



Eliciting the Willingness to Pay (WTP) for Glasses in Rural Burkina Faso

– Final Report –
(January 2018)

Authors:

Prof. Dr. Michael Grimm (University of Passau)

Dr. Renate Hartwig (University of Namur, University of Passau)

Franziska Schiessl (University of Passau)

Contents

<i>Abbreviations</i>	<i>i</i>
<i>Executive Summary</i>	<i>ii</i>
1. Introduction	4
2. Context	6
3. Research Approach and Data	6
4. Results	9
4.1. <i>Summary Statistics and Balancing Test</i>	9
4.2. <i>Perceptions on the Product and Usefulness</i>	12
(a) Perceptions of the glasses	12
(b) Attitude towards glasses, experiences and expectations	12
4.3. <i>Revealed Willingness to Pay</i>	14
(a) Average willingness to pay	14
(b) Demand for glasses	18
(c) Liquidity constraint	20
(d) Regression results and partial effects	21
5. Recommendations and Conclusion	22
References	24

Figures

Figure 1: Sample composition	7
Figure 2: Distribution of defective vision (dioptré)	11
Figure 3: Perception of the ODG glasses	12
Figure 4: Productive effects of glasses.....	14
Figure 5: Distribution of stated prices	15
Figure 6: Willingness to pay by different characteristics.....	17
Figure 7: Demand curves	19
Figure 8: Reason for stated price.....	21

Tables

Table 1: Socio-demographic characteristics	9
Table 2: Socio-economic characteristics.....	10
Table 3: Health conditions (all shares).....	11
Table 4: Attitude towards glasses.....	13
Table 5: Willingness to pay by treatment arm	22

Abbreviations

BDM	Becker–DeGroot–Marschak
CSPS	Centre de Santé et Promotion sociale
GVG	Good Vision Glasses
INSD	Institut National de la Statistique et de la Démographie
NGO	Non-governmental organisation
ODG	One Dollar Glasses
RCT	Randomized control trial
UNDP	United Nations Development Programme
WTP	Willingness to pay

Exchange rate used

1 USD = 556 CFA F

Executive Summary

Defective vision is one of the most common disabilities worldwide. According to recent estimates, about 4.5 billion people live with defective vision (Essilor, 2015). Of these, 2.5 billion people live with poor vision unnecessarily because they need, yet do not have, glasses. About 80% of these, i.e. an estimated 2 billion, live in less developed countries and mostly in rural areas (World Economic Forum, 2016).

Given the obvious benefits and the relative little knowledge on the effects of glasses, this study is among the first to shed light on the potential to distribute glasses through the market in a poor rural context. For this purpose, this study assesses the willingness to pay (WTP) for glasses designed by the NGO One Dollar Glasses (ODG). The study was conducted in the rural area of the municipality of Kaya, which is situated 100km northeast of Ouagadougou, the capital of Burkina Faso.

The WTP for glasses is elicited through a variant of the Becker–DeGroot–Marschak (BDM) method, an incentive-compatible method, whereby the participants are invited to bid a price for glasses. In contrast to simple survey questions where the reported WTP is without consequence for the respondent and may even invite voluntary misreporting, the BDM method confronts the respondent with a real purchase decision and is hence incentive compatible.

In total 412 adults living in 21 villages who underwent a vision screening and were diagnosed as being in need of glasses, either because of impaired vision or a cataract, were randomly assigned to two types of treatment, an information treatment and a payment treatment. Four groups in total were formed. The information treatment comprised of a video in which several persons outlined their experience with the glasses they received. The video was shown before the price bid was made. The second treatment consisted of an extension of the payment period to one week. Hence, respondents were exposed to either none of the treatments, one of the treatments or both treatments. The objective of the treatments was to test how sensitive the WTP is to information constraints and liquidity constraints. Since the bids made by the respondents can be linked to the bidder's characteristics, this study is a first step to identify the factors which influence the decision to buy glasses in a constrained setting.

The average willingness to pay is 1,136 CFA F (about 2 USD). This compares to a market price of 5,000 CFA F and thus represents about 20% of the market price. The price statements range from as low as 100 CFA F up to 5,000 CFA F. However, they do not surpass the current market price. Hence, the current market price really marks the upper limit, at least in the rural area in which the study was conducted. Participants were prescribed different kinds of glasses

depending on vision impairment. The standard was corrective glasses, but participants suffering from cataract were offered sunglasses. The average WTP for corrective glasses lies at 1,263 CFA F, the average WTP for sunglasses only at 995 CFA F.

Most respondents were aware of their vision problems. 87% stated that they knew that they had a vision problem prior to arriving at the testing centre. Yet, the average stated price is not different for those who knew and those who did not know. There is also no relationship between the elicited WTP and the severity of the vision problem.

The group that had to pay for the glasses directly and was exposed to the video made on average the highest bid with 1,270 CFA F. For example, for a price of 1,500 CFA F the uptake among the respondents not having been exposed to the video is just 30%, whereas it is 40% for respondents who have been exposed to the video. Prices of the deferred payment groups are the lowest. The deferred payment option even though it was offered was not taken by any of the participants in this study. In general, there is not much evidence that income and wealth is an important determinant of the size of the bids made, yet two-thirds of the participants responded to the question why they made the bid they made, that they did not have money to spend on the glasses. In fact, there are a number of areas that the participants still consider more important to spend money on, i.e. treatment of acute health problems (e.g. malaria), food and children's education (in that order). Only when these are secured/satisfied it can be expected that participants are willing to spend more on glasses.

The results also show that the stated price is strongly influenced by the literacy level of the participant and the market price he or she estimated for the product. Illiteracy reduces the willingness to pay by about 30%. A 1% increase in the estimated market price increases the willingness to pay by 0.28%.

Concerning the productive effects of glasses, 63% agree that the quality of their work is affected by their vision problems. Furthermore, 58% also agree that the speed with which tasks are done is reduced by their vision problems. On the benefits side, 68% agree that it would be possible to work longer hours with glasses due to better vision in the dark. 77% also think that they would make less errors if they had glasses. 50% find it difficult to concentrate on detailed tasks.

1. Introduction

Defective vision is one of the most common disabilities worldwide. According to recent estimates, about 4.5 billion people live with defective vision (Essilor, 2015). Of these, 2.5 billion people live with poor vision unnecessarily because they need, yet do not have, glasses. About 80% of these, i.e. an estimated 2 billion, live in less developed countries and mostly in rural areas (World Economic Forum, 2016).

Rural areas in developing countries are still characterized by a lack of infrastructure, including health services offering and promoting vision screening, which might explain the undersupply of glasses in these areas. A lack of information and awareness regarding the causes of and remedies to impaired vision are a further obstacle, as well as, financial constraints which are severe in rural areas in most developing countries where a large part of the population still lives from subsistence agriculture and is situated below or just above the poverty line.

The implications of impaired vision and particularly the effects of glasses has thus far been an issue which remained neglected in health policy and research in developing countries. Despite the fact that it has implications for most aspects of life including reading and educational achievement, employability, productivity and earnings as well as personal-, work- and road safety. Given the obvious benefits and the relative little knowledge on the effects of glasses, this study is among the first to shed light on the potential to distribute glasses through the market in a poor rural context. Two factors are at the core of this study: One is the potentially high need for glasses; the other is the highly constrained setting. This study assesses the willingness to pay for glasses designed by the NGO One Dollar Glasses (ODG). ODG is the umbrella organisation registered in Germany. The local entities of the NGO in the different countries run under the name of Good Vision Glasses (GVG). The glasses sold are partly also produced locally, that means GVG has a number of employees producing the frames for the glasses, the lenses are imported.

Thus far, the willingness to pay for glasses and ODG glasses in particular has not yet been rigorously explored. Existing studies asking participants the simple question of how much they would be willing to pay for glasses report figures ranging between 1 to 4 USD (Glewwe and Schaffner, 2014; Karnani et al., 2011). In this study, we illicit the willingness to pay (WTP) for glasses for adults through a variant of the Becker–DeGroot–Marschak (BDM) method, an incentive-compatible method, whereby the participants are invited to bid a price for glasses. The key difference is that simple survey questions are without consequence for the respondent and may even invite to voluntary misreporting, whereas the BDM confronts the respondent with a real purchase decision.

