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Estimating the Efficiencyof Dutch Housing Corporations

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This paper attempts to identify the relative efficiency of housing corporations in the Netherlands, making use of a panel dataset running from 2001 until 2010 covering the entire population. Like for most organizations in the public sphere, the production process of corporations is not straightforward. It should be classified as a two-stage process whereby in stage 1 the organization facilitates a service that is put into use in stage 2. Therefore, several concepts of performance measurement are available, depending on the viewpoint we take and the accompanying choice of output and input measures. In this paper, we distinguish between the concepts of 'economic' and 'social' efficiency as measures of performance. Economic efficiency refers to the management of the housing stock of corporations, whereas social efficiency focuses on the attainment of their social goals. We conduct a Data Envelopment Analysis to estimate and compare results of various sub models. In general it is found that substantial differences in efficiency appear, so that there seems to be scope for efficiency gains in the Dutch social housing sector.

Keywords: Efficiency, Housing Corporations, Data Envelopment Analysis

JEL classification:C14, C61, R31

I Introduction

The Dutch social housing market is dominated by housing corporations;[1]privately governed organizations executing a set of public tasks. In 2010, nearly 2.3 million dwellings were in the hands of corporations. This boils down to nearly 75% of the rental housing stock or35% of the total housing stock.[2]From an international viewpoint, these figures are remarkably large.According to Priemus (2002), no country in the European Union even comes close to this figure. Also, in a recent survey, Whitehead and Scanlon (2007) show that among a subset of European countries, the Netherlands have the highest percentage of social housing. Moreover, because nearly all social housing is in the hands of corporations, the conclusion is easily drawn that their performance and execution of tasks is of vital importance to the Dutch housing market, and, therefore society.In order to determine the drivers of success or failure of corporations, the first exercise is to map their performance. However, measuring the performancewithin a public sector is more complicated than it is for a private sector, because public institutions often provide a diffuse set of goods and services which are hard to compare and measure.[3]

Estimating the performance of (organizations within) the public sector has received more and more attention throughout the recent past. In general, performance is evaluated along two dimensions; effectiveness and efficiency (see Priemus 2003). Effectiveness is defined as the extent to which certain goals are achieved, whereas efficiency questions whether the production process of the organization doesn't spoil resources (inputs). An organization running optimally should perform well along both lines.

Most empirical literature presents one measurement exercise that deals with the concepts of efficiency and effectiveness simultaneously. Efficiency is then defined as the ratio between weighted output and weighted input.Typically, empirical literature of this kindeither attempts to measure efficiency of entire governmental bodies, such as municipalities (see for exampleGeys and Moesen(2009) or Geys et al.(2010)) or focuses on one specific sector, such as health care (Borge and Haraldsvik, 2009) or road maintenance(Kalb, 2010) for example.The first type of research nearly always suffers from the constraint that data availability is limited. Therefore, the choice ofinput and especially output measures used to estimate productivity and efficiency may be dependent on the datasets that are available.

This research attempts to measure the performance of housing corporations, thereby focusing on one specific sector: social housing.The need for a coherent measurement of corporations has increased because of their augmented autonomy throughout the last decades. A number of corporations have been put in the spotlights due to incidents[4], and the question rises whether or not social housing can actually be executed in a setting without direct intervention from the government. Because of these incidents, the Dutch central government aims to control and monitor the sector more stringent and thereby enhance efficiency. A proposal has been accepted that effort should be done on moderating the costs in the social housing sector. The explicit goal

[1] The terms housing association or housing society are sometimes used as well. In judicial terms, corporations are either foundations or associations.
[2] Sources: CorpoData and Central Bureau of Statistics (CBS).
[3]For an elaborate discussion on measurement issues in the public sector, see Stevens (2005).
[4] There has been a sequence of reports of integrity violations. Furthermore, decision failures have caused billions of euros losses on high-risk projects and finance.

is formulated that operational costs should remain constant for at least four years.[5] The question arises whether or not such a narrow based policy can be justified. Therefore we broaden this narrow measure of cost efficiency to find a basis on which corporations could be judged. Because the dataset we obtained allows us to choose various combinations of performance measures, we are able to identify their robustness by comparing different submodels and disentangling the different concepts of efficiency. Note also that knowledge about housing corporations isinformative on a large scale, becausethey have a dominant position in the housing market.Therefore, this paper attempts to map the efficiency of corporations by making use of a broad panel dataset running from 2001 until 2010.

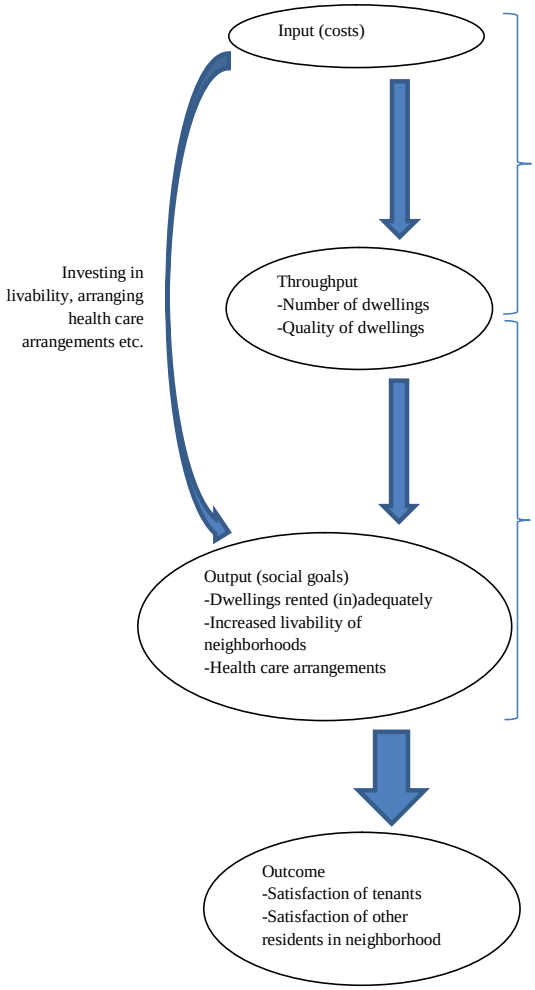
Dutch housing corporations are in a unique position as they are private institutions, executing a set of public tasks. However, despite of their private character, they are relatively unaffected by the discipline of the market (Koolma, 2008). Also, direct control from central or local government is lacking, especially on issues like efficiency.[6]Indeed, the ties between government and corporations have loosened throughout the recent past, both administrative and financially. Finally, supervision, both internal and external, appears to be ineffective,or at least insufficient to prevent the incidents that have tainted the sector in the recent past (see Koolma, 2012). Therefore, Koning en Van Leuvensteijn (2010) characterize the position of Dutch corporations as the 'Bermuda triangle of management'. Koolma and Gerrichhauzen (2011) prefer the more favorable description'community based organizations with a legitimacy based upon mutual confidence with stakeholders'. No matter how the position is phrased, it is clear that because of theirhigh degree of autonomy, efficient and effective execution of tasks is not self-evident.

