THE BENEFITS OF BUILDING BARRIER-FREE: A CONTINGENT VALUATION OF ACCESSIBILITY AS AN ATTRIBUTE OF HOUSING.

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Author

Fernando Alonso
Instituto Universitario de Estudios Europeos
Universidad Autónoma de Barcelona
Edificio E-1
08193 Bellaterra (Barcelona)
España
Tel. 93 581 20 16
Fax. 93 581 30 63
E-Mail: fernando.alonso@uab.es

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Abstract

Estimating the social benefits of barrier-free building has always required indirect solutions, such as calculating the savings in social services, hospitalisation or adaptations made possible by the increase in accessibility. This research uses the Contingent Valuation Method to gain a direct appraisal of the benefits from barrier-free housing. When comparing two similar dwellings, with the only difference being their accessibility conditions, the 1,007 randomly chosen households that answered the direct survey would pay, on average 12.5 per cent more for being barrier-free. None of the different appraisals made on accessibility costs reaches 5 per cent. This confirms the social profitability of building without barriers and shows the potential size of the private market for those housing developers that meet the demand. Accessibility is a general concern, an economic good or attribute that most households value, irrespective of the physical conditions of their members.

Introduction

The home synonymous with shelter, privacy and well being, can also mean isolation, lack of security or discomfort, if a minimum degree of physical accessibility is not provided, especially for those people whose needs are greater: the disabled. We can define accessibility, or the avoidance of barriers, as 'the way in which houses, shops, theatres, parks and places of work can be reached and used' (CCPT, 1996). Accessible construction has been promoted in different European countries through laws, the spreading of policies and standardisation or through the development of good practice. But despite being a physical characteristic of housing, accessibility is also a market commodity. Dwellings are heterogeneous goods, consisting of many different attributes (surface, location, neighbourhood, quality, etc.), which altogether determine its value or price in the market (Harrison and Rubinfeld, 1978). Whenever an explicit market exists, the valuation of these attributes is made through revealed preference models, mainly hedonic pricing methods. Not being the case for accessibility, where legal standards have just begun to be applied, we created a specific market by means of surveys using the Contingent Valuation Method (Mitchell and Carson, 1989). The valuation survey was applied in 1,104 homes in the metropolitan areas of Madrid and Barcelona.

Accessible and Adaptable Housing

'There is no human being who matches all the average proportions and abilities; a standardised person does not exist. Every person deviates from the average to a greater or lesser extent.' (CCPT, 1996). Accessible and Adaptable Housing are two ways of designing and building that take into consideration all the types of users of the built environment: children or the elderly, adults or the disabled, etc. Both are concepts, not absolute categories, therefore need few precise specifications to be fulfilled.

We may easily define Accessible Housing as that having no architectural barriers, that is no design or construction characteristics that prevent ease of access and free movement for people with any kind of limited ambulatory functions. Accessibility criteria can only be a collection of minimum measurements and recommendations addressed to increase the range of use and function for people with different abilities and physical conditions. These criteria are not unique: diverse professions, legislative bodies, or member states of the EU use the concept depending on their own traditions and interests (Helios II, 1996). A standard European Concept for Accessibility (ECA) is in progress to unify home design criteria, like passage width, turning space, door use, user operation, reaching and holding, seating or perceiving information. Designers' expertise and common sense are also important because not all of the construction elements can be precisely measured or predefined to be accessible.

The Adaptable or Lifetime Home is a concept developed during the 1980s in several European countries including Norway, The Netherlands and Great Britain. It is a normal dwelling intended for all kinds of households, but constructed with foresight so that it can be inexpensively transformed to fit the changing requirements of its residents throughout their lives or those of a disabled member, if so required (Nolte, 1988). It puts together accessibility and adaptability through the fulfilment of standards such as:

step-free entrances,wider doors and corridors, switches to be situated at a reachable level, easy operating doors and windows, sufficient space for wheelchairs, provision

for a future stairlift and space for a through-the-floor-lift from the ground to the first floor, and
accessible toilet facilities on the ground floor.

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The Costs of Accessibility

Improving accessibility standards in housing could be considered an inefficient and expensive solution if disabled people were the only beneficiaries. The costs of abolishing barriers from the outset, before initiating construction (*a priori* costs), have been estimated in several studies. Dunn (1988) estimates the extra costs of barrier-free construction as between 0.25per cent and 4.2per cent, depending on the number and type of dwellings and whether they are new buildings or renovations. The author estimates that this increase would not reach 1per cent if 10per cent of all new developments were made accessible. According to Bringa (1997), in Norway, the necessary increase in floor space in 1989 was 16m^2, which resulted in additional costs of 8,000 Kroner~~?~~ (c. €400). Van der Voordt (1990) cites a Dutch survey by the National Housing Council (Nationale Wooningrad) on three different social housing projects developed as traditional housing. Once the final budget had been made, some precise changes were introduced to make them adaptable. The differences then ranged from €2,407 in the first project to minus €–63 [Euros] in the last one, in which design improvements and better layout resulted in cost reductions.