Since the bids made by the respondents can be linked to the bidder's characteristics, this study is a first step to identify the factors which influence the decision to buy glasses in a constrained setting. It answers a fundamental question in the decision-making process, i.e. at which price are poor people in rural areas willing to buy glasses. This is not only an important question from the perspective of the consumer with impaired vision but also crucial information for ODG to plan the business operations and market development in poor rural areas. In addition, this study also provides information to what extent the willingness to pay can be increased by the provision of additional information and marketing messages as well as to deferred payment as an alternative payment mechanism. These latter aspects provide information on the potential effectiveness of marketing and information campaigns and the potential usefulness of alternative distribution mechanisms.

The study was conducted in Burkina Faso. The market price for GVG glasses in Burkina Faso is currently 5,000 CFA F (ca. 9 USD).¹ We find that in the rural areas studied, the average willingness to pay for glasses is around 20% of the market price currently charged. In our case, very few people are willing to pay amounts that come close to the market price. This is an observation that is coherent with other studies in the literature on the adoption of health technologies (see e.g. Cohen and Dupas, 2010; Dupas, 2014; Kremer and Miguel, 2007; Mobarak et al., 2012; Tarozzi et al., 2014) or other socially desirable technologies (see e.g. Grimm et al., 2017 for solar lamps), which show that demand is highly price elastic. Furthermore, these studies also show that the benefits of these 'new' technologies/products are not fully internalized advocating for cost-sharing, i.e. subsidized end-user prices to bring adoption rates to socially desirable levels (see e.g. Bates et al., 2012). In contrast to this, following a market based paradigm, one would assume that the WTP is high enough but constrained by a lack of liquidity. Concerning the latter, we find that this is not the case in our setting. The option to defer payment by one week did not increase the willingness to pay and respondents did not make use of this option when it was offered. Our study however indicates that households might be information constraint. Lifting this constraint, i.e. through a video outlining some of the benefits of corrective glasses, can increase the willingness to pay by 11% to 14%.

We will return to these aspects in more detail in the remainder of the report which is structured as follows: Section 2 briefly presents the study location and context. Section 3 outlines the methodological approach and sampling. The results are discussed in Section 4 and Section 5 concludes.

¹ Exchange rate used 1 USD=556 CFA F.

2. Context

The study was conducted in the rural area of the municipality of Kaya, i.e. in the villages surrounding the city of Kaya. Kaya is situated 100km northeast of the capital Ouagadougou in the Central North region of Burkina Faso. The municipality of Kaya is divided into seven urban sectors and 71 villages and covers an area of 870km². The city of Kaya is the seventh largest city of Burkina Faso. Following the latest census in 2006, the community has a total population of 117,122 inhabitants (INSD, 2016). 53% of these people live in rural areas, i.e. the 71 associated villages. Following the 2006 census, the average household size in the municipality is 5,9 (INSD, 2016). Agriculture and livestock production are the main economic activities. There is no major industrial activity in Kaya. However, the city is known for its crafts sector, in particular its leather goods. Given the economic structure, the region is rather poor. The poverty rate in 2014, i.e. the share of the population living below the national poverty line of 153,530 CFA F per capita per year (equivalent to 276 USD) was estimated at 47%. This is almost seven percentage points higher than the national average of 40.1% (INSD, 2016). The high level of poverty is also reflected in other indicators for the region. For example, only eight percent of the households have electricity compared to the Burkinabè average of 24.4%. Literacy rates are extremely low with only 24.9% of the people older than 15 able to read and write (the average rate in Burkina Faso is 34.6%, INSD, 2016). Burkina Faso as a whole is one of the poorest countries in the world and ranks at position 185 out of 188 countries according the Human Development Index, which is a combined index of income, education and health published by the United Nations Development Programme (UNDP).

3. Research Approach and Data

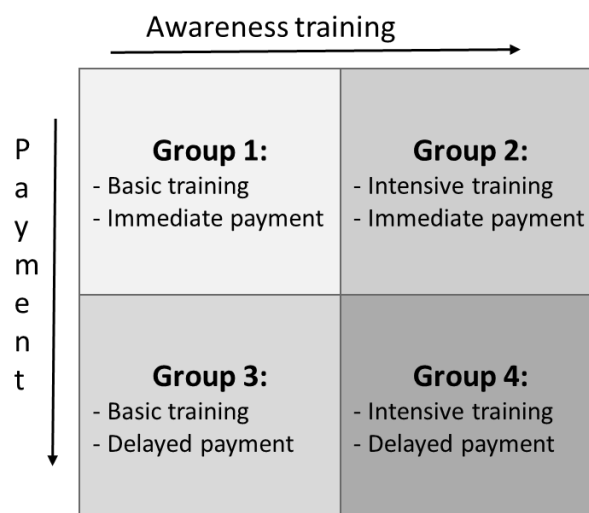
We used the incentive-compatible Becker-DeGroot-Marschack approach to elicit the WTP for glasses among 412 people in 21 villages (see Appendix A for a full list) in the rural community of Kaya. In addition our respondents were randomly assigned to two types of treatment, an information treatment and a payment treatment. The information treatment comprised a video in which different persons outline their experience with the glasses they received. The video was shown before the bid for the price was made. The second treatment comprises of an extension of the payment period to one week (comparable to a zero interest loan for a one week period). Likewise, respondents were informed about this option, before they made their bid. The objective of the treatments was to test how sensitive the willingness to pay is to information and liquidity constraints respectively. In the following section we briefly describe that sampling process and the bidding game in more detail.

For this study we used a two-stage sampling procedure. In a first stage, we selected the respective villages based on three criteria:

- (i) Villages need to be accessible and have necessary infrastructure (i.e. a location in the shadow) to conduct the vision screening.
- (ii) Villages have not been subject to GVG marketing events before.
- (iii) Villages are not in close proximity to each other or to villages in which GVG has already conducted outreach activities.

Concerning the second stage, participants in our study are not randomly selected, but self-select into participating in the vision screening.² The randomization only took place once the results of the vision test were known at which stage the participants needing glasses were randomly assigned to one of four groups (Figure 1).

Figure 1: Sample composition



The willingness to pay experiment and accompanying survey were implemented in October 2017. All participants were asked for their consent to participate in the study and to be interviewed.³ Enumerators worked in parallel to avoid communication between participants prior to their statement of the bid so that price statements would not be influenced by other people’s statements or views.

Following the vision screening, only participants which were prescribed glasses were interviewed. In our sample participants were prescribed two kinds of glasses depending on

² Hence our sample is not necessarily representative of the general population of the study region.

³ Ethics committee approval and authorization from the Ministry of Health of Burkina Faso has also been obtained prior to the study implementation. The study has also been approved by the ethics committee of the University of Passau.

vision impairment, corrective glasses or sunglasses in case the participant suffered from cataract. Following the vision screening participants were randomly assigned to one of the four groups. The participants were given sample glasses so that they could take a detailed look at the product. In the following the enumerator explained the real purchase offer procedure (see Appendix B for the instructions which were given to respondents). Respondents were instructed, that they could only buy the glasses they got prescribed if their bid equalled or exceeded the randomly drawn price. They were also informed that prices are non-negotiable and that they could not change their stated price afterwards. Prices would be drawn in public once all participants have made their price statement. Participants which were selected into the information treatment were shown the video, participants that were selected into the deferred payment treatment were informed about the possibility to delay payment by one week but an upfront payment of 25% would nevertheless be required. Following the treatments and additional explications the participants were asked for the price willing and able to pay. Note, that the NGO used only the label 'Good Vision Glasses' (GVG) and made no reference to 'One Dollar Glasses' as this obviously could have strongly influenced the reported willingness to pay.

