# Conspicuous Consumption and Expenditure Visibility: Measurement and Application*

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**Abstract**

Individuals live in society, and many of their consumption decisions are observed by others. This may affect consumers' behavior, as they both observe other consumers and are aware of being observed by them. 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 U.S. households. We find that our visibility survey could predict up to one third of the 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

This paper studies a previously unexplored feature of consumer expenditures: their *visibility*. We develop a survey instrument that can be applied in different societies, designed to measure the extent to which different expenditure categories (namely, different groups of goods and services) are visible to members of a society. We apply the survey to U.S. households, and construct an aggregate measure of visibility: a *visibility index*. The index is offered as a new resource that can be used in empirical work on consumption. As an example application, we show that it predicts a substantial amount of the cross-expenditure variation in total expenditure elasticities, as estimated from Consumer Expenditure Survey (CEX) data.

Empirically quantifying expenditure visibility could mold real-world content into a rather diverse set of theories. First and most obvious among these are signaling theories, some of which are at least as old as Plato's quote in the epitaph above. Applied to the behavior of consumers in industrial economies, the observation that visible expenditures may become signals did not escape early writers like Smith and Marx, and was at the basis of Veblen's (1899) *"The Theory of the Leisure Class"*, where the term *conspicuous consumption* was coined to describe the advertisement of income and wealth through lavish spending on visible items. The term has since been continually discussed and applied by economists (see, e.g., the Conclusions in Spence's 1973 seminal signaling paper). For a brief survey and references to the recent literature on conspicuous consumption, see Heffetz (2004, §1.2).

Other theories that could benefit from an empirical measure of expenditure visibility include social learning theories, where individuals base their actions on what they learn observing others—possibly to the point of ignoring their own private information (Banerjee 1992; Bikhchandani et al. 1992). A central assumption in these models is that while actions (like spending and consumption) are observable, the information they are based on is not (or at least not credibly). A third group of theories where visibility is relevant is that on social identity and conformity, where people identify with a certain social group and wish to resemble typical members of the group (Akerlof and Kranton 2000; Shayo 2007). Perceived distance from the group is likely to be related to perceived discrepancies from typical expenditure patterns of group members. Finally, visibility may play an important role in theories where the utility from consumption is context-dependent. For example, when individuals' perception of the quality of a consumer item is determined by comparing it with what they consider a 'typical' such item (Frank 2007), high visibility may help individuals in assessing what is typical.

To the extent that these theories capture aspects of real-world phenomena, differences in the visibility of different consumer expenditures might translate to differences in expenditure patterns. For example, to the extent that consumption is used as a (conspicuous) signal, and if some expenditures are more visible (have more conspicuousness potential) than others, then a measure of cross-expenditure differences in visibility might help predict some of the cross-expenditure differences in Engel curves. Long recognized and well-recorded, these

latter have hitherto remained a largely unexplained empirical fact (see discussion in Section 4 below, where this idea is explored empirically). Similarly, regarding the other theories mentioned above, our measure of visibility could help predict which expenditure categories might be subject to herd behavior and informational cascades; might be used as visible signs of social identity and group membership; or might be more context-dependent or positional in consumption than other expenditure categories (and by how much).

The rest of this paper proceeds as follows. Section 2 outlines the theoretical foundation and the design of our visibility survey. Section 3 reports survey results, details how they are used to construct a visibility index, and discusses findings in light of the index. Section 4 demonstrates how the visibility index can be used in empirical work, and shows that it can predict up to one third of cross-commodity variation in total expenditure elasticity for a subset of U.S. households. Section 5 concludes.

# 2 The Visibility Survey: Design

## 2.1 Model

The concept of expenditure visibility we set out to measure is best understood in the context of a model due to Ireland (1994). In this simple Veblenesque two-good model, consumers are identical in all but their exogenous, and only privately known, income $y$. Consumers allocate their income between two types of expenditures: $v$, which is visible to society, and $w$, which is not. 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 $v$.

This setup opens the door for conspicuous consumption behavior: individuals may manipulate their expenditure on $v$ in their attempt to inform (or misinform) society regarding their income type $y$ (or equivalently, regarding their non-visible consumption $w$). For this to happen, the public's perceptions regarding one's $y$ (or $w$) should somehow affect one's utility.

Denoting by $g(v)$ society's beliefs concerning one's unobservable $w$ based on the observable $v$, Ireland's utility function is specified as follows:

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

It is a convex combination (or weighted average) of two terms. The first, $f(v,w)$, denotes *fundamental utility*: the utility resulting from consumption of $v$ and $w$. This is just the familiar notion of utility from the standard textbook model. The second term, $f(v, g(v))$, denotes *spectators' view*: what others believe one's fundamental utility is. The weight $a$ can be thought of as a measure of one's sensitivity to society's view, or to social status. With $a = 0$ the model reduces to the standard model where social effects are assumed away. At the other extreme, with $a = 1$, consumers consume with the sole purpose of being seen consuming—not too far from Veblen's (1899) idea of consumption by the Leisure Class. With $a$ in the interval $(0, 1)$, consumers maximize $U$ considering both terms. To the extent that the resulting allocation differs from what it would have been with $a = 0$, consumption is used as a signal.

With a few assumptions regarding $f(\cdot,\cdot)$, Ireland (1994) shows existence and uniqueness of a fully separating equilibrium. Such an equilibrium is characterized by the usual two conditions: (a) given society's belief function $g(\cdot)$, individuals maximize $U$ in (1) above; and (b) society's beliefs are indeed correct: $g(v) = w$. In what follows we focus on this equilibrium. See Heffetz (2007a) for an explicit solution, further discussion, examples, and interpretations.

## 2.2 Measurement

Moving from model to measurement, what is the empirical meaning of the distinction between $v$ and $w$? In the model above, visible (or observable) expenditures $v$ are common knowledge.[1] Transitioning from formal definitions to real-world applications, notice that words like *visible* and *observable* do not necessarily mean that $v$ is, literally, observable with the naked eye. For our purposes, consumption is considered visible if, 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, the visibility we wish to measure is a *cultural*, rather than *physical*, feature of commodities, determined by 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, and 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.

Focusing on one society, at one point in time—the United States, today[2]—we turn now to report on the design, implementation, and findings of a new national telephone survey we conducted during May 2004 to January 2005.[3] The survey asked respondents about different items consumed in their society. As in other surveys of this type, all we could hope to measure was *perceptions* of visibility. However, as the aspect of visibility we were trying to capture was, as discussed above, cultural rather than physical, perceptions were likely to be important. Evidence presented in Section 4 below suggests that this indeed was the case.

The main question in our survey read:

[1] Naturally, in a fully-separating equilibrium, $w$ becomes common knowledge as well. We discuss this crucial point below.

[2] Arguably, the U.S. being extremely diverse culturally and socially, many more than one society exists in it at any point in time. We discuss this point in related work (Heffetz 2007b).

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

> 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 that they like to, and do, spend more than average on [*jewelry and watches*].
>
> 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 [*jewelry and watches*] in the example above replaced by each of thirty-one expenditure-category titles (listed in Table 1 and discussed below). The order in which the categories appeared was randomly selected for each respondent.

The question was selected from a few possibilities that had been considered and tested in an early pilot study. The chosen wording of the question reflects both theoretical considerations and experience during these pilot tests. Regarding the former, remember that the equilibrium we focus on is fully separating. In such an equilibrium, the signal each household sends through its visible consumption $v$ is sufficient for its non-visible consumption $w$ (as well as its income type $y$) to be fully worked out by society. With both $v$ and $w$ thus public knowledge, 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: in equilibrium, people are expected to be informed about both.

Things get still more complicated in a reality where 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 difficulty 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.[4]

Our findings during the pilot phase of the survey seemed to confirm all three concerns.

[4]Frank (1985, 152; 1999, 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 fee or payment (such as rent) backed by a written contract.

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 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 the model above, such as household size, and ages of household members. Interestingly, the only household characteristic we do explicitly model—total household income $y$—seemed instrumental as well 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 the model).

