 CEX extracts from Harris and Sabelhaus (2000).

Figure 2: Consumer expenditures and visibility

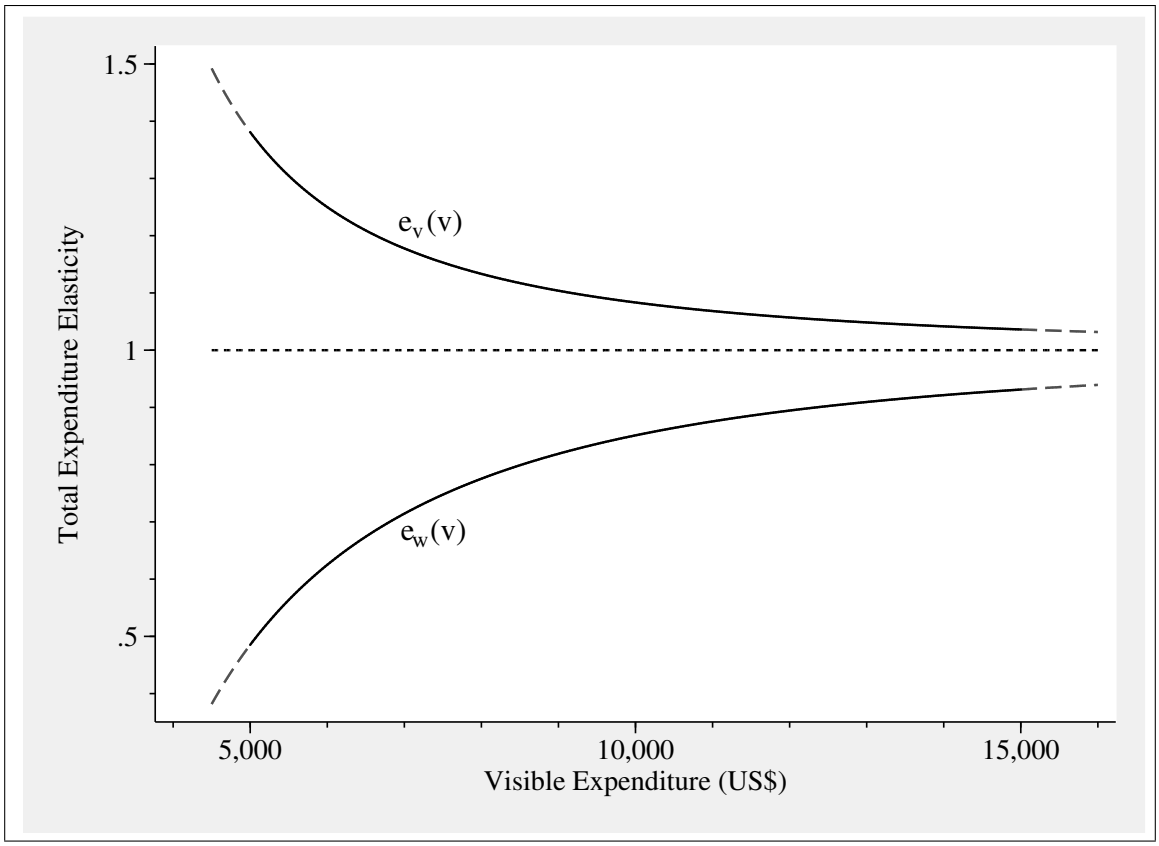
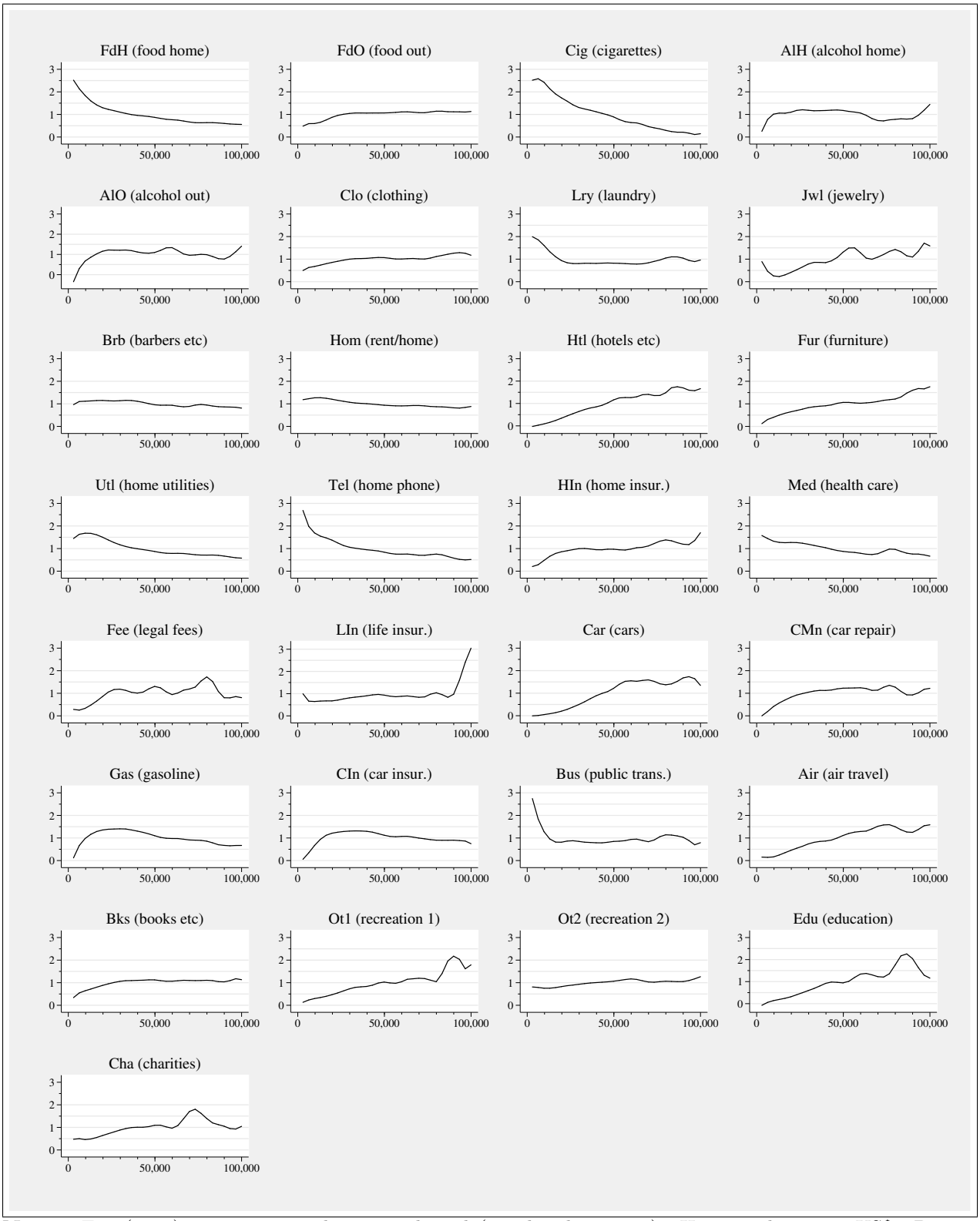
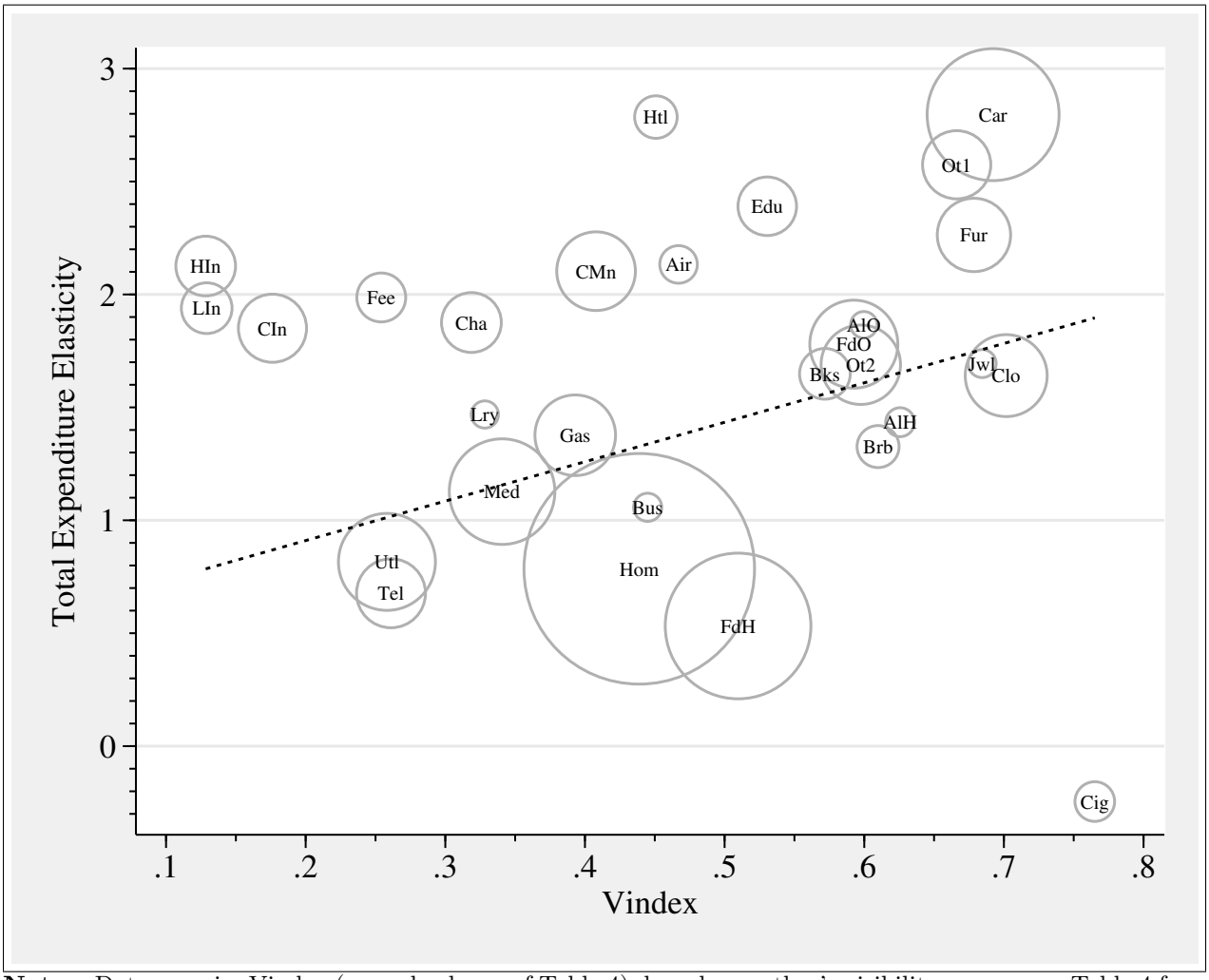


Figure 3: Total expenditure elasticities for visibles and non-visibles



Notes: Fan (1992) regressions with quartic kernel (see details in text). Horizontal axes in US$. Data: 1997:1-1997:4 CEX extracts from Harris and Sabelhaus (2000).

Figure 4: Normalized expenditure shares and total household expenditure



Notes: Data: x-axis: Vindex (second column of Table 4), based on author's visibility survey; see Table 4 for standard errors. y-axis: average elasticities, estimated nonparametrically using 1997:1-1997:4 CEX extracts from Harris and Sabelhaus (2000). See details in text. Area of circles proportional to category size. Dashed line: OLS, weighted by size.

Figure 5: Visibility and elasticity