The increase in floor area in an accessible or adaptable home compared to the conventional home depends on several factors, but experts agree that improving accessibility is overall a question of good design. From a review of the literature we can conclude that the cost of increasing accessibility from the outset will vary depending on how widespread this way of building is, the experience of the professionals involved, the type of building and the shape of the plot[2]. All these factors make it extremely difficult to estimate a single amount for the increase in the average cost of this type of construction.

When the dwelling has not been constructed with a view to permitting subsequent adaptations for the needs of elderly or disabled members the transformations needed may be deeper and their costs higher. These *a posteriori costs* are also highly variable and dependent on several different characteristics of the building. The National Centre for Personal Autonomy and Technical Aids (CEAPAT) of the Spanish Ministry of Work and Social Affairs is dedicated to accessibility promotion and the provision of technical help for disabled people. The Centre develops housing adaptation projects for institutions or private owners. Table 1 represents the average costs of different adaptations in dwellings, gathered over the course of two years.

(TABLE 1)

The table shows the possible cost of the most common transformations remembering that both the diagnosis and the architectural project are produced free of charge by CEAPAT. Even if the costs of these transformations are high, the results in many cases are not the optimum given that it is not possible to act upon structural elements or the general design of the buildings. Both reasons illustrate how building with barriers or without some minimum adaptability considerations would mean a future costs for the residents. Moreover, a dwelling designed without accessibility would never offer any disabled person

the same welfare as one designed with it from the beginning would, even if the costs incurred in transformations were high.

A further source of information relative to all kinds of transformations developed in Spanish dwellings can be obtained from the Spanish Housing Survey (MOPU, 1991). This survey undertaken in 24,000 homes, concludes that in 25.8 per cent of the homes some kind of interior alterations had been made for different reasons. Of these, 35.1 per cent had made 'habitability reforms', 21.2 per cent had made '"layout reforms', 37.9 per cent had made 'bathroom reforms' and 38.3per cent had made 'kitchen reforms'. It is plausible to consider that, apart from the adaptations specifically made for the disabled, a considerable number of these alterations could have been made more simply and less expensively, if the dwellings had been accessible or adaptable from the outset.

The Benefits of Accessibility: A Direct Estimation.

The appraisals for increasing accessibility in a given project are usually made through cost-effectiveness, i.e. by calculating the minimum costs to reach previously stated objectives. In this way the difficult problem of estimating the benefits is avoided. In other cases a cost-benefit methodology was undertaken, estimating benefits in an indirect form, that is through the savings in costs derived from the increase of accessibility in dwellings. They can be summarised by the following:

- Ill or disabled people are able to stay at home, instead of residing in special care homes.
- A reduction in the public funding required for the adaptation of dwellings for disabled people.
- Savings in the relocation of disabled people.
- The reduction of social and sanitary home assistance costs.

Good examples of these methods can be found in the studies of Adolf Ratzka in Sweden (Ratzka, 1984) and from the Joseph Rowntree Foundation in Great Britain (Cobbold, 1997). Their fundamental limitations are that they cannot include benefits for non-disabled people with reduced mobility problems (for example, people with baby prams, temporarily injured people and pregnant women). Nor can the methods include the increase in comfort or security that the design without barriers produces for everyone.
In order to estimate the direct benefits that come from the consumption of accessibility, the observation of a market in which this good is traded is required. The benefits are derived from the choices that households of all kinds –(not simply those with disabled members) make, and from their willingness to pay for the good. Unfortunately, no such market in accessible houses exists, in which we are directly able to observe the prices paid for them in comparison with the prices paid for houses with barriers. That is why we have created a hypothetical market by directly asking the households about their willingness to pay for a better accessibility in the case of it being available. This is what is known as the Contingent Valuation Method (CVM).

The contingent valuation method

Initially proposed by Ciriacy-Wantrup (1952), this method was further developed in the 1970s, but it was not until the last decade that its use became more common. The CVM uses survey questions to elicit people's preferences for typically public goods by finding

out what they would be willing to pay for specified improvements in them. It circumvents the absence of real markets by presenting consumers with hypothetical markets in which they have the opportunity to buy the good in question. The ultimate aim is to obtain an accurate estimate of the benefits of a change in the level of provision of some public good, which can then be used in a cost-benefit analysis. In order to do this the survey must simultaneously meet the methodological imperatives of survey research and the requirements of economic theory (Mitchell and Carson, 1989). The method can also be applied to the valuation of any goods without a market. It has mostly been applied as a form of measuring environmental externalities in order to be able to include them in cost-benefit analysis.