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

$$z_i = \widetilde{f}_i(X) + \epsilon_i, \tag{2}$$

where $X$ is a vector of household characteristics, and $\epsilon_i$ is an error term associated with category $i$. This error term can be thought of as driven by random and unobservable peculiar tastes. While Ireland's (1994) model discussed above assumes that the only component of $X$ in which households differ is income $y$, and that $\epsilon_i$ is 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 $\epsilon_i$, as well as the predictive power of each of the components of $X$ (as expressed by $\widetilde{f}_i(\cdot)$), differ substantially 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.[5]

With this reduced-form model in mind, our survey attempts to measure how visible $z_i$ is. But since (2) 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 $\epsilon_i$. 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 (2), this translates to asking

[5]Notice that the reduced form model in (2) 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 $\epsilon$). For example, household size can be endogenously selected and hence affected by tastes.

respondents about their knowledge of $\xi_i$, defined as

$$\begin{aligned} \xi_i &\equiv z_i - E[z_i|X] \\ &= \left(\widetilde{f}_i(X) + \epsilon_i\right) - \left(\widetilde{f}_i(X) + E[\epsilon_i|X]\right) \\ &= \epsilon_i - E[\epsilon_i|X], \end{aligned} \tag{3}$$

where $E[\epsilon_i|X]$ is the expected value of $\epsilon_i$ given $X$. Since, by construction, $E[\xi_i|X] = 0$, asking about the likely knowledge of $\xi_i$ 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.

## 2.3 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. We therefore 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 U.S. are 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 composition, yet large enough to keep their number manageable. As a starting point we chose Harris and Sabelhaus (2005) (henceforth H&S), who collapse the UCC spending titles into forty-seven categories.[6] As these are cross-referenced with comparable National Income and Product Account (NIPA) values, they facilitate comparisons between micro-level and macro-level analyses and results.

Adapting the H&S categories to our purposes we regrouped them into thirty-one new categories, which together cover more than 95 percent of consumption reported by the CEX.

[6]For a list of the H&S categories, see titles 23–69 at `www.nber.org/ces_cbo/032/cextitle`.

Detail on the regrouping process we followed is provided in Appendix A, along with further explanation and comment on the resulting consumption categories. Each new category was given a descriptive title that reflects the empirical importance of the UCC items it consists of. These are listed in Table 1.

[Table 1 about here.]

Stating the obvious, we point out that this list of thirty-one categories is 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`, grouping together all health-related expenditures, might be less than perfectly visibility-homogenous.[7] These categories could be divided into smaller subcategories only at the price of making the questionnaire longer and, consequently, losing observations.

On the other hand, two of our thirty-one categories—`Und` (undergarments and nightwear) and `Cel` (mobile phone services)—were not empirically significant enough to warrant their own categories. As discussed in Appendix A, they resulted from subdividing the more general H&S categories "Clothing and Shoes" (into `Clo` and `Und`) and "Telephone and Telegraph" (into `Tel` and `Cel`). This was done for two main reasons. First, we thought it likely that both cellphones and clothes play a special cultural role. Since we believed both to be relevant to conspicuous consumption, we found closely looking at them of particular research interest.

Second, subdividing these categories was a good way to assess the validity of our methods and the credibility of the resulting visibility index. 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 shown below, this prediction was confirmed by the survey results.

Finally, we point out that although the added subcategories `Und` and `Cel` are not used when we apply our findings below to expenditure data,[8] the remaining twenty-nine categories still vary substantially in size. This is both expected and, arguably, inevitable. The housing category (`Hom`), by far the largest, alone accounts for almost one third of the total expenditure of a typical U.S. household in the CEX data. However, we found no obvious way in which it could be further divided and yet remain easily understood by telephone surveyees. This variance in size did not seem to affect the categories' perceived visibility (or at least not in an obvious way), as shown below.

[7] 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.

[8] As discussed above, H&S do not report expenditures on underclothes and cellphones separately from the (much larger) categories "Clothing and Shoes" and "Telephone and Telegraph", respectively.

# 3 The Visibility Survey: Findings

## 3.1 Sample and Demographics

We used random digit dialing (RDD) to get a random sample of the population over 18 in Continental US (excluding Alaska and Hawaii). Our response rate is estimated at 15 percent of working residential numbers (with no language barrier). We completed 480 interviews, with mean duration of 13 minutes.

Table 2 reports demographic characteristics of our respondents. The last column reproduces Census (2000) figures. The table should be interpreted with caution: one should refrain from directly comparing Census figures with our respondent sample, for reasons that are both technical (different definitions, different years, etc.) and substantial (theory vs. empirics, who sends and who receives signals, etc.). These are discussed in Appendix B. Here we note that our sample closely resembles (in first moments) the Census population in number of children in the household and in percent Black, married, and employed. Possibly resulting from the telephone methodology, our respondents are less male, Hispanic (language issues), and Westerner (time-zone issues), and they report higher income and education levels (note that one in five refused the income question). In what follows, we analyze results based on the full unweighted sample of 480 completed interviews. In related work (Heffetz 2007b), we analyze our survey results by demographics.

[Table 2 about here.]

## 3.2 Benchmark Results

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 more than two thirds of the responses to the category `Clo` ("clothing and shoes, not including underwear, undergarments, and nightwear") are either "Almost immediately" or "A short while after", more than two thirds of the responses to the category `Und` ("underwear, undergarments, nightwear and sleeping garments") are "Never". 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.[9]

[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. This suggests that extreme visibility levels were not in general more likely to be assigned to consumption categories than other visibility levels.

[9] 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 480 respondents refused to answer this question, and that only about 1.5 percent answered "Don't know", provides no evidence supporting such a claim.

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, 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.[10] 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 between indices and rankings across methods range from 0.96 to 0.99.

In the rest of this paper we refer as the "visibility scale", "visibility index" or, in short, *"Vindex"*, to the Normalized Mean index. This choice has no significant effects on our results.

## 3.3 Discussion: Consumption and Visibility

The results in Table 4 look promising. All three methods above result in similar indices that seem to measure a real and previously unexplored feature of consumption. Each of the three indices covers a substantial segment of the theoretically feasible range $[0, 1]$, which suggests that the surveyed population perceives some expenditures to be substantially more visible than others.

[10] 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.

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`).[11] While only 13 percent of the respondents said they would take a long while or longer to notice an atypically high expenditure on this category by the household of a new person they met, 81 percent said they would notice it almost immediately or after a short while. Less surprising are the next two most visible categories: cars (`Car`), and clothing excluding undergarments and nightwear (`Clo`).

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 (`LIn` and `HIn` which include life, home, fire, and property insurance) are thought by at least 83 percent of the respondents to be noticed either after a long while or never. For any of these categories, at most 9 percent think that they would be noticed almost immediately or after a short while. 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 §2.3.

Table 4 reveals an interesting pattern: while its top is unambiguously dominated by durable and nondurable goods, its bottom is dominated by services. At the top of any of the three indices and rankings are goods like cigarettes, cars, clothes, furniture, appliances, jewelry, and equipment (TV, video, audio, musical and sports). Similarly, with the one exception of underclothes, the bottom is dominated by service-related expenditures like insurance policies, legal and accounting fees, telephone charges, utilities bills, etc.

This is seen graphically in Figure 1. The figure shows the distribution, along the visibility scale, of the twenty-nine empirically significant (see footnote 8) categories and their related expenditures (weighted by size). We classify each category as either a good or a service, and mark the top of the spike that represents it with ● (good) or ○ (service).[12] The horizontal axis—Vindex—reproduces the visibility index from the second column of Table 4.[13] The vertical axis shows how empirically important each category is. The height of each spike corresponds to the average size of the relevant expenditure as a percentage of total household expenditure. It is based on 5,821 households for which full-year expenditure data exist in the 2002:1–2002:4 CEX extracts downloaded from Harris and Sabelhaus (2005). The histogram at the background groups the spikes into 7 bars, providing another measure of the empirical distribution of consumer expenditures along the visibility scale.

The sorting pattern that appears in the figure—goods to the right, services to the left—is striking given that our main survey question makes neither an explicit nor an implicit

[11] 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.

