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# **Towards a reliable estimation for the Dutch housing need**

**A research on the objectives and limitations during the process of improving the current models of estimation.**

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Master thesis

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## **Preface**

You're about to read a research about the models of estimation which are used in order to estimate the housing demand within the Netherlands for the upcoming years. This master thesis is part of my master program economic geography, which is one of the master trials of the Radboud University of Nijmegen. Before I will start with a review of my research, I want to express my gratitude to Prof.Dr. Frans Boekema, Eric de Leve, and Laura Engelbertink for their support during the complete research process.

## Summary

This research is an attempt to get more crib on the Dutch housing market. In order to get more crib municipalities and consultancies use models of estimation to develop their housing programs. These models of estimation contain problematic aspects. Especially the demand side of the current models of estimation are considered as not sufficient. It becomes more and more important to know were and in which kind of house people want to live, instead of looking at the number of households. The main question of this research is: *Which improvements on the demand side of the current models of estimation for the Dutch housing need make the current models of estimation for the Dutch housing need more reliable?* By answering this question, it was important to reveal what the problems and limitations are during the development of a model of estimation for the qualitative housing demand.

This research started with a wide analyses of the Primos and Socrates models of estimation. Out of the literature and the interviews with the experts could be concluded that the Primos model of estimation is reliable enough, but that the Socrates model of estimation can be problematic. Especially on the scale of the municipality and corop region is the Socrates model of estimation not sufficient enough. So the rest of this research focused more on the Sorcrates model of estimation than the Primos model of estimation.

An important aspect of a model of estimation is the structure of this model. Within the chapter about the structure of the models of estimation three aspect need to be keep in mind. First of all is it important to know that research assumes that the number of households which will be living within a region is the starting point in order to estimate the housing demand. Secondly is it necessary to make a distinction between the complete housing market and the active housing market. In order to make your model more reliable it is interesting to look which household are currently living in their preferred living environment and who don't. This kind of knowledge will give you also a better understanding of the suitability of your current housing stock. The third important aspect of the structure of a model of estimation is that there needs to be a filter included which decides which households are potential movers and who aren't. So which households will become part of the active housing market.

During the selection of the variables one important adjustment was made. When we look at the variables that need to be included we saw that it would be wise to add the variables educational level, and the number of rooms within the model. Both variables can make your model more reliable without making it too complex. The variable income needs to get a less important role within the estimation of the qualitative housing preferences of a household. Just like the fact that the price tag of a house isn't something that a household prefers. Nobody wants to buy a house because it has a certain price tag. A household prefers a set of characteristics which has a certain price. So the income of a household and the price tag of a house can only say something about the fulfillment of these wishes. You have to make an exception for the estimation for the housing characteristic form of ownership. Since the Dutch housing market is known for its high amount of regulations would it be wise to estimate the division of owner occupied houses and rented houses on the basis of the income of a household. Beside the fact that it would be wise to include, exclude or change variables, chapter 6 concluded that classification of these variables is highly important and can have a huge impact on the outcome of your model of estimation.

During the selection of variables and the analyses of the relations between these variables this chapter described two main problems/limitations. First of all, there is a constant contemplation about the complexity of your model and the explanation power of your model. Secondly, the data sources are the biggest limitations. At this moment, most consultancies are only using the data out of WoON (2012) to estimate the housing preferences of a certain households. These are preferences of households before they enter the housing market. It would be more interesting if we combine this data with the actual movements, so with the preferences after a household enters the housing market. Since it isn't possible to get the GBA statistics, you aren't able to make this estimation.

At this moment consultancies use the data out of WoON (2012) in order to estimate the number of movements. Every household who say that they will move in the upcoming two years is according this estimation a potential movement. Chapter 7 concluded that this isn't enough. You have to look what the cause of this potential movement is. It would be wise to define a potential movement as a real movement on the basis of the income of a household and a changed household situation.

Like already mentioned, the WoON (2012) research is the most important data source for the models of estimation for the qualitative housing demand. Unless the fact that WoON has been honoured as a reliable data source, it has his limitations. First of all, it is a research which is conducted on a national scale, which means that there aren't enough respondent on a lower scale to make more complex estimations. Secondly there are no questions included about the intentions of households. It's possible to overcome these problems. The first problem is possible to overcome by oversampling the WoON (2012) research. At this moment this is too expensive, but it's also possible to combine the respondents out of the same living environment in order to get enough respondents. It's possible to overcome the second problem by conducting an own research in which a conjuncture measurement is the best approach or by using the results of the WoON research in combination with the GBA data base.

Unless the fact that it's always possible to make the models of estimation more reliable, almost all experts explained that we can make more improvements during the presentation and interpretation of models of estimation for the Dutch housing market. There is too much trust within the outcome of these models, and sometimes even considered as the truth. The experts explained three types of solutions. First of all, simply explaining the assumptions. When it becomes clear which assumptions are included, it's clear what the limitations of the outcome are. The second possibility is by giving multiple scenarios. By giving multiple scenarios it becomes visible that the outcome of a model of estimation could be different if other assumptions are included. There is one problem with this approach. Sometimes policy makers simply choose one scenario as the truth, which is most of the time the most positive scenario. Thirdly, it would be wise to make the policy maker part of the development of a model of estimation. So the policy maker will have an influence on which assumptions are included.

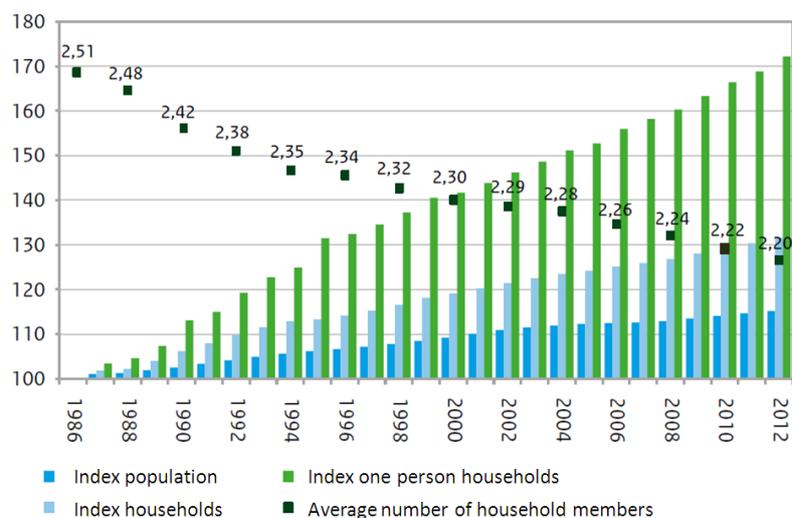
# 1. Introduction

The last decade, the Dutch housing market changed dramatically. The international crisis had an impact on multiple aspects of the Dutch housing market (WoON, 2012). This sentence is the opening sentence of the WoON report 2012. On April 2013, Drs. Blok, the minister of living and civil service, presented this report to the council. WoON is a periodical research conducted by the Ministry of home affairs in elaboration with the Central Bureau of statistics (CBS) and is one of the most important studies on the field of living within the Netherlands (WoOn, 2012). Topics of this research are the actual living circumstances, living costs, the number of movements during the last two years, movement plans and housing needs (Blok, 2013).

## 1.1 Inducement

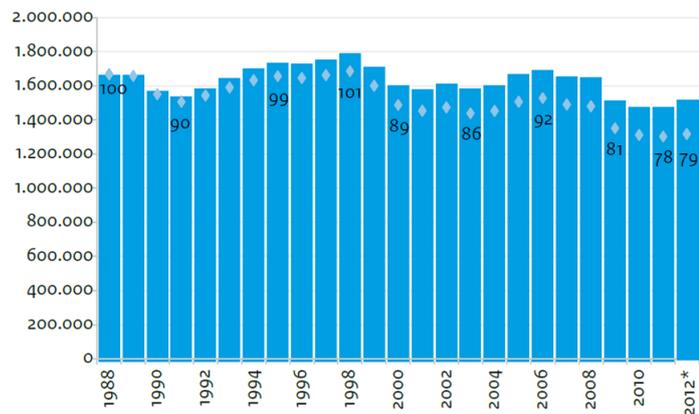
The Dutch housing market is changing all the time, but the changes during the last years have been more dramatically than ever. First of all, the Dutch households are becoming more individualistic. During the period 1986 – 2012 the average number of people who are part of one household shrunk, from 2,51 to 2,20 (CBS). Within every age group the amount of one-person households is growing (WoON, 2012). So this more individualistic characteristic isn't only caused by the growing amount of elderly. This trend is important, because these households (with a more individualistic character) prefer different houses (WoOn, 2012). This trend has as result a growing need to change the current housing stock in order to house the households of the future. Secondly, there is a new trend within the division between owner occupied houses and rented houses. At this moment the total number of inhabited houses contain 40,7% rental houses and 59,3% owner occupied houses. This ratio is the same as the ratio of the last WoON study, which is remarkable because the percentage of owner occupied houses was growing for decennia (WoON, 2012). Consultancies and other actors like municipalities and provinces that always worked with a growing percentage of owner occupied housing, are now facing a new situation which could have a huge impact on the Dutch Housing market. Thirdly, it becomes harder for a household to find a house. Since 2009, 200.000 households have entered the Dutch housing market, but the amount of households with a home grew with 140.000 (WoON, 2012). So 60.000 households are still living in a student accommodation or cohabiting

with someone else. This problem is partly caused by the reduction of the realization of building plans. The last three years, developers constructed 60.000 new houses per year, which is significant less than the period before, in which developers constructed 72.000 new houses per year (WoOn, 2012). The more individualistic characteristic of the Dutch households is also part of



**Figure 1: Individualisation of the Netherlands. Source: WoON (2012)**

the problem. Fourthly, the Dutch housing market is less dynamic than ever before. The number of moved households reduced by 19 percent (WoON, 2012). This shrinking number of movements is mostly located within the owner occupied housing sector, in this sector the number of movements shrank with 42% (WoON, 2012). As a reaction on the reduced number of movements, the number of households that have a



**Figure 2: Shrinking number of movements. Source: WoON (2012)**

desire to move grow. There are 14% more households who prefer to move than in 2009, which are 2.15 million potential movements (WoON, 2012). A potential movement means that a household has a desire to move within a time period of two years. WoON (2012) talks about a slowly loading reservoir of potential movements. So a great amount of desired movements aren't cancelled, or like WoON say evaporated, it is just a matter of time that these movements eventually will take place. When the economic situation in the Netherlands improves, WoON (2012) suspects that these households will overcome their barriers to move, and move to their desired situation (Schilder & Conijn, 2013). These potential movements are important, because they have a huge impact on the demand side of the Dutch housing market. It's hard for municipalities and consultancies to react in the right way on these changing situations, because there are multiple causations for these new situations. In the next paragraph I will give an example of this problem by using the topic 'potential movements'.

On the basis of the research of Schilder & Conijn (2013), it is questionable that there is a slowly loading reservoir of potential movements. Of course the crisis had an impact on the Dutch housing market, but even without the crisis the consumer is limited by many different variables. The financial status of a household is one of these limitations during the process of moving towards a new home (Ortalo-Mangé & Rady, 2006). Only a limited number of households have the ability to purchase their desired living circumstances, without any financial support. So you need to go to a bank for a mortgage. The possible amount of mortgage depends on the income and the capital of a household. According to Schilder and Conijn (2013) is it impossible to state that these potential movements are really potential movements, when you miss the data about the number of acceptations of mortgage applications. Another possible barrier is the residual mortgage of a household. The number of movements shrank mostly under households with an age of 25-45 (WoON, 2012). Households with these characteristics are also the households with the biggest residual mortgage (Schilder & Conijn, 2013). Schilder and Conijn did a research on the causality between the amount of the residual mortgage and the tendency to move. They indeed concluded that a residual mortgage cause a lower tendency to move. All in all Schilder and Conijn (2013) conclude that there is no slowly loading reservoir of potential movements. Schilder and Conijn came with another conclusion than WoOn (2012) because they look at another causality. Simply because of these multiple causalities is it hard to know what the exact impact of these changes will be. It is possible to make an estimation on the basis of some specific data like WoON

(2012), but when you use other data, like Schilder & Conijn did, you will conclude something different. Since we find more and more variables that are influencing the housing market and we have to deal with constantly changing developments, it becomes harder to get a good insight into the field of living.

## **1.2 Societal relevance: Towards a more reliable estimation for the Dutch housing market.**

To get an overview of all the variables and causalities actors like municipalities and consultancies use models of estimation to frame these changing situations. Within the Netherlands there are multiple estimation models that try to make a reliable estimation of the Dutch demographic developments, and the Dutch housing market. Examples are: the Primos model of estimation, the 'regionaal demografische prognose '(RDP), the 'interprovinciale bevolkingsprognose'(IPB), the 'Projecting population events at regional level'(PEARL), the GBpro model of estimation, and the model of estimation of Progneff.

### **1.2.1 The (un)certainities of framing.**

An estimation for the Dutch population like the number of Dutch households and the characteristics of these households has been proved as useful for even private or public organizations and is reliable on multiple scales, but there lies a problem within the translation from the available data to an estimation for the housing demand. This part of the housing market is harder to frame into a model of estimation, than the estimation for the Dutch population (Harms & Doeswijk, 2013). This was the conclusion of a debate between experts in Utrecht, organized by the council of living environments and infrastructure. Like illustrated within the inducement, there are too many variables that correlate with unpredictable economic and societal developments. The causal trends between these variables contain a high uncertainty rate in time but also have different outcomes on different scales (Harms & Doeswijk, 2013). So it is hard to add these trends within a model of estimation, but without these trends the models are unusable. Looking at the reliability of the Primos model of estimation for the Dutch housing need (which is one of the Dutch models of estimation which estimate the housing need), we see that 30% of the outcomes had a deviation higher than 5%, and 5% of the outcomes had a deviation higher than 10% (Poulus & Faessen, 2010). So this Primos model of estimation isn't that reliable. Why is this estimation unreliable? To answer this question I have to do a complete research, but for now I will give some first explanations. In order to have a good insight in the current models of estimation, we need to split these models into two parts: the estimation of the housing demand, and the estimation of the housing stock. Also called the demand and supply side of the models.

The supply side of the models of estimation include the production, renovation and demolishing of houses. The realization rate of these actual building plans is one of the complicating factors for the models of estimation, which is influencing both the demand side and the supply side of the models of estimation. The movements on a local and regional level are highly influenced by the changes within the housing stock, simply because you can't move towards a house which isn't available (Faessen & Poulus, 2010). So the realization of the building and demolishing plans have a huge impact on the number of movements. Research institutes use data that contain the building and demolishing plans of organizations like municipalities, the state, and the province (Faessen & Poulus, 2010). One of the

conclusions of the debate between the experts in Utrecht (Harms & Doeswijk, 2013) was that the realization of these specific building programs are highly uncertain, and make the current models of estimation less reliable. These building programs are uncertain, because municipalities have planned to build more houses than necessary (Manshanden et al., 2009).

The demand side of the models of estimation entail the number of households and their desires, preferences and wishes. As a result of the overproduction of houses, the demand side of the models of estimation became more important (Harms & Doeswijk, 2013). Instead of questioning: where can I build new houses? Municipalities have to answer the question: Are people willing to life in this specific area? To answer this question you need much more data than demographic data can provide (Harms & Doeswijk, 2013). Aspects like the quality of education, care, and accessibility are becoming more and more important. Also the economic developments became more important, examples are: purchasing power, employment rate, and trust of consumers (Harms & Doeswijk, 2013). Since most of the models of estimation prevailingly look only at demographic developments, it's questionable that the models of estimation provide enough data to make a reliable estimation. This lack of other variables than demographic variables makes it hard to determine a more detailed housing need.

Of course there are lots of complicating factors, which are too much to explain for now. Important for now is that the current models of estimation don't include enough variables to determine a more detailed housing need, because they prevailingly look at demographic developments. So the models of estimation are useful in order to determine the Dutch population and household characteristics, but it is hard convert this data into the housing demand. Since these models of estimation are used to make important decisions about aspects within the field of living, (Venhorst and Wissen, 2007), this is a highly problematic situation. In order to create better and more effective policy within the field of living, we need to develop a more reliable model of estimation for the Dutch housing need. This model must give a better explanation of the relation between the number of households and their actual housing demand, which eventually will lead to policies, which can react in a more reliable way on the changing developments.

### 1.3 Scientific relevance: combining knowledge

There has been written a lot about the Dutch housing need. Especially about the impact of the crisis on the Dutch housing market. Examples are authors like Pijlic & Stegeman (2013), who say that the crisis lies within our definition of a good economy, and we don't need to go back to this 'normal' situation, or authors like Francke (2010), Schilder & Conijn (2013), and Elsinga et al. (2011) who try to explain how the current situation is created over time. All these authors came with different explanations about the impact of the crisis on the Dutch housing market, but maybe more important, all these authors came with different causations. Like concluded in paragraph 1.2, it would be useful to take a critical look at the models of estimation that combine these causations, so we can convert the demographic data into the housing demand in a more reliable way.

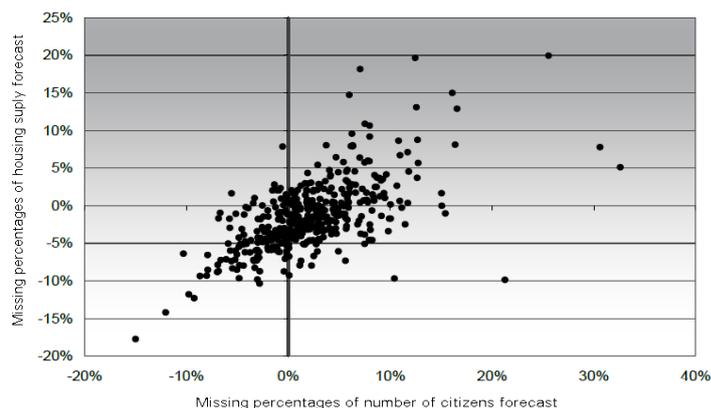
These models of estimation have been the topic of research for many times. An interesting text for this research is the text of Johan van Iersel (1999). In this text he tries to explain the shortcomings of the models of estimation which were used in 1999. He begins his text with the understanding that you can split an model of estimation for the housing demand into two parts, an estimation of the population and it's characteristics, and an estimation on the basis of the first estimation for the upcoming housing needs. According to van Iersel (1999) the most important shortcomings are: the uncertainty of the amount of in- and out coming migration, the economic developments on national and regional scale, and the uncertainty of building policy. Van Iersel (1999) states that the economic developments on the local scale are most relevant, because he assumes that the economic situation on the local scale is the most important factor that generates a movement of a household. Unless the fact that van Iersel (1999) makes really clear conclusions it's still doubtful that his conclusion are still valid, because he finished his research in 1999 (a time in which the Dutch housing market had complete different characteristics). Beside the fact that his text is a bit outdated, he still doesn't include more variables than the current models of estimation. Another interesting research is the work of Boelhouwer and Hoekstra (2011) who looked at three socio cultural developments which aren't used within the current models of estimation but have a significant influence on the future housing demand. They again concluded that we need to include more factors within the current models of estimation, and that the most important shortcoming of the current models of estimation are this lack of other variables than demographic developments. In order to convert the data about the population into the housing demand, we need to look at other variables than just the demographic developments.

Beside the fact that scientists conducted a lot of research on the shortcomings of the current models of estimation, they also looked at the differences between different kinds of models of estimation. Especially the comparison between the Primos model of estimation and the model of estimation of the provinces are well investigated. Authors like Venhorst and Wissen (2007), and van Iersel (1999), looked at this specific difference. These papers had multiple conclusions, but in a broad sense they concluded that the current Primos model of estimation has the best methodological background, but faces problems in order to react on changes at a regional scale, and the model of estimation developed by the provinces make a better forecast for developments on the regional scale but has a weaker methodological background (Venhorst and Wissen, 2007). In order to highlight the relevance of their own model, the

research institutes who developed models of estimation for the Dutch housing market have written multiple texts about the comparison between their own model of estimation and other models of estimation. Examples are: de Jong et al. (2005), Provincie Gelderland (2012), and Stam (2012).

Scientists also conducted research on the practical use of these models of estimation. A good example is the research conducted by Van Der Reijden et al. (2011), who looked at the attainability of a national monitor within the field of living. Interesting is that, at this moment, there is no complete view on all the building plans at a national level, because all municipalities create their own building plans (Der Reijden et al., 2011). So municipalities or provinces use their own data for their estimation of the housing demand without knowing which building plans other municipalities are creating. This makes the current models of estimation less valuable, because more building plans will be created than necessary. When you don't know that another municipality tries to fulfill the same housing need as your municipality, you'll be building two houses for one household. So it would be useful if there was a model which would include the building plans of all municipalities. At this moment the ministry of home affairs is creating a monitor for the local and regional building plans (Der Reijden et al., 2011). Beside this monitor, the TNO building model of estimation gives a good understanding of the production side of the housing needs (TNO, 2011). By linking this new monitor to the TNO building estimation model, the reliability of the production side of the current models of estimation will improve.

Looking at the literature about the demand side of the housing market, we see that there is a lot written about variables which have an impact on this demand side, but there aren't that many models of estimations which try to combine these causations. So it would be useful, to focus on the creation of a model of estimation which enable us to make a more reliable estimation of the demand side of the current models of estimation. The current models of estimation are also less reliable on her demand side, because it is hard to convert demographic data into the housing demand (Poulus & Faessen, 2010). I will take the Primos model of estimation as an example. Looking at figure 3 you will see that the missing percentages of the number of citizens who are looking for a new house (which is one of the most important variables within the current models of estimation) is much higher than the missing percentages for the housing supply. All in all we can conclude that it would be useful to focus on the demand side of the model, because there is a growing desire to combine these different causation into a model that gives us a better insight in the relation between the number of households and the housing demand.



**Figure 3: Missing percentages of the current Primos estimation model. Source: (Poulus & Faessen, 2010)**

Of course there are municipalities, provinces or researchers who try to combine the different estimation models and different causalities, but there isn't any research conducted on the shortcomings and objectives during the realization of a model that tries to entail this new perspective of a more qualitative housing need. A more qualitative housing need means that we need to focus on the question: In which places and under which conditions are certain households willing to live? Instead of simply looking at the amount of households (Harms & Doeswijk, 2013). Like mentioned before Harms & Doeswijk (2013, p.1) say: *'To answer this question much more data is needed than is provided by demographic developments'* (Harms & Doeswijk, 2013). An example of a model that tries to include other variables than demographic developments is the Houdini model which was created on a conference about system dynamics in Washington DC (Eskinasi et al., 2011). *'Houdini is a system dynamics model of the Dutch regional housing markets with the diPasqaule and Wheaton real estate model as a conceptual cornerstone. Houdini is being developed in a setting of possibly drastic changes in Dutch housing policy'* (Eskinasi et al., 2011, p.2). The Houdini model is illustrated in attachment A. The Houdini model caught interests because of its prospects of generating insights into a transition towards a more stable housing market (Eskinasi et al., 2011). The Houdini model is interesting because it is an example of how you can create a model that frames the Dutch housing developments. Beside the fact it creates the possibility to make different strategies it also include more variables, and it is relatively easy to add more variables (Eskinasi et al., 2011). I won't give a full explanation of the Houdini model, because it is just an example of a model which includes more variables/causalities. Important for now is that there is scientific prove that it is possible to generate a dynamic model which includes more variables/causalities. Nevertheless this Houdini model was only a short experiment during a conference, so it isn't a better model for the demand side of the Dutch housing need. There is still a desire for a model which contains other variables than demographic developments, in order to get a better insight in the causation of the housing need.

## 1.4 Formulation of problem and research goal

The previous paragraphs concluded two things. First of all, there is a growing desire to get a better and a more reliable model of estimation for the Dutch housing need, because the current models of estimation lack the ability to react on the changing developments. To resolve this problem, we need to reveal the objectives and shortcomings during the development of a model of estimation. This is more important than the creation of an improved version of the current models of estimation, because other consultancies or agencies are constantly looking for possible ways to improve their models of estimation. This research should help these consultancies during their development of their own model of estimation. Secondly, the previous paragraphs concluded that especially the translation of the demographic data into the housing need must become more reliable. Especially the demand side of the housing market is hard to estimate on the basis of a model. So in this research the focus lies on objectives and shortcoming during the realization of an improved model of estimation for the demand side of the housing need.

The aim of this research is to make the models of estimation for the Dutch housing need more reliable, by giving insight into the limitations and the objectives during the creation of a more reliable estimation for the demand side of the Dutch housing market. Like said before this research shall mostly focus on the translation of the demographic data into the housing need and not on the housing supply. Beside the fact that this model needs to be more reliable, it must enable policy makers and consultancies to make a better forecast of specific local, regional, and national developments, on the basis of their own data. This is formulated in the following research goal:

***The research goal of this research is getting a better understanding of the limitations and objectives during the development of a more reliable model of estimation for the Dutch housing need, by the creation of a model of estimation which is an improvement of the demand side of the current models of estimation.***

I won't create a complete new model. This would be unwise, because a lot of knowledge is contained within the current models of estimation. I will improve an existing estimation model by adding variables/causations or eliminate variables/causation to/of the current model, or by changing the impact of the current variables. I will explain in paragraph (2.1) which model of estimation I choose to improve. This doesn't necessary means that my model of estimation would be better, but the process of trying to improve the current models will reveal the objectives and limitations which the developers of models of estimations are facing. During this research I will only focus on the relation between the translation of the demographic data into the housing need. So I won't focus on the establishing of the demographic variables.