To illicit the willingness to pay for glasses, we used the BDM approach first proposed by Gordon Becker and colleagues in 1964 (see Becker et al. 1964). As outlined above, with the BDM method participants announced the price at which they were willing to buy glasses. Following the price statement, glasses were then 'auctioned off' at a (market) price, i.e. a price that was randomly drawn within a reasonable price range around the true market price, whereby only those bidding at or above the drawn price received the glasses and paid the drawn price. Participants bidding lower did not receive glasses, but received a card with the address of the next GVG shop. Prices were randomly drawn at the village level, to avoid social tensions when two or more people in the same village have to pay different prices.

We chose the BDM approach for this study, because unlike stated WTP questions it incentivizes truthful responses. Furthermore, the BDM method allows to observe the exact price at which a participant is willing to buy the product. This yields more precise data as compared to take it or leave it approaches which only provide price bands and also allows to draw a detailed demand curve (see Figure 5 below). Compared to the Vickery second price auction, the BDM approach also prevents conflict between bidders as they do not bid against each other but against a random price. On the other hand, the BDM approach has also been criticized that it is too complex to understand particularly in less education settings. In order to improve understanding we included a first hypothetical auction using a product familiar to the households in our setting, i.e. a sack of rice.

A socio-economic questionnaire was administered to the participants after the bidding. This was done to avoid distorting effects on the participant's behaviour. Furthermore, we were very careful in avoiding to give the participant any priming on the price for glasses. Furthermore, participants were not informed about the price ranges in the draw in order to not invite for strategic bidding behaviour and thus to bias their willingness to pay.⁴

4. Results

4.1 Summary Statistics and Balancing Test

Tables 1 to 3 summarize the key characteristics of our sample. 60% of the sample are male. The average age is 57 years. The majority is married (83%) and lives largely in polygamous unions. Literacy rates in our sample are low with 81% of the participants never having attended school and 83% unable to read and write. About a quarter of our sample (25%) suffers from chronic illness, most dominantly, chronic pain and hypertension. A large share of the participants also suffered from serious health problems related to their impaired vision such as occasional headaches, eye infections, epiphora, trachoma or dry eyes and cataract. Hence, eye related problems and illnesses are not unknown to our study population.

Table 1: Socio-demographic characteristics

	Mean	S.D.
<i>Personal Characteristics</i>		
Sex (male, share)	0.60	
Age (yrs.)	57.51	14.96
Married monogamous (share)	0.33	
Married polygame (share)	0.50	
Single/widowed (share)	0.16	
Mossi (share)	0.95	
Moslem (share)	0.66	
Illiterate (share)	0.83	
No schooling (share)	0.81	
<i>Household characteristics</i>		
# of member	12.50	7.59
# of children (0-5 yrs.)	2.57	2.56
# of children (6-18yrs)	4.28	2.99
# of elderly (65+ yrs.)	0.86	0.83

Notes: The number of observations (N) is 412. S.D. are standard deviations.
Source: ODG survey, Burkina Faso (2017).

⁴ Prices in the draw varied by village and ranged between 400 and 1,500 CFA F. The average price drawn was 837 CFA F.

Our study population is mostly engaged in subsistence agriculture and rather poor with an average monthly cash income of about 28,000 CFA F (about 50 USD) or 3,600 CFA F in per capita terms. Of the participants which provided information on their income, 43% would be considered poor based on the 2014 poverty line.⁵ That households are relatively poor is also reflected in a number of other factors, i.e. 84% report that their income is insufficient to cover their household needs, financial penetration is low with 75% not having a bank account and only three persons owning a car. Households in our sample are rather large with 12.5 members on average. The household size also reflects that most participants live in polygamous unions. Dependency ratios are also very high with on average over seven members younger than 18 or older than 65.

Table 2: Socio-economic characteristics

	Mean	S.D.
Subsistence farmer (share)	0.72	
Inactive (share)	0.16	
Other employment (share)	0.12	
Main breadwinner (share)	0.35	
Regular monthly income (CFA F)	27,997	33,992
Per capita monthly income	3,643	9,527
Income insufficient to cover needs (share)	0.84	
Work negatively affected by vision problems (share)	0.63	
Days inactive due to vision problems last months (no.)	1.35	5.24
Revenue lost due to inability to work (CFA F)	22,737	81,667
No bank account (share)	0.75	
Credit difficult to obtain (share)	0.56	
Person of confidence for support (share)	0.71	
Has a vehicle (share)	0.68	
Car (share)	0.01	
Motorcycle (share)	0.55	
Bicycle (share)	0.71	

Notes: The number of observations (N) is 412. S.D. are standard deviations.

Source: ODG survey, Burkina Faso (2017).

Vision problems of children are rather low in frequency with only about 39 children reported to have vision problems (not shown in the table), yet this information is self-reported and not based on a diagnosis, hence it might seriously underestimate the true extent of the problem. Only in four households children had glasses already. For the elderly, vision problems are

⁵ For our sample, or for the households for which we have information on income, poverty is a bit lower than the regional average which is estimated at 47% (INSD, 2016).

much more recognized with three-quarter having problems (again self-reported). In absolute terms, in 15 households, elderly had glasses already (not shown in the table).

Table 3: Health conditions (all shares)

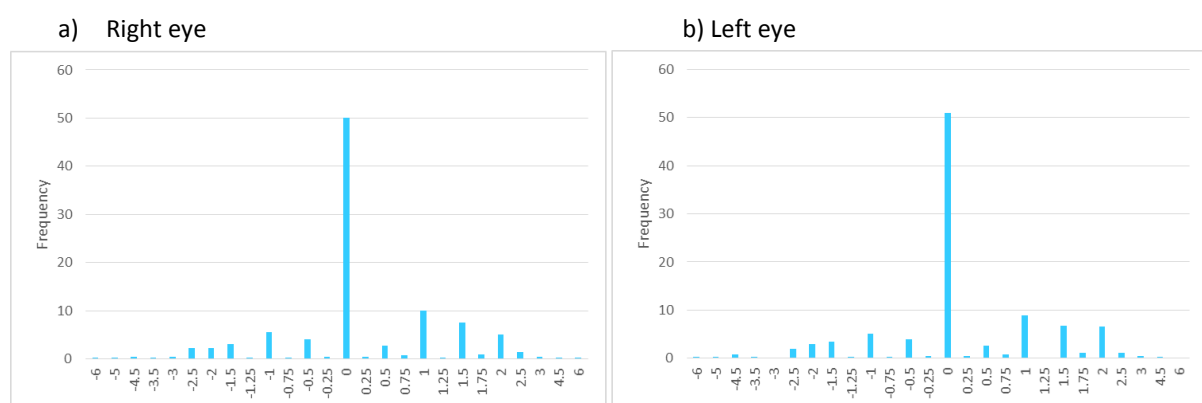
	Mean
Participants with chronic illness	0.28
Of which chronic pain	0.35
Of which hypertension	0.18
Of which other illness	0.60
Participants suffering from headache	
Of which often	0.15
Of which sometimes	0.41
Of which never	0.45
Participant ever had an eye infection	0.44
Participant ever had other eye problems	0.31
Of which bad eyesight	0.36
Of which cataract	0.05
Of which watery eyes	0.24
Of which trachoma and dry eyes	0.14

Notes: The number of observations (N) is 412.

Source: ODG survey, Burkina Faso (2017).

Figure 2 below shows the distribution of defective vision in dioptres of the study population. 16.5% of the participants in our study have defective vision at or above +/- 2 dioptres in at least one eye. Figure 2 does not include those participants that suffer from cataract.

Figure 2: Distribution of defective vision (dioptre)



Notes: Zeros relate to participants who have only defective vision with the other eye.

Source: ODG survey, Burkina Faso (2017).

To verify that the four groups shown in Figure 1 share exactly the same characteristics and hence are fully comparable, we performed a so-called 'balancing test'. This test consists of multiple *t*-tests and shows that our four groups have indeed been perfectly randomized and

that there are no statistically significant differences between the groups along the main socio-economic characteristics (see Table C in the appendix).