[12] Although the distinction between goods and services is not unambiguous, with varying classification conventions that are all in constant evolution, most of our categories intuitively belong in one group or the other. BEA's (1990, 13) conventions, for example, read: "In general, goods are commodities that can be stored, or inventoried. ... Services are commodities that cannot be stored and that are consumed at the place and time of purchase. If commodities have both a good and service component, the classification generally is based on the relative importance of the two components." We classify the following categories as goods: `FdH, FdO, Cig, AlH, AlO, Clo` (including `Und`), `Jwl, Hom, Fur, Car, Gas, Bks, Ot1`.

[13] Since the horizontal position of the spikes is only based on the point estimates (with no indication of confidence intervals), Figure 1 should only be interpreted in conjunction with Table 4, which reports the relevant standard errors. In practice, however, these standard errors are small.

distinction between goods and services. While the question asks about spending "more than average on [line from Table 1]", the good/service distinction seems to emerge from the replies. In other words, a commodity's place on the visibility scale seems highly predictive of the commodity's classification as a good or a service. In Section 4 below we provide quantitative evidence that a commodity's visibility is highly predictive of its total expenditure elasticity. Here we merely point out, qualitatively, that visibility seems to also predict other, less formal, features of commodities. Although any classification of expenditure categories into goods and services is somewhat arbitrary, the general pattern in Figure 1 is visually clear and does not depend on one specific classification (but remember that underclothes and cellphones are left out).

[Figure 1 about here.]

Figure 1 is otherwise informative in that it 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 0.05). This lack of correlation rules out the possibility that it is mainly relative size that our Vindex captures. In fact, the large housing category (`Hom`) falls right at the center of the visibility scale. Housing's average share of total expenditure is almost one third, and the remaining two thirds are seen to lie around it with roughly one third on either side.

The central position of housing on the visibility scale is particularly interesting given the amount of attention housing received in the literature on positional consumption (see e.g. Frank 1999 (Chapter 9), who quotes back from Marx 1849). While spending on a house is thought to be noticed faster than spending on most (but not all) services, large expenditures on many other goods are noticed still faster (but remember that a house typically lasts longer and that—according to four fifths of our respondents—it will eventually be noticed). Thus, to the extent that positionality requires visibility, our findings do not reject the hypothesis that housing is a positional (or status) good. As to most other goods—durable as well as nondurable—our findings suggest that they could all have a significant positional component. Furthermore, if the visibility of houses and other goods is associated with spatial proximity, our findings complement recent empirical evidence suggesting the within-neighborhood positionality of consumption (e.g. Luttmer 2005, who finds that an individual's self-reported happiness decreases with higher neighbors' incomes).

Finally, it is interesting that while our survey respondents are quicker to notice the cost of housing than related expenditures such as utilities, they are still quicker to notice goods inside the house such as furniture and appliances (`Fur`) or computers, audio, video, and musical equipment (`Ot1`). 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).

# 4 Application: Visibility and Elasticities

## 4.1 Predicting Total Expenditure Elasticities

The relationship between total expenditure and expenditure on a certain commodity—the Engel curve—is one of the most fundamental relationships in consumer theory. Yet while empirical estimation of Engel curves is neither uncommon nor new (e.g., Blundell and Duncan 1998, who provide references dating back to Working 1943), the reasons for the observed cross-commodity differences in their shapes are not well-understood. What is it that makes one commodity a luxury, another a necessity and yet another an inferior good? Put slightly differently, what are the determinants of a commodity's total expenditure elasticity?

Answers to this question typically rely on assumptions of differences in tastes for different commodities at different income levels. For example, according to Maslow's (1943) hierarchy of needs, individuals first seek to satisfy "physiological" needs, moving with increasing incomes to satisfy safety and social needs, through to the higher needs associated with self-actualization. Thus, goods that satisfy physiological needs are necessities and goods that satisfy self-actualization are luxuries.

However, lacking an empirical method to directly quantify the extent to which a given commodity satisfies each type of needs, Maslow's theory and its likes make no empirical predictions. A self-actualization commodity is predicted to be a luxury, but a commodity is regarded a self-actualization commodity rather than a physiologically-needed one *because* observed demand patterns show it to be a luxury rather than a necessity.[14] Stigler and Becker's (1977) critique applies to such circular reasoning: "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 this section we offer an alternative approach. Combining our visibility index with household expenditure data we show, empirically, that a commodity's total expenditure elasticity can be predicted by its visibility. We thus achieve, simultaneously, two aims. First, we show that cross-commodity variation in the shape of Engel curves can be empirically predicted from a *measurable property* of commodities. Second, we demonstrate how, being such a measurable property of commodities, our visibility index can be used in empirical analysis to generate new evidence.

The evidence below is purely empirical. We know of no general theory predicting a visibility-elasticity correlation. However, we show elsewhere (Heffetz 2007a) that Ireland's model outlined in §2.1 above generates a visibility-implies-luxuriousness result when it is solved for a Cobb-Douglas fundamental utility.

Analyzing the shape of the Engel curve when $f$ in equation (1) (on p. 3 above) is Cobb-Douglas, and comparing it with the standard model (the $a = 0$ case), we show there how introducing Ireland's 'signaling by consuming' component turns a standard Linear Expenditure System (LES) into a system of nonlinear Engel curves that are only asymptotically

[14] Formally, commodities that are empirically observed to have elasticities below (above) unity are *assumed* to satisfy physiological needs (self-actualization) and are postulated to enter the utility function in ways that render them necessities (luxuries).

linear. We further show in Heffetz (2007a) that for the homothetic Cobb-Douglas case

$$f(v,w) = \beta_v \log(v) + \beta_w \log(w) \tag{4}$$

total expenditure elasticities ($e_v \equiv \frac{y}{v}\frac{dv}{dy}$ and $e_w \equiv \frac{y}{w}\frac{dw}{dy}$) change in predictable ways: while in the standard no-signaling model these elasticities are constant at unity ($e_v = e_w = 1$), in the signaling version they become $e_v > 1$ and $e_w < 1$ (both asymptote towards unity as $y$ grows). In other words, visibles become luxuries and non-visibles become necessities in a homothetic Cobb-Douglas model with a conspicuous consumption component.

Back to our empirical evidence below, it should be emphasized that while the model in Heffetz (2007a) is explicit about the causal direction flowing from visibility to luxuriousness, all we show is empirical correlation between the two. One could always argue that the variation in luxuriousness found in the data is caused by factors unrelated to visibility. Furthermore, if such 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.

## 4.2 Empirical Results

Figure 2 shows nonparametric Engel curve estimates for our twenty-nine consumption categories. The estimates are based on 2002:1–2002:4 CEX extracts downloaded from Harris and Sabelhaus (2005). They are obtained using Fan's (1992) locally weighted regression (with quartic kernel) calculated at 30 total annual expenditure points between \$6,980 and \$129,549.5. This interval stretches from the first to the ninety-ninth percentile of the sample of 5,821 households for which full-year expenditure data exist.

[Figure 2 about here.]

The Engel curves in Figure 2 resemble other estimates from the literature in that they exhibit wide cross-commodity variation in their shapes (see Lewbel 2006 for a review). While some are close to linear, others are highly concave or convex. Still others alternate between linearity, concavity, and convexity at different total expenditure levels. Finally, while most are monotonically increasing, tobacco expenditures (`Cig`) and—to a much smaller extent—laundry (`Lry`) and public transportation expenditures (`Bus`), exhibit intervals of inferior good behavior.

The regressions presented in the figure can be used to construct total expenditure elasticity estimates for each commodity group at each of the 30 total annual expenditure points estimated.[15] We take each locally weighted regression to represent the households that lie in an interval centered at the estimation point, and whose length is equal to the distance between two such points. We thus assign a weight to each of the 30 local elasticities, corresponding to the (weighted) number of households in the total expenditure interval they represent. Using these weights, we calculate average elasticity for each consumption category. We do this both over the whole population, and by five quintiles.[16]

[15] Total expenditure elasticity at each such point is just the slope of the relevant regression, multiplied by total expenditure and divided by the predicted value of the dependent variable (at the estimation point).

[16] Due to the discreteness of the locally weighted regression grid, each quintile represents $20 \pm 2$ percent of the weighted household population.