## 1.5 Formulation of a research question

After the research goal of this research is described, the research questions within this research need to be described. By the formulation of a research question, guidance is given to get a better insight into this research. First the main research question is formulated, which will be the central question of my research. Secondly some sub questions are formulated which will say something about how the main question will be answered.

### **Main question:**

*What are the objectives and limitations during the process of making improvements on the demand side of the current models of estimation for the Dutch housing need, in order to make the current models of estimation for the Dutch housing need more reliable?*

### **Sub questions:**

*Which model of estimation for the Dutch housing need is often used, and is suitable for this research?*

*What are the current complicating factors of the demand side of the current model of estimation for the Dutch housing need?*

*What is the right structure for a reliable model of estimation for the Dutch housing need?*

*What are the shortcomings and missing variables of the demand side of the current model of estimation for the Dutch housing need?*

*Which specific variables need to be excluded?*

*To what extent will these variables have an impact on the actual housing need?*

*Which mechanism needs to be included in order to define which potential movements will become actual movements?*

*Which data sources are available and need to be included in order to develop a reliable model of estimation?*

*To what extent is it possible for policy makers and consultancies to work with these new variables/causations?*

## **2. Theoretical framework**

In this chapter, the theoretical framework of this research will be discussed. Like described within the previous chapter, the aim of this research is to improve a model of estimation, and reveal the objectives and problems during this process. In order to answer the main question of this research a theoretical starting point is needed in order to make use of the existing knowledge which has been created during a long tradition of developing models of estimation. In this research one specific model of estimation will be used as a starting point. Firstly I will describe in this chapter which model of estimation is chosen as the starting point of this research. Secondly, the structure and mechanisms of the chosen model will be described. Thirdly, a broad description of the used variables within this model will be given. Fourthly the used data source, which is necessary to run the chosen model will be described.

### **2.1 Models of estimation for the Dutch housing need**

Within the Netherlands there are multiple national models of estimation which are used within the field of living, like: the Primos model of estimation developed by ABF research (Stam, 2012), the PEARL model of estimation developed by 'het ruimtelijk planbureau' (RPB), and the GBpro which is developed by the bigger municipalities. The outcomes of these models of estimation can be different for the same situation. These different outcomes are the result of different assumptions, which are included within the models of estimation. In this paragraph the differences between the models of estimation will be explained, and one model of estimation will be chosen to be the starting point of this research.

#### **2.1.1 Primos**

The most used model of estimation is the Primos model of estimation. The Primos model of estimation makes an estimation of the number of residents, the number of households, the housing stock and the housing demand. The Primos model of estimation is applicable on a national, regional and local scale (Otter et al., 2011). ABF research looks at the demographic developments. On the basis of these demographic developments they are able to determine labor variables and variables which are necessary to determine the housing need. This Primos model of estimation is often used as a basis for further policy, and has been quoted as the most reliable model within in the Netherlands (Venhorst and Wissen, 2007). Since the Primos model of estimation is the basis of further policy, the assumptions of this model have an influence on which building plans are created, cancelled or postponed. With this in mind we can say that the Primos model of estimation has a huge impact on the Dutch housing market. Another interesting aspect of the Primos model of estimation is that it is close related with the Socrates model of estimation. The Socrates model of estimation is a well-known model of estimation for the qualitative housing demand. Beside the fact that the Primos model of estimation has earned its stripes, there is a lot of transparency about the mechanisms and assumptions which are included within the estimations. An example is the text 'Transparantie in cijfers' by Faessen & Poulus (2010).

### **2.1.2 PEARL**

The RPB and the CBS started in 2004 with the development of new model of estimation which is applicable on the regional level, which got the title PEARL (de Jong & Alders, 2006). So where the Primos model of estimation is applicable on each scale, the PEARL model of estimation is specialized on the regional scale. Logically this means that PEARL can make a more reliable estimation for the housing need on the regional scale than the Primos model of estimation (de Jong & Alders, 2006). This is possible, because the data resources of RPB are located on a lower level than the data resources of ABF research. Another difference between the Primos model of estimation and the PEARL model of estimation is the estimation of the household characteristics. RPB added origin groups to their model, and each origin group has different demographic developments (de Jong & Alders, 2006). The PEARL model of estimation won't be useable for this research for three reasons. First of all is the PEARL model of estimation too much focused on the regional scale, more than the Primos model of estimation. Secondly, the RBP doesn't publish a lot about how their model of estimation works and which assumptions are included. Thirdly there isn't any model of estimation close related with the PEARL model of estimation which estimate the qualitative housing demand.

### **2.1.4 GBpro**

The GBpro is developed by and for the bigger municipalities of the Netherlands. Pronexus is now maintaining this model of estimation. The municipalities developed GBpro because there was a growing desire to look at the scale of neighborhoods (Stam, 2012). The GBpro estimate multiple trends which create a certain range of possible developments. The most negative trend is the trend without any inwards migration, and most positive trend is the trend with a inwards migration which equals the last ten years (Stam, 2012). In order to make an estimation on the scale of the neighborhood, Pronexus gathers their data on this scale. Here lies a problem, because all neighborhoods have different characteristics, you'll need a complex model to make a reliable estimation. This won't be a problem when there are a lot of publications about this model of estimation. Since the municipalities use a lot of data sources which are highly private, there aren't that many publications about the GBpro model of estimation. The GBro shall not be the central model of my research, because of this lack of data about the included mechanisms and lack of available data sources.

### **2.1.5 Conclusion**

In this research the Primos model of estimation will be the starting point of this research. So in this research I will try to improve the demand side of the current Primos model of estimation, and explain what the problems and objectives are during this process. There are four reasons why I choose the Primos model of estimation. First of all, the Primos model of estimation is applicable on multiple scales. Secondly, ABF research published a lot about their model of estimation (Faessen & Poulus, 2010), which makes it easier to work with this specific model. Thirdly, the Primos model of estimation has been quoted as the most reliable model of estimation within the Netherlands. Fourthly, the Primos model of estimation is close related with the Socrates model of estimation which is a well know model of estimation for the qualitative housing demand.

## 2.2 The structure of the Primos model of estimation .

After the Primos model of estimation was chosen as the starting of this research, the structure and estimation mechanisms of the Primos model of estimation will be explained. In this paragraph the included variables will be illustrated, and a broad description of the relations between these variables will be given. Like mentioned before, the focus of this research lies on the demand side of the Primos model of estimation, because this is the place within the model where ABF research convert the demographic data into the housing demand. So this paragraph will only give a description of the demand side of the Primos model of estimation.

The basis of the demand side of the Primos model of estimation is a combination of two main variables namely: the variable ‘number of citizens’ and the variable ‘household situation’. Figure 4 is a simply illustration of the demand side of the Primos model of estimation. The Primos model of estimation starts with the calculation of the number of people who live in a specific area on a specific time. In order to make this calculation, ABF research looks at four variables: the variable ‘number of births’, the variable ‘number of people who die’, the variable ‘foreign migration’, and the variable ‘domestic migration’ (Poulus & Faessen, 2010). ABF research calculates the number of people living in a certain area on a specific time, by adding these minuses and plusses to the current number of inhabitants. Poulus & Faessen (2010, p. 13) say: ‘it is relatively easy to make a forecast of the number of births, number of people who die, and the foreign migration, because the trends of these variables are relatively stable’.

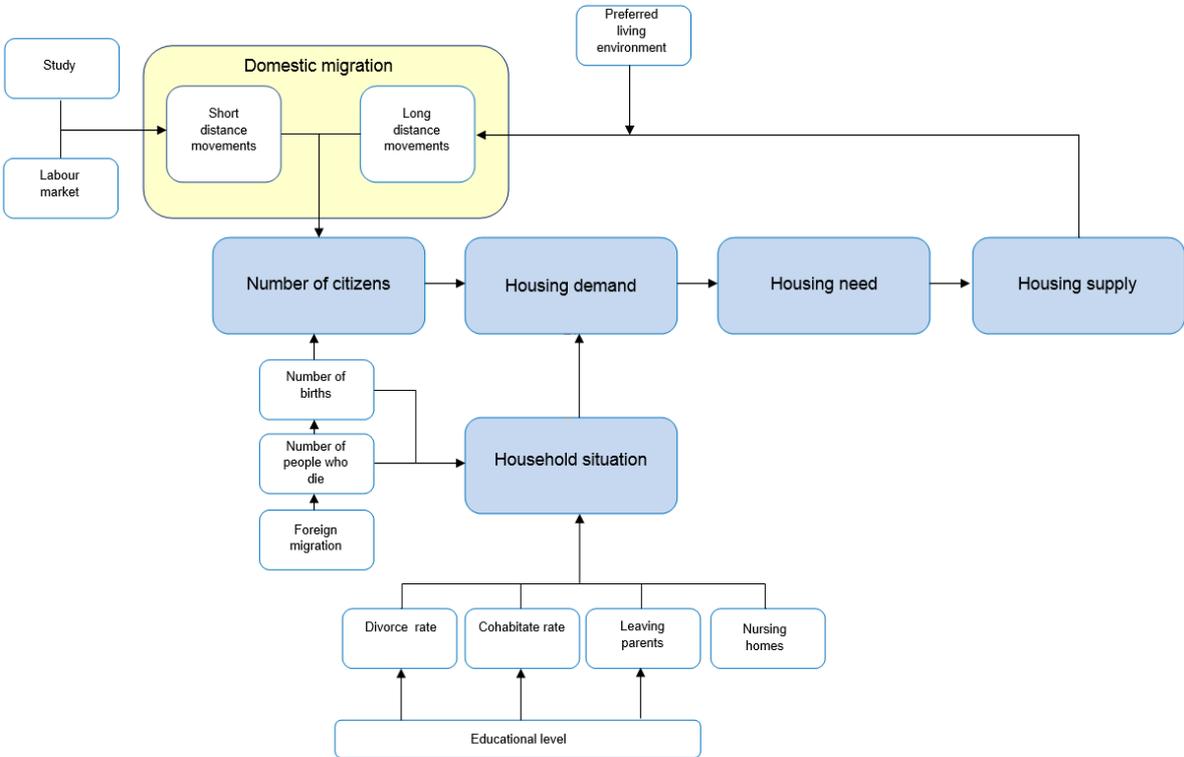


Figure 4: Basis of Primos model of estimation

In order to estimate the number of births, ABF research looks at the fertility level within the different municipalities. ABF research explains that these differences between municipalities are created by socio cultural differences but ABF research doesn't include these socio cultural differences within their model. For the number of people who die, ABF research uses the main of the municipality. These mains can be very different, but ABF doesn't include the cause of these differences in their model. The number of foreign migrations to a specific region is estimated on the basis of a distribution mechanism (Poulus & Faessen, 2010). So ABF research looks at the total number of foreign migrations towards the Netherlands and distribute this number over the different municipalities. During this distribution ABF research looks at the trends of the past years (Poulus & Faessen 2010). So when the last years a lot of Turkish people moved to Amsterdam, the model include this data within the distribution.

The domestic migration is much more complicated to estimate than the other variables. ABF research makes a difference between long distance movements, and short distance movements. A long distance movement is according to ABF research a movement from one region to another. Logically, a short distance movement is a movement within a region. According to the model, the variable study, and the variable labour market cause long distance movements (Poulus & Faessen, 2010). To calculate the amount of long distance movements, ABF research uses a trend analyses. It is possible to see these developments as a trend because there are seldom big fluctuations of employment rates, or a movement of an university. So ABF research assumes that these trends are constant and can be used to make a reliable estimation. In order to make a reliable estimation you need to include other demographic developments (Poulus & Faessen, 2010). In order to achieve this, ABF research doesn't look at the absolute number of movements (x-1000) but at the relative number of movements (X%). The short distance movements are according to ABF research caused by the variables 'house building programs' and 'preferred living milieu' (Poulus & Faessen, 2010). So the interaction between the demand and the supply of houses cause short distance movements. When the housing production grows and there is enough demand, the model assumes that the number of short distance movements will grow. The variable preferred living environment looks at the specific place where the houses are build. So it matters according to the Primos model of estimation if a house is standing in the centre of the city or within a rural area.

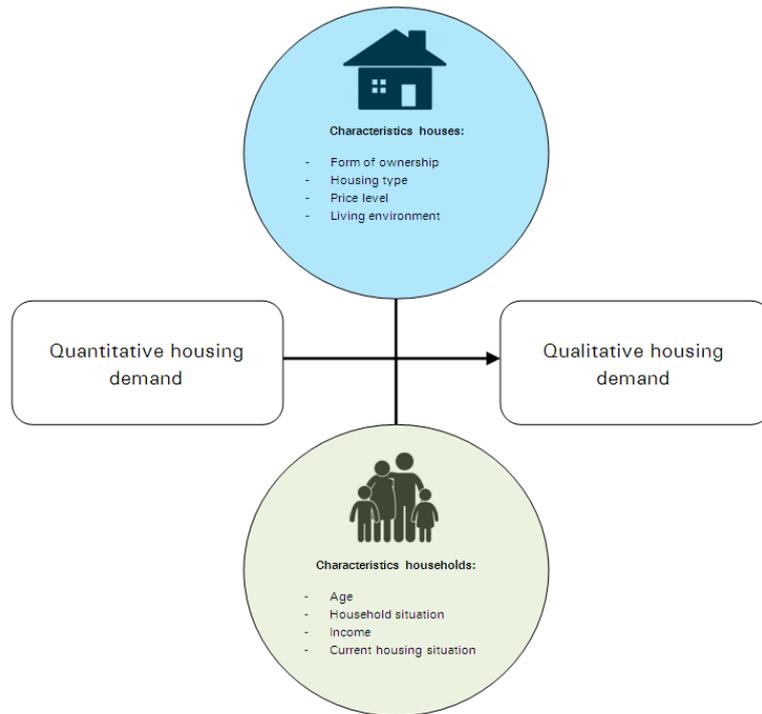
The second main variable within the Primos model of estimation for the housing need is the household situation, which means that the model of estimation looks at the number of household members and the characteristics of these household members. The birth and dead rate within a specific area partly cause the changes within the household situation. Beside this data, the model tries to make a forecast of the number of people who will divorce, cohabit, or young people who leave the house of their parents (Poulus & Faessen, 2010). The household situation is mainly dependent on the current trends within these variables. Beside these basic trends, ABF research did a research on the relation between the educational level of a household and the increasing individualism rate. They concluded that the educational level has a huge impact on the household situation (Poulus & Faessen, 2010). Children with a higher educational level leave the house of their parents earlier. Also in a later stage of their live a higher educational level will cause a more individualistic household situation: people with a higher

educational level will cohabit on an older age, will have children on an older age, and divorce quicker than household with a lower educational level. Another variable which ABF research include in the Primos model of estimation for the estimation of the household situation, is the number of nursing homes within the region. Regional differences within this variable can be considerably (Poulus & Faessen, 2010). In some regions there aren't any nursing homes, but in other regions 30 till 40 people per 1000 citizens are living in a nursing home. Since most nursing homes have units for only one person, the amount of nursing homes can influence the household situation dramatically. The combination of the variable 'number of citizens' within a specific area and the variable 'household situation' results in a forecast of the total number of households.

### **2.2.1 The Socrates model of estimation**

ABF research developed additional to the Primos model of estimation the Socrates model of estimation in order to make a more qualitative translation of the demographic data into the actual housing demand. In other words, ABF research developed the Socrates model of estimation to estimate the market potentials within the Dutch housing market (Co Poulus, personal communication, 07-05-2014). The Socrates model of estimation doesn't only looks at how many households will live within a specific area, but also looks at the wishes of people (Poulus & Heida, 2005). So the Socrates model of estimation focuses more on the characteristics of the balance between the demand and the supply of houses. This means that ABF research included certain characteristics of households and characteristics of houses in order to link these characteristics to each other. On the basis of this mechanism is ABF research able to estimate the housing preferences. The basic idea of the Socrates model of estimation is illustrated in figure 5. Each household get a set of characteristics. Some of these characteristics like the age and household situation are derived from the Primos model of estimation, but ABF research needed to add a few more variables in order to make a better estimation of the qualitative housing demand. The added characteristics are the current housing situation and the income of the household. Also the houses got qualitative characteristics like: the price level of a house, the housing type, the form of ownership, and the neighbourhood in which the house is standing translated into a certain living environment (Poulus & Heida, 2005).

So a division of the households is made on the basis of age, household situation, the current housing situation and the income of a household. The division of house is made on the basis of form of ownership, price level, the preferred living environment in which the house is standing, and the housing type. On the basis of the relations between these characteristics, the preferred living situation of each household type will be estimated. By combining this information with the quantitative outcome of the Primos model of estimation, ABF research is able to estimate the demand of houses with a specific kind of ownership, specific kind of housing type, specific type of price level, within a specific living environment.



**Figure 5: Basis of translation within Socrates model of estimation**

## **2.3 The definition of the variables within the models of estimation of ABF research.**

The definition of some variables which are included in the models of estimation will be described within this paragraph, in order to get a better understanding about these variables. In this paragraph you can find the definition of ABF research described. A critical analysis of these definitions will be given in chapter 6.

Let's start with the difference between the housing need and the housing demand, because these terms can be confusing. The housing demand is the amount of houses which are necessary for a certain amount of households (with specific characteristics) at a certain time, and the housing need is the ratio between the housing demand and the housing supply. Another important variable for this moment is the household situation. Here ABF research makes a difference between multiple categories of households, like: households with children, households without children, and single parents household etc. ABF research doesn't look at the number of children who are living within these households. They only differ between households with children and households without children (Poulus & Faessen, 2010).

In order to get a good image of the variables 'long distance movements' and 'short distance movements', a good definition of a region is necessary. According to ABF research a long distance movement is a movement from one region toward another, and a short distance movement is a movement within a region. This is for now a good definition, but there is one problem, namely: what is a region? For now I will use the corop regions as the region, which is in line with choices that will be made in paragraph 2.5

Within the Socrates model of estimation the definition of two variables need to be further explained. First of all the variable living environment. Each postal code within the Netherlands is by ABF research classified (on the basis of criteria which are illustrated in attachment F) as a certain living environment. The second definition that needs some explanation is the variable preferred living situation. The preferred living situation is the set of the characteristics that a house should have according to a household with certain characteristics.

## 2.4 Data used by ABF research.

The focus of this paragraph will lie on the used data sources by ABF research for their Primos and Socrates models of estimation. This won't only give an understanding about the Primos and Socrates models of estimation, but it will also give an idea about the available data sources. For now only a description of the used data sources will be given, in chapters 6 a critical analyses on these data sources will be conducted.

ABF research uses for the Primos model of estimation mainly the data of the 'Central Bureau of statistics' (CBS), the 'gemeentelijke bevolkingsadministratie' (GBA), and the housing stock information of 'Systeem woningvoorraad' (SYSWOV). To estimate the number of citizens who will be living within a specific region ABF research uses the data of the CBS and the GBA (Poulus & Faessen, 2010). ABF research uses the data of the CBS for the national trends, and uses the data of the GBA for the dividing mechanisms. So within the estimation of the population ABF research uses a bottom up and a top down approach (de Jong et al., 2005). This result in the fact that for the variables 'number of births', 'number of people who die', 'foreign migration', and 'domestic migration' the sum of the municipalities will be the same as the national estimation. I will take the variable 'number of births' as an example to explain how this mechanism works. In order to determine the number of births, ABF research looks at the national fertility numbers, multiplied by the number fertile woman (age 15-49) living within the region (de Jong et al., 2005). ABF research will only use other fertility numbers of the municipalities when the fertility numbers of the municipality are extremely different than the national fertility numbers. So only for exceptions, ABF research uses a bottom up approach in order to determine these variables. The foreign migration works a bit different. ABF research makes an estimation of the foreign migration on the basis of a yearly publication of the CBS. Within this data there is no distinction made between registered and unregistered foreign migration, but ABF research tries to include these unregistered migrations within their model (Poulus & Faessen, 2010). How the data is collected for the domestic movements is already explained in paragraph 2.2. Which sources ABF researchers used isn't explained within their documents about the data collection. For the household situation, ABF research uses mainly the data out of the GBA, but like figure 4 illustrates the variables 'number of births' and 'number of people who die' also have an influence on the household situation. Like already mentioned, for these variables ABF research uses the data of the CBS (Poulus & Faessen, 2010). Important to know is that the CBS database is integral with the data from the GBA (Poulus & Faessen, 2010). So the household statistics of the GBA are consistent with the citizen statistics

The information for the housing supply comes out of an estimation of the TNO model of estimation. The TNO model of estimation uses the data source SYSWOV to mak its estimations. The TNO estimation model for the housing stock is also part of ABF research. For the first three coming years it is relative simple to estimate the housing supply (Poulus & Faessen, 2010). This relatively easy, because this building plans for the upcoming three years are stable. For the long term estimation, ABF research developed an estimation model that makes an estimation on the basis of the number of households. After this estimation, the model divides the households over the municipalities on the basis of the current trends, which are created by the building programs. This data source isn't that important

for this research since this research focuses on the demand side of the housing market. Nevertheless is it important to know how the housing supply is estimate since it has an influence on the short distance movements.

The Socrates model of estimation has a Primos engine so the above standing data sources are also necessary for the Socrates model of estimation. Within the Socrates model of estimation is especially the estimation of the housing preferences important. In order to make this is estimation ABF research uses the 'Woning behoefte onderzoek' (WBO), which is presented within the WoON (2012) rapport. Like already mentioned is the WoON research a periodical research conducted by the Ministry of home affairs in elaboration with the Central Bureau of statistics (CBS) and is one of the most important studies on the Dutch field of living (WoOn, 2012). 70.000 people participated during the WoON research. For this research is it important to split this group of participants into two groups. People who say that they want to move during the upcoming two years, and a group of people who say that they won't move during the upcoming two years. This is important, because only the first group (the group with a high tendency to move) answered questions about the preferred characteristics of their possible new house. During the last WoON research in 2012, 13.253 respondent said that they think that they will move during the upcoming two years.

**Tabel 1: Data sources**

	<b>CBS</b>	<b>GBA</b>	<b>SYSWOV</b>	<b>WBO</b>
<b>Number of citizens</b>	Estimation of national trends	Estimation for dividing mechanism	X	X
<b>Number of births</b>	Estimation of national trends	Only for exceptions	X	X
<b>Number of people who die</b>	Estimation of national trends	Only for exceptions	X	X
<b>Foreign migration</b>	Yearly publication	X	X	x
<b>Household situation</b>	Only by the estimation of the above standing variables	Estimation of the household situation	X	X
<b>Housing supply</b>	X	X	Used within the TNO model of estimation for the housing supply	X
<b>Housing preferences</b>	X	X	X	Estimation of the housing preferences

## 2.5 Suitable model on the scale of the Corop region.

In order to develop a model which is useable, some choices need to be made about the scale on which the model needs to be useable. Every scale has their own models, but more important their own data sources and limitations. On a lower scale the data sources will be more limited but will the model will react better on the specific trends within that region. On a higher scale there will be sufficient data sources but there is a risk that the model becomes too broad. The model of estimation that will be developed within this research will be suitable on the scale of the COROP regions. Figure 6 is an illustration of the different COROP regions. The COROP regions are created within 1971 and are mostly used for research purpose. I choose the scale of the COROP regions because this is the place where the balance between the supply of houses and the demand for housing become becomes important, and where the qualitative housing programs are developed (Niek Bargerman, personal communication, 07-06-2014). A housing program is always a discussion between municipalities and a above standing institution like a city region or province. Especially the transition of the quantitative results into a qualitative housing demand is conducted on the level of the municipalities, but you have to look at the housing programs of the nearby municipalities (Niek Bargerman, personal communication, 07-06-2014). Beside the fact that this is the place where the housing market is situated, this scale is also the scale which is problematic for the current Socrates model of estimation. Since the Socrates model of estimation is a model which is developed for a national scale is it logical that it becomes less reliable the moment you use this on the scale of a COROP region or even on the scale of a municipality (Rik ten Broek, personal communication, 06-06-2014). Unless the fact that the model won't be that reliable, the outcomes of the Socrates model of estimation are extremely interesting, because it reveals the differences between different COROP regions which can give direction to the policy of municipalities (Rik ten Broek, personal communication, 06-06-2014). So it would be useful to look at the objectives and limitations that the developers of the Socrates model of estimation are facing at the level of the COROP region. It was not possible to look at a lower level, because there isn't sufficient data available. The moment you use a model of estimation on this scale you will have an outcome which will be completely unusable (Niek Bargerman, personal communication, 07-06-2014).



Figure 6: COROP regions

### **3. Research design and research methods.**

In this chapter the research design, the strategies and methods of this research will be described. This chapter will start with the explanation about the chosen research strategy. Secondly a research design will be made, in which the steps of this research will be illustrated. Each step will have their own research methods and research goals. Thirdly, an overview will be given of the data sources which are used during this research.

#### **3.1 Research strategy.**

The grounded theory approach will be the research strategy which will be used to improve the current models of estimation for the Dutch housing need. A grounded theory approach can be characterized as a way of doing research, in which the researchers' consciousness tries to exclude all his pre information about the subject, and tries to develop new theoretic insights (Verschuren & Doorewaard, 2007). In other words, the researcher tries to develop a new theory. A great advance of the grounded theory approach is the possibility to develop a theory in a recognizable way for the actors who have to work with this new theory. Theories created on the basis of a grounded theory approach are mostly developed on the basis of empirical and practical phenomena, instead of the creative and associative thought of the researcher, and are so on recognizable in their field of interest (Verschuren & Doorewaard, 2007). Since I am developing an improvement of the current Primos model of estimation, which is a model that provides information in order to develop policy within the field of living, a strategy as the grounded theory approach is suitable for this research. Beside the fact that the grounded theory approach is recognizable, it is also a strategy which enables a researcher to get a total view of a complex situation (Verschuren & Doorewaard, 2007). Since I am dealing with a complex situation with multiple causation, a grounded theory approach should give me a good guidance through these multiple causations.

