

Online grocery shopping in Catalonia: How non-targeted surveys can miss the mark

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Abstract

Purpose: The goal of the present methodological note is to show that surveys which are not targeted at primary grocery shoppers risk substantially underestimating the uptake of e-grocery services. Research based on such data is also liable to mismeasure the impact of explanatory variables.

Design/methodology/approach: Data of Tuneu, Tarrats and Arimany-Serrat's (2023) recent survey among Catalanian consumers are repurposed. Importantly, Tuneu et al.'s survey did not require respondents to be the primary grocery shopper of their household. The present study first calculates the penetration rate of e-grocery services for the sample *as is* (something, to be clear, the original article does not do). Based on a novel proxy, the study then filters out the non-primary shoppers and recalculates the penetration rate. Correlations between key constructs are also recomputed.

Findings: After the proposed correction, the penetration rate of e-grocery services is 7.3-10.3 percentage points higher. As for the factors influencing adoption, correlation coefficients can be up to six times higher.

Research limitations/implications: Albeit an improvement over extant research, the primary grocery shopper proxy remains a proxy. Also, the approach still requires some of the same assumptions found in earlier articles, namely that all households have a primary shopper, and that many non-primary shoppers will respond to the survey as individuals – rather than as a member of their household.

Practical implications: The takeaway for researchers is that one should explicitly consider the household nature of grocery shopping. Concretely, consumer surveys should either target individuals responsible for a substantial part of the household's grocery purchases or explicitly ask respondents to answer on behalf of their household.

Originality/value: Compared to extant research, the method used in this note requires less bold assumptions and produces more precise estimates of the bias involved. It may also provide a way to recalculate, and thus salvage, estimates proffered by earlier studies.

Keywords: Online grocery shopping, Catalonia, Household division of labour, Survey research, Sampling strategy

Jel Codes: L81, L66, D13

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1. Introduction

In two recent papers, Van Hove (2023, 2024) argues that surveys which are not targeted at so-called primary grocery shoppers (individuals who are responsible for most of the grocery shopping of their household) risk underestimating the adoption of online grocery services. Van Hove also presents estimates of the extent of this bias in two prior studies. However, these estimates are, as Van Hove admits, imprecise. One obvious reason – albeit not the only one – is that, given the design of the surveys, it is impossible to determine which respondents are primary shoppers, and which are not. Hence, assumptions are needed as to how households divide the grocery shopping.

In a recent article in this journal, Tuneu et al. (2023) examine the uptake of online grocery shopping in Catalonia during the COVID-19 pandemic. Tuneu et al. do not present any estimates of the magnitude of the impact. Instead, they focus on how constructs such as subjective norm, perceived risk, and others correlate with intention to use. However, the data collected by Tuneu et al. – which were gracefully provided by the authors – do make it possible to substantially improve upon Author's simulations. This is because one of Tuneu et al.'s survey questions can be used to proxy respondents' involvement in grocery shopping.

This novel proxy lies at the core of this note's contribution, as it allows to filter out the non-primary shoppers and thereby avoid some of the strong assumptions employed in prior research by Van Hove (2023, 2024). The new method produces more precise estimates of the bias identified by Van Hove. It may also provide a way to recalculate, and thus salvage, estimates proffered by earlier studies.

The remainder of the note is structured as follows. Section 2 first provides the necessary details about Tuneu et al.'s research. Subsequently, Section 3 summarises Van Hove's critique and Section 4 uses Tuneu et al.'s data to come up with a better estimation. Section 5 concludes.

2. Tuneu et al.'s Research

In their article, Tuneu et al. (2023) report on a survey conducted in the first half of 2021. The goal was “to collect the opinion of Catalan people” on the online purchase of groceries during the pandemic (Tuneu et al., 2023: page 478). The data collection approach was fairly atypical, in that the questionnaire was not sent directly to consumers, but rather to the contact e-mail address of 25 companies, with a request for the survey to be completed by their employees. The companies were selected from the SABI (Iberian Balance Sheet Analysis System) database, with the following filters: small and medium-sized companies, based in Catalonia, in active status, and with NACE code 5211 (Retail sale in non-specialised stores with food, beverages or tobacco predominating).