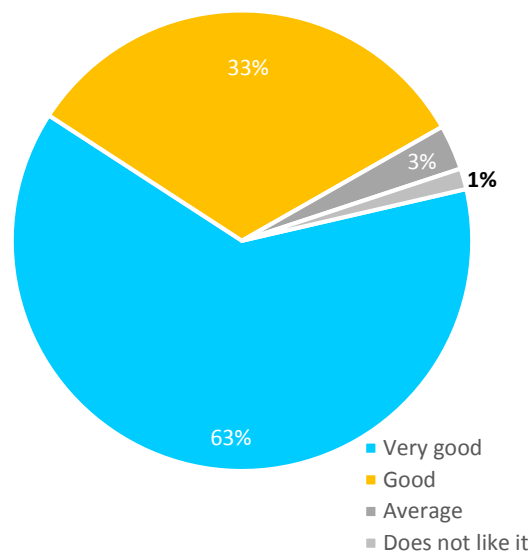
4.2 Perceptions on the Product and Usefulness

Before we turn to the results from the willingness to pay experiment we report some more descriptive statistics regarding the perceptions of the product by the study participants. This information was also collected after the respondents had made their bid for the glasses.

(a) Perceptions of the glasses

The style of the glasses was very much appreciated by the participants with 96% saying that they find the glasses good or very good. Only 1% does not appreciate them. Upon inspection, the participants judge that the glasses would last almost two years on average (28 months).

Figure 3: Perception of the ODG glasses



Source: ODG survey, Burkina Faso (2017).

Irrespective of the ODG model, the participants estimate that corrective glasses cost almost 6,000 CFA F on the market.

(b) Attitude towards glasses, experiences and expectations

Glasses are well accepted in our study population (see Table 4). 52% of the participants know at least one other person wearing glasses. They are generally perceived to be accepted in their nuclear environment. Only 9% think that glasses are embarrassing and only 3% think that they can have negative effects.

Table 4: Attitude towards glasses

	Share
Knows a person wearing glasses	52%
Glasses accepted in village	97%
Glasses considered embarrassing	9%
Glasses have negative effects	3%
Aware of vision problems	87%
Difficult to get used to glasses	42%

Notes: The number of observations (N) is 412.

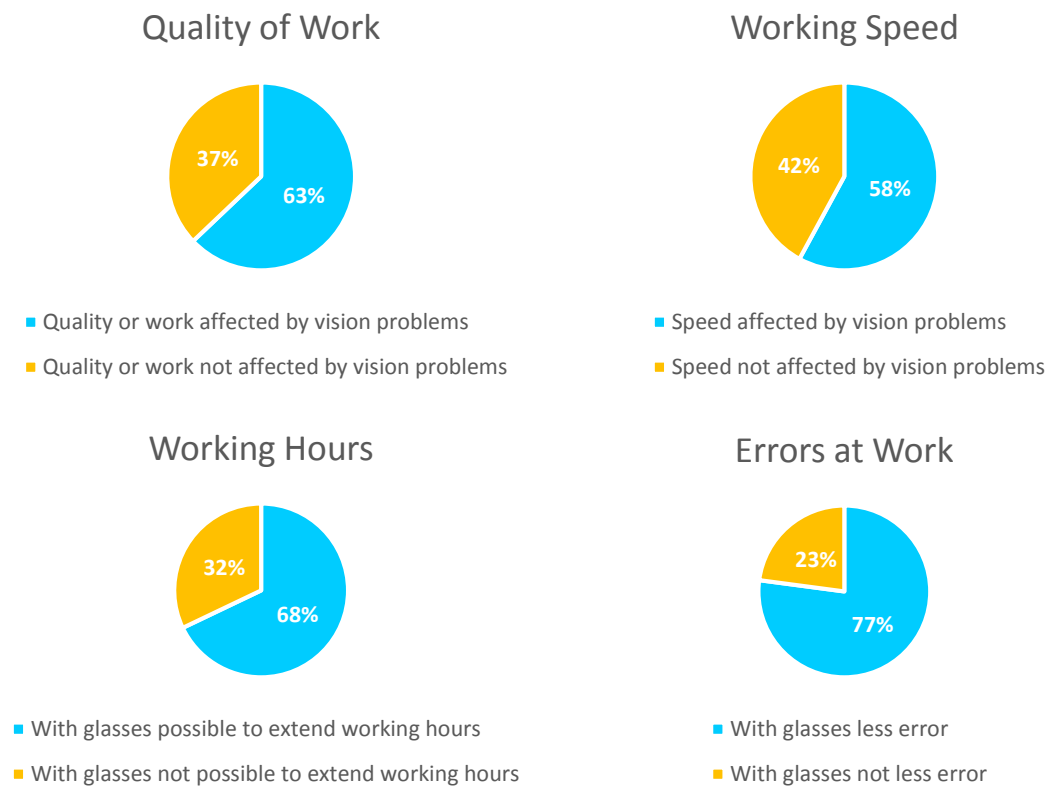
Source: ODG survey, Burkina Faso (2017).

Our study population was already well aware of their vision problems. 87% stated that they knew that they had a vision problem prior to arriving at the testing centre for the day. Likewise, they also acknowledge, that it will be difficult to get used to the glasses.

Generally, there is no disagreement on the importance of glasses. This judgement does also not decline much with age. However, there are number of areas that the participants still consider more important to spend money on, i.e. treatment of acute health problems (e.g. malaria), food and children's education (in that order). Only when these are secured/satisfied it can be expected that participants are willing to spend more on glasses.

Concerning the productive effects of glasses, 63% agree that the quality of their work is affected by their vision problems. Furthermore, 58% also agree that the speed with which tasks are done is reduced by their vision problems. On the benefits side, 68% agree that it would be possible to work longer hours with glasses due to better vision in the dark. 77% also think that they would make less errors if they had glasses. 50% find it currently difficult to concentrate on detailed tasks.

Figure 4: Productive effects of glasses



Source: ODG survey, Burkina Faso (2017).

4.3 Revealed Willingness to Pay

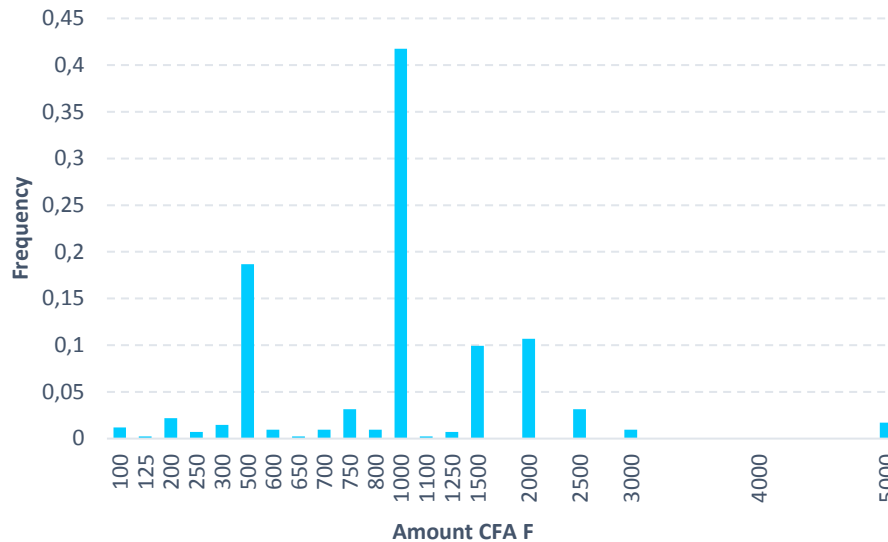
In the following we will discuss in detail the revealed willingness to pay. We first present the average willingness to pay and show how the average compares across different socio-economic groups. We then present demand curves that show how the uptake of glasses increases as the price decreases. Finally, we present the results of a multivariate regression analysis and discuss the partial effects. The latter informs how the willingness to pay changes with individual characteristics holding all other characteristics constant.

(a) Average willingness to pay

Figure 4 shows the distribution of all bids made. The average willingness to pay is 1,136 CFA F (about 2 USD). This compares to a market price of 5,000 CFA F and thus represents about 20% of the market price. The price statements range from as low as 100 CFA F up to 5,000 CFA F. However, they do not surpass the current market price. Hence, the current market price really marks the upper limit, at least in the rural area in which the study was conducted. Furthermore, it also has to be noted that the bids constitute about one third of the average daily per capita cash income of the households of our study population. This is a non-

negligible share (see Table 2). 310 of the 412 participants made bids above the price which was randomly drawn at the village level. Hence, glasses were distributed to these 75.2% of the participants.