For non-profit organizations, theory of voluntary sector failure is postulated by Salomon (1987), a theory which is the subject of an ongoing debate (Anheier & Ben-Ner, 2003). The interaction between nonprofit sectors and national governments is regarded as a critical success factor. In non-scientific comments the reported errors in the Dutch case have been attributed to amateurism, remarkably one of the four philanthropic failures in the theory of Salomon. Several authors argue that nonprofit organizations have a function in situations of both government and market failure, and claim that these organizations can be more efficient than state and market if they choose a well-balanced way of operation (Enjolras, 2000; Dollery & Wallis, 2004). However, the absence of a straightforward maxim and the inheritance of philanthropic weaknesses make them vulnerable to loss of efficiency and effectiveness.

As noted, it is hard to map the 'production' process of organizations in the public sphere. Corporations are of no difference in that respect. As for most public institutions, the production process could be classified as a two-stage process (see De Witte and Geys, 2011) where in the first stage the corporation has to create the facilities that can serve the public, such as building and maintaining a proper and sufficient-quality housing stock. In the second stage, actual supply and demand are being brought together so that (hopefully) the social goals that corporations are ought to pursue are attained. Steps one and two together, then, lead to the outcome (satisfaction of inhabitants). In addition, corporations conduct activities so as to combine housing and care, or increase livability in the neighborhoods. Figure 1 presents this process in simplified form.

[5]Ministry of National and Kingdom Affairs (2013).Letter to the chairman of the House of Parliament, subject: operational costs corporations. *24-01-2013.*
[6]Schilder et al. (2006) indicate an absence of control on internal efficiency and overpayment for resources in the institutional design.

Figure 1.'Production' process of housing corporations



The paper is set up as follows. Section II summarizes previous research on the performance of housing corporations. Section III briefly describes the institutional background of social housing in the Netherlands. Section IV discusses the method of Data Envelopment Analysis. In section V, we elaborate upon our choice of input and output measures. Empirical results of the efficiency measurement are given in section VI. Section VII briefly discusses how to control for exogenous variables whereas section VIII relates efficiency scores to cost levels. Section IXfinally, concludes.

II Previous research

Research attempting to measure the effectiveness and efficiency of Dutch housing corporations is scarce. Indeed, Priemus (2003) states that we cannot really justify any kind of reform within the social housing market because in the current situation "we are under-informed about the efficiency of housing corporations" (pp. 269). There have been a few attempts to fill this hiatus and conduct empirical assessments.

De Graaf et al. (2001) conduct a Data Envelopment Analysis (see below) on a subset of housing corporations in 1998 in order to measure the 'policy efficiency' of corporations. Policy efficiency - as opposed to economic efficiency - focuses on the question whether social goals are attained in the cheapest possible way. Therefore, this approach takes the two stages of figure 1 in one time, covering both the concepts of economicand social efficiency. The authors conclude that a large part of corporations is performing optimally and the gains that can be achieved by the other corporations are minimal. However, the researchers acknowledge that these results should be interpreted with caution. They argue that data availability should be improved in order to refine measures of inputs and outputs. De Graaf et al. also note that, because corporations are not given explicit goals to accomplish, it is hard to quantify their performance. Finally, their method of data revision and processing reduces the dataset to a small sample, containing only ten percent of the population. This raises the question whether the conclusions still stand by using a more extended dataset and a slightly different specification.

Our method differs in four ways from the research of De Graaf et al. (2001). First of all, this paper uses a broad panel data set covering ten years of data instead of one cross-section. Secondly, our method of combining municipal-and postal code-data sources with the dataset of corporations is different, leaving the entire population of corporations intact.Thirdly, we attempt to examine multiple concepts of performance, by disentangling the economic and social efficiency of corporations.Fourth, we propose a different specification of certain output parameters.

Hakfoort et al. (2002) incorporate the aforementioned research in a broader project attempting to give an overview of the social housing sector and the role of corporations. They conclude that the current environment will not automatically give the right incentives to perform efficiently. This statement is thus somewhat conflicting with the results of the actual efficiency scores found by De Graaf et al. (2001), which were relatively high.[7]

Koolma (2008,2010) presents a set of general findings that support the notion that efficiency in the social housing sector could be enhanced. First of all, Koolma identifies a rise in organizational costs per dwelling since 2002. Secondly, these costs are positively correlated to the size of corporations. After a merger, costs are structurally higher as well. The question rises whether this increase in costs can be justified by an increase in service levels. A third important finding is that land and dwellings are being bought above market prices. It seems that their comfortable financial position has led corporations to be 'overrelaxed' in their purchasing

[7] In principle the two findings can be reconciled with each other. As a Data Envelopment Analysis focuses on relative efficiency, it could still be the case that the differences in efficiency are small, whereas the sector as a whole is operating inefficiently. Intuitively however, one would expect that if efficiency is low in absolute terms, relative efficiency scores should reveal a substantial spread.

practices. Indeed, Gruis et al. (2008) state that a healthy financial position may be a 'blessing as well as a curse' (pp. 15). Finally,Koolma notes, investments of corporations do not track forecasts in housing market conditions, that is, local shortages or surpluses of dwellings are not always taken into account adequately.Thus corporations do not seem to feel the direct pressure from the market. Koolma(2008) also acknowledges that differences between corporations in their cost levels and investment patterns are quite substantial. We would therefore expect to see at least substantial variation in efficiency scores.

This study contributes to previous research by adopting a coherent view on performance measurement of housing corporations.Corporations are obliged to file their financial and operational statements, the formats of which are prescribed by law. These accountability reports are checked and put in a database by the central state agency C*entral public housing fund* (CentraalFondsVolkshuisvesting, CFV).This agency has provided us with a dataset that comprises the entire population. Robustness is tested along the lines ofmultiple subdatasets using different performance indicators.

III Institutional background

Dutch housing corporations are in a rather unique position being private institutions in judicial terms, but facing the statutory obligation of executing public tasks. The number of housing corporations active in the Netherlands rose rapidly since the founding of the *housing act* (Woningwet) in 1901. From the very beginning, there were political concerns about the efficiency of the voluntarily controlled organizations, resulting in strict accounting prescriptions and the obligation to set rents in accordance with market levels. The housing act made it possible for corporations to receive governmental support, under the condition that the organization was only acting in the public interest. State support was gradually reduced throughout the years, however, and the ties between government and corporations have been loosened ever since. The so-called *balancing and grossing act* (Bruteringsoperatie[8], Ouwehand and Van Daalen, 2002) in 1995, which converted state loans and future subsidy obligations to lump sums, was the most fundamental reform in forcing the corporations to stand on their own feet. With this operation, state support in the form of subsidies ceased to exist. The lump sum conversion has been very profitable to the housing corporations (Van der Schaar, 2003), and so induced cash windfalls in the sector (Koolma, 2008).

State aid is currently limited to a few areas where corporations can get a special treatment over private parties(European Commission, 2009). For example, loans to corporations are guaranteed by the *guarantee fund social housing* (WaarborgfondsSocialeWoningbouw, WSW). If necessary, the government will act as a last resort. This guarantee fund ensures that loans can be undertaken at favorable interest rates. Also, in some occasions local governments sell land at a discount to corporations as part of social policy (De Kam 2012). Currently, the only source of direct subsidies or grants to corporations is the *central fund*. These subsidies are only provided under special circumstances however, for example when a corporationfaces severe financial problems.