The authors received 238 reactions, of which 211 were retained after eliminating duplicates and incomplete responses. Descriptive statistics can be found in Tuneu et al.'s Table 4 (Tuneu et al., 2023: pages 482-483). As the authors point out when listing the limitations of their research (Tuneu et al., 2023: page 489), the sample is not representative. In light of the survey's distribution method, it is unsurprising that older people are underrepresented, and that 88.6% are employed or self-employed.

Importantly, maybe precisely because the sample is not representative, Tuneu et al. do not proffer any numbers concerning the adoption or use of online grocery shopping among their respondents. Rather they are interested in how constructs such as subjective norm, perceived risk, enjoyment, etc. affect respondents' intention to use, and how intention ultimately drives usage behaviour.

Even though Tuneu et al.'s research goals thus lie elsewhere, their data nevertheless allow to better underpin Van Hove's (2023, 2024) critique concerning a substantial part of the empirical research on online grocery shopping.

3. Van Hove's Critique

The essence of Van Hove's (2023, 2024) argument is straightforward. A first observation is that surveys which do not explicitly require respondents to be the primary grocery shopper of their household are liable to end up with a sample that comprises a substantial share of what one could call 'secondary shoppers' (household members who do take part in the grocery shopping but who are responsible for less than half) and even non-shoppers. This is especially true when the sample is representative, or made representative, of the general

population in terms of gender; see Van Hove (2024, Table 3c) for examples. The reason is that in many countries the grocery shopping is still today mostly carried out by a female member of the household (Van Hove, 2024, Table 3d). Hence, in a gender-balanced sample of the general population, many of the men – and some of the women – will have only marginal involvement in the grocery shopping, or even none at all.

If, then, a survey asks these respondents whether they themselves buy groceries online, they may well answer ‘no’, even when their partner/household in fact does. In other words, there is a danger of false negatives and, thus, a risk of underestimating adoption.

As Van Hove (2024) points out, the problem can be avoided by asking respondents to answer on behalf of their household. Van Hove also provides examples of studies that do just that; however, numerous others do not. Tuneu et al.’s paper falls in the second group. For their Usage behaviour variable, they simply ask: “How often do *you* use online supermarkets?”, “How many hours do *you* use online supermarkets each month?”, etc. (Tuneu et al., 2023: page 496; emphasis added). Items of other scales are phrased in the first person; see, for example, this item for Perceived risk: “I am concerned with the quality of the products delivered when ordering from online grocery shopping” (Tuneu et al., 2023: page 495).

Van Hove’s remarks obviously beg the question how big the underestimation might be. Van Hove (2023, 2024) tries to calculate this for, respectively, studies by Wang, Kim, Holguín-Veras and Schmid (2021) for the US and Choi, Jang and Choi (2022) for South Korea. However, as Van Hove admits, these calculations are rough – for a number of reasons.

For one, the problem signalled above, by definition, does not occur in one-adult households. Unfortunately, without access to the raw data, the share of these households can typically not be determined (Van Hove, 2023: page 3; Van Hove, 2024). This is why Van Hove (*ibid.*) writes that, at least from this perspective, his estimates should be read as an upper bound of the mismeasurement of adoption.

Second, the calculations necessitate rather strong assumptions. This can be demonstrated based on Van Hove’s (2023) simulations for the Wang et al. (2021) article, reproduced in Table 1 below. A first step in the calculation consisted in separating the adopters in Wang et al.’s sample (374) from the non-adopters (541). This is done because for adopters the most sensible assumption is that respondents have answered the question correctly; that is, that there are no false positives. Subsequently, column (1) computes the number of non-adopters per gender. The next step is then to determine the probability that a given respondent is the primary grocery shopper of their household. This is where a first (seemingly strong) assumption is needed, based on information from another source than the study at hand. Based on an earlier overview of studies that, unlike Wang et al., do target primary shoppers (Van Hove, 2022: pages 252-253), Van Hove (2023) sets this probability at 65% for women and (thus) 35% for men; see column (2).