Of course, it was possible to use other research strategies. A survey won't be used as a research strategy because a survey research requires a lot of knowledge about the subject before you start your research (Verschuren & Doorewaard, 2007). This is problematic for this research because the main reason for doing this research is this lack of knowledge. It is impossible to create an adequate question list about the models of estimation for the housing demand, and beside the fact that it is questionable that you will get the right results, it would be really hard to get enough respondents who work with models of estimation like the Primos model of estimation. Also the non-dynamic characteristics of a survey research strategy makes the strategy less suitable for this research, especially since I have to deal with a dynamic situation like the Dutch living needs. An experiment strategy won't be used because of the external validity. Within an experiment strategy you have to exclude a lot of variables to measure the impact of certain variables (Verschuren & Doorewaard, 2007), but when these variables aren't excluded, like in the real world, the results will be completely different. Since the aim of a model of estimation for the Dutch housing need is to develop an estimation which matches as good as possible with the future developments, an experiment strategy wouldn't be the right strategy to improve these model of estimation. Beside the problem of external validity, the experiment strategy wouldn't be the most practical strategy. It will take a lot of time to proceed all the experiments for all the possible causation in order to improve the current models of estimation. You'll need a whole thesis per causation to succeed the aim

of this research. The main reason why the research strategy case study isn't used in this research is because of a lack of external validity. Of course, it would be possible to answer the research questions by looking at one or two regions. When you use the strategy case study, the model will even be more suitable for this specific region than the model which will be generated by a grounded theory approach, but if you want to use the same model for other regions you will face some problems. The main reason for this problem is that regions in the Netherlands can have completely different characteristics. So when a model is developed for the region Achterhoek and you will use the same model for the region Amsterdam, you won't have a reliable model for the region Amsterdam. Since the aim of this research is to make a model of estimation which is suitable for all the COROP regions within the Netherlands, a case study approach wouldn't be the right strategy to succeed this goal. A desk research strategy won't be used because you need for a desk research strategy a lot of data and literature to conduct your research (Verschuren & Doorewaard, 2007). There is not enough data or literature available to answer the main question of this research. Besides the fact that it would be impossible to find enough data, you will also have no contact with the actors who eventually have to work with the developed model, and because of this reason it will be questionable that the model will have any value for the field. All in all, the grounded theory approach will be the best strategy for this research.

### **3.1.1 Characteristics of a grounded theory approach**

In order to conduct a good-grounded theory approach research, the researcher needs to have three characteristics. First of all the researcher needs to have a searching attitude (Verschuren & Doorewaard, 2007). So the researcher needs to test and evaluate every theory. In other words the researcher is on a discovery. During this discovery the researcher needs to be completely open, but also critical for new insights created by research data and relevant literature. In other words the researcher needs to be 'theoretical sensitive' (Strauss & Corbin, 1990).

Secondly, during the research the researcher is constantly comparing empirical data and theoretical concepts (Verschuren & Doorewaard, 2007). The researcher is constantly comparing his new findings with his own findings and the findings of others. There are multiple ways of comparing these findings (Verschuren & Doorewaard, 2007). In this research I will mostly make use of secondary theoretic comparisons. This means that the researcher compares a founded phenomenon/theory with the theories which are developed by other researchers. Let's translate this to the aim of this research: I will compare founded phenomena/theories about causations which have an influence on the conversion of the demographic data into the housing need with the current theory of the Primos model of estimation for the Dutch housing need. When these causations improve the model, they will be added. At this moment these causations become part of the theory. When I find new data, I compare these added causations with the new data. At this moment I compare my new findings with my old findings, called a primary empiric comparison. So in this research two kinds of comparisons are made: primary empiric comparison and secondary theoretic comparisons.

Thirdly, the grounded theory approach can be dangerous in terms of validity. So I as a researcher need to follow some strict procedures in the form of coding (Verschuren & Doorewaard, 2007). In the first phase of the development of a theory it's all about the exploration of the research field.

In this phase the so-called 'sensitizing concepts' play an important role. These are the main concepts of the research, of which the exact definition in the beginning of the research is unclear. In order to do a research, which has a high validity I need to take notes of the temporary definitions, called 'open coding' (Strauss & Corbrin, 1990). Next, I must compare the codes and the information within these codes with each other, and by doing so defining the definition. In this process of 'axial coding' I connect concepts with each other and create causal relations (Strauss & Corbrin, 1990). At the end, I must make some decision about the core terms of the new theory. This process of 'selective coding' creates a core description of the developed theory (Strauss & Corbrin, 1990). After the formulation of these core terms, I will describe the argumentation and develop the theory. This process of open, axial, and selective coding is illustrated in appendix B.

### 3.2 Research design and methods.

Figure 7 illustrates the research design of this research. These steps illustrate a constant process decision-making. So it won't be the structure of the text, but it is a constant thinking process for each possible adjustment. During the first step the current models of estimation for the demand side of the housing market will be analysed. The theory, which lies behind this model of estimation, will be the starting point of this research. Since the models of estimation of ABF research are the starting point of this research, the data of ABF research is the only used data. The structure and theory of these models of estimation for the Dutch housing demand are already explained in chapter 2. After this step I develop the first temporarily model (figure 4 & 5). So the Primos and Socrates models of estimation are the first temporary model.

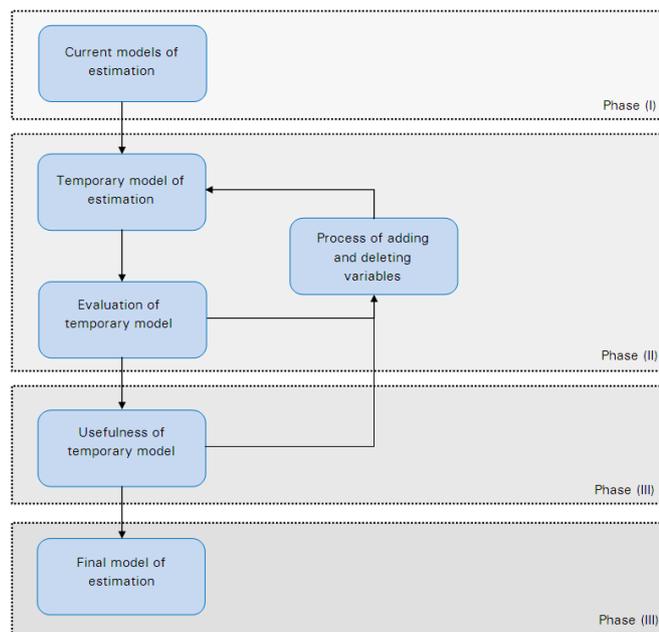


Figure 7: Research design

After this step I develop the first temporarily model (figure 4 & 5). So the Primos and Socrates models of estimation are the first temporary model.

Now we reach the stages in which the grounded theory approach will be used. Phase two is the phase in which there is a constant search for new variables. Like illustrated in figure 7 there is a loop in this phase which include the actions development of a temporary model, the evaluation of this temporary model, and the process of adding and deleting variables. To find these new variables/causations I will look at the scientific literature, and policy documents about the Dutch living needs. Beside these documents and literature I will conduct interviews with scientists and practitioners who have knowledge about variables\causations which have an impact on the Dutch housing demand. This process of looking for new variables also includes the search for evidence to delete certain variables. So beside a constant search for new variables/causations, there is also a constant search for proof to delete certain variables. After I found proof that a certain variable must be added or deleted in order to make the model more reliable, I will add or delete this variable to/from the model. After this action, I create a new model. This new temporary model needs to be evaluated. Evaluation at this point means that I look at these variables in relation to the model. In other word: Is the model more reliable than the previous temporary model.

In phase three I make the model more useful for the practitioners. In this phase I conduct meetings with practitioners about the usefulness of the new model. I will delete variables, when I found proof that certain variables/causations makes the model too complicated to work with. This does not mean that in phase three I only delete variables. I will add a variable/causation when a certain variable/causation makes the model more manageable, and doesn't influence the reliability of the model. During this phase I will conduct meetings with practitioners, and have a lot of interaction with my internship organisation Stec Groep.

This type of design has a problem. It consists two loops. These loops in phases two and phase three will create a never ending process. I will put a specific time period on each phase, in order to prevent an ongoing research. These time periods need to have hard boundaries, because otherwise I will never end this research. You can find this time schedule in my research schedule which is illustrated in Appendix C. When all these phases are conducted I will develop my final product.

### **3.3 Research data**

Like described in the previous paragraphs phase two and three are the phases wherefore data needs to be collected. During these phases I use two kinds of sources to collect knowledge, namely: persons and literature. In both phases I will conduct interviews. During these interviews I see the interviewee as an expert and not as a respondent. I will interview experts who are working at consultancies which are well known for experience within the field of living like: ABF research, PBL, OTB, RIGO, Explixa, and SmartAgent, and experts who worked for the province Gelderland, the province Brabant and the city region Arnhem-Nijmegen. I didn't conducted an interview with experts who are working at municipalities, because the opinion of a lot of municipalities about models of estimation is based on what the outcome of this estimation means for their housing policy. A lot of municipalities don't trust the models of estimation because it most of the time means that they have to many building plans (Rik ten Broek, personal communication, 06-06-2014). For phase two, I will interview these people because of their knowledge about the causations of housing needs and housing preferences. During phase three questions about their experiences with working with estimation models will be included. The interviews in both phases will be semi structured, because I want to steer the conversation in a certain direction. This structure needs to be really loose, because I want to make sure that the interviewee really gives his own opinion. The structure includes the opinions of other practitioners or scientist, and is in this way semi structured. By doing this I create some kind of discussion which will result in a better clarification of the subjects. I will always illustrate the temporary model during the interviews, as a starting point of the conversation.

In phase three I will beside the described interviewees speak with practitioners working at my internship organisation Stec Groep. Stec Groep is a consultancy firm that gives advice within the field of living. They work for clients like: municipalities, regions, banks, developers, investors, and housing corporations. In order to give an advice they often use the Primos model of estimation, so they can explain the usability of a variable/causation for their consultancy to me. These talks will be informal talks which will be constantly taken during this research.

## **4. The certainties within the current models of estimation for the Dutch housing demand**

Like I already mentioned in chapter two, the Primos model of estimation for the Dutch housing market in combination with the Socrates model of estimation are the central models of this research. These models are the central models because they are the dominant models within the field of living. Like described in the inducement, there are some shortcomings/missing variables within the current models of estimation for the Dutch housing demand, but we can't forget that ABF research and their models of estimation earned their stripes within the field of living. It isn't a coincidence that the Primos and Socrates models of estimation are the models that are the basis of a great amount of policy within the field of living. So it would be wise to look at the aspects that strengthen the models of estimation, because these are just as important as the shortcomings of the current model of estimation.

### **4.1 Broad evaluation of the Primos model of estimation**

The goal of the Primos model of estimation is to estimate the number of households within a region. This estimation is based on demographic developments and the in and out flow households towards/out a region. It's logical that the formation of households is mainly caused by demographic developments (Harry boumeester, personal communication, 09-07-2014). The demographic variables are considered as useful and reliable. *'Variables like the age of the household and the household composition are vital variables within the current models of estimation'* (Roelf Jan van Til, personal communication, 12-05-2014). Especially on a national scale is demographic data more than sufficient, but also on a lower scale are the demographic variables reliable are pretty detailed (Niek Bargerman, personal communication, 07-06-2014). During the interviews there wasn't any expert who said that there was something wrong with the demographic variables which are included within the Primos model of estimation. One of the reasons that these estimations for the demographic variables is reliable is because it is relatively easy to estimate these variables. The demographic variables aren't only suitable to estimate the natural growth of the population, but the demographic variables are more than useful for the estimation of movements. Most of the movements within the region are caused by changes within the household situation (Johan van Iersel, personal communication, 16-05-2014). So when you have a reliable estimation for each household situation you are able to explain a big part of the quantitative housing demand.

Within the estimation of the housing demand are beside the internal movements, the external movements important and difficult aspects within the estimation. According to the experts, ABF research uses the right variables for their quantitative estimation of movements from one region toward another region (Johan van Iersel, personal communication, 16-05-2014). *'We have to keep in mind that 80% of the movements take place within the own municipality, for the other 20% are job opportunities and study the most important motivations'* (Johan van Iersel, personal communication, 16-05-2014). Since the division of job opportunities and universities is constant, and a monitor approach is good enough to reveal possible fluctuations is the approach of ABF research sufficient to estimate the in and out flow of households towards and from a region. So the Primos model of estimation is considered by the experts as more than sufficient for the estimation of the quantitative housing demand.

Beside the fact that the models contain the right variables, ABF research is well known for his experience with models of estimation and his good methodology (Roelf-Jan van Til, personal communication 12-05-2014). Especially the Primos model of estimation contains a lot of expertise. So it is not unexpected that the director of ABF research Co Poulus (personal communication, 07-05-2014) said: *'The strength of the Primos model of estimation lies within the 30 years of experience in monitoring demographic developments'*. ABF research developed in these 30 years a lot of qualities and tricks to make models of estimations mostly on the basis of trend analyses. So ABF research is constantly monitoring the trends which are included in their models of estimation. This expertise makes their model one of the most reliable models of estimation within the Netherlands (Co Poulus, personal communication, 07-05-2014). This means a lot, in comparison with other countries the Netherlands has a lot of scientific and practical knowledge about the development of demographic and housing models of estimation. *'The Netherlands is a real star player within the European field of demographic and housing models of estimation. Beside the quality, there is also more attention for these models of estimation than in other European countries'* (personal communication, Dorien Manting, 27-05-2014). PBL has from time to time meetings with foreign developers of models of estimation, to exchange ideas. Dorien Manting (personal communication, 27-05-2014) explains that these developers are most of the time impressed about the quality of the Dutch models of estimation. This high quality is created by the tradition we have with the development and monitoring of models of estimation. Since the Dutch models of estimation are well known for their high quality, and the Primos model of estimation is considered as one of the best Dutch models of estimation, we can say that the Primos model of estimation is a high quality model of estimation.

## 4.2 Focus on the Socrates model of estimation

The strength of the demographic variables and the expertise of ABF research which is included within the Primos model of estimation are used during the estimations of the Socrates model of estimation, because the Primos model of estimation and de Socrates model of estimation are concurrent (Co Poulus, personal communication, 07-05-2014). Beside the Primos engine on which the Socrates model of estimation runs, a good aspect of the Socrates model of estimation is that it has a competition and substitution mechanisms. This is important the moment two households will compete for the same house. There is a mechanism included to simulate this effect of competition. This means that ABF research estimate how much a household will downgrade their preferred living situation (Niek Bargerman, personal communication, 07-06-2014). Like the Primos model of estimation is the Socrates model of estimation used a lot of times for the development of housing policy (Rik ten Broek, personal communication, 06-06-2014). Beside the fact that the Socrates model of estimation is already well used, there is an increase in interest for this specific model (Co Poulus, personal communication, 07-05-2014). So authorities will keep using the Socrates model in the future.

Still the experts consider the Socrates model of estimation as weaker than the Primos model of estimation. *'The models of estimation for the qualitative housing demand aren't that reliable, there are too many factors who can cause a different outcome. These factors can be completely different tomorrow, which makes it hard to make a model of estimation. For now are the estimations of a qualitative model of estimation only an aid which can give you some direction'* (Niek Bargerman, personal communication, 07-06-2014). The Socrates model of estimation is not sufficient enough especially on the scale of the municipality and the Corop region, which is logical since this model has been developed on a national scale. There are too many place-bounded factors which has an influence on the qualitative housing demand (Niek Bargerman, personal communication, 07-06-2014). Since the experts consider the Socrates model of estimation as weaker than the Primos model of estimation, the focus of this research will lie on the translation of the quantitative housing demand towards a qualitative housing demand. A better understanding of the reliability and an insight in the possible improvements can help authorities to move away from their focus on the numbers instead of the quality of these numbers. Stadsregio Arnhem Nijmegen is a good example of an authority who wants to leave this discussion about the numbers of houses a municipality is allowed to build behind (Rik ten Broek, personal communication, 06-06-2014). Instead of focussing on the number of houses which need to be built, it would be wise to look which kind of buildings need to be build.

## 5. The structure of the model of estimation

As a start of the analyses the focus of this chapter will lie on the structure of the model of estimation. You can include all the right variables within your model of estimation but when you use the wrong structure, you still can't make a reliable estimation for the qualitative housing demand. This chapter describe what is wrong with the structure of the current models of estimation, and what the structure should be in order to make a reliable estimation for the qualitative housing demand.

### 5.1 A too simplistic view

Most models of estimation have a too simplistic view of the housing market. Take for instance the Socrates model of estimation. Figure 8 illustrates the basis of the Socrates model of estimation. The Socrates model of estimation looks at the future number of households and their demand in relation to the number of houses that are available. On the basis of this confrontation three groups are created: a demand of houses which aren't available in the current housing stock, a supply of houses where nobody wants to live in, and a number of households that move to another house (Poulus & Heida, 2005). The last group include the movement within the current housing stock and movements towards new build houses. This model is too simplistic in two ways. First of all it doesn't get you enough information about the current housing situation and housing stock of a specific region. In order to get a good view on your current housing situation and housing stock it would be wise to separate the total housing market (the current housing situation) from the active housing market. The moment you know how your total market looks like, it enables you to see possibilities within your current housing stock. Only when you know how your total market looks like you'll be able to make adjustments in it (Harry Boumeester, personal communication, 09-07-2014). At this moment is it too hard for municipalities to make the connections between the possibilities within their building programs and their possibilities within the current housing stock (Lucas van Eijdsen, personal communication, 22-07-2014). Secondly, in order to make this division you need to take a closer look at the potential movements. I will describe further on in this chapter what this critique really means.

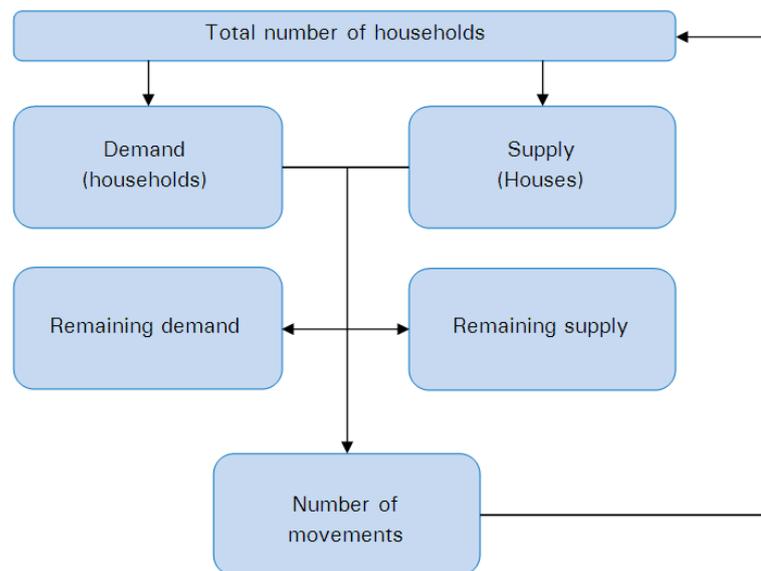


Figure 8: Basis idea of the Sorcrates model of estimation

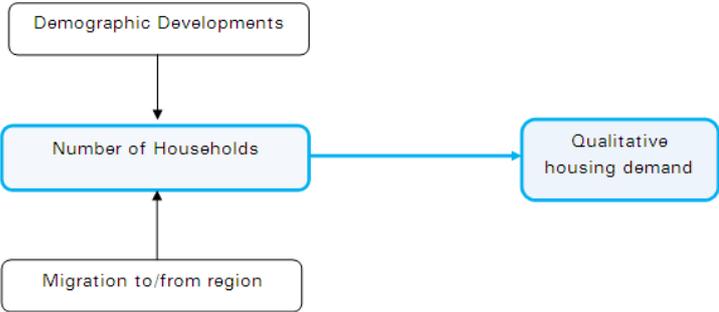
### 5.2 A new structure

In figure 11 is illustrated how I will

look at the Dutch housing market. In this paragraph will be described what this illustration exactly means. The green arrows are the most important arrows within the model, this is the place where the model links the characteristics of the households to the characteristics of the housing stock. Beside the green arrows is it important to look at the red arrow. This red arrow illustrates the calculation for the possible fulfilment of a potential movement of a household.

Under the developers of models of estimation for the housing demand there is a never-ending discussion about what the starting point of these models must be. Should we start with the future number of households or should we start with the realisation of building plans (Niek Bargerman, personal communication, 07-06-2014). A significant part of the developers say that you should start with the realisation of building plans, because this is the trigger of all movements. I will see the future number of households as the starting point of my model, because without these building plans there is still a certain housing demand. Building plans can explain the fulfilment of this demand, but my goal is to estimate the qualitative housing demand not the fulfilment of this demand. The starting point of the model (illustrated in figure 9) is for now the same as the Primos and Socrates model of estimation developed by ABF research. This means that this model will have a Primos engine to estimate the demographic developments within a region.

There is one more important aspect of this starting point. The model will look at the qualitative housing demand of all the households instead of focussing on the households who are willing to move. Also ABF research looks at the housing demand of all the households, but a lot of consultancies or agencies focus only on the active part of the housing demand. In order to get a view of the underlying causations of the establishment of the



**Figuur 9: First part of model**

active part of the housing market you'll need to look at the housing situation of all future households (Harry Boumeester, personal communication, 09-07-2014). For now is the conversion of the demographic data into the qualitative housing demand done in the same way as is done by ABF research. So they look at the preferences a household for a certain type of house, a preferred living environment, a certain price level and the preferred form of ownership.

The second part of the model (illustrated in figure 10) is the part of the structure where the current housing stock and the qualitative housing demand of all the households meet each other. So in this stage we meet the first green arrow within the model. This green arrow connects the characteristics of all the households within the area to the characteristics of their living circumstances at this moment. The goal of this estimation is to get insight in the current housing situation and the current housing stock. Especially the current housing stock becomes more important. The x number of new houses must fit within the current housing stock. The new building plans which are the result of the outcome of a model of estimation must resolve the biggest concerns within the current housing stock (Lucas van Eijdsen, personal communication, 22-07-2014). Since the composition of your households will change over time, there will come a time in which the housing stock doesn't fit anymore to the preference of these households (Harry Boumeester, personal communication, 09-07-2014). Where the quantitative housing demand will shrink over time, will the qualitative demand always exist (Niek Bargerman, personal

communication, 07-06-2014). So it would be wise to look which households are living within their preferred housing situation and who don't. At this moment are authorities neglecting the current housing stock, even if they have the data (Niek Bargerman, personal communication, 07-06-2014). Only by a separation of the active market from the total market, you are able to see which adjustments within the current housing stock are interesting (Harry Boumeester, personal communication, 09-07-2014).

The green arrow illustrates the mathematical calculations that estimate the amount of people who are living in their preferred living circumstances and who won't. After the estimation the model defines four different kinds of combinations within the current housing market, by looking at the current housing stock and the qualitative housing demand. The first group are the households which are new for a specific area. These are the households who are moved from another region towards this specific region, starters on the housing market, and new households which are caused by a divorce. Since these households are new for this region it is logical that they are looking for a place to live. So they will be actively looking for house within this specific region. The second group is a certain amount of households who are living in a house which doesn't suit their desired living circumstances. At this moment the model suggests that these households will become active on the housing market. The third group is the amount of households who are living within their preferred living circumstances. The model suggests that these households won't be active on the housing market unless they won't be able to finance their current situation. How this exactly works will be described in chapter 7. The different groups are changing all the time. The moment the characteristics of the household change it is possible that they won't be living anymore in their preferred living circumstances. At this moment they will belong to another group. The fourth group exists of houses without a household, so houses which are empty at a specific moment. There are multiple causations for an empty house, but within this research this percentage is only caused by households where the last member of the household died. The sum of the first three groups must be uniform to the total amount of households within the region at a specific time. Important to mention is that this percentage will be constantly changing. So the model doesn't look at one moment which households are actively looking, but the model simulates constantly which households will become active on the housing market. The fourth group is simply caused by demographic developments our houses that can't be sold.