[8] Officially, this act is entitled as 'Wet balansverkortinggeldelijkesteunvolkshuisvesting', but 'Bruteringsoperatie' is the most often used term.

Operationally, the ties between government and corporations are loose as well. The onlybinding condition that has to be fulfilled is that all resources of the corporation should be employed in public housing.If a corporation fails to meet these requirements, its status of registered institution can be withdrawn by royal decree.[9]In 1993, central government formulated a set of public tasks or 'performance fields' with guidelines by means of the*social housing management decree*(BesluitBeheerSocialeHuursector, BBSH). This decree is not binding and can be interpreted at own insight. The total set of tasks has been broadened throughout the years. The most recent version of the BBSH encompasses the following seven performance fields, on which corporations should focus their operations.

1. *Adequate housing of the target group, that is, persons with incomes within the boundaries of the rent benefit.*
2. *Preserving the quality of the housing stock.*
3. *Preserving financial continuity.*
4. *Improving livability of the neighborhoods.*
5. *Providing housing and fostering services to the elderly, the disabled or other persons that are in need of care or guidance.*
6. *Giving renters the opportunity to get involved with policy and administration.*
7. *Conducting business in a frugal and efficient way.*

The first six performance fields all deal with effectiveness: they reveal which goals should be pursued by the corporations. The final field reveals that efficient application of resources is of importance as well. However, this set of tasks does not give the corporations a blueprint for how to operate. Corporations can freely determine which tasks to give priority. Therefore, it is not possible to give the BBSH-goals a priori weights. Also, there exist no explicit minimum performance levels or targets. Therefore, these goals do not provide clear guidelines that can be used to compare corporations' performance. The only comparison material, are the corporations themselves. In addition, the central government encourages corporations to interpret the tasks with a degree of freedom by taking into account the specific characteristics of the environment and geographical region in which they operate.

Next to the more general tasks as laid down in the BBSH, corporations sometimes make explicit agreements with the municipalities in which they are active. In this way, they are able to tailor their output to local demand and adjust their decisions in conformity with local policy. The share of corporations that has indeed made such agreements has decreased between 2002 en 2005, but increased sarply from 2005 onwards (Severijn 2010). In 2010, 273 out of 401 corporations (68 percent) have made agreements with the relevant municipalities. Again, however, these agreements are not legally binding. Thus, whether or not these agreements are made, corporations do not face sanctions for not meeting the requirements. Overall, then, the framework in which corporations are operating leaves them a high degree of autonomy.

[9]Housing Act, article 70, clause 2.

This high degree of autonomy leads Conijn (2005) to conclude that proper measurement of efficiency is impossible. First of all, he states, the BBSH gives so much scope for interpretation that a measuring rod with which to compare the corporations' output is not available. This critique is actually the core problem of all efficiency measurement exertions in the public sector. As noted above, all autonomously operating bodies lack a clear objective, so that it is up to the researcher to choose proper measures of input and output. Indeed, municipalities, for example, face an even higher degree of autonomy compared to corporations. The main problem is however, that the fields of the BBSH can be operationalized via multiple measures. Therefore, one always has to consider different sets of outputs so as to check for robustness. Secondly,Conijn argues, because costs cannot be ascribed to separate activities, it is impossible to map cost efficiency. This problem can be solved or at least alleviated by using methods of frontier estimation. We argue, therefore, that the measurement of efficiency among corporations is not an insurmountable hurdle. It is, however, important to keep in mind that such research is by definition sensitive to the specification of models. Therefore, this paper uses several robustness checks.

IV Methodology

In the literature on efficiency measurement, the method of frontier analysis is the most common. Frontier analysis can be both non-parametric,for example Data Envelopment Analysis(DEA) and parametric,for example Stochastic Frontier Analysis(SFA). Both methods share the feature that they construct a best practice frontier on the basis of the data used by the researcher. For reasons explained below, we choose the non-parametric method of DEA as basis of our analysis.

Data Envelopment Analysis was introduced by Charnes et al. (1978) who based their method on the ideas of Farrell (1957). The method constructs the best practice frontier of a group of decision making units (dmu's) by solving a set of linear programming problems. This frontier gives all combinations of inputs and outputs that are deemed to be efficient. Consequently, every dmuis compared to this frontier to determine its efficiency. If admu is on the frontier, it is said to be efficient.The further away from the frontier the less efficient it is.The best practice frontier thus consists of the envelopment of all the efficient dmu's. The inefficient dmu'slie inside the frontier.

The linear programming problem in the input oriented setting, following the notation of Coelli(1996),reads:

$$
\begin{aligned}
& min_{\theta_i,\lambda}\theta_i \\
s.t. & \\
& X\lambda \leq x_i\theta_i \\
& Y\lambda \geq y_i \\
\lambda \geq 0 &
\end{aligned}
$$

Where $\theta_i$denotes the efficiency score of dmu$i$, x_i and $y_i$are respectively, the input and output vectors of dmu$i$. $X$and Y are the input and output matrices for the entire set of dmu's. Finally, λ is a vector of weights to be determined in the optimization problem, so that $X\lambda$ and $Y\lambda$ is the weighted sum of, respectively, inputs and outputs of a 'virtual dmu'. In the model, we thus search whether there exists a possibility to 'defeat' dmu$i$, by constructing a virtual dmu, being a linear combination of all existing dmu's.

The virtual dmu needs to meet the requirements that it produces at least as many outputs and uses no more inputs compared to dmu$i$. If we fail to construct a virtual dmu that meets these requirements, the efficiency score obtains its maximum value of 1. The efficiency score θ_i then reveals by how much total input of dmu$i$ could decrease without decreasing output. It could be interpreted, as a 'measure of defeat'. Not only does the virtual dmu succeed in producing the same amount of output as dmu$i$, it needs only a fraction of $\theta_i$of inputs for it. Thus, an efficiency score for a dmu of 0.75 means that all its inputs could be reduced by 25 percent. In a similar way, one could also choose an output orientation where the efficiency score can be interpreted as the percentage with which output could increase without decreasing input.

Note that we do not impose any weights on inputs and outputsbeforehand. That is, because different inputs and outputs cannot always be added up or compared a priori, the model determines the weights that the virtual dmu receives. It is in general, however, possible to construct an extra constraint on the weights. We could for example allow for variable returns to scale (VRS) technology, as opposed to the constant returns to scale (CRS) approach, by adding the constraint:

$$\lambda N1' = 1$$

Where $N1$is a vector of ones.We will consider both a VRS (input-oriented) and a CRS specification.

V Data and output of the BBSH-fields

In our measurement of efficiency, we will consider two concepts of efficiency: narrow (economic efficiency) or broad (social efficiency). We define economic efficiency as the extent to which the housing stock portfolio is being managed in an economic and frugal way (i.e. stage 1 in the production process, see figure 1). Social efficiency questions whether the social (BBSH-) goals are achieved efficiently (i.e. stage 1 and 2 in the production process). The operationalization of stage-1 is quite straightforward (see section VI); stage 2 is more demanding and complex. Therefore, this section presents potential output parameters for the BBSH-fields.