Even though Van Hove demonstrates that the final outcome of Table 1 is not very sensitive to this choice, this is clearly a step in the calculations where improvements would be welcome. Indeed, there is ample evidence that the gender division of grocery shopping can vary markedly between countries. For example, Van Hove (2024) points out that for the case of Korea the 65% for women appears conservative.

With the probabilities selected in column (2), column (3) then calculates the number of male and female non-primary shoppers among the non-adopters. Columns (4) and (5) tag these as ‘wrong’ respondents, in that they should not have been queried about their adoption of e-grocery services. As explained, this is where the danger of false negatives emerges.

To gauge this probability, a second assumption is needed. Van Hove (2023) again uses an external piece of information, namely the proportion of new adopters as measured by another survey for the same country (the US), conducted at almost the same point in time, and – crucially – a survey that did target primary food shoppers. Concretely, the 19.4% in column (6) comes from Jensen, Yenerall, Chen and Yu (2021). This is not to say that Jensen et al. is perfect as a benchmark. There is, for example, a difference in time frame: Jensen et al. ask about use during the month of June 2020, whereas Wang et al. (2021: page 273) measure adoption between March and May/June; that is, over a period of three-four months.

Non-adopters	Primary grocery shopper?		'Wrong' respondent		New adopter?		False negative	
	Split	Number	Number	% of non-adopters	Split	Number	Number	% of non-adopters
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
♂ 249	yes, 35%	87						
	no, 65%	162	162	30%	yes, 19.4%	31	31	5.8%
♀ 292	yes, 65%	190			no, 80.6%	131		
	no, 35%	102	102	19%	yes, 19.4%	20	20	3.6%
					no, 80.6%	82		
541		541	264	49%		264	51	9.4%

Table 1. Mismeasurement of new adoption of grocery deliveries in Wang et al. (Van Hove, 2023)

A drawback of the approach is also that an adequate point of comparison may simply not exist. Van Hove (2024) uses a probability taken from the very study that he criticises – for lack of a better estimate (for Korea). As shown in the next section, the Tuneu et al. data make it possible to come up with a better yardstick – not just for this step, but also for the first assumption, in column (2).

To wrap up the present section, it is important to mention that the simulation in Table 1 ultimately indicates, in columns (8)-(9), that there might be as many as 51 false negatives on a total of 541 non-adopters (or 9.4%), and that Wang et al. would thus underestimate new adoption by 5.6 percentage points (51/915) – if all households were dual-adult and if all households have a primary shopper. Where the Choi et al. (2022) paper is concerned, Van Hove (2024) puts the potential underestimation at 7.6 percentage points.

4. A Better Estimation of the Bias

As alluded to earlier, Tuneu et al.'s data allow for a better test of Van Hove's critique. This is because (1) singles can be removed, and (2) Tuneu et al.'s questionnaire provides an indication, albeit rough, of respondents' involvement in the grocery shopping for the household.

Figure 1 illustrates the approach in detail. As can be seen, the first step consisted in data cleaning. For one, three respondents who are younger than 18 were removed, as they are unlikely to be primary grocery shoppers. Their removal also increases the comparability with extant studies, which typically consider only adults. The second step consisted in checking whether respondents' answers were consistent. For example, it was verified that respondents who answered 'never' for the third item of the Usage behaviour scale (UB3: "How often do you use online supermarkets?") also had a low score for the first item of the 'Covid and online grocery' scale (CAOG1: "During the Covid-19 I bought more groceries online"). For CAOG, respondents were asked to score the statements on a 7-point Likert scale, ranging from strongly disagree to strongly agree, so scores higher than 4 – scores indicating agreement with the statement – were deemed inconsistent for non-users. This proved to be the case for six respondents, which were eliminated.