Figure 3 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 (whole population) average elasticities described above. Each consumption category is shown as a circle with an area proportional to the size of the category. The rim of the circles is thick for goods and thin for services. The dashed line shows best linear fit, weighted by size.

[Figure 3 about here.]

Figure 3 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 a *luxuriousness by visibility* story. One example of a good fit is the family of vehicle-related categories. 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.

More generally, insurance schemes resemble many other services in the figure in that at a given visibility level, they have elasticities that are, on average, higher than goods with similar visibility levels. Thus, it appears that at a given visibility level, services are on average more elastic than goods. An alternative (and equivalent) reading of the figure is that at a given elasticity, services appear substantially *less* visible than goods. Below we quantify these differences in a regression setup. As to interpretations, an intuitive one would be that our visible vs. non-visible consumption allocation model could apply to allocations within expenditures on goods *separately* from allocations within expenditures on services.

Finally, expenditures on cigarettes (`Cig`)—at the bottom-right corner—seem to fit our model perversely. This suggests that our simple signaling model does not capture well the intricate social and cultural aspects of the behavior of U.S. smokers.[17]

Next, Figure 4 reproduces a minimized version of Figure 3 (in its top left corner), as well as five additional versions that correspond to five total expenditure quintiles. These versions

[17]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 U.S. 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. An alternative explanation is that smoking is currently viewed as a signal of having a self-control problem.

are instructive in that they illustrate graphically the fact that elasticities may be far from constant. Furthermore, the range within which the elasticity of each commodity varies, in turn exhibits substantial variation across commodities. Compare, for example, expenditures on contributions and charities (`Cha`) with those on laundry and dry cleaning (`Lry`), both at visibility level of 0.34 (see Table 4). While the former retains income elasticity above unity (and never too far above it) at all income levels, the latter changes from being close to perfectly inelasticitic at lower incomes (first and second quintiles) to having elasticity well above unity at higher incomes (fifth quintile).

These cross-quintile variations in elasticities, along with the related variations in the relative weight of each expenditure, translate to a substantial cross-quintile variation in the correlation between visibility and luxuriousness. As seen by the changing slope of the dashed line along quintiles in Figure 4, the overall correlation seen at the top left (or, equivalently, in Figure 3) is driven by strong correlations at the top three quintiles, especially the third and fourth.

[Figure 4 about here.]

We now turn to examine the weighted OLS regressions depicted by these dashed lines. These are reported in Table 5, in six columns that correspond to the six graphs in Figure 4. In interpreting these regressions, one should bear in mind that as they are based on only 29 observations, results may depend crucially on each expenditure. We return to this point below, when discussing robustness checks and reporting results.

[Table 5 about here.]

Panel A reports results from the regressions depicted by the dashed lines in the figure. The left-most column, column (A), corresponds to graph (A). It shows that overall—for the whole population of households and for all consumption categories—the positive correlation between visibility and luxuriousness is significant both economically and statistically. The Vindex coefficient is large and significant ($p < 0.02$), and the $R^2$ statistic shows that our visibility survey predicts a substantial 20 percent of the cross-commodity variation in luxuriousness. Columns (1)–(5), corresponding to the first through the fifth quintiles, put figures on the changing slope of the dashed lines discussed above. While no visibility-luxuriousness correlation is found at the bottom two quintiles, it is substantial at the top three. Interestingly, the correlation peaks at the fourth quintile, declining somewhat around it: while $R^2 = 0.23$ for both the third and fifth quintiles (and $p < 0.01$ for the Vindex coefficient), $R^2 = 0.36$ (and $p < 0.001$) for the fourth quintile. In other words, the overall correlation between visibility and luxuriousness in column (A) is clearly driven by the top quintiles, and especially by the fourth quintile, where more than one third of the cross-commodity variation in elasticities is explained by visibility alone.

Panel B repeats the regressions from panel A, with an added control indicating whether each commodity is a good (Service = 0) or a service (Service = 1). The reported results again verify what is seen graphically in Figure 4: controlling for visibility, the elasticities of services are substantially higher than those of goods (the average difference over the whole population is above two thirds of a unit elasticity, with $p < 0.05$ for the whole population

and for each quintile but the bottom one). Correspondingly, the addition of the Service dummy drives up both the size and the significance of the Vindex coefficient. The fit of this augmented model improves substantially, and over one third of the variation in elasticities is explained between the Vindex and the Service dummy ($R^2 = 0.35$ in column (A)). Model fit is seen to improve with income until it peaks at the fourth quintile with $R^2 = 0.49$.

It should be emphasized that as a single regressor, the Service dummy has no explanatory power: in regressions (not reported) that repeat the specifications from Panel B without the Vindex variable, both the Service coefficient and $R^2$ are virtually zero. In other words, while information regarding whether we classify a commodity as a good or a service is, in itself, uninformative regarding elasticity, the same information becomes a strong predictor of elasticity when coupled with information on the commodity's visibility. The findings in Panel B are thus consistent with a model where individuals allocate resources between visibles and non-visibles *separately* for goods and for services, as mentioned above.

**Robustness**

In order to examine how the findings above depend on each expenditure, we subjected the regressions in Table 5 to *influential analysis* (e.g. Hayashi 2000). We repeated each of the twelve regressions twenty-nine times, each time leaving a single expenditure category out of the regression. The resulting 348 regressions (not reported), each with 28 observations, allowed us to examine how results are affected by the inclusion or omission of each category. In other words, this part of the analysis offered a systematic way to examine and quantify—expenditure by expenditure and quintile by quintile—which commodities fit our luxuriousness-by-visibility narrative and which do not. We provide here a brief summary of the findings.

As suggested by Figures 3 and 4 and as discussed above, the single most important expenditure that fit our luxuriousness-by-visibility model is that on cars. Without the `Car` category, the Vindex coefficient invariably drops, rendering Panel A results insignificant. Panel B results remain significant, both economically and statistically. For the overall population (column (A), Panel B), $R^2$ drops from 0.35 to 0.23 (and the $p$-value of the Vindex coefficient drops from 0.001 to 0.037). For the third, fourth, and fifth quintiles (columns (3), (4), and (5), Panel B), $R^2$'s drop to 0.27, 0.32, and 0.29, respectively ($p$ drops to 0.012, 0.003, and 0.012). This suggests that while cars play a significant role in the visibility-luxuriousness correlation—an interesting finding in itself, as discussed above—a strong correlation remains among the other twenty-eight expenditures, once a good/service control is included. Finally, leaving out any expenditure category other than `Car` did not weaken the correlation more than trivially.

On the other hand—and, again, as suggested by the graphs and as discussed above—expenditures on tobacco (`Cig`), homeowner, fire, and property insurance (`HIn`), and life insurance (`LIn`) do not fit our narrative well. Leaving either one of them out of the regressions substantially improves the fit of the model: in column (A), $R^2$'s increase to 0.23–0.25 (Panel A) and to 0.38–0.42 (Panel B); in column (3), $R^2$'s increase to 0.25–0.26 and to 0.40–0.43; in column (4), to 0.39–0.40 and to 0.53–0.54; and in column (5), to 0.28–0.32 and to 0.50–0.54. No other category consistently influences our results more than trivially when left out.

# 5 Conclusion

*Do better-off households spend larger budget-shares on visible items?*

The contribution of this paper is twofold. First, by showing that visibility can be measured, it adds questions such as the one above to the set of questions empirical economists can legitimately ask. The ability to quantify socio-cultural aspects of commodities, of which visibility is but one, is a necessary step in economists' quest to better understand consumption. Examples of theories other than conspicuous consumption that could benefit from a measure of visibility are given in the Introduction. There are many others. To the extent that individuals rarely live in social isolation, consumption and other domains of economic behavior can be said to be 'always and everywhere' a socio-cultural phenomenon.

Second, having developed a method to create the visibility index as a new empirical tool, this paper carries out the other necessary steps that culminate in an attempt to empirically answer one question (the one above) in one specific context (the U.S.). The main finding—that a strong correlation between visibility and elasticity does hold in our data, but only for the top (and especially the fourth) quintiles—may be interpreted in several ways. One interpretation suggests that the social effects that underlie the correlation are only economically significant at higher (either absolute, or relative) income levels. Another is that the relevant social groups one should study are smaller than the whole nation.

