The Effects of Subsidized Housing on the Property Values of Neighbourhoods within its Vicinity

by

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1. INTRODUCTION

1.1 Purpose of the Study

South Africa is plagued with high levels of unemployment and poverty, with a poverty head count of 8.0% (Statistics South Africa, 2014) and an unemployment rate of 26.5% (Statistics South Africa, 2016). This directly causes a need for housing within the country. Many households are not able to afford the houses that the market provides due to a lack of income and high levels of debt. There is also a limited supply of houses for the low income market (Western Cape Department of Human Settlements, 2017). This has created the need for state intervention.

Government aims to address the housing need of the poor through the provision of houses at no cost, the provision of plots with municipal services, the provision of low cost rentals and the provision of affordable housing. Unfortunately, these housing developments were initially placed on the urban periphery where they had a lack of access to economic opportunities and social services (Department of Human Settlements, 2009). The Government has thus implemented the Housing Code of 2009, which aims to integrate low income households into more affluent areas, in order to provide these households with greater access to economic and social opportunities. In some cases however, this had the unintended consequence of "not in my backyard" (NIMBY) reactions within the host communities.

NIMBY is a phrase used to express opposition towards subsidized housing developments (Bratt, 2015). NIMBY's are concerned with the potential negative effects that subsidized housing developments can have on their communities. These include the possibility of an increase in crime, poverty, traffic, noise, over-crowded schools and as the focus of this paper, a decline in property values (Obrinsky and Stein 2007; Bratt 2016; Fischel 2000; Nguyen 2005). These concerns are however often based on perception, as opposed to factual evidence to this effect.

The purpose of this study is therefore to determine if subsidized housing developments truly have a negative impact on the property values of neighbourhoods within its vicinity. The focus of the study will be on Residential Development Programme (RDP) housing and Social Housing i.e. rentals, largely because these programmes have garnered the most opposition and media attention. If the results show that a negative impact exists, this may alert the State to develop policies, plans and designs to mitigate these negative impacts. If

the results are positive or shown to have no effect then it may appease host communities to allow these much needed subsidized housing developments within their communities.

Previous studies on the topic have found mixed-results (Nguyen, 2005). These studies are however largely conducted within the US. There is a paucity of studies on the topic within South Africa (Du Preez and Sale, 2013). One such study on a proposed social housing development within the Eastern Cape was conducted by authors Du Preez and Sale (2013). The results were negative. It should however be noted that a proxy community was used as opposed to an actual housing development, as the paper aimed to determine what the effect of the proposed social housing development could be. The USA has very different housing programmes and social circumstances, which cannot be generalised to apply in South Africa. Similarly the proxy analysis completed within the Eastern Cape cannot necessarily be generalised to other provinces and results may also vary if an actual social housing development is used. It is therefore still necessary to determine what the results would be within the South Africa context, when actual housing developments are applied within the analysis.

1.2 Research Questions

The study will attempt to answer the following questions:

a) What is the impact of RDP housing developments on the property values of neighbourhoods within its proximity?
b) What is the impact of Social Housing developments on the property values of neighbourhoods within its vicinity?

1.3 Research Methodology

This study will make use of quantitative methods to determine the impact of subsidized housing developments on the property values of neighbouring houses. This is largely so that the results can be objective and unhindered by the perceptions or opinions creating the NIMBY fears. A case study of representative subsidized housing developments will be used in the analysis. The Heideveld Infill RDP housing project will be used as a representation of the RDP housing developments whilst the Belhar Gardens will be used as a representation of a social housing development.

The housing sales prices and characteristics of houses in close proximity to the developments were obtained from the City of Cape Town and runs from the year 2010 to 2017. Data on neighbourhoods with similar house price trends, but which are unaffected by RDP or social housing developments were also obtained from the City of Cape Town in order to do a comparative impact analysis. The impact analysis will make use of the

Difference-in-Difference (DD) method. The DD method "estimates the counterfactual for the change in outcome for the treatment group by calculating the change in outcome for the comparison group. This method allows one to take into account any differences between the treatment and comparison groups that are constant over time" (Gertler et al., 2010). Heideveld and Belhar would be the treatment group, whilst Steenberg and Ravensmead would be the corresponding comparison groups. The results will provide insight into the potential effects of different housing programmes on the prices of properties in neighbouring areas.