Next, single-person households (hh) were separated from the rest, as the former are, by definition, primary grocery shoppers – implying that for this group the adoption rate of e-grocery services will have been measured correctly. Ideally, one should single out single-*adult* households (pun intended), but with Tuneu et al.'s data this proved impossible. For example, a respondent who identifies as separated/divorced and is part of a household with two or more members may well be the only adult but might also be living with a new partner (or even with one or both parents).

In the following step, users of e-grocery services were identified – the assumption being, in line with the explanation in the previous section, that for users there is no danger of mismeasurement. The separation of the non-users from the users was done based on respondents' answers to the question on the frequency of use of online supermarkets (UB3; see above). Concretely, respondents who answered 'never' were considered non-users.

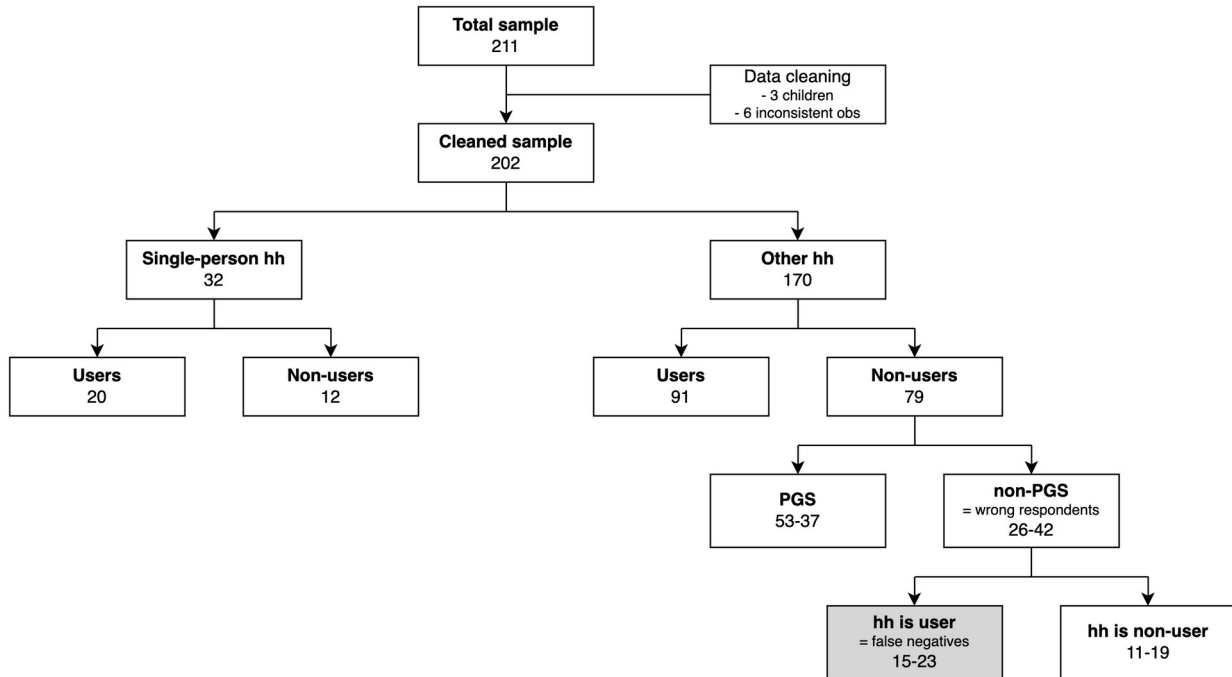


Figure 1. Estimation of number of non-primary grocery shoppers in Tuneu et al.'s sample