The creation of a hypothetical market is made through correctly prepared surveys and undertaken by specially trained personnel. The surveyor acts as a provider of the good and the respondent as a potential consumer. The method obtains its rigor and credibility from two fundamental aspects: the correct specification of the good to be valued and the construction of a reliable and neutral valuation scenario that provides valid and relevant responses. To achieve this, the creation and preparation of the survey has to go through a period of different tests, including the use of focus groups and personal interviews. Pre-test surveys will allow any potential biases to be eliminated from the survey questions and the accompanying material (photographs in our case).

One of the greatest advantages of the CVM is that it allows us to include all types of values or benefits of accessibility, whether they come from:

- their direct use or *use value*, that is: standard of living, comfort or present security;
- the possibility of future use or *option value*, that is: prevention or future security; or
- the use others could make from it or *existence value*, that is: altruism, solidarity or civility.

The use of the CVM in valuing accessibility, opens the possibility of making a direct estimate of the benefits. – (or increase in well-being) perceived by all kinds of household as a result of the removal of barriers in their privately owned dwellings.

The survey as an instrument for valuation

The valuation survey was applied in Madrid and Barcelona, and their metropolitan areas, represented by the municipal districts of Alcobendas, Alcorcón, Getafe and Majadahonda in Madrid, and Badalona, L'Hospitalet, Sabadell and Sant Cugat in Barcelona. Its creation and design lasted five months. During this time, several interviews and focus groups were conducted, together with pre-test surveys in sixty households. The final survey was carried out in the homes of 1,104 people. Of these, 1,007 were randomly selected, and the remaining 97 were chosen for having handicapped occupants. These homes were obtained from a list of handicapped members provided by the *Coordinadora de Minusválidos de la Comunidad Madrileña*, a participating Non Governmental Organisation (NGO). Only the head or spouse of each family, representing the whole household, answered the survey, which was carried out in June 1997. It included questions mainly about the following subjects:

- any possible member of the family with limited mobility (disabled people, elderly people, injured persons, pregnant women or small children),
- technical aids used.
- adaptations made or which were desired in the home.;

- the existing barriers and the problems that they caused; and
- other economic and social-demographic data.

The most important part of the survey corresponded to the description of the 'scenario' and the valuation questions. In order to show the difference between a conventional and a barrier-free dwelling, without the necessity of reading long paragraphs of text, the survey included the use of photographs with a descriptive purpose. These showed different types of residents in everyday life inconvenienced by barriers in their buildings. The photographs, totalling 21, were very carefully taken and selected in order to avoid any kind of bias. To represent the people with different types of mobility conditions, they were divided into three groups:

- *disabled people*: in wheelchairs, with crutches or of an elderly age (5 photographs);
- *persons with temporary limited mobility*: with baby prams, small children, with a leg in plaster, and with a walking stick (5 photographs); and
- *persons without mobility problems who are inconvenienced in their daily activities by different architectural barriers:* stairs, narrow lifts, inaccessible windows, uncomfortable clothes-drying areas, badly-positioned switches, over-heavy front doors, narrow halls (11 photographs).

In contrast to the previous ones, a fourth group showed 10 photographs of dwellings where those situations had been avoided thanks to good design and barrier-free planning.

Lastly, a fifth group showed two drawings of a house layout before and after the adaption of a toilet, which was made possible in an easy and inexpensive way because the house had been constructed to adaptable standards. This was the unique adaptable-solution shown, given the difficulties that respondents had in understanding layout plans.

After viewing the photographs and answering some questions related to them the respondents confronted the valuation questions. In them they had to make a purchasing choice between two dwellings which were similar in all characteristics (location, height, surface, quality), but differed in the degree of accessibility and in their prices. The use of a purchase choice instead of a rent increase was due to the high level of home ownership in Spain, which is nearly to 80per cent.

The first choice, a *conventional dwelling*, had similar barriers to those shown in the first three groups of photographs. The second choice, an *accessible/adaptable dwelling*, as shown in the fourth group of photographs, had no barriers whatsoever. The second house was more expensive than the first by a certain amount. This amount had to be related to the purchase capacity of the household. For this reason the bids were fixed as percentages. Six prices ranging from 5 to 20per cent where chosen[3]. The bid vector was designed after the tests done during the focus groups and the subsequent piloting. Each price was included in the same number of questionnaires and randomly assigned to each participant. The respondents, once informed of the difference in price, had to choose to buy one of the two houses, or could refuse to buy either. This valuation system called Dichotomic or Referendum format was first used by Bishop and Heberlein (1979). The whole survey proceedings met the strictest guidelines in order to ensure the reliability and consistency of the answers obtained. The sample was divided so that we were able to evaluate both *accessible* and *adaptable* houses.