As described above, corporations have considerable leeway in choosing their policies. The only binding constraint is that all operations should be aimed at 'serving the public interest'. There exist general guidelines (BBSH), but corporations are encouraged to design their activities in such a way that local circumstances are taken into account. Whether or not corporations make

agreements with local governments is up to the parties involved. We have obtained a dataset from CorpoData, which is a cooperation scheme in which several parties in the social housing market request data from the corporations.[10] Our dataset enables us to choose from a wide range of possible input and output measures.

In order to measure performance, we need to determine along which lines we judge corporations. The goals formulated in the BBSH are the most apparent as they hold for the entire population of corporations. The BBSH encourages both efficient and effective provision of services. As noted, the BBSH consists of seven performance fields. The first six of concern social goals (effectiveness).The final BBSH performance field deals with efficiency. Below we will first discuss the possible measures of performance for each of the BBSH fields. Hereafter we will return to the problem of measuring efficiency.

1. *Adequate housing of the target group, that is, persons with incomes within the boundaries of the rent benefit*

One should note here that this field covers two dimensions. First of all, corporations should preferably house persons *within the target group,* that is; persons with income below the threshold of the rent subsidy.[11] Secondly, persons should be housed *adequately*,meaning that the rent they pay has to be aligned with the income they earn. To put it simple, low-income earners should be housed in low-rent dwellings, high-income earners in high-rent dwellings. Defining the target group as low-income earners, each client can be classified in one of the following four categories.

A. *Low income earnershoused adequately*
B. *Low income earners housed inadequately (too expensive)*
C. *High income earners housed adequately*
D. *High income earners housed inadequately (too cheap)*

This leads to the following four outputs.

$$BBSH_{1.1} = Low\ income\ earners\ housed\ adequately$$
$$BBSH_{1.2} = Low\ income\ earners\ housed\ inadequately\ (too\ expensive)$$
$$BBSH_{1.3} = High\ income\ earners\ housed\ adequately$$
$$BBSH_{1.4} = High\ income\ earners\ housed\ inadequately\ (too\ cheap)$$

One could debate about which outputs should be counted in social efficiency measurement. That is, it is questionable whether housing of high income groups essentially is a ‘good thing’. For example, one might argue that housing high income earners in cheap dwellings (category D) does more harm than good. Indeed, this inadequate housing prevents persons with a low income to live in there, which may result in queuing up. Housing high income earners can be justified however if the dwelling would otherwise remain vacant, or if this is done to prevent segregation of neighborhoods.

[10] CorpoData is a collaboration ofthe WSW, CFV and the ministry of national and kingdom affairs (Ministerie van BinnenlandseZaken en Koninkrijksrelaties, BZK).
[11] For single person households, the threshold income of the rent subsidy in 2011 is € 21,625 (age below 65) or 20,325 (age over 65). For multi person households this is € 29,350 (<65) and € 27,750 (>65).

To test for robustness we will consider threeways of dealing with the separate categories. The first option is toinclude all four outputs separately.The second one only includes the first two outputs (housing of the target groups). The third option is to include all four categories, but add an a priori value judgment on the relative importance of the categories. In this particular case, we impose the value judgment that housing of the first category is superior to the second, the second is superior to the third en the fourth category is least preferred.[12]

Note however that theseoutputs arenot complete enough to cover the first field of performance, because they only deal with allotments in year t; that is, they reveal the number of new clients. Many dwellings however, will simply berented by the same households as in year t-1. Therefore, we construct an additional measure, namely the total numberof renewed or continued contracts. This is approximated by output$BBSH_{1.5}$[13]

$$BBSH_{1.5} = Number\ of\ inhabited\ dwellings - allotments\ in\ year\ t$$

2. Preserve the quality of the housing stock.

We will choose two different points of view to measure the quality of the housing stock. First of all, quality can be measured by means of characteristics of the dwellings. The so-called *housing valuation scheme* (Woningwaarderingsstelsel, WWS)assigns points on the basis of,for example,the number of rooms, the quality of the kitchen, and the size of the house. A higher score means a better quality.

$$BBSH_{2a} = Average\ quality\ points\ WWS$$

Quality could alternatively be measured using housing prices.[14] One should note however that not only the quality of the dwelling influences itsvalue, but so does the location. We will therefore correct the values of the dwellings for the price of the location. That is, the value of dwellings in areas with above (below) average land prices will be corrected downwards (upwards).

$$BBSH_{2b} = Average\ value\ of\ dwellings\ corrected\ for\ location$$

3. Preserve financial continuity.

The Central public housing fund formulates two kinds of judgments concerning the financial position of corporations, the 'judgment of solvability' and the 'judgment of continuity'. The first judgment reveals whether the current solvability is satisfactory, the second indicates whether solvability is sufficient in order to conduct the operations that are planned for the future. For current solvability, we use solvability in year *t* as an output. For continuity we use the forecasted solvability in year *t + 5*, which comprises the effects of scheduled operations from year *t + 1* up and until year *t + 5*.

[12]One should note that the value judgment of the second and third group remains arbitrary as both categories fulfill one of the two requirements of the first BBSH-performance field. In our specific preference structure, we implicitly assume that housing low-income groups is more important than housing adequately.

[13]The extent to which existing contracts between corporations and tenants consist of adequate housing is beyond the control of the corporation. For example, if the income of an existing tenant increases beyond the threshold of the rent subsidy, he or she cannot be forced to move out by the corporation.

[14] In the Netherlands, all houses are being valued by means of the Act 'Valuation real estate' (Wet Waarderingonroerendezaken, Woz). Our dataset contains the Woz-values of all dwellings of the corporations. We have however excluded the years 2001-2004 from our analysis, because data for these years was incomplete.

$$BBSH_{4a} = Solvability\ year\ t$$
$$BBSH_{4b} = Forecasted\ solvability\ year\ t + 5$$

Note, however that the judgment of the CFV does not account for the trend in solvability, while a negative trend could be an indicator for threatened continuity on the long run. In spite of a sequence of unexpected financial breakdowns of housing corporations in the last 3 years, the CFV has not (yet) changed the formalized method of judgment. Therefore, we stick to the two indicators of the CFV.

4. Improve livability of the neighborhoods.

Since 1997, corporations are not only responsible for their own dwellings and tenants, but for the quality of living in the neighborhoods in which they hold possession as well. The most straightforward measure of output is an aggregate score of livability. Note however, that simply taking this score of livability as output may not be adequate. Corporations of course are only partly responsible or accountable for the livability in their neighborhoods. Other factors, which are exogenous to the corporations, such as the level of criminality or municipal expenditures may be of influence as well. Indeed, we would prefer to know what the corporation *adds* to livability in the neighborhood. As a first option, the *change* rather than the *level* in livability could be chosen as performance indicator. This is appropriate as long as exogenous circumstances remain fairly constant.

$$BBSH_{5a} = \Delta Livability^{15}$$

This score on livability originates from the so-called 'Leefbaarometer' ('livabilometer'), made available by the Ministry of national and kingdom affairs.[16] The livabilometer gives both a general score of livability and separate scores on six subdimensions. These subdimensions are (1) the composition of population, (2) social relationships, (3) public space, (4) safety, (5) level of facilities and (6) housing stock.[17] The last dimension is the one on which corporations probably have most influence as it measures the extent to which the housing stock is balanced concerning the types and ages of the dwellings. If we only take into account this sub-dimension, and thus remove the dimensions which are (largely) exogenous to corporations, we are left with the measure over which corporations have the most control.

$$BBSH_{5b} = Livabilometer\ score\ on\ housing\ stock$$

5. Provide housing and foster services to the elderly, the disabled or other persons that are in need of care or guidance.