Note that, within the cleaned sample of 202, there are $20 + 91 = 111$ users, or 55%. This is clearly a high penetration rate. In a survey conducted in November 2021 among 6,750 consumers in 12 European countries, 33% of Spanish consumers indicated they had shopped for groceries online (InternetRetailing & Salesforce, 2022: page 9). And according to Eurostat (2024) statistics for 2021, only 11.18% of the Spanish population had bought food or beverages online in the previous three months. However, one should take into account that the present study's definition of 'user' is lenient, in that respondents who answered 'very infrequently' were also classified as users. Above all, one should remember that Tuneu et al.'s sample is not representative (and only for Catalonia). Perhaps their focus on food professionals – see Section 2 – goes some way to explaining the high penetration.

Once users and non-users had been separated, a key step consisted in identifying the non-primary grocery shoppers (non-PGS in Figure 1) among the non-users. Besides the possibility to isolate single-person households, this is another instance where the Tuneu et al. data provide value added. Concretely, respondents' reaction to the first statement of Tuneu et al.'s 'In-store grocery' (IG) scale, which reads "I like to buy groceries in physical supermarkets" (IG1), was exploited. It was assumed that respondents who score high (4-7) on this item are more likely to be primary grocery shoppers. In other words, respondents who score between 1 and 3 were deemed to be non-primary grocery shoppers. In a sensitivity analysis, the cut-off between the two groups was moved from 4 ('neither agree nor disagree') to 5 ('somewhat agree'). With the first cut-off, the non-primary grocery shoppers number 26 (or 33% of the non-users who are part of a multi-person household); with the second, 42 (or 53%). As argued above, these are 'wrong respondents', in that there is a danger of false negatives.

As an aside, quite a few of the users of e-grocery services also score low for IG1: 24% score between 1 and 3, and no less than half (50%) have a score below 4 – a figure that is comparable to the non-users. This should not, however, be seen as undermining the proposed proxy. Dislike of in-store shopping may, in fact, motivate the adoption of electronic alternative. In a study for Belgium, Van Droogenbroeck and Van Hove (2021: page 13, Table 3) find that users score significantly lower on perceived shopping enjoyment than non-users.

For the final step, an estimate of the incidence of false negatives among the non-PGS non-users was needed; or, in other words, an estimate of the probability that the *household* proves to be a user after all. One option would have been, as in Van Hove (2023), to use information from a comparable study for the same country that did

target primary grocery shoppers. However, for Spain there is no such point of comparison. The only study that showed up in the systematic literature review of Van Hove (2022) is Arce-Urriza and Cebollada (2010). This research is not only too old; the authors also did not rely on a consumer survey. Rather they obtained purchase data from a leading Spanish grocery chain and examine only users.

Hence, the study had to resort to option two; meaning: as in Van Hove (2024), use a probability taken from the study under scrutiny. Fortunately, unlike Van Hove, the study had access to the raw data, which makes a crucial difference. Indeed, whereas Van Hove had no choice but to use the adoption rate for the full sample – which, if Van Hove’s critique is valid, is itself biased – access to the data makes it possible to use only those observations that can be considered reliable; read: only those respondents who, based on the same proxy as used earlier, can be deemed to be primary grocery shoppers. Specifically, it was calculated how many of the respondents in multiple-person households who have a score of 4-7 for IG1 (5-7 in the sensitivity analysis) are users (that is, have a score higher than 1 for UB3). The outcome was 70 out of 123 (56.9%) – and 43 out of 80 (53.8%) in the sensitivity analysis. Applying these percentages to the number of ‘wrong respondents’ calculated in the previous step (respectively, 26 and 42) gives an estimated number of false negatives amounting to (roughly) 15 and 23.

In a robustness check, the calculations were made separately for men and women (always in multiple-person households), but the resulting percentages of users among the primary grocery shoppers proved to be very similar: 55.9% for men vs. 59.4% for women when the PGS cut-off is set at $IG1 > 4$, and 54.3% for men vs. 54.5% for women for $IG1 > 5$. The remainder of the note therefore does not present any further gender-specific results.