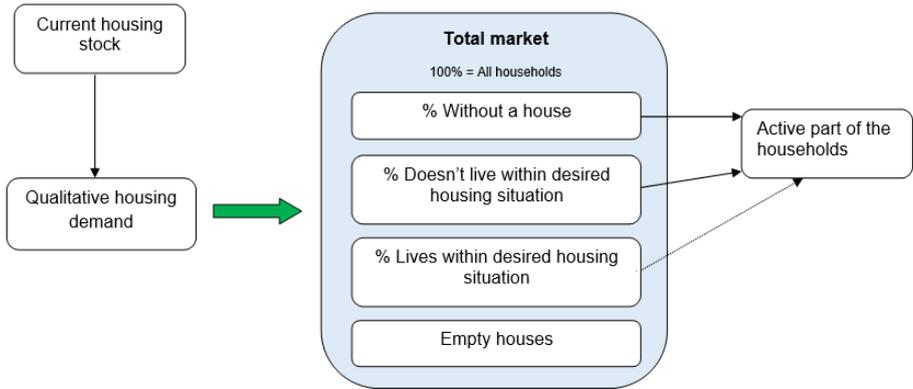
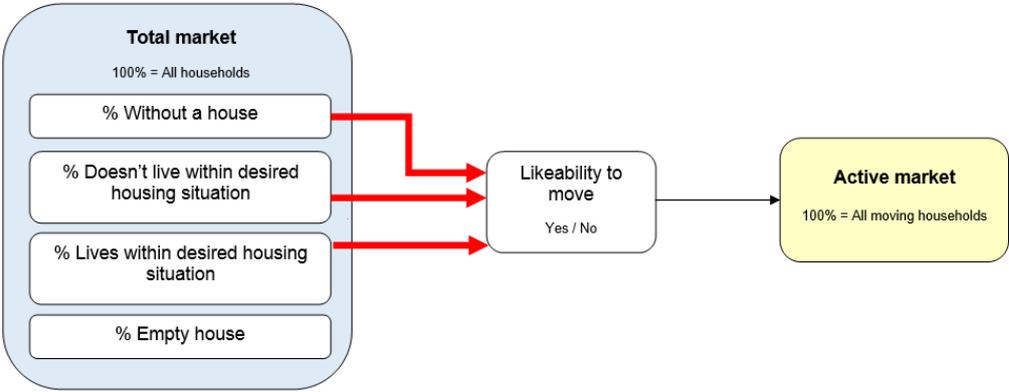


Figure 10: Part two the total market

The third part of the model (illustrated in figure 11) is the transition from the complete market towards the active market. This means that the model makes a difference between a potential movement and a real movement. Not every household is willing or able to move in order to live in their preferred living situation, and not every household is able to stay living within their preferred housing situation. So a filter is included to estimate what the amount of households is who are really willing to move in order to live in their preferred living circumstances. This filter is illustrated by the red arrow. The combination of the characteristics of the household and the characteristics of the house they live in define the possibility that a household will pass this filter. More about the exact mechanisms behind this filter and the explanation why this filter is so important is explained in chapter 7. The moment a household don't pass the filter, they will still be living in their current house. This household will stay in this house until their possibility to move is high enough, because their household characteristics changed.



**Figure 11: Part three of model**

The moment a household pass the filter two things happen (illustrated in figure 12). First off all, a household (with a set of specific characteristics) enters the active housing market, and secondly they leave their current house. This means that their current house (also with a set of specific characteristics) becomes available for other households. The variable housing stock 1.0 has been included into the network to simulate this effect. The housing stock 1.0 is the housing stock which is currently available. A closer look at this variable reveals that the currently available housing stock is defined by three flows: houses which were empty the moment the model of estimation starts with his estimations plus houses that became empty because the last member of the household died, the number of houses which are the result of the realisation of building- and restructuration plans, and like already mentioned houses that became available because the households of these houses moved towards another house to fulfil their preferred living situation. When a household enters the active housing market, the model looks if there is a house available within the housing stock 1.0 which meets their preferences. This process of combining the characteristics of the households with the characteristics of the houses has been conducted in the same way as in part two of the model, and once again is illustrated by a green arrow. When there isn't a house within housing stock 1.0 that doesn't meet the preferences of the household, the model will look at the development and restructuration plans. The moment that these plans meet the preferences of the household, the model expect that this household won't move at this moment, but will

move in the future. So you don't need to add more houses into your building programs. Important to mention is that, the model mostly looks at the changing characteristics in time. Since it will take some time to realize the building plans, you need to look at the preferences of the household at the moment this plan is realized instead of the preferences at this moment. This upcoming housing stock is called housing stock 2.0, and is based on the building plans which are developed by the municipality. So the households who are actively looking to fulfil their preferred living situation are now divided over two groups namely: a percentage of households that finds their preferred living situation within housing stock 1.0, and a percentage of households that find their preferred living situation within the development plans. But like illustrated within figure 12 there is another group: households who can't find a house at this moment, but also won't find a house in the further which has their preferred characteristics. This is the most interesting group, because this is an indication for the future building program. On the basis of this percentage new building programs will be developed. The main difference between this structure and the structure of ABF research is the double estimation of an qualitative housing demand. The model begins with an estimation of the qualitative demand of all the households, followed up by a likeability to move filter. Then the model looks at the qualitative housing demand of the households who are actively looking for a new house. In this way the model isn't too focused on the active part of the housing market, and the model doesn't neglect the current housing stock. This mechanism includes one problem. In practise, when a household can't find a house which has their preferred characteristics, they will downgrade their preferences. This mechanism isn't included within this model, because it's too complicated to include within this research. It will take too much time in order to construct this mechanism.

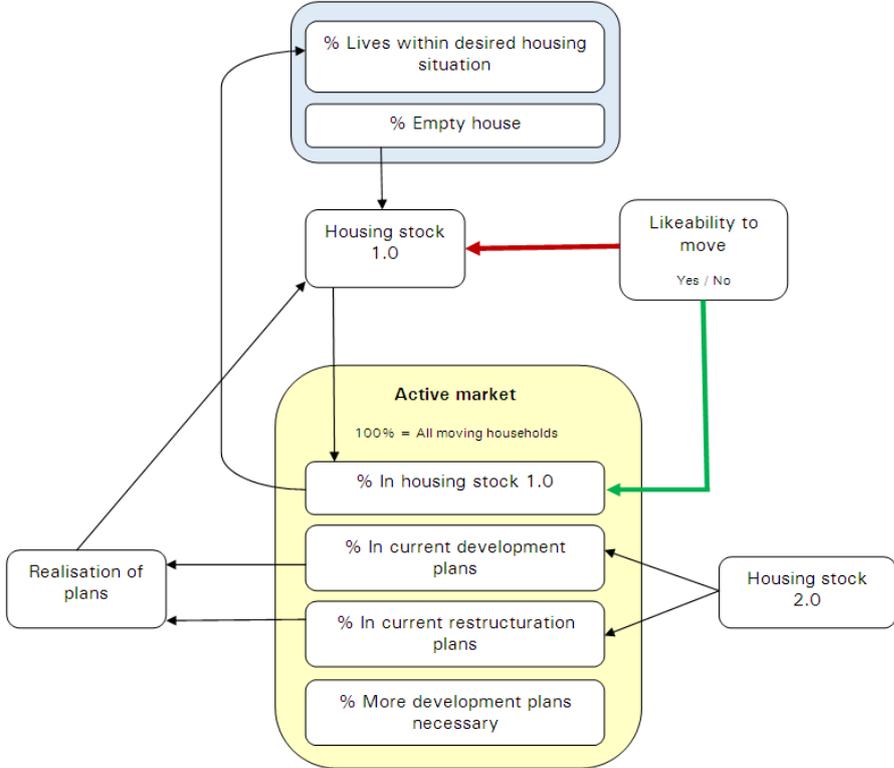


Figure 12: Part four of the model

In this research the main focus will lie on the green and red arrows. So this research will look at how the characteristics of the a households can be linked to specific characteristics of houses, and I will look at the likeability of a household to move. This means that this research will neglect to look at the supply side of the model. I am aware of the fact that the uncertainties of the realisation of the building plans can have a huge influence on the outcome of the estimation, but it will take too much time to look more deeply into this aspect of the housing market. Also the uncertainties during the demolishing and restructuration of houses will be neglected in this research.

### **5.3 Conclusion**

So all in all can we conclude that we have to keep three things in mind. First of all is it important to start with the number of the future households, because even without building plans there is a certain housing demand. Building plans can explain the fulfilment of this demand, but the goal of the model is to estimate the qualitative housing demand not the fulfilment of this demand. Secondly, it is highly important that your model of estimation most be able to say something about the current housing situation and the upcoming housing situation. So it is important to make a distinction between the complete housing situation and the active housing situation. Only when you have a good image of the complete housing market and your current housing stock, it becomes possible to see your possibilities. Especially in a time in which the qualitative demand becomes more important is it really interesting to look at your current housing stock. Thirdly we have to include a filter within the model of estimation to say something about which households will be part of the active housing market. So which potential movement are real movements?

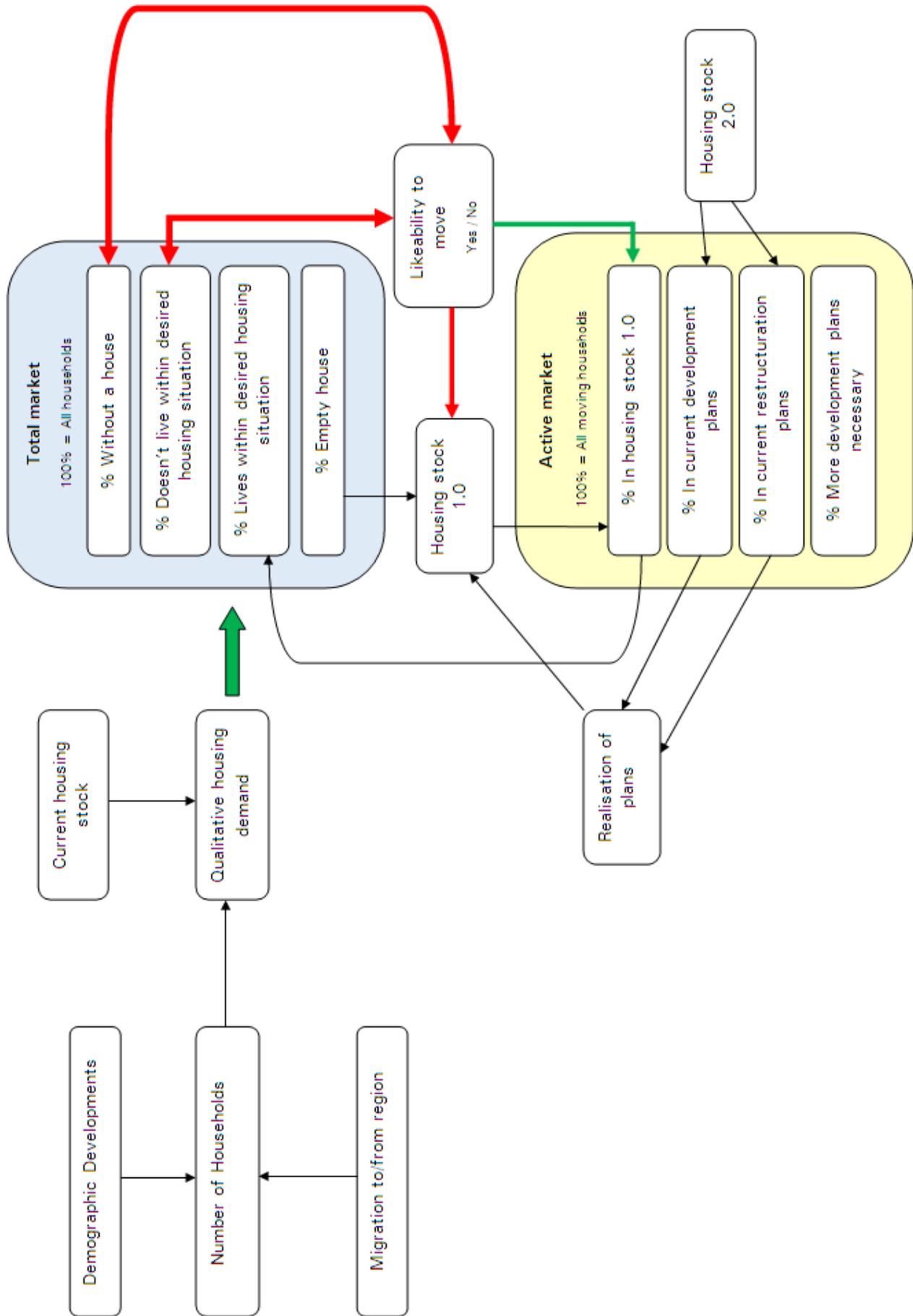


Figure 13: Structure of the model of estimation for this research.

## **6. Characteristics of the households and houses**

After the structure of the model has been analysed, this chapter will look at the characteristics of the households and the characteristics of the houses which are used in order to estimate the qualitative housing demand. In this chapter I will firstly take a critical look at the used characteristics to define households. Secondly I will look which characteristics are used to make a separation of different houses. Thirdly I will look at the correlations between these characteristics. All in all, I am describing how I see the green arrows within figure 13. Important to keep in mind during the analyses of this part of the model is the question: What is a housing demand? (Harry Boumeester, personal communication, 09-07-2014). For now the housing demand of a household is the preferred situation in which a household desires to live. So it doesn't matter that a household won't be able to fulfil this wish. This wish can't be too complicated. Of course we want to know as much as possible about the qualitative housing demand of a household, but you have to keep in mind what the added value of this variable is in relation to the complexity of the model (Rik ten Broek, personal communication, 06-06-2014). The moment your model becomes too complex, it becomes useless.

### **6.1 Characteristics of the households**

ABF research makes a difference between households on the basis of age, household type, and income. During this classifications they make a distinction between five age groups, four household types, and four income groups. So ABF research works with 80 different household groups. Besides these characteristics, ABF research makes a separation between thirteen kinds of preferred living environments in which these households are living (Poulus & Heida, 2005).

#### **6.1.1 Age**

The variable age will be the first variable to be included into the network. Like described in paragraph 4.1 we can point out a lot about the qualitative housing demand on the basis of demographic data like the variable age. After doing an analyses on the basis of the WoON (2012) data we can conclude that there is a correlation between the age of a household and the preferred form of ownership and the preferred type of housing, illustrated in attachment D. So we are able to define for every life phase the qualitative housing demand, which enable us to develop a model of estimation for a significant part of the qualitative housing demand on the basis of the age of a household (Johan van Iersel, personal communication, 16-05-2014). In order to define the age of a household, ABF research looks at the head of the household. The head of the household is the eldest person within this household. In this research the age of a household is defined in the same way as ABF research did. The five different age groups and their preferred living situation are illustrated in table 2.

**Table 2: Variable age in Socrates model of estimation. Source: WoON (2012) & Poulus & Heida (2005)**

<b>Classification of ABF research</b>				
Young	Head of the household is under 30			
Middle age	Head of the household is between 30 and 44 years old			
Advanced age	Head of the household is between 45 and 65 years old			
Senior	Head of the household is between 65 and 74 years old			
Old	Head of household is above 75			
<b>Preferred housing situation age groups</b>				
	<b>Single family dwelling</b>		<b>Multifamily dwelling</b>	
	<b>Owner occupied</b>	<b>Rented</b>	<b>Owner occupied</b>	<b>Rented</b>
Young	49%	18%	7%	25%
Middle age	64%	18%	8%	10%
Advanced age	41%	18%	13%	28%
Senior	15%	10%	19%	57%
Old	4%	7%	16%	72%

Now it's clear that there is a correlation between age and two characteristics of houses, an analyses was conducted on the classification of the different age groups, illustrated in attachment D. Since the percentages for a certain preferred characteristic will change if you make another classification, it's very important that these different age groups have the right classifications. The analyses illustrated in attachment D concluded that most of the age groups have the right classifications, but the age group 'young' is problematic. The preferences of this age group are illustrated in table 3. Looking at the most youngest ages you'll see that the respondents between the age of 18 and 22 have different preferences than the respondents who are older than 22. Where respondents younger than 23 years prefer a rented multifamily dwelling, respondents older than 22 prefer an owner occupied single family dwelling. These different preferences are created by the high amount of students who are situated within this young age group. Since students have different preferences is it logical that this will influence the preferences of this age group as a whole (Mulder et al., 2010). This means that it would be wise to make an extra group for the respondents who are at this moment younger than 23 years old. On the basis of this new classification a new table of preferences is calculated and illustrated in table 4.

**Table 3: Preferences of different ages. Source: WoON (2012)**

Age	Single family dwelling		Multifamily dwelling	
	Owner occupied	Owner occupied	Owner occupied	Rented
18 t/m 21	18%	21%	8%	52%
22	22%	25%	9%	44%
23	39%	23%	7%	31%
24	39%	19%	8%	34%
25	46%	21%	9%	24%
26	55%	17%	8%	21%
27	61%	16%	4%	18%
28	63%	15%	8%	15%
29	60%	18%	7%	16%

**Table 4: Definitive classification of age groups. Source: WoON (2012)**

		Single family dwelling		Multifamily dwelling	
Age group	Age	Owner occupied	Rented	Owner occupied	Rented
Students	Under 23	21%	22%	9%	49%
Young	Between 23 and 29	54%	18%	7%	21%
Middle age	Between 30 and 44	64%	18%	8%	10%
Advanced age	Between 45 and 64	42%	18%	13%	26%
Senior	Between 65 and 74	16%	10%	18%	55%
Old	Above 75	4%	7%	16%	72%

It's not possible to use the above mentioned percentages directly, because the preferences differ between generations. We can't assume that each generation has the same preferences (Johan van Iersel, personal communication, 16-05-2014). *'The behaviour of people is changing, whereby comparable future households will behave in a different way in comparable situations'* (Blije et al. 2012, p. 20). So we have to monitor constantly all the specific generations to resolve this problem. You can put this knowledge simply into your model on the basis of a trend analyses. Just look at how the preferences has changed over the last decades and include this into the calculation of the qualitative housing demand.

Let's take for instance a look at the two elderly groups, which are at this moment crucial life phases. The answer on the question: *Will the elderly leave their owner occupied house?*, has a big influence on the whole housing market (Johan van Iersel, personal communication, 16-05-2014). It is hard to define which elderly will move and which will stay. A common mistake is that the preferences of the elderly of the last years is copied in order to define the preferences of the elderly of the future, since there are significant differences between the different generations (Johan van Iersel, personal communication, 16-05-2014). A research of van Iersel & Leidelmeijer concluded (2010) that: the future

generations of elderly have different opportunities and wishes, because of the socio cultural and socio economic trends. This mistake caused strange market potentials, with as result that housing corporations built housing complexes for elderly that didn't want to move at all (Johan van Iersel, personal communication, 16-05-2014).

**6.1.2 Type of household**

Like already mentioned the household type is the second characteristic of a household which is included within the Socrates model of estimation. A lot of scientific research (like Blije et al., 2009) concluded that the demographic changes within a household is one of the main variables causing the living preference of a household (Dorien Manting, personal communication, 27-05-2014). In combination with the age of the household is it possible to define in which life stage the household is living (Poulus & Heida, 2005). Every step from one household situation to another has important consequences for the preferred housing situation (Johan van Iersel, personal communication, 16-05-2014). This is outlined in the correlation analyses presented in attachment D. The household situation has a high correlation with the type of housing a household prefers. Important to mention is that there is no correlation between the household situation and the preferred form of ownership.

Table 5 illustrates the different household types according to ABF research, with their preferences. The estimation for the desired type of housing can be calculated in a reliable way, because we have a good understanding of the trends in the past (Co Poulus, personal communication, 12-05-2014). The same classification as ABF research will be used within this research. The only possibility was to change this classification by adding the number of children within the classification. The number of children isn't included within this model because it will make the model too complex.

**Table 5: Characteristic household type in Socrates model of estimation. Source: WoON (2012)**

Name	Label	Single family dwelling	Multi family dwelling
Single	One person household	51%	49%
Couples without children	Cohabiting without children	59%	41%
Couples with children	Cohabiting + one or more children	88%	12%
Single parent household	Single with children	66%	34%

The characteristic age and household type aren't related. In order to make a reliable estimation it's necessary to combine these two variables. It's logical that a 30 year old single prefers something completely else than a 80 year old single (Harry Boumeester, personal communication, 09-07-2014). This basis relation is the most important relation to estimate the qualitative housing demand (Harry Boumeester, personal communication, 09-07-2014). More about this basis relation is explained in paragraph 6.4.

### 6.1.3 Income

The third household characteristic is the income of a household. Table 6 illustrates the four income groups of ABF research. Income is especially in the Dutch context extremely important. It can explain which form of ownership a household prefers (or is forced too, by the rules of the Dutch authorities) and say something about the opportunities of a household to fulfill their demand. This is outlined in the correlation analyses, illustrated in attachment D, which concluded that there is a correlation between the variable income and the variables preferred kind of ownership and preferred housing type. The classifications of the different income groups are directly linked with the rules of the Dutch authorities. Since these rules are constantly changing and this classification of ABF research has been published in 2005, is it logical that this separations doesn't have the right classifications. So I had to create a new classification for the variable income. Income has been defined within this research as the disposable income of the whole household. This definition is chosen, because most of the regulation rules of the Dutch government are based on the disposable income of a household (Ministerie van financiën, 2013).

**Table 6: Classification of ABF research for the variable income in Socrates model of estimation. Source: (Poulus & Heida, 2005)**

Name	Classification
Low income	Households with a disposable year income lower than € 14.000
Low middle income	Households with a disposable year income between € 14.000 and € 19.000
High middle income	Households with a disposable year income between € 19.000 and € 40.000
High income	Households with a disposable year income which is higher than € 40.000

One approach to determine which classification would be useful is by looking at the data sources. When certain data sources uses certain classifications are you obliged to use these classifications. An important data source for the variable income within the Dutch context is the CBS database. The CBS database makes two different kinds of classifications. Illustrated in table 7. Like illustrated within this table, the classification of the CBS is a relative classification. So the CBS makes the separation between different income groups on the bases on the amount of income of a household compared with the other households. This is problematic, because beside the fact that you look at the economic situation of people you have to look what this economic situation really means. Aspects like the granting of mortgages, rules for corporations, and regulation rules of the Dutch government could have a significant impact. An example of a research that concluded that you have to look at these kinds of aspects of the Dutch housing market is the research of Schilder & Conijn '*Verhuizen in de Crisis*' (2013). You can add the impact of mortgages simply by using the right classifications or by adding certain math mechanism to the model (Roelf Jan van Til, personal communication, 12-05-2014).

Table 7: Four group classification of CBS Statline for the variable income. Source: CBS statline

	Single family dwelling		Multifamily dwelling	
	Owner occupied	Rented	Owner occupied	Rented
1 <sup>st</sup> 25% group	22%	29%	6%	43%
2 <sup>nd</sup> 25% group	32%	26%	8%	35%
3 <sup>rd</sup> 25% group	45%	17%	13%	25%
4 <sup>th</sup> 25% group	57%	13%	12%	18%

Table 8: Four group classification of CBS Statline for the variable income. Source: CBS statline

	Single family dwelling		Multifamily dwelling	
	Owner occupied	Rented	Owner occupied	Rented
1 <sup>st</sup> 10% group	26%	25%	8%	41%
2 <sup>nd</sup> 10% group	17%	36%	4%	43%
3 <sup>rd</sup> 10% group	28%	27%	8%	37%
4 <sup>th</sup> 10% group	37%	22%	9%	32%
5 <sup>th</sup> 10% group	45%	16%	14%	25%
6 <sup>th</sup> 10% group	48%	16%	12%	24%
7 <sup>th</sup> 10% group	59%	12%	11%	18%
8 <sup>th</sup> 10% group	64%	10%	12%	14%
9 <sup>th</sup> 10% group	70%	6%	13%	10%
10 <sup>th</sup> 10% group	72%	4%	15%	9%

So a classification in which certain aspects of the Dutch housing context are included is necessary to make a reliable estimation for the qualitative housing demand. An important regulation rule for the Dutch housing corporations is the € 33.000,- border. ‘90% of the regulated rented dwellings of a corporation, needs to be allocated to households with an income below € 33.000,- (Blije, et al. 2012). A second important income border within the Dutch housing context is the € 43.000,- border, which is included within the income dependent rented policy of the Dutch government introduced on the first of July in 2013 (Lijzenga, 2013). In order to define the classification of the highest and lowest income groups, the Dutch tax rates borders will be used, which lies on € 56.000,- and € 19.000,- (Ministerie van financiën, 2013). This regulations rules result in five different income groups, illustrated with their preferences in table 9.

**Table 9: Classification for the income groups**

		Single family dwelling		Multifamily dwelling	
Name	Range	Owner occupied	Rented	Owner occupied	Rented
Low income	Under €19.000,-	22%	29%	6%	43%
Low middle income	Between €19.000,- and €33.000,-	32%	26%	8%	35%
Middle income	Between €33.000,- and €43.000,-	45%	17%	13%	25%
High middle income	Between €43.000,- and €56.000,-	57%	13%	12%	18%
High income	Above € 56.000,-	69%	6%	14%	11%

There will be some critique the moment I chose to work in this way with the variable income. First of all, within the model of this research income is the only included wealth variable, but aspects like the employment rate, the unemployment rate, or the flexibility of the economy of a city could have huge impacts on the outcome of models of estimation for the quantitative housing demand and the qualitative housing demand (Roelf Jan van Til, personal communication, 12-05-2014). These kind of aspects can cause fluctuations of the income of a household or change the possibilities a certain income creates. So for a long term estimation it would be useful to look at aspect as the unemployment rate or the flexibility of the economy.

Secondly, it is impossible to say anything about what a household will do with their money. It is hard to say anything about the amount of money which is actually used for housing purposes. *'It's possible to know how much money a household can spend in total, but it's impossible to know which household prefer something like a long vacation to America above an owner occupied house and which households won't go on an expensive vacation, because they prefer to live in an owner occupied house'* (Niek Bargerman, personal communication, 07-06-2014).