Figure 5: Distribution of stated prices



Source: ODG survey, Burkina Faso (2017).

11 out of the 412 participants were willing to pay at least 3,000 CFA F. These participants are however rather different from the average participant in our study. They are younger (on average 45 years), live more commonly in monogamous unions and thus also have fewer household members (10.8 vs. 12.5). They are also richer with an average monthly income almost twice of that of the study population (6,868 CFA F vs. 3,643 CFA F). While some of them are farmers, they also work as salaried employees in the private and public sector and in self-employment. Still, the participants willing to pay more than 3,000 CFA F represent less than 3% of our sample.

If we look at the average willingness to pay by the different treatment groups, we see that the direct payment group which also saw the video made on average the highest bid with 1,270 CFA F (see Figure 5 a). Prices of the deferred payment groups are the lowest. The deferred payment option even though it was offered was not taken by any of the participants in this study (we come back to this below). In a few (five) cases where people were considering making use of this option a family member or neighbour immediately offered to pay for the participant.⁶ This does of course not rule out income constraints, but at least it suggests it is not a pure liquidity constraint.

⁶ Note, that the respondent was just with the interviewer team when he or she was asked to make the bid. Other villagers could only join once the price was drawn and for the successful bids the payments had to be made.

Comparing the results by gender, we see that men made on average higher bids than women (1,205 CFA F vs. 1,033 CFA F), which might of course at least partly be explained by how resources are allocated within the household (Figure 5 b)). Participants older than 60 years stated a significantly lower price than younger participants (Figure 5 c)). If we compare the willingness to pay across different income groups, we do not find significant differences (Figure 5 d)).⁷

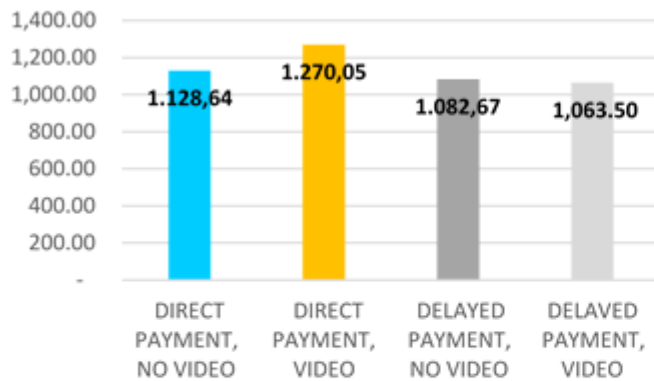
In our sample participants were prescribed different kinds of glasses depending on their vision impairment. The standard was corrective glasses, but participants suffering from cataract were offered sunglasses. Hence, differentiating by the type of glasses, the average price for corrective glasses lies at 1,263 CFA F. The price for sunglasses for cataract patients is significantly lower at 995 CFA F (Figure 5 e)).

We further verified if there are differences in the average price statement for people that are aware of their vision problem and those that are not. The average stated price is not different for the two groups ($p=0.64$) with prices at 1,143 CFA F for those aware and 1,091 CFA F for those not. We also verified if the severity of the vision problem has an influence on the price. Again, we do not find any difference in the reported price ($p=0.89$). Both groups, i.e. people needing a correction of less than two dioptres vs. those needing one above two dioptres are willing to pay around 1,130 CFA F.

⁷ Note the group <1,500 CFA F represents the median, the group >7,000 CFA F the top 10% of the reported income distribution.

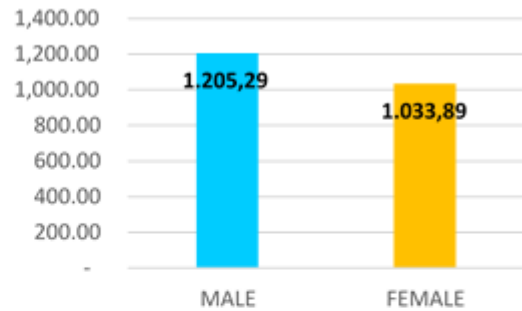
Figure 6: Willingness to pay by different characteristics

a) By treatment group



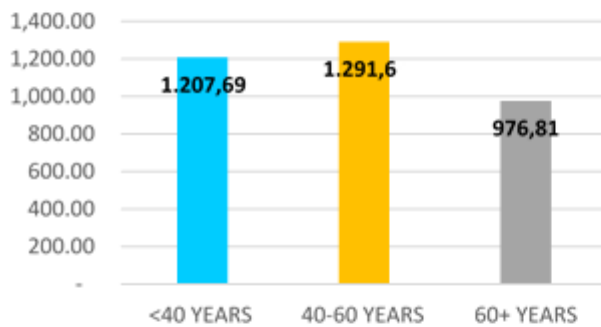
Notes: There is no statistically significant difference between groups ($p=0.2126$).

b) By gender



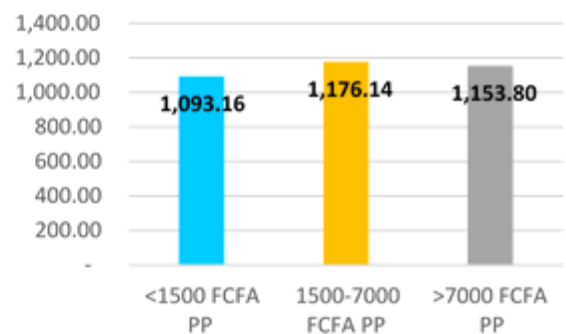
Notes: Prices are statistically different between men and women at a 97.5% level ($p=0.025$).

c) By age



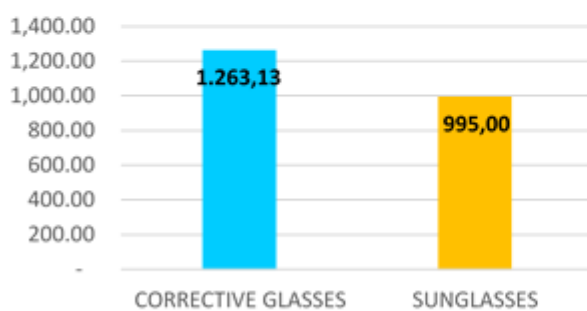
Notes: Prices are statistically different between groups at a 99%-level ($p=0.0003$).

d) By income



Notes: There is no statistically significant difference between groups ($p=0.6228$).

e) By type of glasses



Notes: Prices are statistically different between groups at a 99%-level ($p=0.0004$).

Source: ODG survey, Burkina Faso (2017).