5. Discussion and Conclusion

The above calculations suggest that Tuneu et al.’s sample might contain 15 to 23 false negatives on a total of 202. In other words, if one were to use their data to calculate the household adoption rate of online grocery shopping – which, to repeat, Tuneu et al. do not do – the underestimation could amount to 7.3-10.3 percentage points.

Van Hove (2023, 2024) puts the underestimation of (new) adoption in Wang et al. (2021) and Choi et al. (2022) at, respectively, 5.6 and 7.6 percentage points. However, the results are difficult to compare. First, the papers examine different countries. Second, the samples of Wang et al. and Choi et al. are representative, or made representative, of their target population, whereas this is not the case for Tuneu et al. Finally, one also must keep in mind that, unlike in the present paper, Van Hove was unable to set apart single-person households. Still, the results obtained in the present paper, with an improved method, confirm that the problem identified by Van Hove (2023, 2024) may well be substantial.

This said, the calculations presented in Figure 1 are not without limitations. For one, the proposed primary grocery shopper proxy is still but a proxy. The approach also cannot avoid making some of the same assumptions made in Van Hove (2023, 2024), namely that all households have a primary shopper, and that many non-primary shoppers will respond to the survey as individuals – rather than as a member of their household. For a discussion of the plausibility of these assumptions, see Van Hove (2023: pages 4-7).

Finally, it can be noted that Van Hove (2023: page 4), referring to the Wang et al. (2021) paper, also claims (but does not demonstrate) that “when adoption and continuance intention [...] are (substantially) mismeasured, it goes without saying that the same is true for the causal effects of the determinants”. In order to gauge to what extent this is true for the Tuneu et al. data, correlations between their constructs were computed. This was done a first time for the full sample – that is, for the sample as cleaned in the present paper – and a second time for the sample of primary grocery shoppers (both single- and multiple-person households). The rationale is that one should not ask a non-primary shopper whether they think ‘online grocery shopping is fun’ or whether they ‘see physical grocery shopping as a leisure activity’. The decision whether or not to use e-grocery services, and to what extent, will probably be taken mostly by the primary shopper of the household. Hence, it is their personal characteristics and their perceptions that matter.

Table 2 presents the differences in correlations between the two samples – correlations for primary grocery shoppers *minus* correlations for all respondents – expressed as a percentage of the latter. In the Table, SN = social

norms, VIS = visibility, PR = perceived risk, ENJ = enjoyment (of online grocery shopping), ITU = intention to use, COAG = online grocery shopping during the Covid-19 pandemic, IG = In-store grocery shopping, and UB = usage behaviour. As can be seen, several of the correlations differ markedly.

	SN	VIS	PR	ENJ	ITU	COAG	IG	UB
SN	-	-	-	-	-	-	-	-
VIS	1.5%	-	-	-	-	-	-	-
PR	-49.4%	-54.2%	-	-	-	-	-	-
ENJ	21.6%	14.4%	510.2%	-	-	-	-	-
ITU	3.1%	0.1%	-9.4%	4.9%	-	-	-	-
COAG	-46.9%	-21.2%	-20.4%	-147.3%	3.2%	-	-	-
IG	-0.3%	-8.6%	-40.2%	17.1%	-138.4%	-141.3%	-	-
UB	2.3%	-4.9%	-64.2%	5.9%	-0.8%	4.4%	-97.6%	-

Table 2. Correlations: primary grocery shoppers sample (N = 154) vs. full sample (N = 202), difference in percentage

The takeaway for researchers is that – regardless of whether the purpose is to measure or to explain – one should explicitly take into account the household nature of grocery shopping. In other words, consumer surveys should either target individuals responsible for at substantial part of the household’s grocery purchases or explicitly ask respondents to answer on behalf of their household. For policymakers, the message is that many estimates of the impact of the COVID-19 pandemic on the uptake of online grocery shopping should be interpreted with caution.

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