Off course this critique is justified, but there are reasons for not including more wealth variables into the network. There are multiple filters within the WoON research which enable a researcher to make better calculations, but maybe more important, when you monitor the situation constantly you'll notice if your estimations for the income of a household where to positive or to negative. Simply by monitoring the fluctuations of the incomes of the households, it becomes possible to make a good estimation on the basis of a trend analyses (Co Poulus, personal communication, 12-05-2014). Beside these aspects, it isn't the goal of a developer of a model of estimation for the qualitative housing need to develop an estimation for something like the development of the employment opportunities (Co Poulus, personal communication, 12-05-2014). Co Poulus explained that ABF research tried to include the development of the employment opportunities into their model, but these kind of variables are according to Poulus too complex. In order to include a variable like the development of the employment opportunities you need to create a complete new model of estimation. It's hard to make a model of estimation for most of the wealth variables, because there are even more uncertainties than within a model of estimation for

the housing demand (Dorien Manting, personal communication, 27-05-2014). The moment you have to develop a complete new model of estimation, you don't strengthen your goal, but you create a new goal (Co Poulus, personal communication, 12-05-2014). Beside the fact that it isn't the goal of this research to develop a model of estimation for a wealth variable, there are experts who say that the characteristic income is more than enough. *'When you look at how the housing market works, you'll see that banks give mortgages on the basis of income. So they don't look at things like purchasing power. So why should you include other wealth variables within your model of estimation?'*(Harry Boumeester, personal communication, 09-07-2014). Since it is too complex and unnecessary to add more wealth variables into the model. The model of this research will only use the income variable as a wealth characteristic of the households, but it is extremely important to constantly look at the classifications of the income group. Especially in the Dutch situation where the housing market is constantly changing.

#### **6.1.4 The current housing situation**

An important characteristic of a household which causes a qualitative housing demand is their current housing situation. Especially for the estimation of the separation between rented houses and owner occupied houses there is a direct link between the current housing situation and the preferred housing situation. Especially the movements from an owner occupied house towards a rented house can cause wrong estimations when the current housing situation isn't included (de Jong & Eseveld, 2014). House occupiers want to keep living within an owner occupied house (de Jong & Eseveld, 2014). So we have to include the current housing situation within the model of estimation in order to estimate the demand for owner occupied and rented houses. I won't use the data of the WoON 2012 research. There is a lot of other research available on the relation between the current housing situation which is far more interesting, like the research of de Jong & Eseveld (2014).

#### **6.1.5 Educational level**

The most announced missing variable during the interviews by the experts is the variable educational level of the individuals within the households. The variable educational level can be helpful to make a better translation of the demographic data into the housing demand (personal communication, Roelf Jan van Til, 12-05-2014). The educational level of someone can explain which type of house they prefer, which living environment they prefer, and the likeability that they succeed in fulfilling their wishes (Marlet, 2009). The conducted correlation analyses (illustrated in attachment D) conclude that the experts were right. There is indeed a correlation between the educational level and the variables preferred type of housing and the preferred type of ownership. So the models of estimation will be more reliable when you add the variable educational level into your model. *'It would be extremely pleasant if you know the educational level of someone'* (Dorien Manting, personal communication, 27-05-2014). The preferences of each kind of educational level are illustrated in table 10.

**Table 10: Preferences of different educational levels**

Educational level	Single family dwelling		Multifamily dwelling	
	Owner occupied	Rented	Owner occupied	Rented
Primary school	14%	32%	4%	50%
LBO	26%	24%	8%	42%
MAVO, MULO, VMBO	32%	22%	10%	35%
HAVO, VWO, MBO	49%	18%	10%	23%
HBO or university	60%	10%	14%	16%

Beside the fact that the educational level could explain more about the qualitative housing demand of a household, the educational level could also help to make a better forecast of the income growth of a household. When somebody belongs to a low income group but has a high educational level, would it be logical to say that this income will rise (Harry Boumeester, personal communication, 09-07-2014). All in all we can say that it would be helpful if the variable educational level was included within the models of estimation.

It seems easy to adopt this variable into the models of estimation, but there are some data source problems (Roelf Jan van Til, personal communication, 12-05-2014). CBS has published some information about the educational level of households, but this is published as a mean and on a high scale (Dorien Manting, personal communication, 27-05-2014). At this scale you'll see that there are differences within the Netherlands, but if you want to use this data on a lower scale you won't have enough data (Roelf Jan van Til, personal communication, 12-05-2014). In order to say something about the separation of this data over the municipalities or the neighbourhoods you have to make assessments. These assessments can easily include mistakes. An example of such a mistake is the estimation for the educational level of the active house searchers. Most of the time you'll use the same separation as in the municipality, but it's more likely that this group contains a higher or lower educational level than the educational level of the municipality. So you are obliged to make assessments which you don't want to include (Roelf Jan van Til, personal communication, 12-05-2014). An interesting data source could be the IASA (Dorien Manting, personal communication, 27-05-2014). IASA develops models of estimation in which they explicitly added the educational level. The GBA is another option to get the data. This information isn't public available, but when a municipality wants to estimate their qualitative housing demand is it possible that this municipality can provide the educational level of each household (Rik ten Broek, personal communication, 06-06-2014). Also ABF research is well aware of the explanation power of the educational level, but kept this variable intended out of the model. *'In earlier versions of the Socrates model of estimation there was a classification on the basis of the educational level, but a research conducted by ABF research concluded that a better classification of the age groups had more explanation power than the characteristic educational level. Which was logical according to the research, since the educational level is close related with the income of a household'* (Poulus & Heida, 2005, p. 23). The moment you can get access to the data for the educational level of the households it would be interesting to include this variable within your model of estimation, but since it

would be hard for consultancies to get this kind of data and the explanation power of this variable is partly constituted by the variable income, the variable educational level will only be partly used within the model of estimation of this research. What this really means will be explained within paragraph 6.4

### **6.1.6 Lifestyle approaches**

No matter how good your model of estimation can be on the basis of demographic data, housing demand is still all about making individual decisions. Especially on a lower scale, individual decisions play a more important role. Where demographic data fails to explain these individual decisions, a lifestyle research can help to justify these individual decisions (Diepen & Arnoldus, 2003). Especially in the future when people are even more individualistic, the importance of these individual decisions will grow. Increasingly people want to have control over their own life. They want that their children go to a specific school, they want to go to a specific hospital with specific treatments when they are sick, and they want to live in a specific house in a specific neighbourhood. People want to make decision which apply to their personality and identity (Gert Jan Hagen, personal communication, 28-05-2014). Demographic data can't explain decisions which are made on the basis of the identity our personality of an individual.

In order to reveal the real intentions of people you need to conduct a lifestyle research. '*A lifestyle research looks at the motives and intensions of people, by adding more questions to the research then the obvious questions*' (Gert Jan Hagen, personal communication, 28-05-2014). It's more than simply asking in which neighbourhood someone wants to live, it's about the causations which lie behind these preferences. Off course it is possible to use the classical data as a descriptive variable of a person like the level of education or the household situation, but these variables aren't causing the preferences. The preferences are caused by the personality or identity of an individual. A lifestyle approach is an useful instrument to get an idea about the underlying causations (Gert Jan Hagen, personal communication, 28-05-2014). So a lifestyle approach can help to explain the desired living situations of people on an individual scale. Roelf Jan van Til explains that he would like to add lifestyle variables to the models of estimation, but he also explains that it is really tough to combine these variables with the demographic data which are directly measurable (Roelf Jan van Til, personal communication, 12-05-2014). In order to get a better view on how a lifestyle approach really works, attachment E explains more in detail how a lifestyle approach works.

### **The future of the lifestyle approaches**

There is more and more interest in the lifestyle approaches. '*The lifestyle approaches are getting more and more support. Fifteen years ago, there were real opponents of the lifestyle approaches. Nowadays, these opponents are asking for more information about these lifestyle approaches*' (Gert Jan Hagen, personal communication, 28-05-2014). Slowly an awareness arises, especially in the marketing of houses, that we need to look in a different way at the households within a specific area (Rik ten Broek, personal communication, 06-06-2014).

Unless this high interest and the possibilities a lifestyle approach will create, I won't use a lifestyle approach for this research. Lifestyle variables aren't included for multiple reasons. First of all, it is hard to understand how the different lifestyles are defined, which makes the models more and more

complex (Harry Boumeester, personal communication, 09-07-2014). Since it is hard to understand how the different lifestyles are defined, is it difficult to combine these lifestyle variables with demographic variables. For this reasons the explanation power of the demographic data by the lifestyle approaches is neglected (Roelf Jan van Til, personal communication, 12-05-2014). It would only be interesting to use lifestyle variables when you combine the demographic data with a lifestyle approach.

Secondly, when you combine social economic characteristics with lifestyle variables to estimate the housing demand you'll see that the social economic characteristics will explain the biggest part of this estimation (Harry Boumeester, personal communication, 09-07-2014). So lifestyle variables will only add a little to the explanation power of your model. Since lifestyle variables will make the model extremely more complex, it is questionable to state that a lifestyle approach really adds something to the model. Lifestyle variables will make a model of estimation for the qualitative housing demand unnecessary complex (Harry Boumeester, personal communication, 09-07-2014).

## **6.2 Characteristics of the houses.**

ABF research makes a classification of the houses on the basis of four kinds of characteristics: form of ownership, housing type, with(out) stairs, and the price level. For the characteristic form of ownership ABF research makes a separation between rental houses and owner occupied houses. For the division of the housing type ABF research defines houses as 'single family dwellings' or 'multi-family residential'. Together with the separation of houses with or without stairs, and the three price levels ABF research defines 24 different combinations between characteristics of houses. Later on they added cared living and living within an accommodation that doesn't fit into the previous characteristics (rest group) to the Socrates model of estimation. Which means that ABF research makes a separation between 26 different groups of houses (Poulus & Heida, 2005). These characteristics define what the position of a specific house is on the housing market and thereby which will be the target group of this house (Poulus & Heida, 2005).

### **6.2.1 Form of ownership**

The separation between forms of ownership is necessary since it is the starting point of a lot of housing programs. The Netherlands has a lot of regulations which makes it easy to make an estimation of the number of people who will rent a house and who will buy a house (Harry Boumeester, personal communication, 09-07-2014). So this variable needs to be included within the model. Important to mention is that this variable contains one problem. Since the policy of the national Dutch authority is constantly changing it is hard to make a reliable estimation for a longer period (Lucas van Eijdsen, personal communication, 22-07-2014). Nevertheless, the characteristic form of ownership will be included within the model because it's one of the most important qualitative characteristic within the Dutch housing context (Harry Boumeester, personal communication, 09-07-2014).

### **6.2.2 Housing type**

According to the experts, the most important characteristics of a house are the characteristics housing type and the form of ownership. Like mentioned before, ABF research only makes a distinction between a single family dwelling and a multifamily residential (Poulus & Heida, 2005). According to Harry Boumeester (personal communication, 09-07-2014) this is the most important separation. Which kind of a single family dwelling isn't that important, because the choice between a terrace house or a villa is made on the basis of your income not your preferences (Harry Boumeester, personal communication, 09-07-2014). Beside the fact that this choice isn't caused by a preference, a research on the housing situations in different European countries conclude that the choice for a certain type of housing is a constrained choice (Dirkx & Aalbers, 2012). The choice for a certain type of house is highly constrained by the supply side of the housing market. ABF research didn't include more housing types into their model for another reason, it would make the model too complex. The Socrates model of estimation can handle a limited amount of characteristics, and more housing types didn't create more explanation power than the current characteristics (Poulus & Heida, 2005). Unless these arguments in this research an extra separation is made between the different housing types. In this research a separation has been made between houses which are situated on the ground level and houses that aren't. It's a real preference of households with children to live in a house on ground level.

There is one problem with the variable household type. A research of the province Gelderland concluded that in the past municipalities made a lot of mistakes during the classification of the housing types (Lucas van Eijdsen, personal communication, 22-07-2014). This resulted into a overrepresentation of multifamily residential houses within the CBS database. So when the model estimates a demand for single family houses is it possible that these houses are situated within the current housing stock, but are classified as multifamily residential houses (Lucas van Eijdsen, personal communication, 22-07-2014).

### **6.2.3 Suitability for elderly**

In a timeframe where an ageing population is one of the most important topics on the political agenda, the suitability of houses for elderly becomes more and more important (Niek Bargerman, personal communication, 07-06-2014). So the variable suitability for elderly will also be included within model of this research. One way to look at this variable is the approach of ABF research. ABF research looks if a house is suitable for elderly or not (Poulus & Heida, 2005), so there is nothing in between. To classify a house as suitable for elderly they look at the label 'non stair houses', which means that the living room, the bedroom, the kitchen, and the bathroom are accessible without facing a stair. When a house doesn't meet this criteria this house is not suitable for elderly. It is questionable that this definition is a sufficient label to define a house as suitable for elderly or not. There are multiple houses that have stairs but are suitable for elderly (Harry Boumeester, personal communication, 09-07-2014). Nevertheless it's logical that ABF research chose to work with this definition, because it is the same definition which is used within the WoON (2012). The moment you use another definition for a house which is suitable for elderly, you have to change the question list of WoON (2012) (Harry Boumeester, personal communication, 09-07-2014). So within the model of this research the same definition as ABF research will be used. In the future it would be wise to change the questions within the WoON research, in order to make a better estimation for the demand of houses which are suitable for elderly.

Beside this classification ABF research added one kind of dwelling called cared living (Poulus & Heida, 2005). The houses who got the label cared living are houses which are nearby a nursing home, or relief centres which enables elderly to get the care they need within their own home. I will also use this definition in order to state something more about the demand of houses suitable for elderly.

### **6.2.4 Price level**

For the separation of houses into different price levels (Poulus & Heida, 2005), ABF research developed six different price level groups, illustrated in table 11. The definition of these price level groups are based on the current regulation rules within the Dutch housing policy. So they will change every year. The price level of house could be an indication for the amount of luxury within a house. So it could be useful to include the variable price level within the model. On the basis of the relation between the income of a household and the price tag of a house is it possible to estimate the demand for extra luxury in and outside the house (Johan van Iersel, personal communication, 16-05-2014). Examples of extra luxury are: the amount of preferred square meters and the amount of amenities within the neighbourhood. The combination between income and price level is one of the relations that enable us to explain certain behaviour of people (Johan van Iersel, personal communication, 16-05-2014). It's true that this price tag

could be an indication for extra luxury, but for a model of estimation this information is too specific and too detailed.

So I will look in a different way towards this variable than ABF research. Beside the fact that it will make the model too complex, I don't see this characteristic of a house as something that is the wish of a household to live in. Nobody wants to live in a certain house simply because it has a certain price tag. A household prefers a set of characteristics, and this set of characteristics has a certain price tag (Harry Boumeester, personal communication, 09-07-2014). Looking at the price tag of a house as a desired housing characteristic is the wrong way. *'People don't chose a type of house on the basis of their income or the price tag of a dwelling, but they desire a type of house and then they will try to find a house they can afford which has these characteristics'* (Harry Boumeester, personal communication, 09-07-2014). This does not mean that this isn't a useful variable. Since the price level will give you an indication of the amount of money a household has in real estate, and the amount of money a household needs to have in order to make the actual movement the price level is an extremely important characteristic to estimate the likability to move (Harry Boumeester, personal communication, 09-07-2014).

**Table 11: Characteristic price level in Socrates model of estimation. (Poulus & Heida, 2005)**

Cheap rented houses	Rented houses with a rent till € 358
Mid-price rented houses	Rented houses with a rent between € 358 and € 479
Expensive rented houses	Rented houses with a rent above € 479
Cheap owner occupied houses	Owner occupied houses with a sale price till € 150.000
Mid-price owner occupied houses	Owner occupied houses with a sale price between € 150.000 and € 215.000
Expensive owner occupied houses	Owner occupied houses with a sale price above € 215.000

**6.2.5 Number of rooms**

The most announced missing characteristic of the houses within the current models of estimation are the number of rooms within a house. *'A household with 2 children always wants 5 bedrooms'* (Johan van Iersel, personal communication, 16-05-2014). So the number of rooms can be an important characteristic of a house. A correlation analyses has been conducted to find out the need for this variable. This analyses concluded that there is a high correlation between the characteristics of the household type and the age of the household. The problem of this variable could be that it will create a lot of extra combinations which will make the model far more complex than necessary. This is the reason of ABF research to not include the number of rooms within their Socrates model of estimation (Poulus & Heida, 2005).

Beside the number of rooms the layout of this rooms over the total square meters is a mentioned characteristic that could be important according to the experts. On the basis of a research on the underlying causations of housing preferences of households OTB concluded that the layout of the house becomes more and more important. At this moment we only look at the amount of rooms within a house and sometimes the amount of square meters, but you should look at the combination of these two characteristics. It's interesting to know if somebody wants a great living room or a big bedroom (Harry Boumeester, personal communication, 09-07-2014). Of course is it true that the layout of the rooms over

the total number of square meters is important when you want to buy a house but it is too detailed to fit into a model of estimation. Besides the fact that it is too detailed, it won't be possible to find enough data. It is possible to collect data about the total square meters, but without the layout of this total square meters over the different rooms, this information becomes useless. So only the number of rooms will be part of the new model of estimation.

### **6.3 The living environment as a problematic variable**

Like illustrated in figure 5 the preferred living environment is one of the four variables within the Socrates model of estimation for the Dutch housing demand. The preferred living environment is an important variable since there is a difference in demand between the different types of living environments, and within these different living environments there is a different housing demand (Niek Bargerman, personal communication, 07-06-2014).

Most of the experts think different about the preferred living environment than ABF research. RIGO research, OTB and Smart Agent developed a completely different mechanism for the preferred living environment, and Explica and PBL explained that the way how ABF included the living environment in their model could be problematic. This paragraph focuses on the problems with the variable living environment, and how I will deal with this variable. Before this variable is further described, is it important to know that I consider the preferred living environment variable not only as a characteristic of a house, but also as a characteristic of a household. Since the housing market can be completely different in different parts of the Netherlands, it matters in which environment you live during the estimation of the qualitative housing demand (Harry Boumeester, personal communication, 09-07-2014).

#### **6.3.1 The preferred living environment according to ABF research**

Important to mention is that none of the experts told during the interviews that the variable living environment isn't useful, but they all explained that the method of ABF research can be problematic. The living environment as a preference is useful, because it gives municipalities and building organisations an indication of where your market potential is geographically situated (Rik ten Broek, personal communication, 06-06-2014). It enables a municipality to see which kinds of areas within their municipality are popular. In order to get a good view on the shortcoming of the current approach is it useful to take a closer look at the exact mechanisms of ABF research. Within the Socrates model of estimation, ABF research makes a separation between fourteen different preferred living environments, illustrated in attachment F. The typology of the preferred living environment comes out of the WBO investigations in 1998, and is actualised on the basis of the WoON researches (ABF research, n.d). They make this separation on the scale of the postal code. So for the estimations of the Socrates model of estimation each postal code within the Netherlands has a certain preferred living environment.

The fourteen different preferred living environments are categorized within six types namely: city centre, urban environment outside the centre, green urban environment, centre of village, living in rural environment, and work environment (ABF research, n.d). Postal codes that got the label 'centre' are lying in the centre of the city or village. In each city or village the postal code with the most metropolitan contingent amenities got the stamp 'centre of the city/village' (ABF research, 2008). On the basis of the distance from an area towards this postal code is an area a centre or not. It is possible to have a postal code with a label 'centre' which isn't situated in the centre, because there are more criteria. Other criteria for the label centre are: the density of the households, percentage of jobs in the hospitality sector, percentage of jobs in the retail sector, percentage of jobs in the service industry, and the presence of metropolitan contingent amenities like: a cinema, a theatre, or a gallery (Poulus &Heida,

2005). ABF research makes a separation between three types of city centres namely: city centre plus, city centre, and centre of a small city. City centre plus only exist in the six biggest cities (G4+Eindhoven and Groningen) of the Netherlands. ABF research developed this type of preferred living environment because these cities have an extreme strong urban living environment (Poulus & Heida, 2005). City centre plus means that there is an extremely high amount of amenities within this specific postal code. The distinction between the living environments 'city centre' and 'centre of a small city' is caused by the number of residents within this specific municipality. Cities are places where at least 25.000 households are living. Small cities are places where at least 12.500 households are living with a density of 20 houses per hectare, or with a high amount of amenities (Poulus & Heida, 2005). The above illustrated classification are just a few of the multiple classifications which are used by ABF research to define the 14 preferred living environments. The other classifications are illustrated in attachment F. For the estimation of the demand for a certain preferred living environment, ABF research looks at the results of WoON (2012). Within this research the researcher asked the respondent (with a specific set of characteristics) in which neighbourhood he or she wants to live within their own town. The moment the respondent chose a neighbourhood the research looks at the classification (illustrated in attachment F) and concludes that this specific respondent wants to live within this specific living environment.

### **6.3.2 The problematic aspects of the variable preferred living environment**

The first problematic aspect of the preferred living environment is the method that is used to estimate a certain demand for a preferred living environment. Asking a respondent in which neighbourhood he or she wants to live, it is likely that this respondent chooses a certain neighbourhood on completely other criteria than the classification which is illustrated in attachment F. Probably other classifications for this respondent are more important. This situation is problematic because you aren't measuring the demand of a certain living environment but the demand of a certain neighbourhood. *'There is a big change that the people who said to live in a neighbourhood in their city which has the characteristics of the living environment 'city centre', will say when you give them a picture of a city centre neighbourhood of another town: I don't want to live there!'* (Roelf Jan van Til, personal communication 12-05-2014).

Beside the methods which are used during estimation of the demand for a certain preferred living environment, there is critique on the classification for the different types of living environments. When you work with hard selection criteria you'll cause strange results. *'A good example is the demand for the pre-war preferred living environment. There is always a demand for this preferred living environment, but the only way to resolve this problem is to start a new war'* (Johan van Iersel, personal communication, 16-05-2014). Of course, ABF research included this classification in order to say something about the interesting architecture and the interesting layout of the neighbourhood which is present within pre-war neighbourhoods. Still this classification is problematic, because it's hard to measure an interesting architecture or interesting layout. This classification would be too much subjective. So this classification isn't useable. Beside the fact that the classification isn't that useable it can also result in strange results that doesn't meet the real situation. Since ABF research doesn't work with a grey area between the different classifications, areas that looks pretty similar can have a completely different preferred living environment (Rik ten Broek, personal communication, 06-06-2014).

A good example is the difference between the living environment village or the centre of a village, which is a difference based on the number of amenities. So when there are for instance 18 shops situated within this postal code it is called a centre, when there are 17 it isn't a centre, which is strange because this isn't a completely different situation (Rik ten Broek, personal communication, 06-06-2014). It is even questionable to say that something has a certain living environment on the basis of the characteristics of the neighbourhood. The classification is within the mind of people mostly based on the basis of experiences (Rik ten Broek, personal communication, 06-06-2014).

A third problem lies in the fact that ABF research makes a separation on the scale of postal codes, which isn't logical since postal codes doesn't match the borders of the neighbourhoods. The borders of the neighbourhood would be a much better level to define an area as a certain living environment, because the houses and architecture are more similar within a neighbourhood than within postal codes. A good example that a classification on the scale of the postal code can be problematic is the village Rozendal, which lies in a postal code which mostly include rural characteristics. The village Rozendal, which lies on the edge of Arnhem, itself has a lot of amenities and the character of a city, but because the rest of the postal code include a lot of rural area has this part a rural preferred living environment (Rik ten Broek, personal communication, 06-06-2014).

### **6.3.3 How to deal with the preferred living environment?**

Since there are a lot of different opinions about how to deal with the living environment, it is useful to look how different agencies deal with this topic. I will explain within this paragraph how Rigo research, Smart Agent and the OTB deals with this topic. At the end one of these approaches will be chosen to use within the model of estimation for the qualitative Dutch housing demand of this research. We can split the topic of the preferred living environment into two parts: the classification of the neighbourhoods, and the estimation of the demand for a certain preferred living environment.

#### *Approach of Rigo research*

The reason why Rigo research developed another approach was because of the standard definitions of WoON and ABF research. Rigo research uses a three layer approach for the classification of the different neighbourhoods. The first layer contains the locational characteristics of the neighbourhood, this are characteristics which aren't changeable. This layer also include the current buildings. The second layer is the social layer, this are the characteristics of the households who are living within this area. The third layer is a map with the layout of amenities. It is the interaction between this three layers which define the type of living environment of a neighbourhood. The data for this layers is coming from the level of the address. So you won't have one living environment within one neighbourhood. It is possible to have multiple types of living environments within one neighbourhood. So you won't have a problem with the postal codes which you will have when you use the classification of ABF research. Secondly since you deal with multiple maps you'll exchange the hard classifications of ABF research with more soft classifications. Each map will give you another view on the different living environments (Johan van Iersel, personal communication, 16-05-2014).

Interesting about the approach of Rigo research is that they don't believe in a demand for a certain preferred living environment. A preferred living environment could be used for marketing purpose, but it isn't possible to use a preferred living environment analyses for the estimation of the qualitative housing demand (Johan van Iersel, personal communication, 16-05-2014). It is more interesting too look at amenities within a neighbourhood to estimate the qualitative housing demand (Johan van Iersel, personal communication, 16-05-2014). Amenities like a theatre or supermarket are tangible, a preferred living environment isn't. So the approach of Rigo research is only developed to get a better image of the current housing situation.

### *Approach of Smart Agent*

Smart Agent deals completely different with the preferred living environment. Like mentioned before, Smart Agent is a research consultancy which is specialized in doing research on the basis of a lifestyle approach. The basis of Smart Agent is to look at the consumer. This different starting point cause a different criteria for the classification of the neighbourhoods. Instead of looking at the characteristics of the neighbourhood, Smart Agent looks at the consumers. So which kind of neighbourhood is considered by the consumer as an urban neighbourhood and which as a rural neighbourhood. '*Our research concluded that the consumer decides which kind of preferred living environment a neighbourhood is on the basis of their experience*' (Gert Jan Hagen, personal communication, 28-05-2014). So the perception of the consumer decides what kind of preferred living environment a certain neighbourhood is. Smart Agent tries to find this perception on the basis of pictograms. They show the respondent multiple pictures and ask the respondent to compare these pictures with their view outside their window. Interesting about this approach is that there are areas within the city that aren't experienced as urban. According to the classifications of ABF research for the living environments is this impossible (Gert Jan Hagen, personal communication, 28-05-2014). This also means that it becomes possible to give streets specific street living environments.