In order to get a more precise estimation of the respondents' willingness to pay (WTP), a second valuation question was implemented. If the respondent had answered positively to

the first question, that is to say, had decided to buy the accessible dwelling despite the fact that it was more expensive, then the second question would ask if she would still buy it if the price was increased to a certain amount. On the other hand, if she had answered negatively, the second question would be made at a lower price. This format using a second valuation question is called Double Bounded or Double Referendum and was proposed by Hanneman (1985) and Carson (1985). Its first applications were made by Carson and Steimberg (1990) and Hanneman *et. al.* (1991). In recent years this format has focused researchers' interest due to its greater efficiency and despite its larger statistical demands.

Table 2 shows the different prices (as a percentage increase over the price of a dwelling with barriers) used in the first question, for each of the six types of questionnaire. In bold type the corresponding price for the second question is shown, depending on whether the first answer was 'yes' or 'no'.

(TABLE 2)

In order to obtain the exact WTP of the entire sample, we had to model and adjust the data to a statistic distribution, as shown in the next section.

Finally, a third valuation question was used to compare the WTP for adaptable dwellings against accessible dwellings. The respondents were informed about the differences between both dwelling concepts and subsequently were asked an open-ended question in which they could freely choose the maximum increase in price they would accept to pay for the corresponding barrier-free dwelling (Open Ended format). In 669 of the surveys the accessible dwelling was valued first (with Double Referendum format) and the adaptable dwelling last (with Open Ended format), while in the other 338 it was the other way round. This way we could value separately both types of barrier-free homes and eliminate the bias for question order.

The Results

The results regarding the three formats used (Single Referendum, Double Referendum or Open-ended Question) show a great acceptance of the scenario utilised in the survey. Only 6.2per cent of the sample refused to answer any of the questions at all (Table 3). This is a minimal percentage, considering that in this type of contingent valuation studies, question refusal is often higher than 15per cent. As shown in the table below, seven out of ten respondents would pay some price increase for the adaptable / accessible home.

(TABLE 3)

With the referendum format, 61.9per cent of all the valid answers to the first valuation question were affirmative (as shown above). The increase/decrease in price included in the second valuation question (Double Referendum format) resulted in being too little, as demonstrated by the fact that 75.8% of the respondents kept the same answer after the price increase. The percentage of respondents who change their answer from 'Yes' to 'No' (Yes-No) in the second question, if the price rises, is higher than those who change from No to Yes (No-Yes) if the price decreases.

Results of the single referendum model

Logit and Probit estimations of the linear model derived from the answers to the first valuation question were made. The subsamples for accessible dwellings and adaptable dwellings are estimated separately. Table 4 presents the results of the Logit estimation corresponding to the random sample, with its parameters and estimators.

(TABLE 4)

The coefficient signs of the price variable (function slope) are negative, as expected, showing that the probability to accept the extra payment diminishes as the price rises, which is intuitively correct. The values of the mean for accessible (15.77) and adaptable (18.35) dwellings show an important difference of valuation in favour of the latter; but through the application of a Z-test (Imber et al. 1991), we can confirm that those differences are not significant. So we can conclude that the differences between both types of dwelling perceived by the respondents, were not enough to provoke statistically differentiated demands. The most plausible explanation is that what most households valued is the suppression of barriers, independent of the solution, whether it was adaptable or accessible. A Probit estimation was also made, and demonstrated almost identical results.

Results of the double referendum model through survival analysis

Survival analysis is a statistical technique mainly used to analyse and predict events. Events are things that change from one state to another at some point, rather than things that tend to change gradually (Imber et al. 1991). Some applications in different areas:

- *In life insurance:* to calculate probabilities and average timing of accidents occurrence.
- *In biological science and medicine*: where it is necessary to estimate the success of medical treatments for certain diseases measured by the length of patient survival.
- *In measuring the success of prison programmes* through the study of time from prison release to committing a new crime (Nelson 1982).

In using survival analysis for a contingent valuation study, the survival time is substituted by the number of people who maintain their desire to purchase the good as its price rises. The event, in this case, is buying or not buying the barrier-free dwelling. The time taken until the event is produced, is substituted in this case by the price at which the household decides not to buy the barrier-free dwelling.