Interestingly, the hypothesis that higher-budget households spend larger budget-shares on conspicuous consumption did not necessarily seem intuitive to Veblen. Although focusing on the Leisure Class, he wrote of "pretence of pecuniary decency" through conspicuous consumption as a "need", common to to all classes of humanity: "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" (1899, 85–86). The tools developed in this paper allow us to confront this and similar claims with empirical evidence.

Finally, our paper offers a number of possibilities for future research. One is applying our survey instrument to other classes and other countries (we are currently conducting a visibility survey among several hundred Native Amazonians in Bolivia, in a social, cultural, and economic context that is very different from that of U.S. households). Others include both developing these and other visibility-related theories in order to derive their empirical predictions, and using our visibility data to explore them.

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# Appendix A

## The Construction of Consumption Categories

The forty-seven H&S categories (see footnote 6, p. 7) 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). Asking respondents about expenditures that are zero for most households would have been unnecessarily wasteful. 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. With these two issues in mind, 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.[18] 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.

### 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

[18] Other years seemed to produce similar results.

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 B

## Inter-column Comparability in Table 2 and Related Issues

When comparing our survey respondents' demographics to the figures reported in the Census column in Table 2, a few points should be borne in mind. First, our visibility survey was conducted in 2004–2005, while Census figures are for 2000. However, as these demographics typically change only slowly over time, they should be closely comparable.[19]

Second, since our visibility survey was aimed at a representative sample of the adult US population, we attempted to randomly select one eligible respondent from each household contacted.[20] 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. To the extent that the demographics of the chosen household members systematically differ from those of the Census population, one should not expect the relevant rows in the table to match exactly.

Third, an important issue in applying Ireland's (1994) signaling-by-consuming model to the real world relates to the identity of our model's agents. While the 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. While surveying the vast literature studying this subject is beyond the scope of this paper, it should be noted that the demographics in the Census column are not necessarily those of the typical signal-sender.

Fourth, regarding the *receiving* side of the signaling model, a question arises as to whose opinions those signals are meant to influence. The 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 consumers hope to impress by

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

[20]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.

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 one's attempt to impress members of demographic groups that might be considered more socially desirable than one's own, or, similarly, attempts to impress members of the opposite sex. In such cases, even if we know the identity of those who make consumption decisions on the signal-sending side, it is not clear that their demographics should be expected to match those of the relevant survey respondents.

Finally, we note that this Appendix is aimed at a general discussion of the above technical and theoretical issues. In practice, for the analysis carried out in the present paper, they might be of limited relevance. (For example, the empirical evidence presented in Section 4, which is based on aggregate survey results, holds whether or not the columns in Table 2 are comparable.)

Table 1: Consumption Categories

| | |
|---|---|
| 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 2: Respondent Demographics

| | Visibility Survey | | | Census |
|---|---|---|---|---|
| | Observations[a] | Value | (S.E.) | Value |
| *Mean values:* | | | | |
| Age | 467 | 46.6 | (0.7) | |
| Household size[b] | 475 | 2.9 | (0.1) | 2.6 |
| Children under 18 in household | 475 | 0.8 | (0.1) | 0.7 |
| *Percent distribution:* | | | | |
| Female | 479 | 64.3 | (2.2) | 50.9 |
| Black | 467 | 13.5 | (1.6) | 12.3 |
| Hispanic | 474 | 6.1 | (1.1) | 12.5 |
| Married[c] | 473 | 55.4 | (2.3) | 54.4 |
| Employed[d] | 473 | 63.2 | (2.2) | 63.4 |
| Education:[e] | 474 | | | |
| Elementary (0-8) | | 2.1 | (0.7) | 7.5 |
| High school (9-12) | | 22.2 | (1.9) | 40.7 |
| College (13-16) | | 53.6 | (2.3) | 42.8 |
| Graduate school (17 or more) | | 22.2 | (1.9) | 8.9 |
| Total household income: | 388 | | | |
| Less than $20,000 | | 13.4 | (1.7) | 22.1 |
| $20,000 to $40,000 | | 21.1 | (2.1) | 25.3 |
| $40,000 to $60,000 | | 19.3 | (2.0) | 19.7 |
| $60,000 to $100,000 | | 28.1 | (2.3) | 20.6 |
| $100,000 or more | | 18.0 | (2.0) | 12.3 |
| Region: | 479 | | | |
| Northeast | | 20.5 | (1.8) | 19.0 |
| Midwest | | 24.0 | (2.0) | 22.9 |
| South | | 39.7 | (2.2) | 35.6 |
| West | | 15.9 | (1.7) | 22.5 |

**Sources:** author's visibility survey; Census (2000). See Appendix B for inter-column comparability issues.

[a]Number of respondents reporting demographic characteristic (out of a total of 480 respondents).
[b]Top-coded at 8 (in visibility survey).
[c]In Census: marital status of population 15 years and over.
[d]In Census: employment status of population 16 years and over (civilian labor force).
[e]In Census: educational attainment of population 25 years and over.

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) | 11.9 | 27.7 | 27.7 | 16.7 | 14.8 | 0.8 | 0.4 |
| FdO (food out) | 15.0 | 41.7 | 24.2 | 9.8 | 7.9 | 1.0 | 0.4 |
| Cig (cigarettes) | 46.7 | 32.9 | 6.0 | 4.0 | 9.2 | 1.0 | 0.2 |
| AlH (alcohol home) | 22.9 | 32.9 | 18.8 | 12.3 | 11.9 | 1.0 | 0.2 |
| AlO (alcohol out) | 20.8 | 30.2 | 24.6 | 11.5 | 11.5 | 1.5 | 0.0 |
| Clo (clothing) | 33.8 | 37.5 | 12.5 | 9.2 | 6.5 | 0.4 | 0.2 |
| Und (underwear) | 4.0 | 3.1 | 4.4 | 16.0 | 71.0 | 1.5 | 0.0 |
| Lry (laundry) | 7.9 | 15.4 | 17.1 | 20.2 | 37.5 | 1.7 | 0.2 |
| Jwl (jewelry) | 35.4 | 27.3 | 16.0 | 10.8 | 9.4 | 0.8 | 0.2 |
| Brb (barbers etc) | 19.6 | 33.5 | 22.9 | 12.1 | 10.2 | 1.3 | 0.4 |
| Hom (rent/home) | 17.5 | 22.9 | 18.3 | 19.4 | 19.6 | 1.7 | 0.6 |
| Htl (hotels etc) | 8.1 | 25.0 | 26.0 | 22.7 | 17.3 | 0.6 | 0.2 |
| Fur (furniture) | 25.6 | 40.2 | 19.6 | 9.4 | 4.4 | 0.4 | 0.4 |
| Utl (home utilities) | 9.0 | 14.0 | 12.7 | 21.0 | 42.1 | 1.3 | 0.0 |
| Tel (home phone) | 7.9 | 11.7 | 15.6 | 19.4 | 44.0 | 1.3 | 0.2 |
| Cel (cell phone) | 15.0 | 25.0 | 17.3 | 15.4 | 26.5 | 0.8 | 0.0 |
| HIn (home insur.) | 4.2 | 5.2 | 7.3 | 20.2 | 62.1 | 0.8 | 0.2 |
| Med (health care) | 5.8 | 17.3 | 20.8 | 27.9 | 27.5 | 0.6 | 0.0 |
| Fee (legal fees) | 3.3 | 9.6 | 15.8 | 29.0 | 39.8 | 2.3 | 0.2 |
| LIn (life insur.) | 2.3 | 4.2 | 9.2 | 23.8 | 59.2 | 1.5 | 0.0 |
| Car (cars) | 34.6 | 36.7 | 17.3 | 7.1 | 4.2 | 0.0 | 0.2 |
| CMn (car repair) | 7.7 | 20.6 | 25.8 | 23.1 | 22.1 | 0.4 | 0.2 |
| Gas (gasoline) | 10.2 | 20.4 | 16.9 | 17.7 | 33.1 | 1.5 | 0.2 |
| CIn (car insur.) | 4.8 | 10.6 | 9.2 | 20.0 | 54.4 | 1.0 | 0.0 |
| Bus (public trans.) | 10.2 | 22.7 | 22.1 | 19.6 | 22.3 | 2.7 | 0.4 |
| Air (air travel) | 7.3 | 26.9 | 26.7 | 18.8 | 18.8 | 1.0 | 0.6 |
| Bks (books etc) | 14.4 | 32.9 | 27.9 | 14.6 | 9.4 | 0.4 | 0.4 |
| Ot1 (recreation 1) | 23.3 | 40.0 | 21.5 | 8.3 | 6.5 | 0.4 | 0.0 |
| Ot2 (recreation 2) | 14.4 | 36.0 | 25.0 | 12.9 | 10.4 | 0.6 | 0.6 |
| Edu (education) | 14.2 | 33.5 | 24.4 | 14.4 | 11.7 | 1.5 | 0.4 |
| Cha (charities) | 6.5 | 15.0 | 20.6 | 23.5 | 33.3 | 0.6 | 0.4 |
| Total | 15.0 | 24.3 | 18.5 | 16.5 | 24.5 | 1.0 | 0.2 |