This field (which has been added to the BBSH in 2001) shows a certain overlap with the first field. Indeed, in the first field we already take into account the housing of persons aged over 65 with low incomes, as they simple belong to the target group. One could argue therefore that the

[15] The outputs accompanying the fifth BBSH field have been transformed so as to yield the necessary positive output parameters for all observations.
[16] Because data on livability is presented on postal code level, we converted the measures to the scale of corporations by means of taking a weighted average. Data are available for the years 2002, 2006, 2008 and 2010.
[17] These subdimensions are further divided into 49 indicators. These indicators include both (subjective) judgments of inhabitants and measures on their actual behavior.

target group should be split into two sub-targetgroups: (1) low-income people (age <65) and (2) the elderly (irrespective of income). Outputs 1.1-1.4 could then be reformulated:

$$BBSH_{1.1}, = Low\ income\ earners\ housed\ adequately\ (< 65)$$
$$BBSH_{1.2}, = Low\ income\ earners\ housed\ inadequately\ (< 65)$$
$$BBSH_{1.3}, = High\ income\ earners\ housed\ adequately\ (<65)$$
$$BBSH_{1.4}, = High\ income\ earners\ housed\ inadequately\ (< 65)$$

And we add:

$$BBSH_{5.1} = Housing\ elderly\ adequately$$
$$BBSH_{5.2} = Housing\ elderly\ inadequately$$

Further, $BBSH_{1.5}$ could be split up, i.e. we distinguish between 'ordinary' and 'special' dwellings. Special dwellings are those suitable for housing of the elderly and handicapped. Ordinary dwellings are all other houses.

$$BBSH_{5.3} = Inhabited\ number\ of\ 'ordinary'\ dwellings$$
$$BBSH_{5.4} = Inhabited\ number\ of\ 'special'\ dwellings$$

Finally, corporations also play a role as intermediary party in the arrangement of housing, health care and well-being contracts between health care suppliers and clients of corporations. Therefore, we also include:

$$BBSH_{5.5} = Number\ of\ health\ care\ arrangements$$

6. Give renters the opportunity to get involved with policy and administration.

The active involvement of tenants could be reflected by (annual) meetings between the corporation's administration and (representatives of) its tenants.One should note however, that every year only one or two percent of the corporations fails to organize these meetings. Therefore, the spread in this measure is low. Moreover, whether or not meetings are organized provides only verylimited information on the extent to which renters have a say in corporations' policymaking. Unfortunately, however, better data is unavailable. Therefore, we have decided to exclude this performance field from our measurement.

Opmerking [JV1]:
Rik: jij had bewijs dat grote corporaties die wel meetings organiseren juist lager scoren op klanttevredenheid? Kun je dat ergens aantonen? Of heb je dat ergens gepubliceerd?

7. Conduct business in a frugal and efficient way.

The final BBSH-field tries to incorporate the notion that corporations should not spoil resources. This is where efficiency measurement comes into play. This is the actual goal of our research, and will be elaborated upon in the next section.

Concluding, we assign output measures to the first five BBSH-fields only. Table 1 summarizes descriptive statistics for the abovementioned measures.

Table 1. Descriptive statistics of BBSH performance measures (pooled data)

BBSH field	Performance measure	N	Avg	St. dev	Min	Max
Housing of target groups (1)	1.1 (Housing low income earners adequately)	3970	320.98	548.75	0	5187
	1.2 (Housing low income earners inadequately)	3970	23.67	64.88	0	1104
	1.3 (Housing high income earners adequately)	3970	120.22	209.80	0	2565
	1.4 (Housing high income earners inadequately)	3970	24.27	50.66	0	897
	1.5(number of inhabited dwellings minus allotments)	3964	5440.18	9028.89	0	74230
Quality of dwellings (2)	2a (average points WWS)	3865	131.92	13.57	59	211
	2b (average value of dwellings corrected for location, in 1000 euro's)	2277	166.74	35.83	15.57	314
Financial continuity (3)	3a (solvability year t)	3592	0.49	0.17	0.09	1.20
	3b (solvability year t+5)	3985	0.49	0.22	0.01	4.82
Livability (4)	4a (Δlivability)	1580	0.48	5.40	-47.14	88.05
	4b (score on housing stock)*	1585	0.90	20.41	-49.19	45.59
Housing and care (5)	5.1 (number of elderly people housed adequately)	3970	63.45	122.89	0	2412
	5.2 (number of elderly people housing inadequately	3970	9.74	30.49	0	807
	5.3 (number of ordinary dwellings)	3965	4692.03	7992.50	0	69797
	5.4 (number of special dwellings)	3965	752.31	1701.18	0	41861
	5.5 (number of health care arrangements)	4009	222.64	1370.17	0	26174

* The score on the housing stock can vary from -50 to 50.

VIModel specification and resulting efficiency scores

As noted, we take two points of view in measuring efficiency: narrow and broad.We define economic efficiency as the extent towhich the housing stock portfolio is being managed in an economic and frugal way (i.e. stage 1 in the production process, see figure 1).Social efficiency questions whether the social (BBSH-) goals are achieved efficiently (i.e. stage 1 and 2 in the production process). Below, we will create models for both viewpoints.

Stage-1 efficiency

In thefirst set of models (models *i* and *ii*), we focus on stage 1 of the production process only. That is: we try to answer the question whether or not the housing stock is being acquired and managed efficiently.

Model *i* focuses on the management of the existing housing stock, that is, the relation between the total quality and quantity of the existing stock and the costs incurred to acquire this. We assume that the costs of the existing stock are represented by the level of depreciation and changes in value of assets,and interest payments. Also, maintenance costs are included.As outputs we take the total dwelling stock as starting point. This stock can however be splitted into different subcategories via a number of ways. First of all (model *ia*), we distinguish between 'ordinary' and 'special' dwellings as defined above, where again; special dwellings are defined as those suitable for housing the elderly and/or handicapped and ordinary dwellings are all other houses. Secondly (model *ib*), we distinguish on the basis of rental prices (cheap, affordable or expensive). Finally (model *ic*), we distinguish between physical characteristics of dwellings (single-household dwellings, multi-households dwellings, high-rise dwellings, units in nursing homes, and other).

Model *ii* focuses on the separate building and demolishingactivities of the corporations. As outputs we use both the number of newly built dwellings as well as the total net present value of these dwellings. Also, the total number of demolished dwellings is included.As inputs we use,

Opmerking [JV2]:
Dit deel blijft het struikelblok.

Onderaan dit bestand staat hierover een uitgebreid commentaar.

the costs of acquiring the ground, the buildings costs and demolishing costs. Dwellings are separated into rental dwellings, units in nursing homes and dwellings for sale. Table 2 summarizes the specifications of the stage-1 models.

Table 2. Inputs and outputs model i and ii.