Smart Agent investigated the relation between the lifestyle of a person and the preferred living environment. People prefer certain areas on the basis of their lifestyle, but more interesting is the social relationship profile of somebody. This relation is much stronger. Certain neighbourhoods are able to house certain social relationship profiles better than other neighbourhoods (Gert Jan Hagen, personal communication, 28-05-2014). For instance, a strong urban neighbourhood is more suitable for an individualistic person. Beside this social relationship profile, Smart Agent also looks at the specific motives to prefer a certain neighbourhood. These specific motives contain certain aspects of lifestyles. Let's take the variable authentic. It's possible to say that certain people like a specific neighbourhood because they experience it as authentic. In order to analyse this motives, Smart Agent looks at the lifestyle of the people who prefer an authentic neighbourhood, and concluded that mostly people with a red lifestyle prefer an authentic neighbourhood. If you do more of these kind of analyses you'll be able to connect multiple variables with each other. This can be variables stating something about: the household situation, the preferred living environment, and the lifestyle. If you connect enough variables with each other is it possible to estimate the demand for the a specific living environment. The demand for a specific living environment will be calculated on the basis of cluster techniques.

### *Approach of the OTB*

Harry Boumeester (personal communication, 09-07-2014) of OTB research explained that the classification of ABF research for the classification of the living environments is too complicated. According to Boumeester a separation between three living environments is enough. OTB research makes a distinction between households who want to live within a city, households who want to live at the edge of a city, and people who want to live within the rural area. *'It's enough to make this classification because this classification is a good indication for aspects like the amount of amenities a household prefer'* (Harry Boumeester, personal communication, 09-07-2014). This classification is also a well-known classification for provinces. Provinces use this classification in order to make decisions about the concentrations of houses (Niek Bargerman, personal communication, 07-06-2014). It is not interesting to look at the building year of the houses within a specific neighbourhood (like ABF research does) since nobody want to live within a house because of his building year, but because a house has certain qualities (Harry Boumeester, personal communication, 09-07-2014). The only aspect that could be interesting according to OTB research is the image of the neighbourhood. Neighbourhoods which are built in the thirties are popular because this neighbourhoods have a certain image. The problem with an image is that it is too vague to put this in a model of estimation. A model of estimation needs to have a maximum explanation power with at least as possible variables. The moment you try to add the image of a neighbourhood into your model, your model will become a lot more complex with a little growth within the explanation power (Harry Boumeester, personal communication, 09-07-2014). Within this research the approach of OTB will be used, because this approach doesn't make the model too complex, and generates enough explanation power.

## 6.4 Relations between characteristics of households and houses

In order to estimate the housing demand you have to look at the connections between the different variables which are now chosen. Before the housing preferences are estimated, there need to be made some decisions about the approach during the estimation of the housing preferences.

### 6.4.1 Used data source

Most of the consultancies are only using the data source WoON to estimate the qualitative housing demand. Which is logical because it is the only data source available making the connection between household characteristics and characteristics of houses (Harry Boumeester, personal communication, 09-07-2014). This is a problematic situation, because a calculation on the basis of the WoON research results in a too simplistic view of the qualitative housing demand. The basis of this problem lies within the strong tendency of Dutch developers of models of estimation for the housing demand to focus on the balance between the demand and supply of housing. We are concentrating us on 10% of the households who say in an interview, (but at this moment don't move), to move within the next two years (Johan van Iersel, personal communication, 16-05-2014). The preferences of this group are used to estimate the qualitative housing demand. The characteristics of this group differs from year to year and is sensitive for the current economic situation on the housing market (Johan van Iersel, personal communication, 16-05-2014). So it is problematic to focus on this 10%, because this group isn't a good representation of the whole. A research like the WoON (2012) research is used to measure the upcoming qualitative housing demand for all the Dutch households who will move in the future. For example, the last WoON research (2012) concluded that there were some changes within the trends of the qualitative housing demand. Households would desire other housing types, and households out of the high income group doesn't want to move at all, but you'll see that in practise the qualitative housing demand is really stable (Johan van Iersel, personal communication, 16-05-2014). Since the active part of the housing market is sensitive for the current economic situation and isn't a reliable group for all of the households is it wrong to use this group to estimate the qualitative housing demand in the future. You'll get unrealistic results if you estimate the qualitative housing demand on the basis of trends within this active part of the model of estimation (Johan van Iersel, personal communication, 16-05-2014). So it would be wise to look at other ways to estimate the qualitative housing preferences. There are three approaches to estimate the preferred living situation of a household (Harry Boumeester, personal communication, 09-07-2014):

1. During the first approach you look at the housing preferences of the people who say that they want to move during the upcoming two years. These preferences are well know because they are measured within the WoON (2012). Within this approach you assume that people who don't want to move, are living in their preferred living situation. So the current characteristics of their house is their preferred living situation.
2. The problem with approach one is that it is questionable that these preferred living situations which are derived from a question list are real preferences. Maybe the real movements are a better indication for the preferred living circumstances. So you look which households (with certain characteristics) are moved towards which houses (with

certain characteristics). It's possible to find this data on the basis of GBA data sources. Also this approach has two problems. First of all is it questionable that before the search for a house the preferences of a household are the same as the moment you find a house. Secondly, when a household needs to move quickly, it is possible that this household ends up in a house which they don't necessary prefer.

3. Approach three is a combination of the first two approaches. So you estimate the preferences in both ways and combine the results on the basis of a weight mechanism. Firstly you will look what the preferences are on the basis of the WoON research. Secondly you will look at the preferences on the basis of the actual movements. There will be a discrepancy between these two sets of preferences. Approach three assumes that the best way to find the actual housing preferences is by looking at this discrepancy. Only in this way is it possible to see the discrepancy between what people want without a step on the housing market and what people want the moment they have been on the housing market.

So approach three would be the best way to estimate the housing preferences, unless the fact that many municipalities have the necessary data available there is a data source problem. It's hard for consultancies to get these kinds of data, because municipalities want to protect the privacy of their citizens. It wasn't possible to get this kind of data to estimate the housing preferences within this research. So within this research only the outcome of WoON (2012) is used to estimate the housing preferences. The moment a consultancy makes a model of estimation for a specific municipality, it would be wise to use the GBA data of this specific municipality and compare these trends with the trends that are derived from the WoON research.

#### **6.4.2 The general preferences.**

In order to say something about the relations between the characteristics of the households and the characteristics of the houses a correlation analyses has been conducted, illustrated in table 12. As you can see in table 12, there are numerous relations which are significant. So for all these relations is it possible to estimate a certain housing demand. This doesn't mean that all these relations will be used. Not all the relation are logical to use, and it's not possible to use all the relations because you'll make assumptions on the basis of a too low number of respondents. In this paragraphs the used relations are illustrated. The used relations are illustrated in table 12 by the green numbers, the black numbers are significant but won't be used, and the red numbers are relations which aren't significant.

#### *Form of ownership*

Let's start with the estimation for the demand of the most complex and important housing characteristic, the preferred form of ownership. The characteristic form of ownership is more complex than the other characteristics because only for the preferred form of ownership the variable income will be used. Income plays a major role within the Dutch context during the choice between an owner occupied housing and a rented housing. Since you have to deal with aspects like the tax rebate of mortgage interest and the rent allowance, you know that households with a high income are forced to live in an

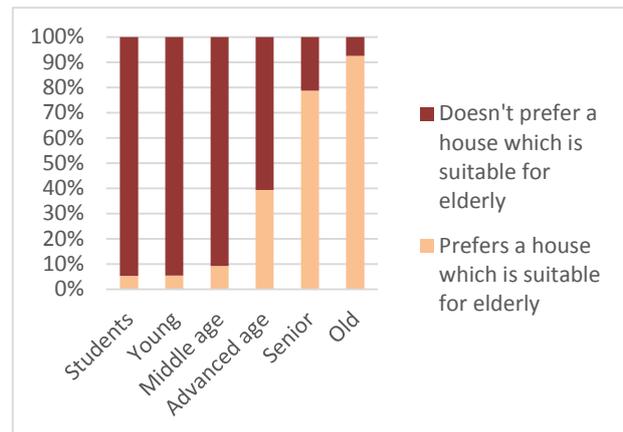
owner occupied house and households with a low income will end up in a rented house (Harry Boumeester, personal communication, 09-07-2014). I won't use income to estimate the preferences of a household for other types of house characteristics, because the income of a household doesn't say something about their wishes, but something about the possible fulfilment of these wishes. So the variable income will be used alongside the estimation of a potential movement. Beside the variable income, the variables age, household type and the current housing situation will be used. These variables have been chosen on the basis of a research of de Jong and Esveldt (2014) and a research of Conijn (2006), who concluded that the variation between owner occupied housing and rented housing is caused by the family situation, money and health. Since the variables age and household type are only interesting if you combine this data (Dorien Manting, personal communication, 27-05-2014), these variables will be combined into one variable. The variable educational level won't be used, because the explanation power of this variable is already present within the variable income (Poulus & Heida, 2005). In order to calculate the actual preferences you'll need to add a certain weight mechanism, where the income of the household will get the highest weight followed by the current housing situation and the household situation (combination between age and household type). In order to say something about the exact weights you'll need to conduct an extra study.

### *Housing type*

The preference for a certain housing type will be estimated on the basis of the household situation and the educational level. Whereby the educational level is optional. On the basis of the correlation analyses is concluded that it isn't possible to see a direct relation between the preferred housing type and a household type, but when you combine the variable age and household situation there is a correlation, like illustrated in table 12. So you can only use the variable household type to estimate a certain demand for a certain type of housing if you combine this variable with the variable age. If you can purchase the data for the educational level, this could be an interesting extra variable, but during the interviews the experts explained that the household situation is the most important variable during the estimation of a certain demand for a certain type of housing.

### *Suitability for elderly*

The suitability for elderly is the most simple variable to estimate. Namely, this variable will be estimated on the basis of one household characteristic: the age of the household. This is logical since this is the only variable which really cause a demand for a house which is suitable for elderly. The demand for houses which are suitable for elderly divided over the different age groups is illustrated in figure 14.



**Figure 14: Demand for houses which are suitable for elderly.**  
Source: WoON (2012)

### *Number of rooms*

The next housing characteristic that needs to be estimated is the preferred number of rooms. Like you see in table 12, there is especially a high correlation between the household situation and the number of rooms. So it would be logical if we use this variable to estimate the demand of houses with a certain amount of rooms. Beside the household situation is it possible to use the educational level of a household to estimate the demand of a house with a certain amount of rooms. If this data is available you'll need to add a weight mechanism into the estimation, where the household situation gets the highest weight. The exact weight needs to be estimated within another research.

### *Living environment*

The preferred living environment will be estimate by two relations. The first relation is the relation between the household situation and the preferred living environment. The second relation is the relation between the educational level and the preferred living environment. Gerard Marlet explains in his book the attractive city (2010) that certain parts of the city attract people with a certain educational level. It are the amenities that are present within this areas which attract people with a certain educational level stronger to this region than to other regions. According to Harry Bouwmeester (personal communication, 09-07-2014) is the classification of three living environment groups enough to cover this trend. It is for this reason that I have chosen to use the approach of the OTB to estimate the demand of a specific living environment. Since we have two relations which are used to estimate the demand for a certain living environment, we once again need to add weight mechanisms into the estimation.

## **6.5 Conclusion: problems and limitations during estimation**

In this chapter multiple aspects have been discussed which can make the current models of estimation more reliable. Looking which variable needs to be include it would be wise to add the variables educational level, and the number of rooms within the model. Both variables can make your model more reliable without making it too complex. The variable income needs to get a less important role within the estimation of the qualitative housing preferences of a household. The income of a household can only say something about the preferred form of ownership, because of the regulation on the Dutch housing market. The preference of other housing characteristics isn't caused by the income of a household. The variable which get the most critique is the variable living environment, because the way ABF uses it causes unusable results, the wrong methods are used, and the postal scale isn't the right scale to define the living environments of an area. There are multiple approaches to make the living environment more useable. In this chapter is chosen for the approach of the OTB which is the approach which is least complex, but sufficient enough to say something about the popular places in the Netherlands. Beside the fact that it would be wise to include, exclude or change variables, this chapter concluded that the classification of these variables is highly important and can have a huge impact on the outcome of your model of estimation. During the selection of the variables and the analyses of the relations between these variables this chapter illustrated two main problems/limitations. First of all, there is a constant contemplation between the complexity of your model and the explanation power of your model. You want to include as much variables as possible, but most of the time your model becomes too complex which cause unaccountable outcomes. The second and most important limitation are the limited data sources. At this moment, most consultancies are only using the data out of WoON (2012) to estimate the housing preferences of a certain households. These are the preferences of households before they enter the housing market. It would be much better if we combine this data with the actual movements, so with the preferences of a household after it enters the housing market. Since it isn't possible to get the GBA statistics, you aren't able to make this estimation, which makes your model less sufficient.

		Form of ownership	Type of housing	Living environment	Number of rooms	Suitability for elderly
Age	Correlation	-0,120	0,340	0,110	-0,197	-0,540
	Sig (2 tailed)	0,000	0,000	0,000	0,000	0,000
Household type	Correlation	-0,157	0,015	0,018	0,290	0,155
	Sig (2 tailed)	0,000	0,073	0,042	0,000	0,000
Household situation (age & household type)	Correlation	0,046	-0,208	0,113	0,359	-0,004
	Sig (2 tailed)	0,000	0,000	0,000	0,000	0,656
Educational level	Correlation	0,228	-0,146	-0,044	0,199	0,267
	Sig (2 tailed)	0,000	0,000	0,000	0,000	0,000
Income	Correlation	0,206	1,139	0,105	0,319	0,106
	Sig (2 tailed)	0,000	0,000	0,000	0,000	0,000

Table 12: Correlation analyses

## 7. Estimation of a potential movement

After the green arrows of the structure of the model of estimation of this research (illustrated in figure 13) has been discussed, the focus of this paragraph will be on the red arrows of the structure. Not all the households that don't live within their preferred housing situation are willing to move or are able to move. So we have to filter the households that are most likely to move from the households that aren't. At this moment the WoON (2012) data is the used data sources to define which households are most likely to move.

On the basis of the questions included within the WoON research is it possible to determine which households are willing to move during the upcoming two years. So the moment a household answers this question positive, they say that they are willing to move during the upcoming two years, this household (with a specific set of characteristics) becomes part of the housing need. At this moment this question is for a lot of consultancies the only filter between the total housing market and the active housing market (Harry Boumeester, personal communication, 09-07-2014). We know on the basis of a research of Carola de Groot (2008) that a lot of households that state they will move won't move in practise, and that a lot of households that say not to move in the upcoming two year have been moved in practise. Only 33% of the people who say to move within the upcoming two years conducted a real movement. Both households that already have a house as well as the starters don't fulfill their desire to move (de Groot et al. 2008). *'It will always be questionable if someone actually will move within the upcoming two years'* (Rik ten Broek, personal communication, 06-06-2014). So this filter isn't that reliable. In this chapter a closer look will be taken at this filter.

A possible solution is the approach of OTB which has been derived in corporation with the NVB (Nederlandse vereniging van bouwverenigingen). Each two years they ask the same question as is mentioned within the WoON (2012): Are you planning to move this year or in the upcoming two years? So far not that interesting, but they added one question. To the households who say that they don't want to move they ask: What will you do the moment you find your perfect house? So what happens when a household finds a house with the perfect characteristics. On the basis of these questions is it possible for OTB to make a distinction between doers, planners, and dreamers (Harry Boumeester, personal communication, 09-07-2014). Doers are the households that want to move in the upcoming year, so with a urgent desire to move. This is the most stable flow. The planners are the people who say to move in the upcoming two years. There is a little bit fluctuation within this flow. The dreamers are the people who say to move the moment they find their perfect house. Since this is the group with the lowest urgency level is it logical that this flow is well known for his great amount of fluctuations. This solution can be interesting, because it gives a better understanding about which households will really move. Instead of one flow, you'll have three groups of households that will possibly enter the active housing market. This solution is not the solution for this research because it still doesn't explain enough about the urgency or possibilities to move, it's still only an answer on a question (Harry Boumeester, personal communication, 09-07-2014). We have to know more about the underlying forces which could explain the difference between a potential movement and a real movement. It's for this reason that I won't include the approach of OTB within the model of this research. It won't overcome the current problems.

More interesting is to look at aspects which cause movements. Changes within the household situation is an important trigger for the realisation of a movement (Harry Boumeester, personal communication, 09-07-2014). Most of the movements are caused by changes within the household situation (Johan van Iersel, personal communication, 16-05-2014). *'When you look at new housing estate projects, you'll see that certain types of houses always attract the same type of households'*. (Johan van Iersel, personal communication, 16-05-2014). So the moment the changed housing preference are caused by a changed household situation is it possible to say that you have to deal with a real movement.

Another characteristic of a household which can have an influence on the willingness to move is the income and the income growth of a household. Especially the movement from a rented house towards an owner occupied house can be triggered by a changing income but the income of a household can also tell us a lot about the likeability that they are able to fulfil their movement (Harry Boumeester, personal communication, 09-07-2014). It's for this reason that it would be wise to connect the income of the household with the price level of the available houses in order to say something more about a potential movement. It is not possible to make a standard classification for the variable price level, because the housing market within different regions within the Netherlands can differ extremely. Unless the fact that we live within a small country the main price level differs extremely within the different regions and there is a great variance in sensitivity for changing economic factors (Brounen & Hij, 2004). So each time we need to make a new classification on the basis of the characteristics of the regional housing situation. This approach can be extremely interesting for municipalities because it gives an understanding about in which price segment the demand for houses with certain characteristics is situated.

## 8. Used data sources

Beside the fact that you need to look at the variables and structure of the models of estimation, you need to look at the data sources. Like we already concluded, most of the time it are the data sources which are the limiting factor. This limited data sources will force you to make adjustments which you doesn't want to make. It would be really helpfull when the GBA data becomes available, but for now we have to deal with the data sources which are available. This chapter will describe how to deal with the available data sources.

### 8.1 WoON a problematic data source on the scale of a municipality

The most important data source which is used for the establishment of the qualitative housing demand is the WoON research. WoON has been honoured as the best available data source for the estimation of the qualitative housing demand (Dorien Manting, personal communication, 27-05-2014). Especially when you compare it with other countries the WoON research is really good. The power of the WoON research lies within his historical trends (Johan van Iersel, personal communication, 16-05-2014). Since WoON is conducted multiple times, it is possible to compare the results of different WoON researches over time. This enable us to see which variables of the qualitative housing demand are constant and which are fluctuating (Johan van Iersel, personal communication, 16-05-2014). Since it is possible to see the fluctuations it becomes possible to see if a certain housing preference really changed or that this change was just a coincidence. For instance, within the last WoON research there was a higher demand for rented houses than the previous WoON researches concluded. Is this a result of the crisis or is it a trend that properties are less important for the upcoming generations? We will be able to answer these kinds of questions because of the great history of the WoON research (Rik ten Broek, personal communication, 06-06-2014). Beside the great historical power of the WoON research the great amount of respondents which are included within the WoON research is prodigious. There is none other research on the Dutch housing market with the same or more respondents.

Unless the fact that the WoON research has been honoured as a reliable data source, it has limitations. First of all, the WoON research is a research which is conducted on a national scale. So the data published in WoON (2012) is suitable for the national models of estimation. It becomes problematic the moment you use this data on a lower scale (Roelf Jan van Til, personal communication, 12-05-2014). On the scale of the municipality there are not enough respondents to make a reliable estimation for some of the variables (Roelf Jan van Til, personal communication, 12-05-2014), and it is not possible to use the same trends which are taking place at a national scale on the scale of the municipality or Corop region. *'The WoON research isn't specific enough for an estimation of a local qualitative housing demand'* (Johan van Iersel, personal communication, 16-05-2014). You could state that it is possible to overcome this problem by simply adding more respondents in the research, but there is by far not enough money available to conduct the WoON research on enough respondents to make it useable on the level of the municipality.

Secondly, within the WoON question list aren't questions included about the intentions of people. For example: there are only questions included about the likeability to move, but you have no idea about the intentions behind this potential movement or an idea of the likeability that this movement is a real potential movement. The same problematic mechanism emerge when you try to estimate the preferred characteristics of houses or the preferred living environments. It is not enough to ask what people want. You'll need to find out what the underlying forces are that cause this preference (Harry boumeester, personal communication, 09-07-2014). So in order to reveal the real preferences of people we need to measure housing preferences in another way than we are doing right now (Harry boumeester, personal communication, 09-07-2014). We have to keep in mind that the WoON research has to deal with some limitations which are maybe impossible to overcome. It is really hard to explore the truly intentions or wishes of people. Of course is it possible to conduct a research and ask the respondents what they want and why they want this, but still it is questionable that they will give you there truly intentions or wishes (Roelf Jan van Til, personal communication 12-05-2014). It's really hard to reveal the wishes of people, because most the time a research reveals the housing wishes of the past and not the future (Dorien Manting, personal communication, 27-05-2014). It matters in which neighbourhood your are living right now, or what your current household situation is, if you ask people questions like: *'In which kind of house do you want to live?'*, or *'Which neighbourhood do you prefer?'*, The answer could be completely different four years later. This problem is problematic for the current models of estimation because: *'We see these uncovered wishes by the WoON research too easily as a trend, and use it to estimate the qualitative housing demand over 30 years'* (Dorien Manting, personal communication, 27-05-2014). So according to Dorien Manting the assumption is wrong that a household with specific characteristics will keep the same qualitative housing demand for a longer period (de Groot, 2011).

### **8.1.1 How to deal with the shortcoming of WoON**

Unless the shortcomings are maybe insuperable problems, it's still possible to use the information of the WoON research if you combine this with other data sources. Consultancies like Rigo research and Stec groep developed a model which enables them to convert these national trends into local trends on the basis of local characteristics (Johan van Iersel, personal communication, 16-05-2014). This is comparable with the structure that is illustrated in figure 13. Rigo research looks at the present houses within the area and the specific household situations in the area. Characteristics of the present houses are: the rate of each housing type, the balance between rented and owner occupied houses, the value of the building (WOZ value), and the date of construction. Specific characteristics of the households are: household type, age, and income (published by CBS). When you make sure that the sum of these trends within the different area's equals the trends on a higher scale (with enough respondents), you are able to estimate the qualitative housing demand. In theory, you can state something about this local characteristics on the basis of the combination of the GBA and the WOZ value of the buildings, but at this moment the administration of the municipality is not that good (Johan van Iersel, personal communication, 16-05-2014). We have to be careful with these kinds of estimations. These kind of estimations can be problematic, because there is a one on one connection between certain types of households and characteristics of the preferred living conditions, but the choice of a household for a

certain house in a certain area is most of the time a substitution of different preferences (Johan van Iersel, personal communication, 16-05-2014).

It's also possible to state more about the wishes of people when you combine the data of the WoON research with statistical data of the CBS or GBA. The value of both data sources will grow the moment you combine them (Dorien Manting, personal communication, 27-05-2014). A good example is the research of Carola de Groot (2008). Carola de Groot looked at the people who said within the WoON research that they had an intention to move, and investigated by looking at the data of the CBS if they really moved. By doing this kind of research she was able to see which characteristics of the households had an influence on the likeability of a real potential movement. So by combining different data sources it is possible to give both data sources more value.

A second possibility to deal with the shortcomings of WoON is simply by the conduction of an own research. When you want to state something about the qualitative housing demand on the scale of the municipality you need to have more information than the information out of WoON (2012) (Rik ten Broek, personal communication, 06-06-2014). So you'll have to conduct an own research in order to develop a good estimation for the qualitative housing demand on the scale of the municipality. Johan van Iersel (Personal communication, 16-05-2014) explains that he conducts a local research for 30% of their advice work within the field of living. During this local research it is useful to add some different question than the questions which are included within the WoON research. It could be useful to add more questions to the research about the motives of people (Johan van Iersel, personal communication, 16-05-2014). Instead of only asking what kind of house or neighbourhood the respondent prefers, you should ask why this respondent prefers this house or neighbourhood. By asking these kind of questions you'll get a better overview of the causations within the qualitative housing demand. When you conduct a research you still have to deal with the problem that it is hard to reveal the real wishes or intentions of people. According to Johan van Iersel (Personal communication, 16-05-2014) is the solution for this problem conjuncture measurements. Conjuncture measurement enable a researcher to conduct a different kind of housing research. A researcher will try to measure the importance of a housing characteristic like a big bedroom versus another housing characteristic like a big living room. So a respondents must constantly chose between two options. Eventually you will get an understanding of the value of certain characteristics for one specific respondent in relation to the other characteristics (Harry Boumeester, personal communication, 09-07-2014). This value needs to be phrased in economic terms. So you won't give a five point scale, but you will ask how much someone wants to pay for a certain characteristic in comparison with another characteristic of the qualitative housing demand (Johan van Iersel, personal communication, 16-05-2014). Conjuncture measurements enable the researcher to make combinations between different characteristics which makes it more interesting than the current method of WoON (2012) (Harry Boumeester, personal communication, 09-07-2014). The biggest problem of conjuncture measurements is that it is impossible to get a row of percentages of preferences as an end result, which makes it unusable to use in a model of estimation for the qualitative housing demand (Harry Boumeester, personal communication, 09-07-2014). This doesn't mean that it hasn't any

value. This kind of research can be extremely interesting for housing corporation or other agencies who take care of the supply side of the housing market.