**Source:** author's visibility survey (480 respondents).

Table 4: Visibility Indices and Rankings

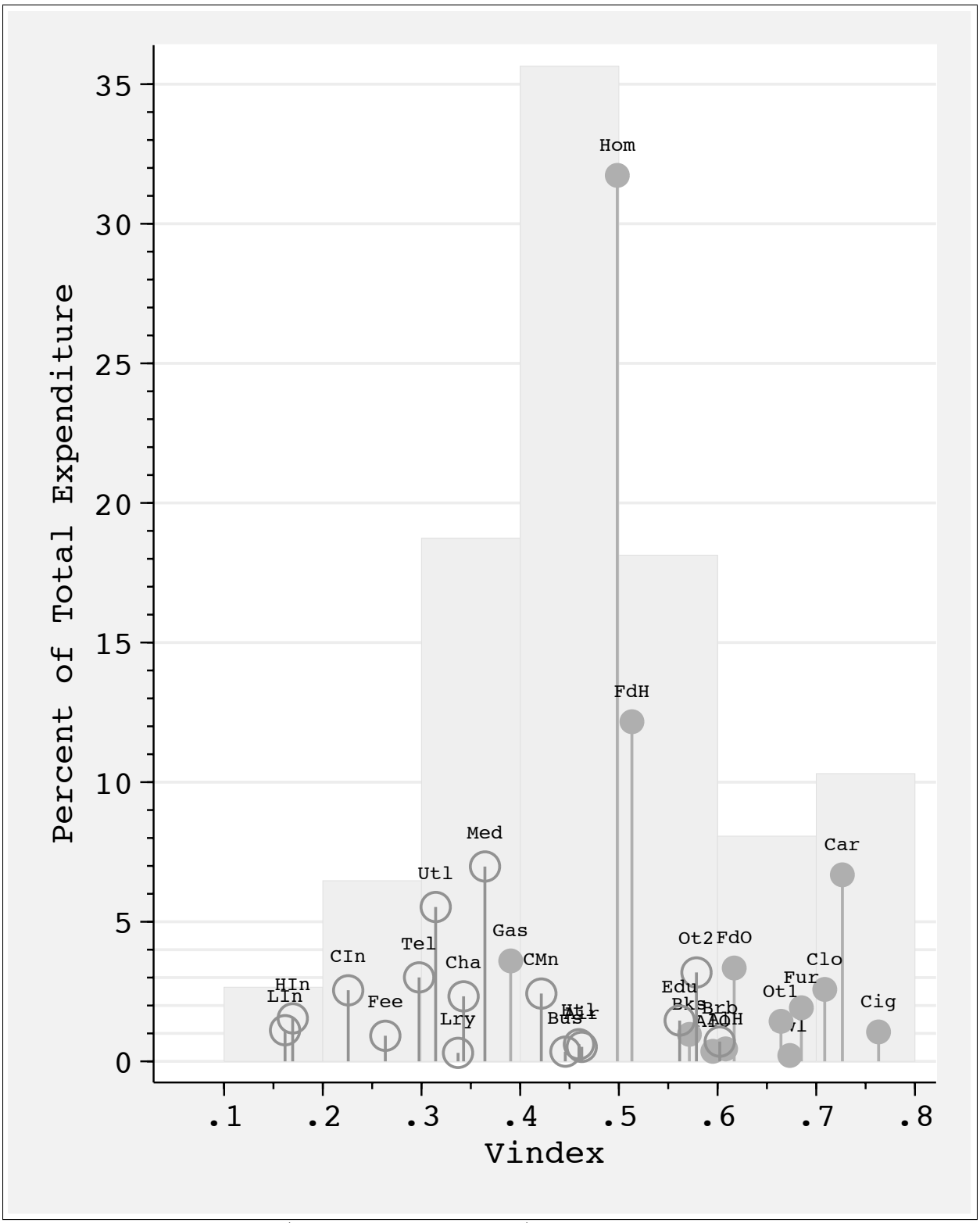
| Category | Normalized Mean | | | Response 1 or 2 | | | Response 4 or 5 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Index | (S.E.) | [Rank] | Index | (S.E.) | [Rank] | Index | (S.E.) | [Rank] |
| Cig (cigarettes) | 0.76 | (0.01) | [ 1] | 0.81 | (0.02) | [ 1] | 0.87 | (0.02) | [ 2] |
| Car (cars) | 0.73 | (0.01) | [ 2] | 0.71 | (0.02) | [ 3] | 0.89 | (0.01) | [ 1] |
| Clo (clothing) | 0.71 | (0.01) | [ 3] | 0.72 | (0.02) | [ 2] | 0.84 | (0.02) | [ 5] |
| Fur (furniture) | 0.68 | (0.01) | [ 4] | 0.66 | (0.02) | [ 4] | 0.86 | (0.02) | [ 3] |
| Jwl (jewelry) | 0.67 | (0.02) | [ 5] | 0.63 | (0.02) | [ 6] | 0.80 | (0.02) | [ 7] |
| Ot1 (recreation 1) | 0.66 | (0.01) | [ 6] | 0.64 | (0.02) | [ 5] | 0.85 | (0.02) | [ 4] |
| FdO (food out) | 0.62 | (0.01) | [ 7] | 0.58 | (0.02) | [ 7] | 0.82 | (0.02) | [ 6] |
| AlH (alcohol home) | 0.61 | (0.01) | [ 8] | 0.57 | (0.02) | [ 8] | 0.76 | (0.02) | [12] |
| Brb (barbers etc) | 0.60 | (0.01) | [ 9] | 0.54 | (0.02) | [ 9] | 0.77 | (0.02) | [ 8] |
| AlO (alcohol out) | 0.60 | (0.01) | [10] | 0.52 | (0.02) | [10] | 0.77 | (0.02) | [ 9] |
| Ot2 (recreation 2) | 0.58 | (0.01) | [11] | 0.51 | (0.02) | [11] | 0.76 | (0.02) | [10] |
| Bks (books etc) | 0.57 | (0.01) | [12] | 0.48 | (0.02) | [13] | 0.76 | (0.02) | [11] |
| Edu (education) | 0.56 | (0.01) | [13] | 0.49 | (0.02) | [12] | 0.73 | (0.02) | [13] |
| FdH (food home) | 0.51 | (0.01) | [14] | 0.40 | (0.02) | [16] | 0.68 | (0.02) | [14] |
| Hom (rent/home) | 0.50 | (0.02) | [15] | 0.41 | (0.02) | [14] | 0.60 | (0.02) | [16] |
| Cel (cell phone) | 0.47 | (0.02) | [16] | 0.40 | (0.02) | [15] | 0.58 | (0.02) | [18] |
| Air (air travel) | 0.46 | (0.01) | [17] | 0.35 | (0.02) | [17] | 0.62 | (0.02) | [15] |
| Htl (hotels etc) | 0.46 | (0.01) | [18] | 0.33 | (0.02) | [19] | 0.60 | (0.02) | [17] |
| Bus (public trans.) | 0.45 | (0.02) | [19] | 0.34 | (0.02) | [18] | 0.57 | (0.02) | [19] |
| CMn (car repair) | 0.42 | (0.01) | [20] | 0.29 | (0.02) | [21] | 0.55 | (0.02) | [20] |
| Gas (gasoline) | 0.39 | (0.02) | [21] | 0.31 | (0.02) | [20] | 0.48 | (0.02) | [21] |
| Med (health care) | 0.36 | (0.01) | [22] | 0.23 | (0.02) | [23] | 0.44 | (0.02) | [22] |
| Cha (charities) | 0.34 | (0.01) | [23] | 0.22 | (0.02) | [25] | 0.43 | (0.02) | [23] |
| Lry (laundry) | 0.34 | (0.02) | [24] | 0.24 | (0.02) | [22] | 0.41 | (0.02) | [24] |
| Utl (home utilities) | 0.31 | (0.02) | [25] | 0.23 | (0.02) | [24] | 0.36 | (0.02) | [25] |
| Tel (home phone) | 0.30 | (0.02) | [26] | 0.20 | (0.02) | [26] | 0.36 | (0.02) | [26] |
| Fee (legal fees) | 0.26 | (0.01) | [27] | 0.13 | (0.02) | [28] | 0.29 | (0.02) | [27] |
| CIn (car insur.) | 0.23 | (0.01) | [28] | 0.16 | (0.02) | [27] | 0.25 | (0.02) | [28] |
| HIn (home insur.) | 0.17 | (0.01) | [29] | 0.09 | (0.01) | [29] | 0.17 | (0.02) | [29] |
| LIn (life insur.) | 0.16 | (0.01) | [30] | 0.07 | (0.01) | [31] | 0.16 | (0.02) | [30] |
| Und (underwear) | 0.13 | (0.01) | [31] | 0.07 | (0.01) | [30] | 0.12 | (0.01) | [31] |