(b) Demand for glasses

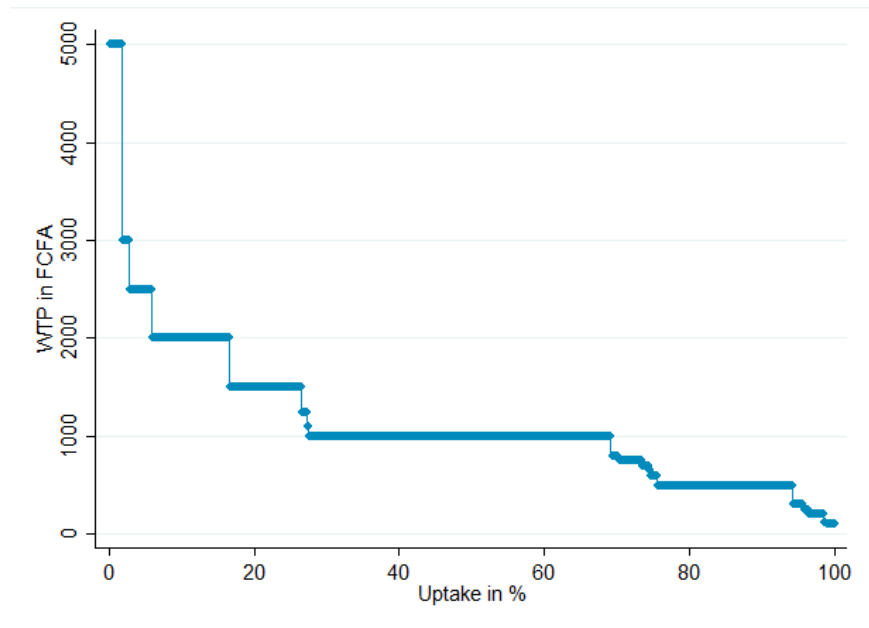
Demand curves that show the distribution of the bids are shown in Figures 6a to 6c. Figure 6a shows demand irrespective of the type of glasses prescribed. Figure 6b then shows the demand for each type separately. Finally, Figure 6c reports the demand for corrective glasses only but separately for the group which saw the video and the one that did not. The interesting feature of demand curves is that they show for each price the cumulative uptake of glasses. For instance in Figure 6a, one can see that for a price of 2,000 CFA F (or 3.60 USD), about 18% of those in need of glasses would buy glasses as they all state a willingness to pay of 2,000 CFA F or higher. If 90% of all respondents in need of glasses would have to be catered through the 'market', the price would have to be as low as 600 CFA F (or 1.08 USD). Or put differently with the current market price, subsidies of 4,400 CFA F would be necessary to achieve this level of uptake.

Interestingly the figures also show that the demand curve for corrective glasses lies somewhat above the curve of the cataract patients. I.e. respondents suffering from cataract and hence who are just in need of sunglasses are not willing to pay as much as those respondents in need of corrective classes. This might to some extent also be due to the age of the respondent. Respondents suffering from cataract are somewhat older than respondents not suffering from cataract.

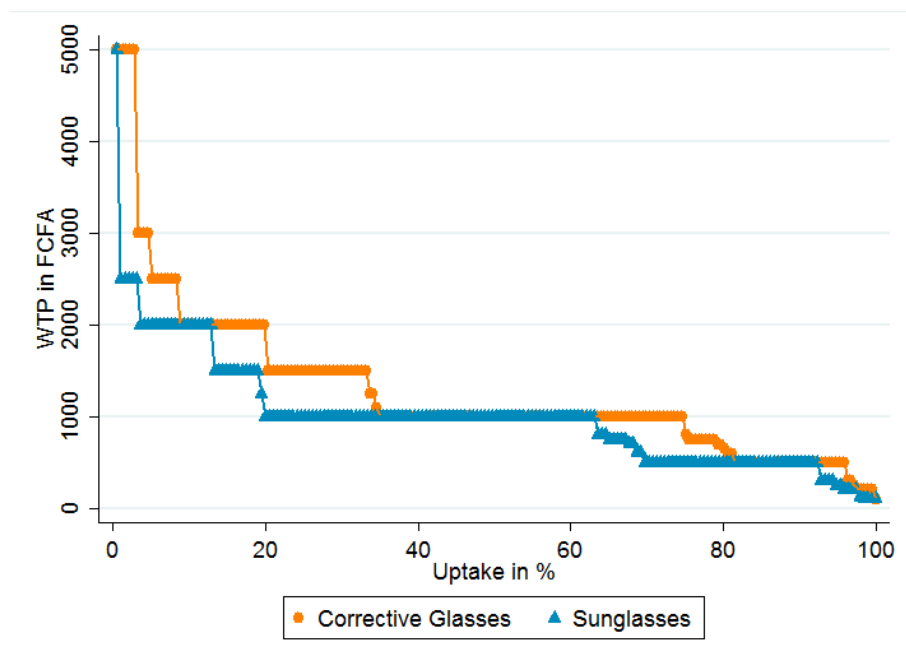
It can also be seen that the video shifts the demand curve up, i.e. the uptake is higher for any price. For example, for a price of 1,500 CFA F the uptake among the respondents not having been exposed to the video is just 30%, but for the respondent having been exposed it is 40%. Hence, again, the video can significantly increase the price respondents are willing to pay.

Figure 7: Demand curves

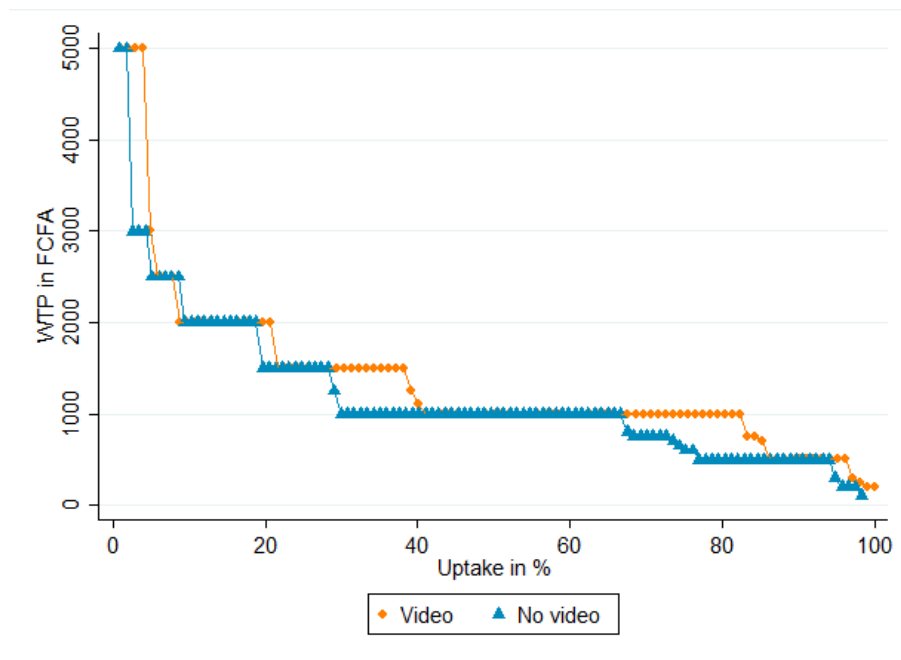
a) Full sample



b) Corrective vs. sunglasses



c) Video vs. no video (corrective glasses only)

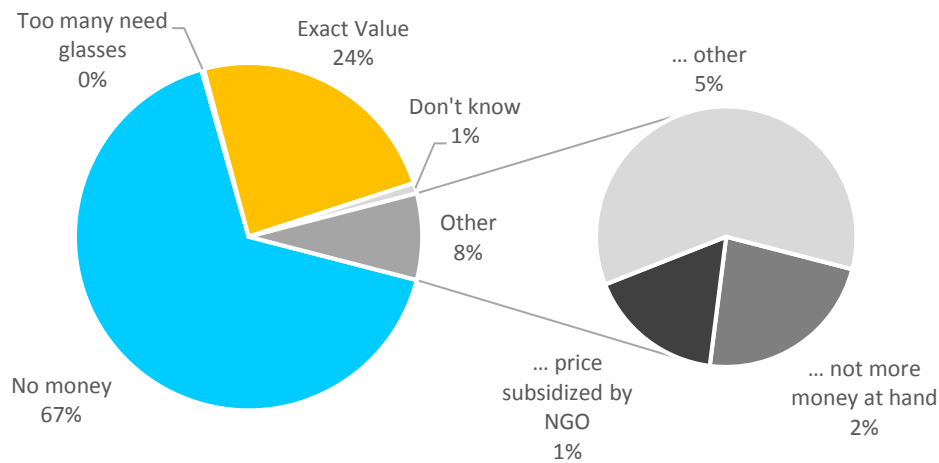


Source: ODG survey, Burkina Faso (2017).

(c) Liquidity constraint

Following their bids, participants were asked the reasons for their stated price. 24% stated that the bid represents exactly the value that they subscribe to the glasses. Two-thirds of the participants responded, that they did not have money suggesting that the majority of the households are indeed liquidity constraint. However, upon more detailed investigation, i.e. when we regress the willingness to pay in a log-linear model on a set of socio-economic variables (see next section for a detailed discussion), we find that income does not significantly influence the willingness to pay. The results of the mean comparison above already point to that. There is some positive correlation with asset ownership as we show below. Yet, the deferred payment option even though it was offered was not taken by any of the participants in this study which also suggests that liquidity constraints are not driving the stated price, at least not to the extent which the participants stated when asked directly.