In our case, the proportion of people willing to buy an accessible/adaptable dwelling depends on the extra amount (expressed as a percentage) that they have to pay, when compared with the price of a conventional house. In this manner we are able to know the price limit, above which an average household would not buy the barrier-free dwelling. To obtain the statistical parameters, we have to assume that the ‘duration’ data, or percentage of households which ‘survive’ as buyers as the price rises is distributed in accordance with a type of known statistical relationship. There exist many diverse distribution functions. The most commonly used are the following: Weibull, Logistic, Lognormal and Exponential. There is not a large disparity among results with different distributions, as seen in Table 5.

(TABLE 5)

The Weibull distribution has efficient statistics and the largest (less negative) Log-likelihood ratio, which is the statistic showing the fitting of the survey data. Furthermore, it is the most used function in this type of study, and the one used in the two most well-known case studies: the valuation study of lost passive use values resulting from the Exxon Valdez oil spill in Alaska (Carson et al. 1992); andthe valuation of benefits derived from keeping the Kakadu Conservation Zone free from mining interests (Imber et al. 1991). Consequently the Weibull distribution was chosen in our study. Table 6 summarises the main central tendency statistics of the Weibull distribution, their standard errors and confidence intervals with 95per cent probability.

(TABLE 6)

The table shows that the mean amount the households would pay as an extra cost for the accessible or adaptable dwellings compared with conventional dwellings is more than 12per cent. The difference between valuations of the accessible and adaptable home is not statistically significant. These results show that what the households valued above all, was the elimination of barriers, without taking into account the difference between Accessible and Adaptable houses. That is why we take as valid the mean for the entire sample: 12.53per cent. This is the increase in value (or benefit) that the households perceive as consequence of the removal of all the architectural barriers from a dwelling.

Results of the open-ended model

The survey respondents had the opportunity to state directly their valuation for both types of barrier-free dwellings through a third valuation question, an open-ended question, of the following kind: '*How much would you pay for an adaptable (accessible) dwelling compared to a conventional dwelling?'* The price is directly obtained from the response to the question, thereby avoiding the need to fit a statistical distribution to the data for its interpretation. In this manner the data treatment and subsample comparison is much simpler.

With this method, the responses obtained show important differences in valuation between the accessible and the adaptable dwellings. Surprisingly, the Adaptable house was given a value 2.3per cent less than the Accessible house. If 14.5per cent of the respondents decided to buy the conventional house (with barriers), whilst having the Accessible house as the alternative, 21.7per cent made the same choice when the Adaptable was the alternative. The difference in the percentage of respondents willing to pay for one or the other type of dwelling increased as the price rose (Figure 1). We can explain these results in two ways: (a) As a consequence of the introduction of a new concept – (adaptability) in a particularly conservative market, such as the housing market; and (b) Due to the difficulties of giving a detailed description of this concept in the limited scenario of a survey.

(FIGURE 1)

Nevertheless, these results should be viewed with a certain caution, because the open-ended question was the third valuation question answered by the respondents, and hence some specific bias could be present in this type of valuation scenario. The learning process consequence of the previous Double Referendum Question could provoke both positive

and negative effects. This could accumulate with other effects, such as the ones derived when changing from closed to open format and the different data interpretation model.

The most important positive effect would be the experience of previous valuations which permits the reconsideration of the willingness to pay, and the possibility to express it directly through an open question format. The main negative effects could come from the loss in exogeneity in the new valuation, that will be seen as being affected by the 'anchoring effect', that is to say, to have a reference to prices coming from a previous valuation, and additionally from the possible incentives of producing a biased valuation. The problem of incentives is clearly shown by the publicly provisioned goods with the 'free-rider' strategy, which represents those people interested in over-valuing their willingness to pay with the intention of increasing the public goods provision, knowing that they won't be required to pay for it. In our case, the dwelling being a private good, the free-rider strategy loses part of its sense, but not all. The hypothetical character of the established market and the importance of the existence value – (which includes altruistic feelings) could also lead to free-rider effects.

(TABLE 7)

From Table 7, we can note the following:

The mean values are very different to those obtained through the Double Referendum format (Table 6). This should not surprise nor invalidate any of the results. According to Haneman and Kanninen (1996), to expect the results to be the same among different formats is like affirming that words have the same meaning whatever the context in which they are pronounced. Any market study shows that this is not the case. Differences between the two question formats used were analysed in diverse studies. Boyle and Bishop (1988) concluded that no single CV technique is neutral, and each has its strengths and weaknesses. Ready et.al. (1996) proved consistency with previous studies when concluding that the Referendum method generated larger estimates of WTP than the Open-ended method. Kealy & Turner (1993) compared the two formats for both public and private goods. The results of the statistical tests they applied show a clear difference when the goods valued are public (from 1.4 to 2.5 times, depending on the type of function used), but an almost negligible difference when the goods are private. For these authors, question format seems relevant only when the goods are public, because the respondents have more difficulties in fixing a value for products they are not used to buying.