	Model i			Model ii
	ia	**ib**	**ic**	
Outputs	-Number of 'ordinary' dwellings -Number of 'special' dwellings -Quality of dwellings (WWS)	-Number of cheap dwellings -Number of affordable dwellings -Number of expensive dwellings -Quality of dwellings (WWS)	-Number of single household dwellings -Number of multi-household dwellings (no elevator) -Number of multi-household dwellings (elevator) -Number of high-rise dwellings -Number of units in nursing homes -Other	-Number of newly built dwellings -Net present value of newly built dwellings (3 separate categories) -Number of demolished dwellings
Inputs	-Depreciation* -Interest payment -Maintenance costs	-Depreciation -Interest payment -Maintenance costs	-Depreciation -Interest payment -Maintenance costs	-Ground costs -Building costs -Demolishing costs

* For 2005-2009, expected depreciation is used rather than real depreciation.

Opmerking [JV3]:
Dit zit me eigenlijk niet helemaal lekker, dat we voor 2005-2009 gebruik moeten maken van expecteddepreciation. Heeft Rik enig idee of expectedand real depreciation redelijk overeen komen? Je zou zeggen, het is één van de best te voorspellen kostenposten.

Als alternatief kunnen we ook 'gewoon' gebruikmaken van totale kosten.

Stage-12 efficiency

The second set of models (*I-VI*) broadens the definition of efficiency, letting the BBSH-fields act as outputs. In this way, we are measuring 'social efficiency' (or as De Graaf et al. (2001) coin it, policy efficiency). That is, we answer the question whether or not corporations attain there social goals in the most efficient way. We now thus broaden our view and take stage 1 and stage 2 of the production process in one time (see figure 1). As outputs, we use the performance measures based on the BBSH-fields as these reveal the social objectives of the corporations. Because the BBSH-fields allow for different performance indicators, several specifications of output choices are possible.

Model *I* focuses merely on the first two(core) BBSH-fields (i.e. provide housing of sufficient quality to the target group). As noted, we will consider threesub models. Model *Ia* includes all allotment categories, while model *Ib* includes only the allotments of low-income groups and thereby disregards the high income groups. Model *Ic* finally imposes a priori weight constraints on the categories. All subsequent models are elaborations of the basemodel *Ia*. Model*II*only slightly alters the base model by including an alternative measure of quality. Model *IIIa* (*IIIb*)includes the solvability in year *t* (*t+5)*. Model *IVa* includes the change in livability, whereas model *IVb* includes only the livability score on the housing stock. Model *V* distinguishes between housing of the young and elderly and includes health care arrangements. Model *VI* finally considers an alternative input measure.

For models *I-V*, we use as inputs (1) operational expenditures[18], (2) interest payments and (3) all other costs. This final entry is simply the difference between total costs and operational expenditures. Model *VI* finally, omits capital expenditures so that operational expendituresis the

[18]Operational expenditures is the sum of (1) wages and salaries, (2) maintenance costs and (3) other operational expenditures.

only input. Because capital expenditures are fixed for a great part, and may show extreme outliers we exclude them in the final model as a robustness check. For details on the models *I-VI*, see table 3.

For all the above mentioned (sub)models, we use DEA as method of determining efficiency. As noted above, the production function in the public sector is hard to identify explicitly, because the process consists of multiple stages (see figure 1). Also, the functional form of the production process is unclear, so that a parametric estimation may easily be misspecified. Therefore it is hard to estimate the true production function, so a non-parametric method like DEA is preferred.

Table 3.Inputs and outputs models I-VI

Outputs (BBSH)	**Model Ia,Iband Ic(basic BBSH model)**	**Model II (alternative quality score)**	**Model IIIa and IIIb(include solvability)**	**Model IVa and IVb (include livability)**	**Model V (include housing and care)**	**Model VI (alternative input)**
Housing of target groups (1)	1.1 1.2 1.3 (Ia only) 1.4 (Ia only) (Ic with a priori weights)	1.1 1.2 1.3 1.4	1.1 1.2 1.3 1.4	1.1 1.2 1.3 1.4	1.1' 1.2' 1.3' 1.4'	1.1 1.2 1.3 1.4
	1.5	1.5	1.5	1.5		1.2
Quality of dwellings (2)	2a	2b	2a	2a	2a	2a
Financial continuity (3)			3a or 3b			
Livability (4)				4a or 4b		
Housing and care (5)					5.1 5.2 5.3 5.4 5.5	
Inputs	-Interest expenditures -Operational expenditures -Capital expenditures					-Operational expenditures

The results of the DEA analyses are presented in Table 4.Clearly, all models indicate that (substantial) efficiency gains can be attained. The different specifications can be reconciled with each other fairly well, as mostaverage scores for the CRS (VRS) models fluctuate around 0.75 (0.65). Model *V* is the most prominent outlier, showing the highest efficiency scores. All models classify only a minority of the corporations as fully efficient. Overall then, the results stand in contrast to the findings of De Graaf et al. (2001) who find hardly any inefficiency.

Table 4. Results of DEA analyses

			Average efficiency		Standard deviation		% fully efficient		Minimum efficiency	
Model	**N**	**t**	**DEA CRS**	**DEA VRS**	**DEA CRS**	**DEA VRS**	**DEA CRS**	**DEA VRS**	**DEA CRS**	**DEA VRS**
ia	368	8	0.53	0.67	0.18	0.19	6%	13%	0.25	0.30
ib	371	8	0.67	0.75	0.17	0.18	9%	18%	0.06	0.07
ic	333	8	0.73	0.82	0.17	0.16	15%	29%	0.30	0.36
II	188	4	0.66	0.74	0.17	0.19	6%	20%	0.32	0.31
Ia	322	10	0.66	0.81	0.19	0.15	11%	24%	0.31	0.38
Ib	322	10	0.60	0.77	0.19	0.16	7%	16%	0.28	0.35
Ic	322	10	0.61	0.79	0.18	0.16	6%	19%	0.20	0.20
II	330	6	0.59	0.80	0.20	0.16	10%	24%	0.22	0.36
IIIa	341	9	0.64	0.81	0.19	0.16	10%	23%	0.29	0.38
IIIb	320	10	0.66	0.81	0.19	0.15	11%	24%	0.31	0.38
IVa*	330	9	0.65	0.82	0.19	0.15	10%	26%	0.31	0.42
IVb*	312	10	0.57	0.75	0.19	0.19	7%	20%	0.21	0.27
V	307	10	0.77	0.89	0.17	0.13	20%	41%	0.41	0.49
VI	266	10	0.55	0.72	0.17	0.20	3%	14%	0.20	0.23

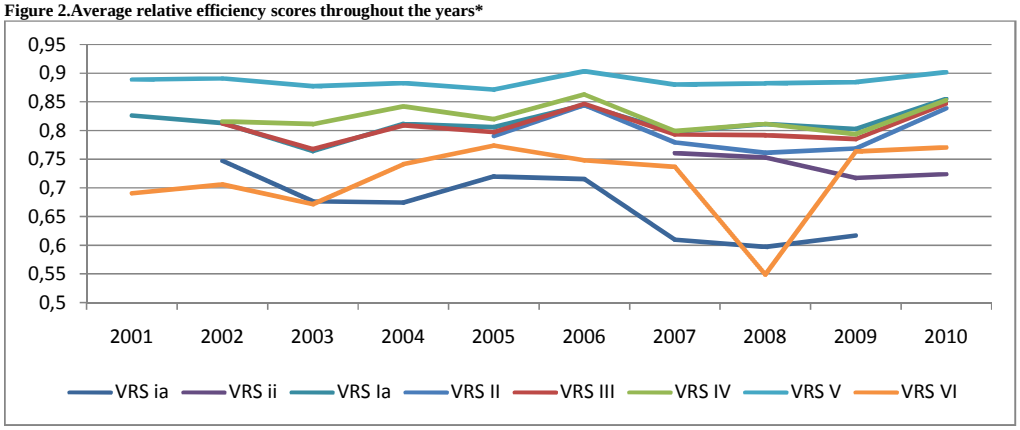
- VRS scores are input oriented.
* Because models IVa andIVb contain transformed outputs, it is inconvenient to use CRS-DEA. See Pastor (1996).