Figure 8: Reason for stated price



Source: ODG survey, Burkina Faso (2017).

(d) Regression results and partial effects

In the following we discuss the results of the treatments and other partial effects in more detail. For this purpose, we regressed the revealed WTP on the treatment variables and set of socio-economic characteristics in a log-linear model. The effects associated with the treatments are presented below in Table 5. The detailed regression results are presented in the appendix in Tables D1 and D2 for the full sample and by the type of glasses prescribed respectively. We see that overall the treatments do not lead to significant differences in the willingness to pay for glasses. However, if we focus on corrective glasses only we see that the exposure to the video has a statistically significant and positive effect on the willingness to pay. In terms of magnitude, the point estimates suggest that the video increases the willingness to pay for corrective glasses by 14%. Even though income does not have a significant effect on the willingness to pay for glasses, irrespective of the type, the regression results do suggest that wealth, here proxied by categorical variables indicating if the participant owns a vehicle, has a positive effect. Participants which own a motorcycle compared to households owning only a bicycle or no vehicle report a 25% higher WTP. Most interestingly however our regression results do suggest that the stated price is strongly influenced by the literacy level of the participant and the market price he or she estimated for the product. Illiteracy reduces the willingness to pay by about 30%. In addition a one percent increase in the market price increases the willingness to pay by 0.28%.

Table 5: Willingness to pay by treatment arm (log linear regression model, dependent variable: elicited willingness to pay (in log))

	Full sample			Corrective glasses			Sunglasses (cataract)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Treatment</i>									
Video (=1)	0.066 (0.056)	0.088 (0.061)	0.070 (0.058)	0.112* (0.062)	0.141* (0.070)	0.139* (0.069)	0.001 (0.095)	0.0312 (0.101)	-0.016 (0.100)
Deferred payment (=1)	-0.069 (0.088)	-0.053 (0.072)	-0.036 (0.069)	-0.001 (0.092)	-0.011 (0.067)	0.022 (0.078)	-0.077 (0.138)	-0.053 (0.128)	-0.046 (0.109)
<i>Control variables included</i>									
Village effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Socio-economic characteristics	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Eyesight characteristics	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Market price	No	No	Yes	No	No	Yes	No	No	Yes
Pseudo R-squared	0.138	0.273	0.416	0.143	0.275	180	0.128	0.166	0.33
Observations (N)	412	412	354	217	217	0.419	195	195	174

Notes: Standard errors in parenthesis. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.10.
Source: ODG survey, Burkina Faso (2017).

5. Recommendations and Conclusion

The study suggests that the willingness to pay for glasses among respondents with a proven impaired vision is relatively low, on average just 20% of the market price. If 90% of all respondents in need of glasses would have to be catered through the ‘market’, the price would have to be as low as 600 CFA F (or 1.08 USD), i.e. about 12% of the actual market price. Or put differently with the current market price, subsidies of 4,400 CFA F would be necessary to achieve this level of uptake.

Yet, the willingness to pay can be significantly increased if persons in need of glasses are exposed to audio-visual information that highlights the advantages of glasses. Whereas for a price of 1,500 CFA F the uptake among the respondents not having been exposed to the video is 30%, it is 40% for the respondent having been exposed to the video. In contrast, deferred payments are not an effective mean to increase the willingness to pay, yet this does not mean that liquidity constraints do not matter because respondents do indeed also report to have not enough money to make higher bids. Moreover, the reported willingness to pay is correlated with the respondent’s wealth. Finally, the willingness to pay also increases with education, also if income and wealth are held constant, suggesting that awareness and knowledge about impaired vision and glasses can further increase the willingness to pay. Again, such information can among other instruments be distributed through a video.

Hence, distributing glasses in resource-poor settings like the one underlying this study, requires smart and context-sensitive marketing strategies that focus especially on awareness raising, information and possibly price subsidies. Such subsidies might be cross-financed through sales at higher prices in urban areas. Another marketing strategy to explore consists of trial periods, especially with groups that potentially benefit economically from wearing eye glasses, such as mechanics, tailors, drivers or students.

References

- Bates, M.A., R. Glennester, K. Gumedde and E. Duflo (2012). The Price is Wrong. *Field Action Science Reports (FACTS)*, Special Issue 4.
- Becker, G.M., M.H. Degroot and J. Marschak (1964). Measuring utility by a single-response sequential method. *Systems Research and Behavioral Science*, 9(3): 226-232.
- Cohen, J., and P. Dupas (2010). Free Distribution or Cost-sharing? Evidence from a Malaria Prevention Experiment. *Quarterly Journal of Economics*, 125(1): 1-45.
- Dupas, P. (2014). Short-run Subsidies and Long-run Adoption of New Health Products: Evidence from a Field Experiment. *Econometrica*, 82(1): 197-228.
- Essilor (2015). *See Change: Our Contribution to Sustainable Development*. Available from: http://www.essilorseechange.com/website/wp-content/uploads/2015/03/Essilor_See_Change_Report.pdf (Accessed: 19/01/2017).
- Glewwe, P. and J. Schaffner (2014). The impact of the Provision of Near Vision Glasses by the Vision for a Nation Foundation on Handicraft Weavers' Productivity in Rwanda. Final Report (January 28, 2014). Available from: <http://d2fyyc8pcxcmc.cloudfront.net/documents/127-1216-productivity-study.pdf> (Accessed: 19/01/2017).
- Grimm M., L. Lenz, J. Peters and M. Sievert (2017). Demand for off-grid solar electricity – Experimental evidence from Rwanda. EFD Discussion Paper 17-15, Washington D.C.
- Institut national de la statistique et de la démographie (INSD) (2016). Annuaire statistique 2015 de la region du Centre-Nord. Ouagadougou: INSD.
- Karnani, A., B. Garrette, J. Kassalow, and M. Lee (2011). Better Vision for the Poor. *Stanford Social Innovation Review*, Spring 2011: 66-71.
- Kremer, M. and E. Miguel (2007). The Illusion of Sustainability. *Quarterly Journal of Economics*, 122(3): 1007-1065.
- Mobarak, A.M., P. Dwivedi, R. Bailis, L. Hildemann, and G. Miller (2012). Low Demand for Nontraditional Cookstove Technologies. *Proceedings of the National Academy of Sciences of the United States of America*, 109(27): 10815-10820.
- Tarozzi, A., A. Mahajan, B. Blackburn, D. Kopf, L. Krishnan, and J. Yoong (2014). Micro-loans, Insecticide-treated Bednets and Malaria: Evidence from a Randomised Controlled Trial in Orissa, India. *American Economic Review*, 104(7): 1909-1941.
- World Economic Forum (2016). Glasses for Global Development: Bridging the Visual Divide (June 2016). Available from http://www3.weforum.org/docs/WEF_2016_EYElliance.pdf (Accessed: 19/01/2017).

Appendix

Appendix A: List of villages

#	Village	Date of visit	# interviewed
1	Fanka	14/10/2017	26
2	Oualga	15/10/2017	17
3	Basnéré	16/10/2017	4
4	Kalambaongo	17/10/2017	22
5	Dondollé	18/10/2017	20
6	Damané	19/10/2017	31
7	Konan	20/10/2017	18
8	Silmiougou	21/10/2017	20
9	Kamsoaongo	23/10/2017	25
10	Namsigui	24/10/2017	16
11	Sian	25/10/2017	22
12	Konkin	26/10/2017	24
13	Delga	27/10/2017	22
14	Napalgué	28/10/2017	12
15	Damesma	29/10/2017	35
16	Koalma	30/10/2017	23
17	Zorkoum	31/10/2017	13
18	Songodin	01/11/2017	22
19	Dahisma	02/11/2017	15
20	Bangassé	03/11/2017	11
21	Basma	04/11/2017	18

Appendix B: Instructions given to respondents

I now invite you to buy the glasses I just presented to you. The purchase process differs from an ordinary purchase because the price is not fixed yet. The purchase procedure works as follows: You are going to make a bet for the glasses, meaning that you name a price at which you are willing to buy the glasses. You should indicate the maximum amount you are willing to pay. After you gave us your bet we are going to draw a ball during a village reunion later today. Every ball indicates a price. If the drawn price exceeds the amount you are willing to pay than you are not allowed to buy the glasses. If however the price drawn is below your bet than you will buy the glasses at the drawn price. You only have the possibility to bet once and you will not be able to change your stated bit afterwards. So remember, if your bet is lower than the price we are going to draw, than you will not be entitled to purchase the glasses.