Doing a local research instead of using the WoON research could be useful, and is most of the time necessary, but you have to keep in mind that you will lose the strength of the historical data which WoON developed. WoON is an interesting research, because you can compare your findings with the findings of the past. The moment you conduct a local research, you will only find a qualitative demand of that moment. Or maybe even from the past (Dorien Manting, personal communication, 27-05-2014). Since you won't be able say something about trends, is it hard to say something about the future. Beside the fact that you lose the historical power of WoON it will also cost a lot of money. On the level of the COROP regions are these costs most of the time too high.

Instead of doing a complete new research is it of course possible to oversample the WoON (2012) by asking the same question as where mentioned within WoON (2012). City region Arnhem Nijmegen is one of the authorities who did an oversampling of the WoON (2012), in order to make a better estimation for their qualitative housing demand. Rik ten Broek (personal communication, 06-06-2014) explained that without an oversampling of the WoON research the Socrates model of estimation wasn't useable within the city region Arnhem Nijmegen. The moment you don't oversample the WoON research, the outcome of the estimation will be to faraway of the real world. Even too much for an indication. In order to say something about the current housing stock, you are obliged to oversample the WoON (2012) research, because otherwise you won't have enough heats (Rik ten Broek, personal communication, 06-06-2014). Still a lot of municipalities don't oversample the WoON (2012) research which is completely logical since this is far too expensive for the most municipalities, and the advanced knowledge is most of the time not enough to cover this expenses (Niek Bargerman, personal communication, 07-06-2014). So most of the time is it not profitable to oversample the WoON (2012).

When you aren't able to combine the results of WoON with other data sources and you don't have the money to conduct a local research there is one other opportunity. You can combine the data of comparable cities (Dorien Manting, personal communication, 27-05-2014). So you have to divide the cities of the Netherlands on the basis of some characteristics. For example, you don't have enough respondents who co-operated within the WoON research, if you want to state something about the qualitative housing demand of Wageningen. The solution could be to look at the respondents out of other municipalities with the same characteristics as Wageningen. The sum of these respondents is enough to state something about their qualitative housing demand. Since these respondents live within a comparable situation is it possible to state something about the qualitative housing demand of Wageningen (Dorien Manting, personal communication, 27-05-2014). In order to define which areas are comparable another classification of the living environments will be used. There will be four different living environment groups namely: the G4 municipalities plus Eindhoven and Groningen, cities, small cities, and rural areas. For the definition of these groups the same definition will be used as ABF research which is illustrated in attachment F.

This is the moment that the environment in which somebody lives is also a characteristic of a household. It matters in which environment you are currently living. The living environment tells a lot about the characteristic of a housing market. I don't assume that someone who is living within a rural area has another set of wishes than someone within an urban area, but the situation on the housing market in urban areas differs extremely from the situation on the housing market in rural areas which result in other housing preference percentages (Harry Boumeester, personal communication, 09-07-2014). So we have to make different sets of housing preferences on the basis of the living environment in which the households live.

## 9. The presentation and interpretation of models of estimation

After the positive and negative aspects of the current models of estimation for the Dutch housing demand have been discussed and the shortcomings during the development of these models have been discussed, it is interesting to look at the interpretation and presentation of these models of estimation. Most of the time the outcomes of the models are too much presented as the truth. *'One of the biggest problem with models of estimation is the presentation and interpretation of these models. Even on a low scale, the outcomes of a model of estimation are too often considered as the truth.'* (Roelf Jan van Til, personal communication, 12-05-2014). This is problematic because models of estimation are only an indication, whereas the housing market is still about individuals who decide to move or not to move. We have to keep in mind that a model of estimation is still a model. A model is by definition not the truth, but it's a simplistic illustration of the truth (Harry Boumeester, personal communication, 09-07-2014). This is completely logical but the following quote illustrates once again that policy makers forget that the outcome isn't the truth. *'I notice during my researches that especially local government are working with the outcome as it is the holy number. There is an outcome on the basis of a model of estimation for the housing need, so this will be the number of houses they are going to build'* (Harry Boumeester, personal communication, 09-07-2014). The trust in models of estimation is a residue of the period after world war two. During this period of extreme housing shortages, every model of estimation was correct, because whatever was built attracted the calculated households. The models of estimation were always right, because the building programs were developed on the basis of models of estimation (Johan van Iersel, personal communication, 16-05-2014). When the housing programs are developed on the basis of the models of estimation and every house will attract a household, it is logical that the models of estimation were always right. During the crisis, we learned the hard way that these models of estimation aren't that reliable as we always thought (Johan van Iersel, personal communication, 16-05-2014).

There are multiple reasons why the models of estimation for the qualitative housing demand can't be seen as the truth. First of all, in order to make a model of estimation you have to make certain assumptions. It is impossible to make a model in which all your assumptions are included nor correct. Logically it is also impossible to develop a standard model which include everything (Roelf Jan van Til, personal communication, 12-05-2014). Beside the fact that it is impossible to include all the assumptions, these assumptions are chosen within a specific context in time. This context differs from the context ten years later. So the outcome of estimation is bounded in time (Lucas van Eijdsen, personal communication, 22-07-2014).

Secondly, a policy maker will change his housing policy on the basis of the outcome of the model of estimation for the housing demand. After he changed his housing policy, the outcome of the model of estimation will be different, because the supply of housing is an important variable within the models of estimation. So the outcome of the models of estimation will change the future (Roelf Jan van Til, personal communication, 12-05-2014). Important to keep in mind is that every municipality will react different on the outcomes of a model of estimation (Dorien Manting, personal communication, 27-05-2014). So it is impossible to include some assumptions in your model to solve this problem. The models of estimation for the housing demand are still dependable on the decisions of municipalities, where to

develop their new housing projects. You can't change the fact that people can only come towards a specific area if there is a place to live in.

Thirdly, the one on one connection between a specific set of characteristics of a household with a house with a specific set of characteristics is an important problem during the estimation. A qualitative housing demand is most of the time a substitution of different preferences. So it's not possible to connect a certain type of households with a specific preferred living situation. For this reason it is impossible to generate a complete real estate program on the basis of a model of estimation for the qualitative housing demand (Johan van Iersel, personal communication, 16-05-2014). You'll need more qualitative data than the current data in order to make a more reliable qualitative estimation for the housing demand.

Fourthly, each year there are new insights which can result in a different outcome of the models of estimation (Dorien Manting, personal communication, 27-05-2014). A good example is the different life expectancy within the last published models of estimation. This life expectancy is extended for multiple times. These small modifications can have a huge impact on the outcome of the models of estimations (Dorien Manting, personal communication, 27-05-2014). Since the context of the housing market is changing all the time it may be wrong to make a model of estimation for the qualitative housing demand. A model of estimation for the qualitative housing demand makes an estimation on the basis of the current context, and it's impossible to include this changing context within your model (Lucas van Eijdsden, personal communication, 22-07-2014). On the basis of these four points is it logical that a model of estimation is always wrong, especially a qualitative model of estimation.

## 9.1 It's all about the story behind the numbers

Above mentioned problems makes it necessary that developers of model of estimation for the qualitative housing market have to explain that models of estimation aren't even nearby the truth. It's our duty as researchers to explain that a model of estimation is only an indication and that the outcome can't be used as hard numbers (Harry Boumeester, personal communication, 09-07-2014). So it would be useful to look more closely at the presentation of the models of estimation. This is important because you can make your model more useable by presenting the model of estimation in the right way. Of course it still possible to make the models of estimation more reliable, but we can make bigger steps towards a better housing program if we improve the communication about models of estimation (Rik ten Broek, personal communication, 06-06-2014). In other words, the story behind the models of estimation is maybe more important than the outcome. *'By giving insights into the dependencies of your model you'll create a better understanding of how to use models of estimation'* (Roelf Jan van Til, personal communication, 12-05-2014).

### 9.1.1 The solutions.

According to the interviewed experts this problem can be solved in multiple ways. The first solution is simply explain which assumptions the model include and what the uncertainties of your model are. It is highly important that you explain why your model of estimation differs from your previous model of estimation (Roelf Jan van Til, personal communication, 12-05-2014). So a developer of a model of estimation has to give more transparency during the presentation of the outcome of a model of estimation. ABF research has always given insights in their mechanisms and the used data sources for the Primos model of estimation. A good example is the text *'transparantie in cijfers'* written by Poulus & Faessen (2010). If you compare this with the transparency of the CBS for their model of estimation PEARL this is much better (Roelf Jan van Til, personal communication, 12-05-2014). When you look at the transparency of ABF research for their Socrates model of estimation you'll see that this is much less (Roelf Jan van Til, personal communication 12-05-2014). So qualitative models of estimation still need to become more transparent. It isn't wrong that there are big fluctuations between the outcomes of the models of estimation over the years, it becomes a problem when you can't explain these changes. We have to accept that models of estimation aren't that stable. The behaviour of people is to uncertain, but we can state what the outcome will be with certain assumptions (Dorien Manting, personal communication, 27-05-2014). Giving more transparency will create some problems. The moment you present your assumptions, the discussion about these assumptions will start. It is impossible for a researcher to include all the right assumptions, so there will always be a discussion about these assumptions (Dorien Manting, personal communication, 27-05-2014), but the moment you make this assumptions upfront in good understanding with the client which will use the outcome of this model of estimation you'll overcome this problem.

Another well-known solution is giving a policy maker multiple scenario's. During this solution you show the limitations of a model of estimation by presenting policy makers different outcomes of the same model of estimation caused by different assumption (Roelf Jan van Til, personal communication, 12-05-2014). By giving multiple scenario's you can show a policy maker the difference between the best

possible scenario and the worst possible scenario. In theory scenario thinking is a great instrument to create more awareness about the limitations of a model of estimation, but in practise it creates another problem. Most of the time, when you present multiple scenarios to a policy maker, the policy maker simply chooses one of the scenarios (Johan van Iersel, personal communication, 16-05-2014). It won't be a surprise if this is the scenario which is most suitable to justify his own policy, or the scenario which generate the most profit (Dorien Manting, personal communication, 27-05-2014). At this moment the policy maker is making investments which he would never make when he knew more about these scenarios. So scenario thinking is beautiful, but you have to give an advice about which scenario is the most reliable and help the development of policy which is resistance for different scenarios (Johan van Iersel, personal communication, 16-05-2014). At this moment the explanation between these different scenarios is not sufficient enough (Johan van Iersel, personal communication, 16-05-2014).

A relatively new approach is to create a kind of approach in which the policy maker is included within the choices made during the development of a model of estimation (Johan van Iersel, personal communication, 16-05-2014). During this kind of policy formation there is a constant two direction information flow between the policy maker and the researcher. This constant flow of information must create an awareness about the limitations of models of estimation, but also about the possibilities. The best aspect of this approach is that the policy maker is really part of the development of the model (Dorien Manting, personal communication, 27-05-2014). You could get the idea after reading the last paragraphs that policy makers are abusing the outcomes of the models of estimation, but this isn't the case. Most of the time a policy maker has no idea how a model of estimation works, or which assumptions are included. An example of an approach in which a policy maker is included within the process of the development of a model of estimation is an application in which the demographic variables are demonstrated in a simplistic way. This application is developed by RIGO research. The application enable the policy maker to make his own assumptions. So a policy maker can change for example the number of births, the migration towards his region, or the emigration out of his region. At this moment the policy maker has millions of different scenario's. Important is that the researcher keeps control over the minimums and maximums of the switches in order to keep the estimations realistic. In this way, a policy maker can see what the best possible scenario and the worst possible scenario is, with all the scenarios in between, but more important he can see which assumptions you need to include to get the best possible scenario (Johan van Iersel, personal communication, 16-05-2014). Important within this approach is that you give the policy maker the right switches. You can include switches about the birth rate or the life expectancy, but these aspects aren't that interesting. More interesting are switches that directly linked with the housing market. So aspects like the migration, or your building plans are more interesting (Dorien Manting, personal communication, 27-05-2014).

It isn't only important to look at how the outcome of the models of estimation is presented, but also when the models of estimation are presented. It's important to take a closer look at the time period between the presentation of models of estimation. The moment you present too many times a model of estimation you'll see that policy makers will wait until the outcome of the model will fit with their own policy. When the period between the different models of estimation is too long, the outcome of the

models of estimation won't be reliable enough to make the right decisions. According to the expert it would be clever to use a time frame of three years between the presentations (Lucas van Eijdsden, personal communication, 22-07-2014).

### Fear the blackbox!

Beside these approaches, you have to keep in mind that your model may never becomes a blackbox. Within our ambition to make the best possible estimation for the qualitative housing demand we added so many variables into the models that we loss track. When you put too many variables in the model, the model becomes too complicated and it becomes impossible to see which variables caused specific outcomes. At this moment your model became a blackbox. So a model becomes a blackbox, when you add to many variables into your model (Roelf Jan van Til, personal communication, 12-05-2014). When your model turns into a blackbox, you won't be able to explain strange outcomes. The moment you can't explain the outcome, the model becomes useless and less reliable. When you develop a model which is less complicated, but open for the world to see, you'll have a more reliable model of estimation simply because you can explain the outcome, and the limitations of this specific option (Roelf Jan van Til, personal communication 12-05-2014). So it could be a wise decision to keep the models of estimation for the qualitative housing demand on a relatively abstract level, in order to prevent the image of a model that includes everything (Rik ten Broek, personal communication, 06-06-2014). The fact that some of the models became a blackbox is the reason why the 'Planbureau voor de leefomgeving' (PBL) developed their own demographic model of estimation. *'The Primos model of estimation was/is for us too much a blackbox, so in order to get an idea about the composition of the models in order to explain the outcomes we developed our own model'* (Dorien Manting, personal communication, 27-05-2014). Interesting is that the model of PBL is considered by others as less transparent than the Primos model of estimation.

**Box 1: The blackbox**

### **9.1.2 The different world view of the researcher and the policymaker**

All these solutions can help but this isn't as simple it sounds like, because *'The world of a researcher differs extremely from the world of a policy maker'* (Johan van Iersel, personal communication, 16-05-2014). Most of the time a policy maker, who paid for the outcome of a model of estimation in order to develop/justify his housing policy, is only interested in the numbers. A researcher would say: it is impossible to give one number, because of the multiple uncertainties (Johan van Iersel, personal communication, 16-05-2014). It is logical that a policy maker is mostly interested in the numbers. A policy maker has to write a report that needs to be approved by the mayor or a city council member. This report needs to include very exactly what the upcoming housing program will be, you can't develop a housing program on the bases of broad margins (Harry Boumeester, personal communication, 09-07-2014). A good example is a quote of Rik ten Broek (personal communication, 06-06-2014): *'We want to think in a qualitative way about the housing programs and leave the discussion about the exact numbers behind, but the moment you have to divide the pie of the housing programs you have to give them hard numbers'*.

Unless this pessimistic image, there is more public support for a more nuanced story in the last years. The time in which every municipality was buying ground like they were walking in a store is over, but the remains are still visible. Municipalities still have a lot of ground positions that need to be sold to make a profit (Johan van Iersel, personal communication, 16-05-2014). Nevertheless, nowadays there is better communication about the shortcomings of models of estimation and growing understanding about how to deal with the outcome of a model of estimation.

## 10. Conclusion

After the complete process of developing a qualitative model of estimation for the housing need has been under a critical loop, the outcome of the process will be summed up within this chapter. The main question of this research was: *Which improvements on the demand side of the current models of estimation for the Dutch housing need make the current models of estimation for the Dutch housing need more reliable?* By answering this question it was important to reveal what the problems and limitations are during the development of a model of estimation for the qualitative housing demand.

After an analysis on the different models of estimation the models of ABF research has been chosen as the central models of this research. ABF research developed two models of estimation: The Primos model of estimation for the quantitative estimation and the Socrates model of estimation for the qualitative estimation. According to the interviewed experts, the Primos model of estimation is considered reliable, the Socrates model of estimation has some problematic aspects. So the focus of this research lies on an attempt to improve the Socrates model of estimation.

An important aspect of a model of estimation is the structure of the model, whereby this research concluded that it is necessary to separate the active market from the total market and a filter needs to be included to determine which household will become part of this active market. After an analyses on the structure of the models of estimation was conducted, the research started focusing on the missing variables. The analyses on the missing variables within the Socrates model of estimation concluded that it would be wise to add the variables educational level, and the number of rooms within the model. The analyses on which variables could be excluded conclude that none of the variables must be excluded, but the variables income and price tag need to get a less important role within the estimation of the qualitative housing preferences of a household. The income of a household and the price tag of a house can only state something about the fulfillment of these preferences. You have to make an exception for the estimation of the housing characteristic 'form of ownership'. Since the Dutch housing market is known for his high amount of regulations, it would be wise to estimate the preference of an owner occupied houses or rented houses on the basis of the income of a household. Beside the fact that it would be wise to include, exclude or change variables, chapter 6 concluded that classification of these variables is highly important and can have a huge impact on the outcome of your model of estimation.

After an analyses on the variables has been conducted, the research focussed on the used data sources. The WoON (2012) research is the most important data source for the models of estimation for the qualitative housing demand. Unless the fact that WoON has been honoured as a reliable data source, it has his limitations. First of all it is a research which is conducted on a national scale, which means that there aren't enough respondents on a lower scale to make strong estimations. Secondly there are no questions included about the intentions of households. These problems can be overcome by oversampling the WoON research, by doing a own research, or by combining the results of the WoON research with the GBA data base.

Like already mentioned, a filter needs to be included in order to define which potential movements will be actual movements. At this moment consultancies use the data out of WoON (2012)

in order to estimate the number of movements. Every household that state that they will move in the upcoming two years is according this estimation a potential movement. Chapter 7 concluded that this isn't enough. You have to look what causes this potential movement. It would be wise to look at changing household situations and the income of a household.

During the analyses on the structure, variables and data sources two main problems/limitations were always present. First of all, there is a constant contemplation between the complexity of your model and the explanation power of the model. Secondly, there are only a few data sources available. At this moment, most consultancies are only using the data out of WoON (2012) to estimate the housing preferences of a certain households. These preferences are the preferences of a household before it enters the housing market. It would be much better to combine this data with the actual movements, so with preferences after a household enters the housing market. Since it isn't possible to get the GBA statistics (because of privacy policy), you aren't able to make this estimation.

On the basis of these conclusions is it possible to state that we can only improve the current models of estimation with minor adjustments. Since all these adjustments are small, is it logical that it is still possible to work with this new model of estimation. Unless the fact that it's always possible to make the models of estimation more reliable, almost all experts explained that we can make more improvements during the presentation and interpretation of the models of estimation for the Dutch housing market. There is too much trust within the outcome of these models, and sometimes even considered as the truth. The experts explained three types of solutions. The most simplistic solution is simply explaining the assumptions. When it's clear which assumptions are included, it's also clear what the limitations of the outcome are. The second solution is a multiple scenario approach. By giving multiple scenarios it becomes visible that the outcome of a model of estimation could be different if other assumptions were included. There is one problem with this approach. Sometimes policy makers simply choose one scenario as the truth, which is most of the time the most positive scenario. Thirdly, it would be wise to choose the assumptions together with the policy maker. So the policy maker will have an influence on which assumptions are included.

## **Recommendations**

As a follow up of this research it would be interesting to conduct some other researches to make the current models of estimation more reliable. These researches would take too much time to conduct during this research, and are for this reason not conducted during this research. First of all it would be interesting to focus more on the supply side of the housing market. Were WoON is a proper device to reveal the bigger trends of the qualitative housing demand, there isn't a proper device to collect data about the qualitative housing supply. This could become problematic. *'We are to much concentrated on the demand side of the model, but the intentions of investors, landlords, housing corporations, and developers are just as important'* (Johan van Iersel, personal communication, 16-05-2014). Secondly it would be interesting to compare the trends out of the WoON (2012) research with the actual movements. For these actual movements you'll need to get access to the GBA data base, so it would be wise to do this in corporation with a municipality who wants to improve their qualitative models of estimation for their housing market. And thirdly, like already mentioned in paragraph 6.4, a research needs to be

conducted on which relations between certain variables are more important than other relations. Since not all of the characteristics of a household have the same correlation with a specific housing preference, a weight mechanism needs to be included. A research on this weight mechanism would make the current models of estimation more reliable.

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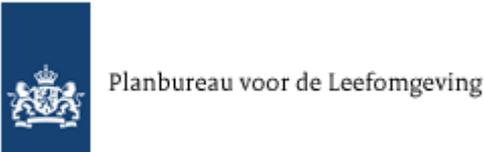
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### **Used data sources:**

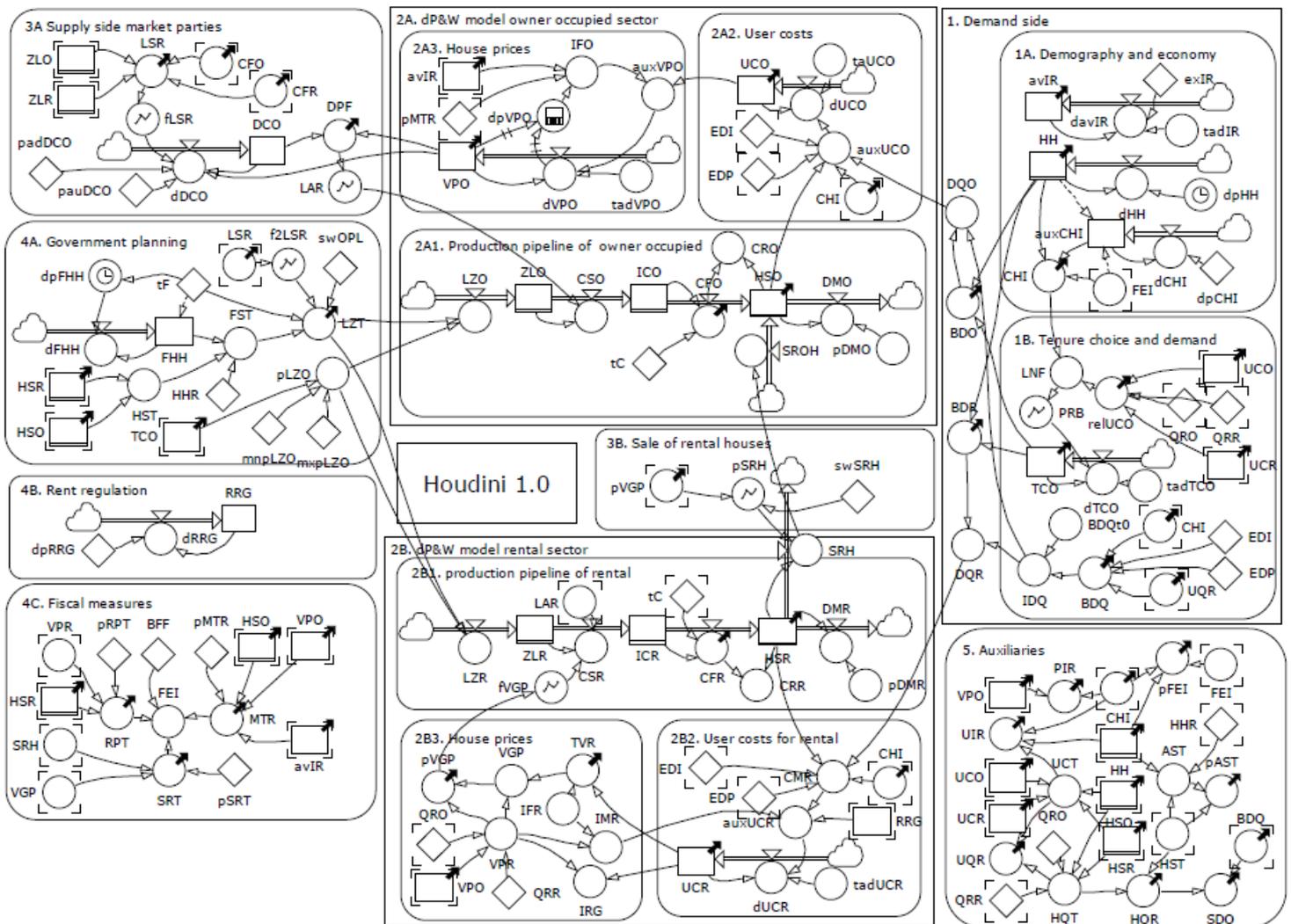
- WoON (2012) results.
- CBS statline

## Interviews

<p>Interviewee: Erik de Leve          Company/organisation: STEC groep          Function: Consultant          Date: Constant          Type: Face to face interviews          Place of interview: internship organisation</p>	
<p>Interviewee: Laura Engelbertink          Company/organisation: STEC groep          Function: Senior advisor          Date: Constant          Type: Face to face interviews          Place of interview: internship organisation</p>	
<p>Interviewee: Ir. Co Poulus          Company/organisation: ABF research          Function: Director          Date: 07-05-2014.          Type: Face to face interview          Place of interview: ABF research Delft</p>	
<p>Interviewee: Roelf Jan van Til          Company/organisation: consultancy Explica          Function: Ownership and consultant          Date: 12-05-2014.          Type: Face to face interview          Place of interview: Lebkrov Rotterdam</p>	
<p>Interviewee: Johan van Iersel          Company/organisation: Rigo research          Function: Senior researcher demographic developments          Date: 16-05-2014          Type: Face to face interview          Place of interview: Rigo research: Amsterdam</p>	
<p>Interviewee: Prof. Dr. Dorien Manting          Company/organisation: Planbureau voor de leefomgeving.          Function: Head of sector urbanisation and mobility          Date: 27-05-2014          Type: Face to face interview          Place of interview: Planbureau voor de leefomgeving. Den Haag</p>	