Nevertheless, it is believed with a certain consensus that the open format offers a lower estimation of the *consumer surplus* (the theoretical measurement of the good's value) compared to the Referendum format. In the majority of markets, when a consumer has to decide whether or not to buy a product, he or she makes that decision based on a given, fixed price. Only on a very few occasions will she decide how much to pay for the product.

The value obtained for the adaptable dwelling was less than that of the accessible dwelling. The differences between the means in Table 6 are in fact statistically significant according to some parametric tests undertaken: Mann-Whitney Test (medians) and the Kolmogorov-Smirnov Test (distribution).

On the other hand, the number or non-respondents is very similar in both subsamples: 21.8per cent in the adaptable dwelling case and 21.9per cent in the accessible one. What

this seems to indicate is that the fact of having less information about the Adaptable Housing did not mean a greater rejection of the question. As a consequence, the fact that this type of housing had a lower valuation, is not due to a lack of information, but due to the good itself or to how it was presented.

Main reasons for the valuation responses

The survey also captured *verbatim* the motives why the households rejected or accepted paying for greater accessibility. The main reasons alleged by those who decided not to pay more for an accessible dwelling, were lack of money (33.1 per cent), lack of consciousness of its need (23.5 per cent) and objections to or rejection of the valuation scenario (10,2 per cent). The motives for those who decided to pay more for the barrier-free home were that the removal of barriers means greater comfort, standard of living and security (44.1 per cent), or planning for the future (43.8 per cent).

Further results

The socio-economic information collected from the surveyed households allows us to analyse further the results and make comparisons among subsamples. Some of these subsamples were analysed in particular detail, especially the following: households with disabled members, households with elderly people and households who experienced any other type of reduced mobility (due to accidents, the presence of small children etc.). Furthermore, the fact of having surveyed in different geographic locations allows comparative spatial analysis. The main comparative results are:

12.5 per cent of the randomly chosen households had at least one disabled member. These households would pay the same as the rest of households for barrier-free dwellings. Those other 97 households coming from the NGO list of handicapped, would pay an average of 1.4 per cent more. (that is, a 13.9 per cent price increase for the barrier-free dwelling).
The proportion of households which had had temporary limitations in their ambulatory functions (for reasons of pregnancy, accidents, small children, etc.), that would buy the barrier-free house, is 11.4 per cent more than the rest.
Even in those households not affected in any form by barriers, an important demand for accessibility was shown. Half of them chose to buy barrier-free houses.
There is a difference in the perception of accessibility shown by those living in houses when compared to those living in flats. The former deny the existence of barriers in 63 per cent of cases whilst the latter in only 38 per cent of cases.
Demand increases at the same time as the earnings of the households rise. However, when the figure of earnings reaches €2.700 per month, the demand begins to decline.
Between the surveyed areas of Madrid and Barcelona, significant differences in demands for barrier-free housing were not perceived.

What we would highlight in these survey results is that there is not a great difference of demand between different groups of people. Our statistical tests show a negligible level of significance when comparing subsamples: the acceptance of barrier-free houses is slightly related to economic situation, gender, physical condition and age. Only those households pre-selected for having handicapped members (totalling 97 in the survey), showed very significant differences of valuation. However, this group can not be taken as representative of the disabled community. Because they are members of a specific organisation for the handicapped, they have a greater-than-average involvement and concern about their

problems. Furthermore, they are on average 25 years younger than the disabled people encountered in the random sample.

A very high proportion (82per cent) of the households recognised that in their dwellings there exist barriers similar to those shown in the photos seen throughout the survey. The photo, which was most frequently identified with, corresponds to that of a mother with a baby pram descending a set of stairs. This situation has been found to occur in two out of seven homes.

Application in the Housing Market

The estimated benefits of improvement in accessibility can be totally or partially applied in the housing market –which is a fundamentally private market. We have demonstrated that under certain informative conditions, the households, in case of a house purchase, would agree to pay more for a dwelling with improved accessibility. But building developers, by their own initiative, will only increase accessibility if the size of their market (effective demand) grows improving their profit expectations. If we consider that throughout Spain 73.3 million square meters of new housing where approved for development in 2000 and that the average price of each square meter in the market is ~~Ptas.150,905~~ € 907€ , we will get an idea of the economic consequences of the degree of accessibility reached.