**Source:** author's visibility survey (480 respondents).

Table 5: Elasticity and Visibility

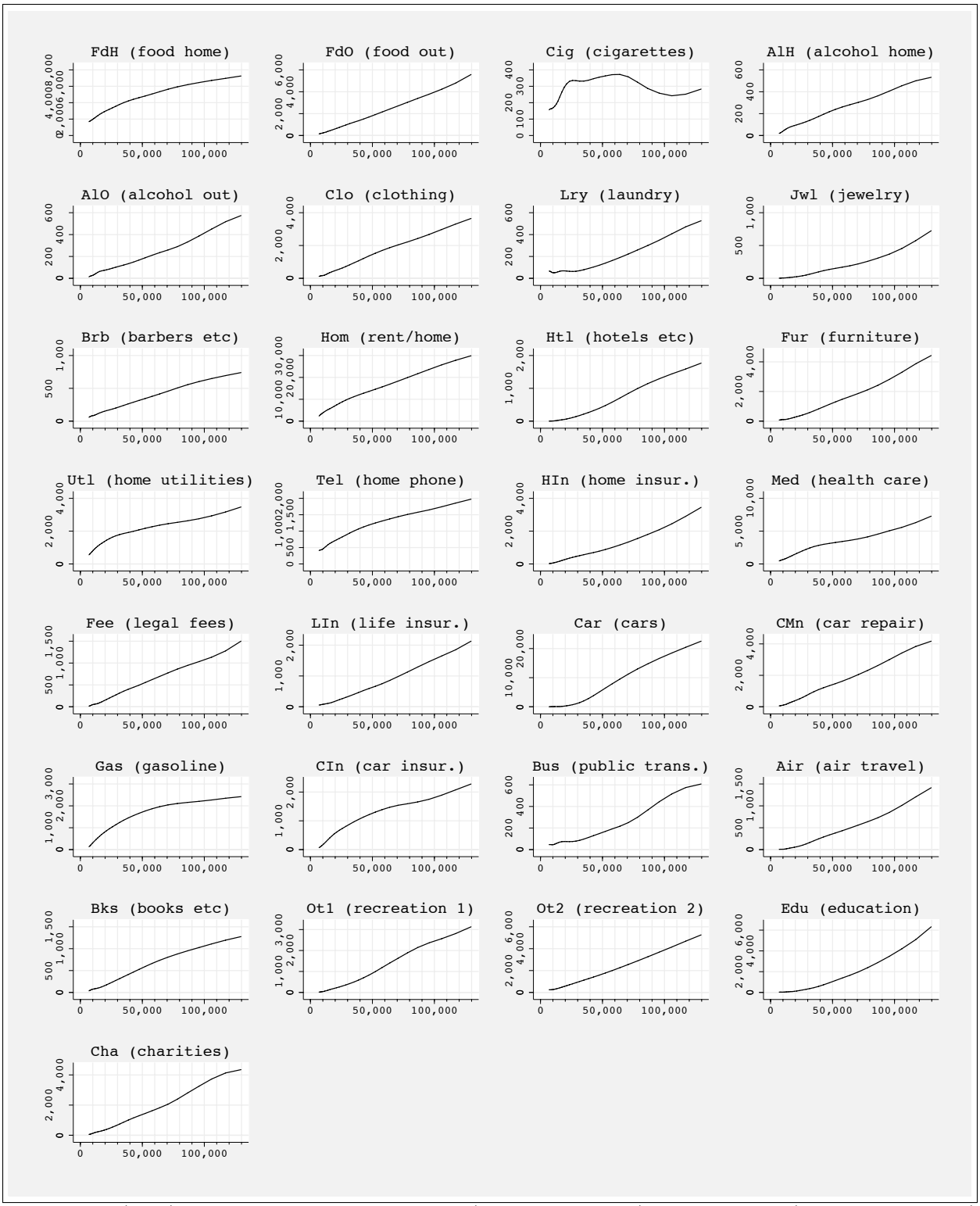
| | (A) | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| | All households | 1st quintile | 2nd quintile | 3rd quintile | 4th quintile | 5th quintile |
| Panel A | | | (No Controls) | | | |
| Vindex | 2.11** | -0.01 | 1.19 | 2.51*** | 2.86*** | 1.37*** |
| | (0.81) | (0.72) | (0.83) | (0.89) | (0.74) | (0.48) |
| Constant | 0.02 | 1.01*** | 0.44 | -0.21 | -0.42 | 0.30 |
| | (0.41) | (0.35) | (0.40) | (0.45) | (0.38) | (0.26) |
| Observations | 29 | 29 | 29 | 29 | 29 | 29 |
| $R^2$ | 0.20 | 0.00 | 0.07 | 0.23 | 0.36 | 0.23 |
| Panel B | | | (Service/Good Control Included) | | | |
| Vindex | 3.67*** | 0.96 | 2.70** | 4.24*** | 4.39*** | 2.47*** |
| | (0.98) | (0.97) | (1.05) | (1.09) | (0.88) | (0.54) |
| Service | 0.68** | 0.36 | 0.60** | 0.75** | 0.71** | 0.54*** |
| | (0.28) | (0.24) | (0.28) | (0.31) | (0.27) | (0.17) |
| Constant | -0.97* | 0.44 | -0.48 | -1.30** | -1.42** | -0.45 |
| | (0.55) | (0.52) | (0.57) | (0.61) | (0.51) | (0.32) |
| Observations | 29 | 29 | 29 | 29 | 29 | 29 |
| $R^2$ | 0.35 | 0.08 | 0.21 | 0.37 | 0.49 | 0.44 |

**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 2002:1–2002:4 CEX extracts from Harris and Sabelhaus (2005). Regressor: Vindex (second column of Table 4), based on author's visibility survey; see Table 4 for standard errors. Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.