<p>Interviewee: Gert Jan Hagen  Company/organisation: Smart Agent  Function: Managing Partner  Date:28-05-2014  Type: Interview on telephone  Place of interview: Stec Groep Arnhem</p>	
<p>Interviewee: Drs. Rik ten Broek  Company/organisation: City region Arnhem - Nijmegen  Function: Project employer  Date: 06-06-2014  Type: Face to face interview  Place of interview: City region Arnhem Nijmegen. Nijmegen</p>	
<p>Interviewee: Drs. Niek Bargerman  Company/organisation: Province of Brabant  Function: Senior advisor living and society  Date: 07-07-2014  Type: Face to face interview  Place of interview: Province of Brabant. Den Bosch</p>	
<p>Interviewee: Dr. Harry Boumeester  Company/organisation: OTB TU Delft  Function: Researcher housing and housing markets  Date: 10-07-2014  Type: Face to face interview  Place of interview: TU Delft. Delft</p>	
<p>Interviewee: Drs. Lucas van Eijsden  Company/organisation: Province of Gelderland  Function: Advisor housing  Date: 22-07-2014  Type: Face to face interview  Place of interview: Province of Gelderland. Arnhem</p>	

# Attachment A: The Houdini model.



Source: Eskinasi et al., 2011

## Attachment B: Coding scheme.

Variables	Open coding	Axial Coding	Selective coding
Housing need	Numbers of houses which are needed.	The ratio between housing supply and housing demand.	√
Housing supply	Number of houses which are available.	Current housing stock + construction of houses, - demolishing of houses.	√
Housing demand	Amount of necessary houses.	Number households that need a house.	√
Number of citizens	Amount of people living in a specific area.	Amount of people who are living within a specific corop region at a specific time	√
Household situation	Number of people living within one dwelling.	Number of people living within one dwelling. In combination with the age of the household	√
Long distance movement	Movement between regions	Movement from one Corop region towards another	√
Short distance movement	Movement within region	Movement within a Corop region	√
Region	Corop region or Border of municipality	Border of Corop region	
Preferred living environment	Desired neighbourhood to live.	Does a household prefer to live in the centre of a city, the edge of a city or in a rural area	√
Preferred living situation	Combination of all preferred characteristics in order to define the qualitative housing demand	Set of housing preferences of a household	√
Educational level	Educational level of household	Educational level of head of the household	√
Lifestyle	Lifestyle of household	Lifestyle of household (by using mechanism of Smart Agent)	X
Age	Age of household	Age of head household	√
Household type	Formation of household	Relation between different household members	√
Income	Income of household	Disposable income of household	√
Form of ownership	Preference for rented or owner occupied housing	Preference for rented or owner occupied housing (mostly based on income)	√
Price tag	Price tag of house	Price tag of house (only used for within the movement filter)	√

Housing type	Type of housing	Preference for residential home or on single family dwelling	√
Number of rooms	Preference for certain amount of rooms	Preference for certain amount of rooms	√
Suitability for elderly	Is the house suitable of elderly	Are the kitchen, bedroom, and living room accessible without facing any chairs	√
Total market	Housing market for all households	Housing situation of all households	√
Active market	Housing market for households who are looking for a new home	Place were households try to find a house which fits to their preferred housing situation	√
Potential movement	A household that will most likely move towards another house	Household that doesn't lives within their desired housing situation	√
Real movement	Number of households that will move according to the model	Number of households that will move on the basis of household situation changes and economic situation	√
Housing stock 1.0	Number of houses that are available.	Number of houses which are caused by movements and the realisation of buildings plans	√
Housing stock 2.0	Number of houses that will be built within the future	Number of houses that will be built within the future	√

## Attachment C: Planning

Task	Begin datum	End Datum
Formulation of research question and research goal	01-01-2014	03-02-2014
Research proposal (Draft)	03-02-2014	10-04-2014
Phase two of research	01-04-2014	05-05-2014
Writing end conclusion phase two	05-05-2014	15-06-2014
Phase three of research	01-06-2014	30-07-2014
Writing end conclusion phase three	20-07-2014	27-08-2014
Conclusion: Combining phase two and three to develop model	30-08-2014	08-10-2014
Overview of whole text	08-10-2014	20-11-2014

# Attachment D: Analyses of the new and old variables

## Age

The variable age will be the first variable which will be tested to be included within the new model of estimation for the Dutch housing need. In order to say something about the explanation power of the variable age is the correlation between the variable age and the variables preferred form of ownership and preferred type of housing calculated. The results are presented in the following tables:

**Correlation with preferred type of ownership**

**Correlation with type of type of housing**

		Age	Preferred type of ownership
Age	Pearson Correlation	1	-,120**
	Sig. (2-tailed)		,000
	N	13776	13748
Preferred type of ownership	Pearson Correlation	-,120**	1
	Sig. (2-tailed)	,000	
	N	13748	13748

		Age	Preferred type of housing
Age	Pearson Correlation	1	,340**
	Sig. (2-tailed)		,000
	N	13776	12523
Preferred type of housing	Pearson Correlation	,340**	1
	Sig. (2-tailed)	,000	
	N	12523	12523

Now it's clear that there is a correlation between age and two housing characteristics, an analyses will be conducted on the classification of the different age groups. ABF research makes a separation between five types of age groups which are illustrated in table (1). Since the percentages for a certain preferred housing characteristic will change if you make another classification, it's highly important that these classifications are the right classifications.

Table 1: Variable age in Socrates model of estimation Source: WoON (2012)

	<b>Preferred type of house and form of ownership</b>			
	<b>Single family dwelling</b>		<b>Multifamily dwelling</b>	
	<b>Owner occupied</b>	<b>Rented</b>	<b>Owner occupied</b>	<b>Rented</b>
Young	49%	18%	7%	25%
Middle age	64%	18%	8%	10%
Advanced age	41%	18%	13%	28%
Senior	15%	10%	19%	57%
Old	4%	7%	16%	72%

In table 2 the preferences of each age are illustrated. It was necessary to combine some ages because of the limited respondents of some ages. A minimum of 150 respondents has been used for this analyses. So for each age group at least 150 respondents are needed. The first age group of ABF research was the classification below 30 years, which looks like a good classification, because of the fact that there is a 9% raise of absolute percentages for owner occupied single family dwellings, between the age of 29 and 30. When you look at the youngest ages in the model you'll see that the respondents between the age of 18 and 22 have different preferences than the respondents who are older than 22. Respondents younger than 23 years prefer a rented multifamily dwelling, respondents older than 22 years prefer an owner occupied single family dwelling. This means that it would be wise to make an extra group for the respondents who are younger than 23. The middle age classification is according to table 2 the right classification. After the age of 45 years old, a trend of shrinking percentage for an owner occupied dwelling starts. Respondents with an advanced age classification are between 45 and 65 years old. ABF research chose to use the 65 years old border because people above 65 are mostly retired. Which is a logical decision. After the age 65 there is an increase of interest in rented multifamily dwellings. This percentage becomes extremely high within the age group above 75 years. So it's logical that ABF research included a classification for this group.

Table 2: Preferences of different ages

Age	Single family dwelling		Multifamily dwelling	
	Owner occupied	Rented	Owner occupied	Rented
18 t/m 21	18%	21%	8%	52%
22	22%	25%	9%	44%
23	39%	23%	7%	31%
24	39%	19%	8%	34%
25	46%	21%	9%	24%
26	55%	17%	8%	21%
27	61%	16%	4%	18%
28	63%	15%	8%	15%
29	60%	18%	7%	16%
30	69%	17%	8%	7%
31	63%	22%	7%	8%
32	62%	19%	7%	12%
33	66%	17%	10%	8%
34	67%	15%	9%	9%
35	65%	16%	7%	12%
36	64%	17%	7%	11%
37	64%	19%	6%	11%
38	63%	19%	8%	10%
39	63%	21%	7%	9%
40	62%	20%	8%	10%
41	61%	18%	13%	8%
42	65%	17%	6%	11%
43	55%	22%	8%	14%
44	64%	17%	6%	12%
45	62%	17%	8%	13%
46	54%	25%	6%	15%
47	60%	22%	8%	11%
48	59%	20%	6%	15%
49	57%	20%	9%	15%
50	45%	22%	10%	22%
51	53%	17%	9%	22%
52	45%	19%	15%	22%
53	51%	21%	12%	16%
54	43%	21%	12%	24%
55	38%	18%	15%	29%
56	38%	19%	12%	31%
57	39%	13%	19%	29%
58	36%	16%	14%	35%
59	22%	19%	23%	36%
60	33%	10%	21%	36%
61	26%	20%	16%	39%

62	22%	16%	17%	45%
63	22%	12%	18%	48%
64	22%	15%	16%	47%
65	22%	12%	18%	49%
66	16%	9%	21%	55%
67	13%	10%	21%	56%
68 t/m 69	18%	13%	18%	51%
70 t/m 71	15%	7%	16%	61%
72 t/m 73	11%	9%	20%	61%
74 t/m 76	7%	9%	18%	66%
77 t/m 79	6%	9%	16%	70%
80 t/m 95	4%	5%	13%	78%

On the basis of this new classification a new table of preferences is calculated and presented in the table 3.

Table 3: Definitive classification of age groups. Source: WoON (2012)

		Single family dwelling		Multifamily dwelling	
Income group	Age	Owner occupied	Rented	Owner occupied	Rented
<b>Student</b>	Under 23	21%	22%	9%	49%
<b>Young</b>	From 23 to 29	54%	18%	7%	21%
<b>Middle age</b>	From 30 to 44	64%	18%	8%	10%
<b>Advanced age</b>	From 45 to 64	42%	18%	13%	26%
<b>Senior</b>	From 65 to 74	16%	10%	18%	55%
<b>Old</b>	Above 75	4%	7%	16%	72%

## Household type

The second variable which needs to be analysed is the household type. A correlation analyses has been conducted in order to state something about the explanation power of this variable. The results of this correlation analyses are illustrated in the following tables. On the basis of this analyses is it possible to conclude that the household type can be used to estimate which type of house the households will prefer, but can't be used to estimate which form of ownership a household prefer. Since this variable can be used to estimate a part of the qualitative housing demand, is it logical that this variable will be used. Table 4 illustrates what the preferences of certain household types are.

**Correlations between household type and type of housing**

		Household type	Preferred type of housing
Household type	Pearson Correlation	1	-,157**
	Sig. (2-tailed)		,000
	N	13776	12523
Preferred type of housing	Pearson Correlation	-,157**	1
	Sig. (2-tailed)	,000	
	N	12523	12523

**Correlations between household type and form of ownership**

		Household type	Preferred type of ownership
Household type	Pearson Correlation	1	,015
	Sig. (2-tailed)		,073
	N	13776	13748
Preferred type of ownership	Pearson Correlation	,015	1
	Sig. (2-tailed)	,073	
	N	13748	13748

Table 4: Characteristic household type in Socrates model of estimation Source: WoON (2012)

Name	Label	Single family dwelling	Multi family dwelling
Single	One person household	51%	49%
Couples without children	Cohabiting without children	59%	41%
Couples with children	Cohabiting + one or more children	88%	12%
Single parent household	Single with children	66%	34%

## Income

The third household variable is the income of a household. In order to state something about the explanation power of this variable, a correlation analyses has been conducted. The results are illustrated at the next page. This analyses concluded that there is a correlation between the variable income and the variables preferred type of housing and the preferred kind of ownership. Of course it is possible to use different kinds of classifications. Within this research the classifications of the income group are based on the current regulation rules of the Dutch government, which resulted in five different income groups (described in paragraph 5.1.3). This resulted in the preferences which are illustrated in table 5.

**Correlations income and preferred type of housing**

		Income	Preferred type of housing
Income	Pearson Correlation	1	-,139**
	Sig. (2-tailed)		,000
	N	13776	12523
Preferred type of housing)	Pearson Correlation	-,139**	1
	Sig. (2-tailed)	,000	
	N	12523	12523

**Correlations income and preferred kind of ownership**

		Income	Preferred type of ownership
Income	Pearson Correlation	1	,206**
	Sig. (2-tailed)		,000
	N	13776	13748
Preferred type of ownership	Pearson Correlation	,206**	1
	Sig. (2-tailed)	,000	
	N	13748	13748

Table 5: Classification for the income groups

Name	Range	Single family dwelling		Multifamily dwelling	
		Owner occupied	Rented	Owner occupied	Rented
Low income	Under €19.000,-	22%	29%	6%	43%
Low middle income	Between €19.000,- and €33.000,-	32%	26%	8%	35%
Middle income	Between €33.000,- and €43.000,-	45%	17%	13%	25%
High middle income	Between €43.000,- and €56.000,-	57%	13%	12%	18%
High income	Above €56.000,-	69%	6%	14%	11%

## Educational level

The fourth announced variable is the educational level of the people who are part of these households. Once again a correlation analyses was used to look at the explanation power of the variable educational level. This correlation analyses is illustrated in the tables below. This analyses concluded that there is a correlation between the variable educational level and the variables preferred type of housing and preferred type of ownership. This resulted in the preferences which are illustrated within table 6.

**Correlation educational level preferred type of ownership**

		Educational level	Preferred type of ownership
Educational level	Pearson Correlation	1	,228**
	Sig. (2-tailed)		,000
	N	13776	13748
Preferred type of ownership	Pearson Correlation	,228**	1
	Sig. (2-tailed)	,000	
	N	13748	13748

**Correlation educational level preferred type of housing**

		Educational level	Preferred type of housing
Educational level	Pearson Correlation	1	-,146**
	Sig. (2-tailed)		,000
	N	13776	12523
Preferred type of housing	Pearson Correlation	-,146**	1
	Sig. (2-tailed)	,000	
	N	12523	12523

Table 6: Preferences of different educational levels

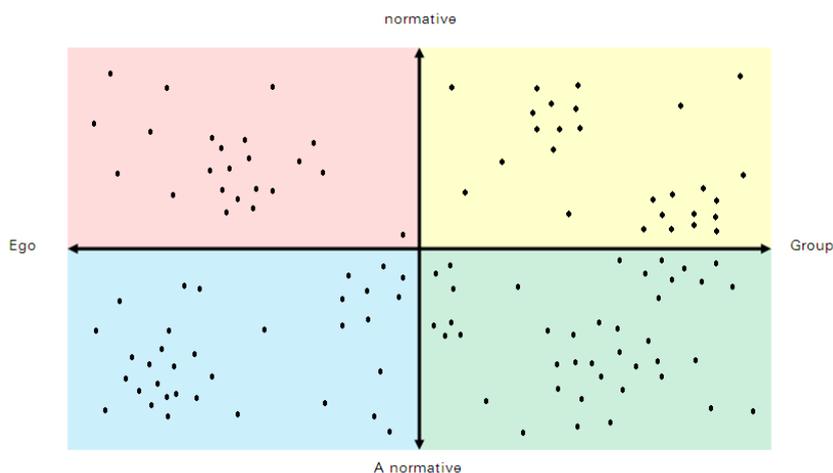
Educational level	Single family dwelling		Multifamily dwelling	
	Owner occupied	Rented	Owner occupied	Rented
<b>Primary school</b>	14%	32%	4%	50%
<b>LBO</b>	26%	24%	8%	42%
<b>MAVO, MULO, VMBO</b>	32%	22%	10%	35%
<b>HAVO, VWO, MBO</b>	49%	18%	10%	23%
<b>HBO or university</b>	60%	10%	14%	16%

## Attachment E: Lifestyle approaches.

In order to get a better view on what a lifestyle approach really is, it would be useful to know how a lifestyle approach works. This attachment explains how a lifestyle approach works. One of the biggest consultancies who works with the lifestyle approach orientated on the field of living is the consultancy SmartAgent. The approach of SmartAgent has been taken in this attachment as an example.

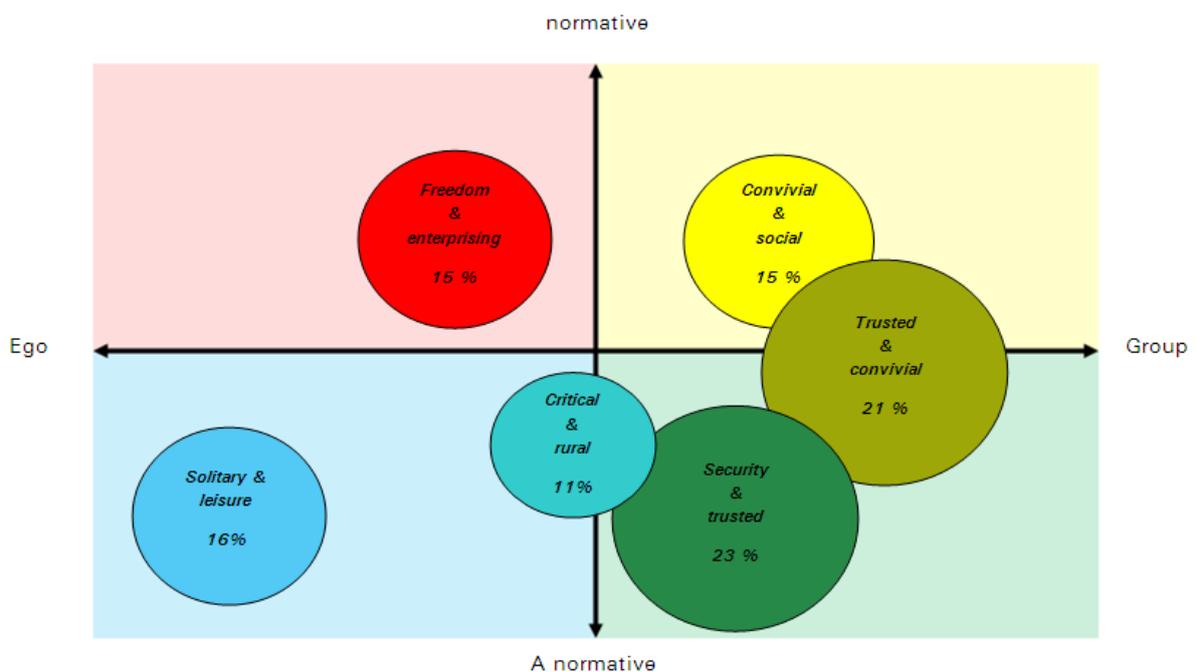
Smart Agent begins their analyses for the housing demand with value patterns of consumers. The value patterns of the consumers are used to get an idea of the motives of the consumers (Gert Jan Hagen, personal communication, 28-05-2014). In order to reveal these value patterns, Smart Agent defined values that could influence your personal decisions. Examples of these values are: adventure, freedom, evolvment, friendship, image, perfection, or harmony. So there is an set of values that influence the behaviour of people (Gert Jan Hagen, personal communication, 28-05-2014). Smart Agent did research on the correlation between certain words and these values, and developed a research mechanism to find the values of people on the basis of these words. This research mechanism makes it possible to connect the specific values with each other. For example, people who prefer the value freedom also prefer the value independency. Smart Agent draws patterns to see how the consumers differ from each other, on the basis of these connections and the results of the correlation between words. These patterns enable Smart Agent to develop a certain scheme of values within a specific area.

Afterwards you need to look at the systematic mechanism behind this scheme. According to Gert Jan Hagen (personal communication, 28-05-2014) there are underlying dimensions which define in which corner of the scheme you belong. This underlying dimension is close related to your sociological orientation. Smart agent works with a two axis system. Illustrated in figure 15. The first axis is group versus ego. There are people who like to follow the opinion of the group, and there are people who like to become more individualistic. This polarity is extremely important for your sociological orientation (Gert Jan Hagen, personal communication, 28-05-2014). The other axis is normative versus a-normative, which means: to what extent is someone conforming their behaviour to the behaviour of society.



Figuur 15: Table with respondents

The next stage is placing all the consumers with their values in the axis diagram. Afterwards Smart Agent does a cluster analysis, in order to make a BSR cluster. These BSR clusters are illustrated in figure 15. This analysis makes clusters on the basis of the similarity between the values of different respondents (Gert Jan Hagen, personal communication, 28-05-2014). Every respondent who had a high score on certain values will be part of one specific cluster, because the attraction to this cluster is higher than towards the other clusters. So there are underlying patterns that create these clusters. It's important to look at the right variables when you conduct a cluster analyses. When you add gender into your analyses you won't get an interesting result, namely: man and woman. There is not a reason why there will be another cluster. Smart Agent uses the underlying values mentioned before as the variables for their cluster analyses (Gert Jan Hagen, personal communication, 28-05-2014). For each clusters a specific set of housing preferences will be created.



**Figure 16: Table with clusters**

Since the housing market is a real complex object to investigate, Smart Agent added a second layer into their analyses. Smart Agent looks at the social relationship profile of the respondent. In order to make this social relationship profile, Smart Agent asks the respondent questions like: Do you want to live nearby households out of the same income group?, Do you want to live completely different than other households?, or Is the main function of your house a place to sleep? Smart Agent developed a housing demand model on the basis of these two layers. This model contains certain trends. So someone with a certain lifestyle prefers a specific house within a specific kind of neighbourhood. The life stage of someone has an influence on this causation. So a 23 years old single person with a specific lifestyle prefers another kind house than a 30 years old married person with the same lifestyle.

Smart Agent conducted this research on the trends between a certain lifestyle and a certain housing demand on a national scale. The moment you want to use these trends on a lower scale, you'll need to convert these trends towards a local scale. Smart Agent uses two approaches to convert this data (Gert Jan Hagen, personal communication, 28-05-2014). The first approach is by doing a second research on a local scale. *'During this research on a local scale we use our obtained knowledge out of the national researches'* (Gert Jan Hagen, personal communication, 28-05-2014). During this local research you try to justify to use the same trends as on a national scale, and if there are differences you have to make adjustments. In order to conduct a reliable local research you'll need at least 75 households per neighbourhood. Since it will cost a lot of time to conduct this research on 75 household, you need to have a significant amount of money. Most of the time, a customer of a consultancy won't pay this amount of money for this kind of research. At this moment Smart Agent uses their second approach, which is called 'data intelligence' (Gert Jan Hagen, personal communication, 28-05-2014). This means that they combine their findings on a national scale with a data source which say something about the households on a local scale. So they combine their lifestyle findings with variables which are available. Examples of these variables are: life stage, educational level, and household situation. Smart Agent has an own database called the GIS database. This data is available on the scale of the address. *'Smart Agent has for every household within the Netherlands a classification of the household and there living circumstances. Not every data is correct, but it gives us a reliable view, especially on the scale of a municipality'* (Gert Jan Hagen, personal communication, 28-05-2014). On the basis of combining data it is possible to estimate the housing demand on the scale of the municipality. Examples of these kind of researches are: (SmartAgent, 2010) and (SmartAgent, 2000).

## Attachment F: Preferred living environment by ABF research

Preferred environment type	Preferred environment	Characteristics
<b>City centre:</b> <ul style="list-style-type: none"> <li>• Close to centre</li> <li>• High employment rate in catering sector, retail, service industry</li> <li>• High density</li> <li>• Multifamily dwellings</li> <li>• High amount of city amenities</li> </ul>	City centre plus:	<ul style="list-style-type: none"> <li>• Centre of, G4 plus Eindhoven and Groningen</li> </ul>
	City centre	<ul style="list-style-type: none"> <li>• At least 25.000 households</li> </ul>
	Centre small city	<ul style="list-style-type: none"> <li>• At least 12.500 households</li> <li>• Density of 20 house per hectare</li> </ul>
<b>Urban environment outside the centre</b> <ul style="list-style-type: none"> <li>• Greater distance to centre.</li> <li>• Higher density</li> <li>• Average amount of amenities</li> </ul>	City build before 45	<ul style="list-style-type: none"> <li>• At least 25.000 households</li> <li>• Houses are mainly build before 1945</li> </ul>
	City build after 45 compact	<ul style="list-style-type: none"> <li>• At least 25.000 households</li> <li>• House are mainly build after 1945</li> <li>• Mainly multifamily dwellings</li> </ul>
	City build after 45	<ul style="list-style-type: none"> <li>• At least 25.000 households</li> <li>• Houses are mainly build after 1945</li> <li>• Mainly single household houses</li> </ul>
	Small city	<ul style="list-style-type: none"> <li>• At least 12.500 households</li> <li>• Density of 20 house per hectare</li> </ul>
<b>Green urban environment</b> <ul style="list-style-type: none"> <li>• Mainly living purpose</li> <li>• Low density</li> <li>• Low amount of amenities</li> </ul>	Green city	<ul style="list-style-type: none"> <li>• At least 25.000 households</li> </ul>
	Small green city	<ul style="list-style-type: none"> <li>• At least 12.500 households</li> <li>• Density of 20 house per hectare</li> </ul>
<b>Village</b> <ul style="list-style-type: none"> <li>• Less than 12.500 households</li> <li>• Low density</li> </ul>	Centre of village	<ul style="list-style-type: none"> <li>• Certain amount of amenities</li> </ul>
	Village	<ul style="list-style-type: none"> <li>• Relative low amount of amenities</li> </ul>
<b>Living in rural environment</b> <ul style="list-style-type: none"> <li>• Less than 12.500 households</li> <li>• Lowest density</li> <li>• Almost non amenities</li> </ul>	Rural accessible	<ul style="list-style-type: none"> <li>• Good accessible areas</li> </ul>
	Rural periphery	<ul style="list-style-type: none"> <li>• Non accessible areas</li> </ul>
<b>Work environment</b>	Work area	<ul style="list-style-type: none"> <li>• Mainly working purpose</li> </ul>

Source: (Poulus & Heida (2005). (ABF research, n.d). (ABF research, 2008)

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