To transfer the values of accessibility obtained through our valuation scenario to the housing market, we had to make the following two assumptions: First, that the average type of building constructed nowadays has similar barriers to those shown by the dwellings in the photos: stairs or steps in the building entrance, narrow lifts, heavy entrance doors, narrow doorways - especially in bathrooms -, reduced mobility space in hallways, etc. Second, that the information available to house buyers is similar to that shown, mainly by way of photographs, to the respondents of the survey. In the actual housing market, the amount of information, regarding accessibility, that buyers have and take into consideration when purchasing their new homes could be considered scarce.
Under these assumptions, the average value incorporated by the removal of barriers in the whole market of newly built dwellings would increase its total value: according to our results with the two valuation formats used by 9.44 per cent or 12.53 per cent. Considering that the market value of the 73.3 million sq. meters of new dwellings built in 2000 in Spain is €66,5 billion[4], we can conclude that incorporating a higher standard of accessibility to that housing stock could be a very profitable decision for both the public and the private sides of the market.

An important aspect to take into account is the distribution of the profits derived from the market growth, once discounted from the cost of improving accessibility. If the market is not competitive, these will be acquired by housing promoters as extra profits. If it is perfectly competitive, the profits will be kept by the households in the form of *consumer's surplus*, or the difference between their maximum willingness to pay and what in reality they will have to pay.

Conclusions

It is becoming widely believed that the increase in the physical accessibility of housing leads to a better standard of living for all. The old idea that the struggle for accessibility is a disabled person's problem is changing. The transformation of a minority demand into a necessity that is generally accepted could act as a positive and complementary stimulus to legislative requirements.

The demand for an optimum accessibility in dwellings is estimated through the Contingent Valuation Method. The willingness to pay for barrier removal was derived from a survey to households in Madrid and Barcelona under the hypothesis of new housing purchase. The results show that most of the sample can perceive and value the benefits privately obtained from improved accessibility. The average WTP is a 12.5 per cent price increase for housing meeting accessible requirements compared to housing with different barriers.

This demand for greater architectural accessibility is not satisfied by current dwellings (82 per cent of the households surveyed recognised having different barriers at home). Whether from a social or private perspective, these results show that the market is operating under suboptimal conditions. The main reasons are: the important effect of barriers on the welfare of residents, the imperfect information provided by the market concerning the supply of accessibility in housing, the difficulties and costs to suppress the barriers once the construction stage is over, and the risks of undesired moves for the residents.

Given that accessibility is recognised as a quality attribute of housing, private incentives exist for investment in information or publicity related to it. Regardless of the existence of comprehensive legislation on private housing accessibility and the degree to which this legislation is fulfilled, public institutions might contribute to enhancing market optimal allocation through the provision of more complete information to potential homebuyers. This would result in an increase of the effective demand for accessible housing and a corresponding increase in the supply of such housing.

Another conclusion of the analysis is the great homogeneity of answers among the different types of households surveyed. Our statistical tests show a negligible level of significance when comparing subsamples. The acceptance of barrier-free houses is slightly related to economical situation, gender, physical condition and age of the respondents. Only those households with previously known handicapped occupants (totalling 97 in the survey) showed very significant differences of valuation. The demand for accessibility provoked by the information in the survey (photographs and text), has proven superior to that coming from self-experience or from the objective need of people. Accessibility demand may be hidden in people's unhappiness with their built surroundings, but it can hardly be expressed if people have no knowledge of any possible ways of satisfying that demand. Ease of comprehension and the lack of psychological compromise may explain why the respondent's recognition of barriers in their own homes was larger when photographs were shown than when a direct statement was required.

The main motives why households would pay for the increase in accessibility are the extra comfort it brings and forethought for the future. These positive motives show that the removal of barriers is generally perceived as an element of standard of living and security. Economic restrictions and rejection of the survey scenario are the main reasons for those not wanting to pay more for barrier-free housing.

The introduction of a new and –(perhaps) insufficiently explained concept (adaptability) generates certain distrust in the particularly conservative housing market. How to improve the spreading of advantages of adaptability should be studied so as to increase logically its acceptance due to its great functionality and social interest. It is expected that the policies of spreading and marketing information may have an important influence on increasing its demand.

The value added by improved accessibility to the annual production of housing in Spain, as derived from households' willingness to pay, could reach €6.3 or €8.3 billion, depending on the valuation format used and the fulfilment of two market assumptions. Transforming the detected demand into an effective requirement of the consumers, involves both public and private interests. The desire of disabled people to obtain a barrier-free environment is heading in the same direction as private interests of general consumers and competitive developers.