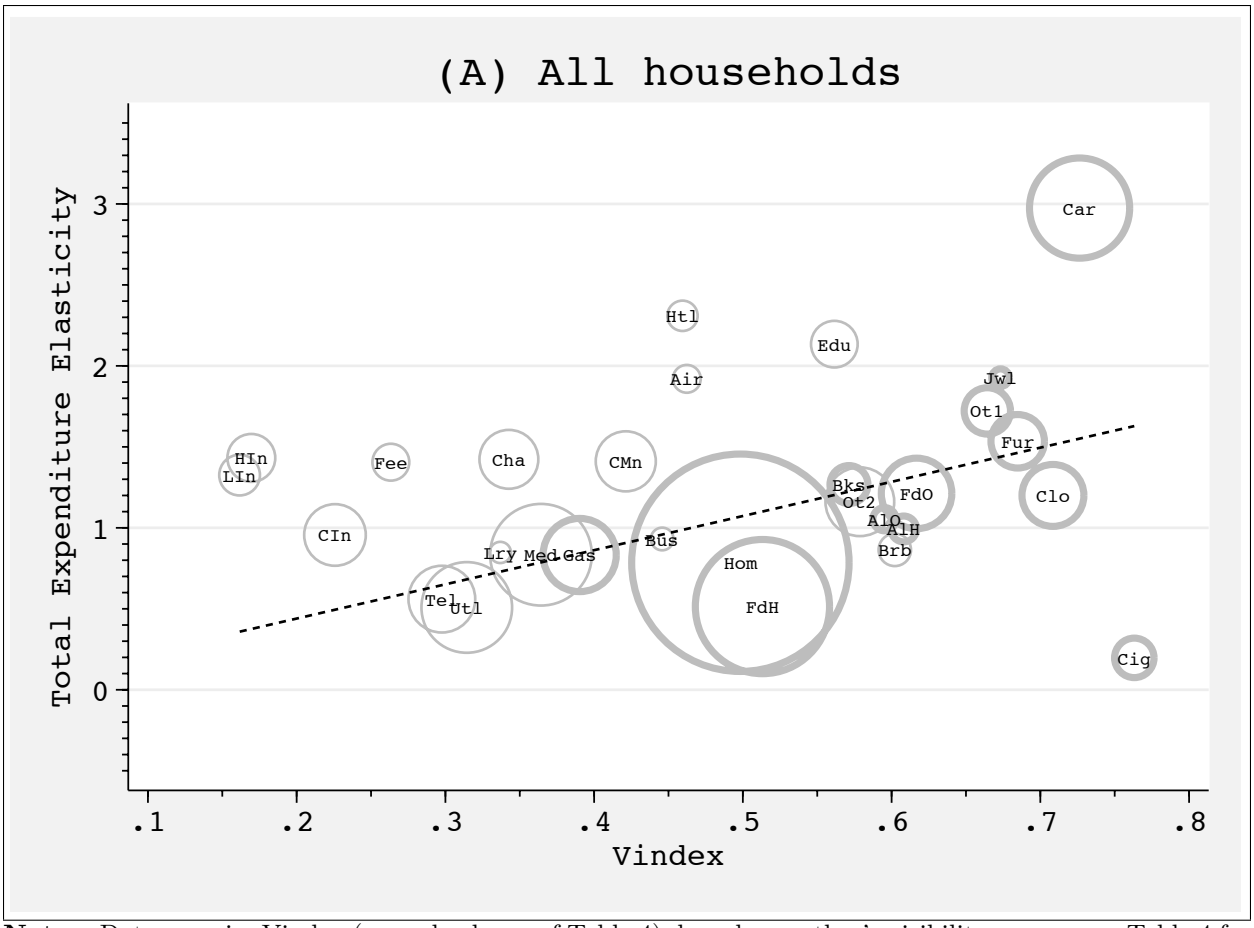

**Notes:** Data: x-axis: Vindex (second column of Table 4), based on author's visibility survey; see Table 4 for standard errors. y-axis: 2002:1–2002:4 CEX extracts from Harris and Sabelhaus (2005).

Figure 1: Consumer Expenditures and Visibility



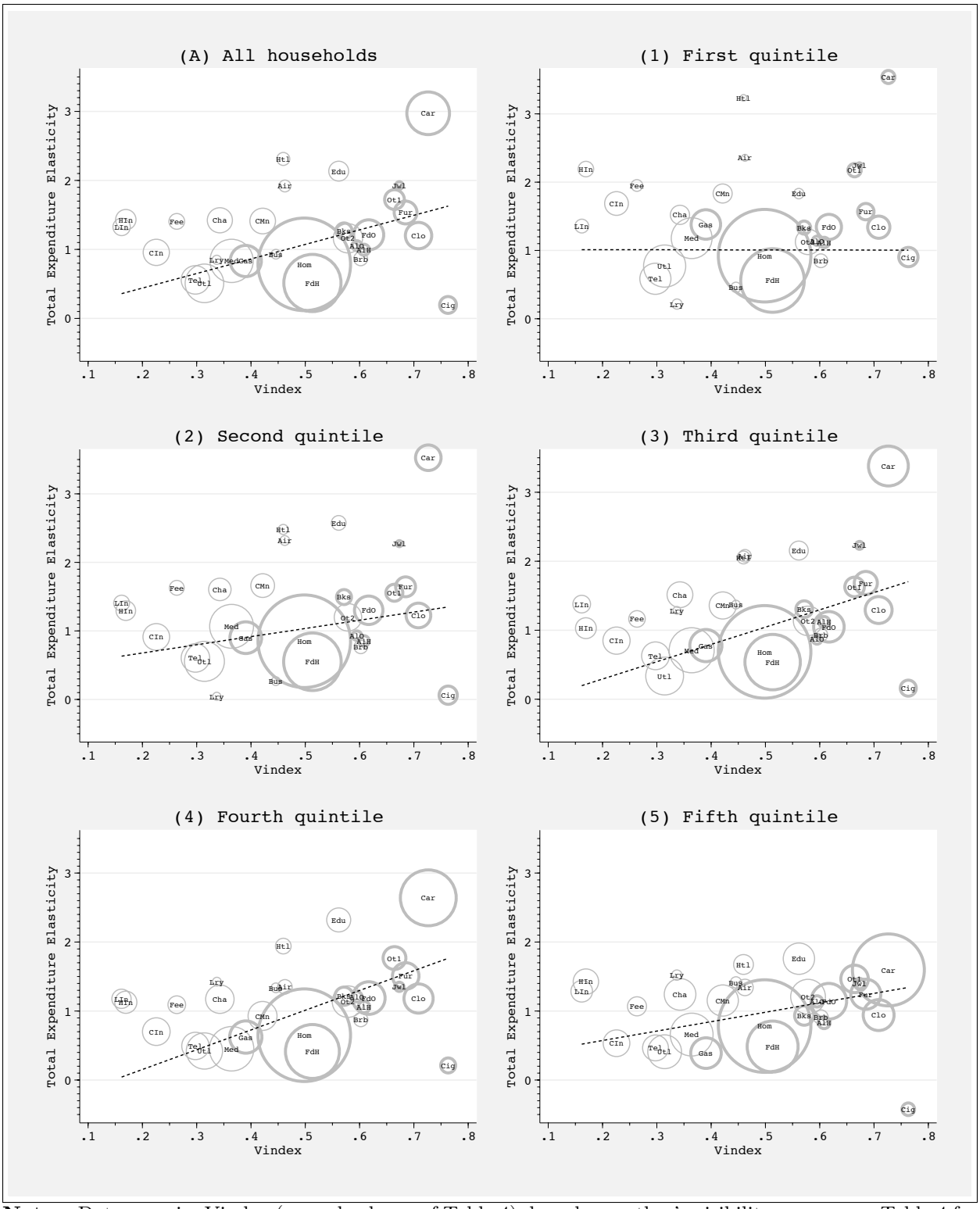

**Notes:** Fan (1992) regressions with quartic kernel (see details in text). Expenditures (both x- and y-axes) are in US$. Data: 2002:1–2002:4 CEX extracts from Harris and Sabelhaus (2005).

Figure 2: Engel Curves




**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 2002:1–2002:4 CEX extracts from Harris and Sabelhaus (2005). See details in text. Area of circles is proportional to category size. Dashed line: OLS, weighted by size.

Figure 3: Visibility and Elasticity – All Households




**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 2002:1–2002:4 CEX extracts from Harris and Sabelhaus (2005). See details in text. Within each graph, area of circles is proportional to category size. Across graphs, `Hom` category circle is normalized to an equal size. Dashed lines: OLS, weighted by size.

Figure 4: Visibility and Elasticity – All Households and By Quintiles