Opmerking [JV4]:
Ik heb voorzichtig ook wat getest met de methode SFA. Correlaties zijn niet hoog tussen DEA en SFA (ca 0.35).

Maar nogmaals, SFA is in dit geval een beetje fragiel en dubieus om te gebruiken.

Table 4 shows average results for the entire period 2001-2010. Figure 2 indicates how the scoresevolve over time. It appears that throughout the years, the average efficiency scores are stable, except for model *VI* which shows a downward dip in 2008.

Figure 2.Average relative efficiency scores throughout the years*



* For expository reasons, not all models are included in the figure

Table 5 shows the correlation scores of the different VRS-models.Correlations between the 'social' efficiency models (*I-VI*) are without exception high (never below 0.48). However, it appears that being socially efficient, is no direct guarantee of economic efficiency, as the correlation scores between models *i-ii* on the one hand, and models *I-VI* on the other, are not constantly high. Correlation does remain positive however, among all combinations of(sub)models.

Table 5. Correlation of the VRS* scores

	ia	ib	ic	ii	Ia	Ib	Ic	II	IIIa	IIIb	IVa	IVb	V	VI
ia	1	0.71	0.77	0.29	0.58	0.62	0.49	0.58	0.60	0.58	0.60	0.47	0.53	0.41
ib		1	0.67	0.25	0.50	0.52	0.43	0.52	0.51	0.50	0.50	0.37	0.43	0.34
ic			1	0.15	0.54	0.58	0.50	0.53	0.54	0.54	0.55	0.42	0.54	0.39
ii				1	0.22	0.22	0.19	0.18	0.21	0.22	0.22	0.11	0.13	0.22
Ia					1	0.89	0.70	0.94	0.99	1.00	0.94	0.76	0.82	0.61
Ib						1	0.76	0.84	0.89	0.88	0.84	0.66	0.72	0.54
Ic							1	0.65	0.70	0.70	0.68	0.53	0.59	0.54
II								1	0.96	0.94	0.92	0.73	0.77	0.59
IIIa									1	0.98	0.95	0.77	0.81	0.61
IIIb										1	0.94	0.76	0.82	0.61
IV											1	0.74	0.79	0.58
Va												1	0.68	0.48
Vb													1	0.52
VI														1

* Correlations of CRS scores are similar (not shown).

VII Correcting for exogenous variables

Opmerking [JV5]:
Sectie VII en VIII heb ik toegevoegd omdat ik het anders wat kaal vond. Gevaar is wel dat je afwijkt van de kern. De vraag is dus, wat moeten we behouden van deze secties en wat niet?

Eventuele andere toevoegingen die het geheel verrijken zijn ook welkom.

To some extent, inefficiency is beyond the control of the decision making unit, because it is being (dis)advantaged by exogenous circumstances. Therefore, efficiency scores that are not corrected for relevant exogenous variables might be misspecified. One should thus keep in mind that the average efficiency score given cannot be judged directly by its magnitude. It is however, beyond the scope of this paper to fully analyze which exogenous variables are relevant and to what extent all the efficiency scores would alter if we were to take these into account. Rather, the goal of this paper has been to compare different concepts of efficiency and different (sub)datasets.To get a grip on this issue however,we correct model *Ia* for exogenous variables.
To account for these background variables we use the method of Ruggiero (1998). First of all, we have estimated the relationship between several background variables, and the efficiency score for our base model (*Ia*) by running the regression:

$$Efficiency(Ia)^{19} = \beta_0 + \sum_{r=1}^{R} \beta_r z_r + \varepsilon$$

wherez_r is a potentialexogenous variable to be taken into account. Taking a 5% significance level as cut-off, the only variables that significantly influence efficiency are the quality of the ground (positive) and the level of urbanity (negative)[20]. Secondly, a variable$Z$ is created that indicates to what extent a corporation is (dis)advantaged.

$$Z = \sum_{r=1}^{R} \beta_r z_r$$

In our case,$R = 2$, because only the quality of the ground and the level of urbanity are considered. In this case, a smaller Z indicates that a DMU is advantaged. Finally, we rerun the first-stage DEA analysis, adding the constraint.

[19] As dependent variable we use the single-bootstrapped DEA scores. See Simar and Wilson (2007).
[20] Excluded variables are: safety in the neighborhoods (from the livabilometer), a dummy variable for having possession in proximity of the coast and the share of minorities in the region.

$$\lambda_j = 0 \; if \; Z_i > Z_j$$

This yields the following scores, shown in table 6.By definition, the efficiency scores are corrected upwards, since the disadvantaged corporations (those with worse exogenous circumstances) are given the advantage that they cannot be compared to corporations that face superior circumstances. It appears that on average, efficiency scores only moderately change. The results still indicate that efficiency gains that can be accomplished are substantial. The correlation between the original *Ia* specification, and the one corrected for background variables is very high (0.97), which is reassuring.

Table 6. Model Ia corrected for exogenous variables

Model	N	t	Average efficiency	Standard deviation	% fully efficient	Minimum efficiency
Ia (VRS)	335	10	0.81	0.15	24%	0.38
Ia (corrected for background variables)	335	10	0.84	0.15	29%	0.45

VIII Efficiency and cost levels

Opmerking [JV6]:
Dezelfde vraag als bij de vorige comment: wel of niet doen?

As noted, an often heard policy instrument to increase efficiency in the social housing sector is to encourage corporations to lower their (operational) costs. The question of course arises to what extent lowering costs comes at the expense of lowered service provision and thereby is harmful for tenants. Consequently, we might ask ourselves whether the level of costs informs us about the efficiency. Table 7 briefly informs us about this issue by relating efficiency scores with (absolute and relative) cost levels. It appears that higher costs lead to higher efficiency scores (the variables with absolute cost levels show positive signs throughout the analysis). Therefore, in as far as reducing costs implies scaling down activities, efficiency is not necessarily enhanced. The results indicate that indeed, increasing costs are being accompanied by more than proportionate increases in output. The variables expressing costs per dwelling have negative signs throughout the analysis however. It seems therefore that policy could best be oriented at reducing (or prevent increasing) relative cost levels.