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[1] See Brewerton & Darton (1997) for the British standard, Bringa (1997) for some Norwegian characteristics and Paricio and Sust (1996) for other flexible housing ideas.

[2] In spite of the conclusions from these studies, reaching a zero or near zero cost for the increase in accessibility, maybe unrealistic nowadays. Besides the costs of incorporating some auxiliary elements (bars, reinforced walls...) or increasing floor area, there exist other important costs of information that are reflected - in an imprecise but certain manner - on the final price of the homes. These are, the costs of innovation and incertitude that come with changes in the building processes, the costs of training the workforce and professionals involved, and the errors which occur whenever new working methods are put into practice.

[3] So that each respondent could know more precisely the equivalence of the percentage on its own case, the repercussion of each percentage was illustrated over the price of two dwellings of 10 and 20 million pesetas of 1997 (equivalent to about €66.700 and €133.400)

[4] Anuario Estadístico (Statistical Yearbook) 2000. Ministerio de Fomento. Centro de Publicaciones 2001, Madrid.

Table 1.- The Cost of Dwelling adaptations and the removal of barriers. (January 1996 – September 1997).

ADAPTATION	DETAILS	Nº CASES	AVERAGE COST €
Lift or elevator	Flats: One level	11	21,028
	Two levels	5	44,044
	Three levels	4	57,753
	Houses	3	33,650
Main entrance	Ramp	12	9,867
	Lifting platform.	28	17,592
Bathroom	Bath, bidet...	16	5,470
Door width	Increase	3	2,608

Source: CEAPAT (IMSERSO). Ministry of Work and Social Affaires

Table 2. Second questions' prices (bold type) related to price and answer in the first question.

MODEL of QUESTIONNAIRE .	PRICE in 1ST QUESTION	PRICE in 2ND QUESTION RELATED TO 1ST ANSWER	
		NO	***YES***
1	5 %	**2 %**	**7 %**
2	7 %	**5 %**	**10 %**
3	10 %	**7 %**	**12 %**
4	12 %	**10 %**	**15 %**
5	15 %	**12 %**	**20 %**
6	20 %	**15 %**	**25 %**

[Please Add Some Explanation]

For example: in the Model 1 questionnaire the respondent was asked if she would pay a 5 per cent increase in price for the barrier free dwelling compared to the standard (with barriers) one. Depending on her answer (No or Yes) the question was repeated with a lesser (2 per cent) or higher (7 per cent) price in order to narrow the interval in which her maximum WTP for avoiding barriers may be located.

Table 3 General Results: valuation acceptance and willingness to pay for barrier-free homes

FORMAT	VALID ANSWERS	WTP=0	WTP>0
Single referendum	93.6 % (942 / 1007)	38.1 %	61.9 %
Double referendum	93.1 % (938 / 1007)	33.4 %	66.6 %
Open-Ended	83.6 % (842 / 1007)	29.6 %	70.4 %

Table 4 Linear model results. Logit Estimation

	ACCESSIBLE DW.	**ADAPTABLE DW.**
Nº VALID SURVEYS	631	311
Constant Coefficient	1.639	1.594
(t)	(7.534)	(5.006)
Price Coefficient	-0.104	-0.087
(t)	(-6.065)	(-3.527)
LogL	-403.02	-196.83
LogLR	-422.38	-203.24
Model Accurate Predictions %	63.1 %	65.9 %
Mean (s. e.)	**15.77** (1.05)	**18.35** (2.28)
Confidence Interval 95 %	(1.94 - 17.60)	(13.88 – 22.82)

Table 5 Main parameters and estimates for Four Survival Distributions

PARAM.	**WEIBULL**	**EXPONENTIAL**	**LOG-NORMAL**	**LOG-LOGISTIC**
LOCATION	**2,65**	**2,53**	**2,42**	**2,43**
(t – value)	**(144,2)**	**(29,0)**	**(118,1)**	**(127,9)**
SCALE	**0,43**	**1**	**0,49**	**0,28**
(t – value)	**(24,7)**		**(38,0)**	**(26,3)**
LOG-LIKELIHOOD	**-438,8**	**-694,4**	**-439,2**	**-443,1**

Table 6 Main Valuation Results with Weibull distribution of survival data

TYPE OF DWELLING	Nº OF BUYERS	MEAN PAYMENT	MEDIAN PAYMENT (s.e.)	95 % CONF. INT.
ACCESSIBLE	**415**	**12.36**	**11.92 (0.27)**	**11.38 - 12.46**
ADAPTABLE	**210**	**12.88**	**12.51 (0.38)**	**11.77 - 13.26**
ACCES + ADAPT	**625**	**12.53**	**12.12 (0.29)**	**11.68 - 12.56**