Version A: If we have drawn a price that allows you to buy the glasses you will have to make the total payment today directly after receiving the glasses.

Version B: If you can't pay for the glasses at once you have the possibility to sign a sales contract and we will return within one week to collect the money. Nevertheless you will have to make an upfront payment of 25% of the drawn price already today. This upfront payment will be deducted from the total price so that only the remaining amount will be collected one week later. Please make a bet which you will be able to pay within one week at most. If you can't pay the total amount after one week you will not receive the glasses in the end.

We are not going to share your bet with others, it stays confidential. For a better understanding of how the purchase procedure works, I will now give you an example.

Imagine we would sell a sack of rice.

Option A: You offer 650 CFA F for the sack. Afterwards we draw a price of 500 CFA F. As your bet exceeds the drawn price, you can buy the sack for 500 CFA F. If you would have offered 450 CFA F, you would not receive the sack.

Option B: You offer 850 CFA F for the sack. Afterwards we draw a price of 750 CFA F. As your bet exceeds the drawn price, you can buy the sack for 750 CFA F. If you would have offered 700 CFA F, you would not receive the sack.

Remember that you will not be able to change your stated bit after the random draw was taking place and that you can only bid once. Please be conscious of the fact that you will not be allowed to purchase the glasses even though your bet falls only slightly below the drawn amount. [Instruction to interviewer: Verify if there are still any remaining questions. Ask for the bet and make sure that the participant is convinced of his bet.]

Appendix C: Balancing test

	Mean	p-value Group 1 vs. 2	p-value Group 1 vs. 3	p-value Group 1 vs. 4	p-value Group 2 vs. 3	p-value Group 2 vs. 4	p-value Group 3 vs. 4
Sex (Male=1)	0.60	0.440	0.530	0.328	0.887	0.840	0.731
Age (yrs.)	57.51	0.864	0.768	0.714	0.647	0.844	0.517
Married monogamous (=1)	0.33	0.753	0.657	0.846	0.457	0.618	0.808
Married polygamy (=1)	0.50	0.980	0.189	0.600	0.207	0.625	0.442
Single/widowed (=1)	0.16	0.653	0.231	0.632	0.465	0.976	0.485
Mossi (=1)	0.95	0.651	0.891	0.846	0.758	0.529	0.746
Moslem (=1)	0.66	0.775	0.893	0.945	0.882	0.729	0.843
Illiterate (=1)	0.83	0.538	0.538	0.696	1.000	0.826	0.826
Chronic illness (=1)	0.28	0.542	0.081	0.299	0.265	0.673	0.491
Agro-pastoralist (=1)	0.72	0.861	0.420	0.155	0.536	0.221	0.543
# of HH members	12.50	0.394	0.952	0.549	0.451	0.866	0.604
Has a car (=1)	0.01	0.952	0.952	0.342	1.000	0.321	0.321
Has a motorcycle (=1)	0.55	0.435	0.628	0.468	0.772	0.958	0.813
Has a bicycle (=1)	0.71	0.205	0.487	0.104	0.576	0.723	0.361
Aware of vision problem (=1)	0.87	0.403	0.853	0.701	0.318	0.235	0.845

Notes: *** p<0.01, ** p<0.05, * p<0.10. Statistically, significant differences would be identified by p-values reported equal or below 0.1.

Source: ODG survey, Burkina Faso (2017).

Appendix D: Detailed regression results

Table D1: Detailed regression results (overall sample), dependant variable: elicited

	(1)	(2)	(3)	(4)
Treatment				
Video (=1)	0.066 (0.056)	0.089 (0.059)	0.088 (0.061)	0.070 (0.058)
Deferred payment (=1)	-0.069 (0.088)	-0.059 (0.072)	-0.053 (0.072)	-0.036 (0.069)
Socio-economic characteristics				
Sex (Male=1)		0.120 (0.074)	0.102 (0.076)	0.088 (0.067)
Age (yrs.)		-0.004 (0.002)	-0.004 (0.002)	0.001 (0.002)
Illiterate (=1)		-0.346*** (0.076)	-0.326*** (0.075)	-0.255*** (0.081)
Chronic illness (=1)		-0.105* (0.052)	-0.098 (0.052)	-0.101** (0.045)
Agro-pastoralist (=1)		-0.098 (0.055)	-0.093 (0.051)	-0.025 (0.047)
# of HH members		-0.001 (0.003)	-0.001 (0.003)	-0.004 (0.005)
Has a car (=1)		0.307 (0.249)	0.305 (0.224)	0.064 (0.083)
Has a motorcycle (=1)		0.232*** (0.076)	0.226*** (0.072)	0.161** (0.066)
Eyesight characteristics				
Aware of vision problem (=1)			0.010 (0.067)	0.052 (0.087)
Corrective glasses (=1)			0.115** (0.053)	0.066 (0.062)
Dioptries above +/- 2 (=1)			-0.025 (0.086)	-0.040 (0.075)
ln(Estimated market price)				0.290*** (0.026)
Pseudo R-squared	0.138	0.272	0.273	0.416
Observations (N)	412	412	412	354

Notes: Village fixed effects included in all specification. Standard errors in parenthesis. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.10.

Source: ODG survey, Burkina Faso (2017).

Table D2: Detailed regression results (by type of glasses) dependant variable: elicited

	Corrective Glasses			Sunglasses (cataract)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment						
Video (=1)	0.112*	0.141*	0.139*	0.001	0.0312	-0.016
	(0.062)	(0.070)	(0.069)	(0.095)	(0.101)	(0.100)
Deferred payment (=1)	-0.001	-0.011	0.022	-0.077	-0.053	-0.046
	(0.092)	(0.067)	(0.078)	(0.138)	(0.128)	(0.109)
Socio-economic characteristics						
Sex (Male=1)		0.042	0.081		0.128	0.034
		(0.097)	(0.132)		(0.114)	(0.093)
Age (yrs.)		-0.002	0.004		-0.003	0.002
		(0.006)	(0.004)		(0.003)	(0.002)
Illiterate (=1)		-0.340**	-0.299***		-0.256	-0.186
		(0.120)	(0.098)		(0.170)	(0.167)
Chronic illness (=1)		-0.069	-0.095		-0.091	-0.114
		(0.101)	(0.097)		(0.112)	(0.084)
Agro-pastoralist (=1)		-0.147	-0.079		0.006	0.038
		(0.095)	(0.100)		(0.093)	(0.059)
# of HH members		0.001	0.001		-0.002	-0.005
		(0.004)	(0.006)		(0.004)	(0.005)
Has a car (=1)		0.504	0.194*		-0.171	-0.353
		(0.356)	(0.109)		(0.209)	(0.208)
Has a motorcycle (=1)		0.250***	0.169*		0.234*	0.220*
		(0.080)	(0.089)		(0.120)	(0.110)
Eyesight characteristics						
Aware of vision problem (=1)		-0.016	0.046		0.006	0.042
		(0.080)	(0.117)		(0.113)	(0.136)
Dioptries above +/- 2 (=1)		-0.018	-0.038			
		(0.083)	(0.083)			
ln(Estimated market price)			0.284***			0.326***
			(0.055)			(0.041)
Pseudo R-squared	0.143	0.275	0.419	0.128	0.166	0.330
Observations (N)	217	217	180	195	195	174

Notes: Village fixed effects included in all specification. Standard errors in parenthesis. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.10.

Source: ODG survey, Burkina Faso (2017).