Table 7.Tobit regression results[21]

	Dependent variable is VRS specification of model:								
	ii	**ii**	**ii**	**Ia**	**Ia**	**Ia**	**V**	**V**	**V**
Wages	0.013 (6.68)***			0.013 (9.40)***			0.012 (7.51)***		
Wages per dwelling	-0.088 (1.76)*			-0.290 (11.41)***			-0.285 (9.64)***		
Operational costs		0.003 (6.91)***			0.002 (8.78)***			0.002 (7.01)***	
Operational costs per dwelling		-0.045 (2.88)***			-0.116 (22.41)***			-0.107 (17.87)***	
Total costs			0.002 (6.43)***			0.001 (8.10)***			0.001 (5.38)***
Total costs per dwelling			-0.020 (4.05)***			-0.055 (26.86)***			-0.048 (20.30)***
Oad	0.00005 (3.67)***	0.00005 (3.90)***	0.00006 (4.13)***	0.00003 (3.24)***	0.00003 (3.85)***	0.00003 (3.76)***	0.00001 (0.97)	0.000009 (0.82)	0.00001 (1.20)
Ground quality	0.037 (0.52)	0.058 (0.78)	0.032 (0.44)	-0.136 (3.05)***	-0.024 (0.56)	-0.100 (2.27)***	-0.184 (3.52)***	-0.076 (1.45)	-0.146 (2.71)***
Proximity to coast	-0.044 (1.38)	-0.044 (1.35)	-0.044 (1.37)	-0.013 (0.62)	-0.002 (0.12)	-0.016 (0.52)	0.025 (1.07)	0.041 (1.74)*	0.025 (1.00)
Share of minorities	-0.080 (0.20)	-0.053 (0.13)	-0.139 (0.35)	-0.097 (0.37)	-0.006 (0.02)	-0.052 (0.20)	-0.213 (0.73)	-0.164 (0.56)	-0.133 (1.18)
Constant	0.63 (7.14)	0.69 (7.54)***	0.68 (3.46)***	1.04 (20.53)***	1.04 (21.24)***	1.04 (21.29)***	1.21 (20.23)***	1.20 (20.56)***	1.19 (19.86)***
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	736	708	737	3194	2828	3194	3045	2694	3045

Absolute z-values (tobit model) between parentheses. * (**) (***) denotes significance at the 10% (5%) (1%) confidence level.

IX Conclusion

Because the production process of public institutions is hard to map accurately, so is the measurement of their effectiveness and efficiency. Moreover, because in many occasions the availability of data is limited, results are hard to interpret properly. This paper has attempted to identify the performance of Dutch housing corporations, by focusing on different concepts of efficiency. By disentangling the production process, we compare both economic efficiency (stage 1) and social efficiency (stage 12). It is comforting to see that slight changes in output parameters do not alter results dramatically as correlations between the different subsets are relatively high. Correlation between stage-1 and stage-12 efficiency is somewhat lower however.

Overall, no matter which specification we adopt, it appears that at least substantial efficiency gains should be attainable by the Dutch social housing sector. Indeed, as long as one observes differences in *relative* efficiency scores, per definition we have inefficiency in absolute terms as well. The non-efficient corporations in relative terms certainly have room for improvement, but it is not per se the case that the fully efficient corporations have nothing to gain. Therefore, the generally accepted notion that efficiency could be enhanced in the social housing sector is supported. Moreover, it appears that in general, increasing cost levels of corporations are being accompanied by more than proportional increases in service provision. Therefore, policies based on cost reduction in absolute terms may do more harm than good. Further research is needed to find whether there exist structural differences between efficient and non-efficient corporations, so as to provide guidelines of how to improve (social) performance within the sector.

[21] Regressions with bootstrapped efficiency scores are not shown but show similar results.

Bij comment JV2, zie pagina 15.

Dit deel blijft het struikelblok, er zijn nog wat knopen door te hakken.

Mijn eigenlijke plan (idealiter) was om 5 verschillende efficiency scores te berekenen:

1. Efficiency in onderhoud
   Output: aantal woningen verbeterd of gerenoveerd, toename in kwaliteit van bezit
   Input: kosten aan onderhoud en verbeteringen

   Onderdeel 1 leidt tot vreemde uitkomsten. Erg lage scores. Dat is ook weer niet zo heel vreemd, aangezien je amper rekening kunt houden met de grootte van het onderhoud. Er is alleen onderscheid tussen verbeteringen van minder en meer dan 20.000 euro. Een goede output ontbreekt dus.

2. Efficiency in Bouwen:
   Output: Aantal woningen gebouwd, bedrijfswaarde van die woningen
   Input: Grondkosten, bouwkosten woningen

   Onderdeel 2 is goed te doen en lijkt me ook het belangrijkste. (Wel alleen data voor 2007-2010).

3. Efficiency in slopen:
   Output: Aantal gesloopte woningen
   Input: Sloopkosten
   Evt correctie voor locatie (OAD, slechte bodem)

   Onderdeel 3 is alleen maar te doen in combinatie met onderdeel 2. Sloopkosten bevatten ook kosten voor bouwrijp maken e.d. zodat je onderdeel 2 en 3 moeilijk uit elkaar kunt trekken.

4. Efficiency in kopen
   Output: Aantal gekochte woningen, bedrijfswaarde van die woningen
   Input: Prijs waarvoor woning gekocht is (*evt. gecorrigeerd voor locatie*)

   Onderdeel 4 leidt ook tot zeer lage efficiency scores (gemiddeld 0.10!!!). Wellicht komt dit door een paar extreme outliers in de data. Er hoeft maar 1 corpo te zijn die heel lage kosten maakt (of de kosten toeschrijft naar een ander jaar).

5. Efficiency in verkopen
   Output: Aantal verkochte woningen, Prijs verkochte woningen
   Input: verkoopkosten
   Evt. correctie voor locatie

Onderdeel 5, idem aan onderdeel 4.

Conclusie: onderdelen 1, 4, en 5 zijn niet goed uit te voeren. Merk ook op dat het deels de volgende oorzaak heeft. Als je slechts 1 input hebt, maar wel een hele grote dataset (ca400 Dmu's), krijg je over het algemeen erg lage efficiency scores. Dit komt omdat er in een lijst van 400 DMU's altijd wel eentje is met een heel lage input. Dit is een zogenaamde outlier. Zo zijn er corporaties bij die nauwelijks sloopkosten hebben, maar wel een redelijk aantal woningen slopen. Zo een corporatie is dan de benchmark voor de rest. Dwz, de rest wordt altijd verslagen door deze corporatie. Het kan zijn dat die data gewoonweg fout is, of dat de input in een ander jaar als kostenpost verantwoord is. Hoe dan ook verstoort dit de uitkomsten.

Je hebt methodes om met DEA outliers te vinden, maar dit is geen routinewerk wat je zomaar even voor veel modellen doet. Je moet steeds opnieuw de DEA analyse uitvoeren. Bovendien heb ik hierbij weer een ander programma nodig. Ik vermoed dat het wel kan met een programma dat we al hebben overigens.

Kortom, als er tijd is, is het bouwverhaal iets wat nog wat uitgebreider aandacht verdient. Voorlopig kom ik niet veel verder dan modellen ia,ib,ic en het model ii, voor bouwen en slopen.

Maar, mocht iemand van jullie denken dat efficiency in (1) onderhoud, (4) inkoop, (5) verkoop wel degelijk is in te passen, wellicht met iets andere input/output maatstaven, dan hoor ik het graag.

X References

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