1.4 Organisation of the Study

This chapter introduces the topic and explains the need for the study as well as the research methods that will be employed to answer the research questions. Chapter 2 provides a context for the study, outlining the housing need, housing policy, location selection and impact of subsidized housing developments within South Africa. Chapter 3 provides a literature review of previous studies on the topic. Chapter 4 outlines the research methodology, whilst Chapter 5 displays the results and findings of the analysis. Chapter 6 concludes with a summary of the study, its findings and recommendations.

2. SUBSIDIZED HOUSING IN THE SOUTH AFRICAN CONTEXT

This chapter focuses on subsidized housing within the South African context, with special reference to the Western Cape Province, which will be used in the analysis to come. Firstly, the need for adequate housing will be discussed, followed by a review of the housing policies of South Africa implemented to address this need. The concept of NIMBYism will then be discussed, with further elaboration on NIMBYism within the South African context. Finally, the results from one of the only studies on a subsidized housing developments' effect on the property values of houses within its vicinity conducted within South Africa will then be displayed.

2.1 The Housing Need

One of the greatest challenges that households have in obtaining adequate housing, is a lack of income to do so. South Africa is plagued with high levels of poverty and unemployment, and the same is true for the Western Cape. Table 1 displays the segmentation of households within the Western Cape per income range, during 2011.

Note that over 50% of households within the Western Cape earn less than R3 500 per month. These households may struggle to obtain mortgage loans from banks in order to purchase a home. Fortunately, this group of households can be fully subsidized by the Government, although the high demand for subsidized housing creates a backlog of approximately 550 000 units in the Western Cape.

Around 28.7% of households earn between R3 501 and R15 000 and can be classified as the gap market. They are referred to as the gap market, because they do not qualify for full housing subsidies from the Government, but also often earn too little to obtain mortgage loans. These households are assisted by the Government, by means of low cost rental accommodation and mortgage linked subsidies, where a portion of the mortgage loan is paid off by the State.

Table 1: Segmentation of Western Cape households into broad markets, 2011

Market segment	Income range	Number of households	Share of market (%)
Subsidy market	R0-R3 500	881 896	50.9
Gap market	R3 501-R15 000	497 843	28.7
Lower gap	R3 501 – R7 500	283 719	16.4
Middle gap	R7 501 – R11 500	137 125	7.9
Upper gap	R11 501 – R15 000	76 999	4.4
Open market	R15 001 and above	352 534	20.4

Source: Western Cape Department of Human Settlement, 2017

Finally, the households receiving more than R15 000 form only 20.4% of the market. These households generally have greater ease of access to mortgage loans for the purchase of adequate housing.

Table 2 highlights the proportion of households within each income segment that fall within different housing market segments. According to the Western Cape Department of Human Settlements (WCDHS), 44.6% of households in the Western Cape earning less than R3500 own their homes. Note that over 300 000 houses have been provided through housing subsidies within the Western Cape, thus many of those earning less than R3 501 may have obtained their homes this way.

Within the gap market however, only 54.2% of households own houses, expressing the need for Government to play a role in the gap market as well. Lastly, 69.4% of households earning more than R15 000 own their homes.

Table 2: Households by Tenure Status and Housing Market Segment in the Western Cape

	Subsidy market (R0-R3500)	Gap market (R3501-R15000)	Open market (More than R15000)	Total
Other	39 671	13 353	3 597	**56 621**
Occupied rent-free	189 245	51 698	7 746	**248 689**
Rented	230 659	150 168	91 103	**471 930**
Owned but not yet paid off	66 725	77 794	135 893	**280 412**
Owned and fully paid off	302 551	177 637	96 199	**576 387**
Total	**828 851**	**470 650**	**334 538**	**1 634 039**
Households by tenure status as a percentage share of the total number households in the Western Cape				
Other	2.4%	0.8%	0.2%	**3.5%**
Occupied rent-free	11.6%	3.2%	0.5%	**15.2%**
Rented	14.1%	9.2%	5.6%	**28.9%**
Owned but not yet paid off	4.1%	4.8%	8.3%	**17.2%**

Owned and fully paid off	18.5%	10.9%	5.9%	**35.3%**
Total	**50.7%**	**28.8%**	**20.5%**	**100.0%**
Households by tenure status as a percentage share of housing market segment in the Western Cape				
Other	4.8%	2.8%	1.1%	**3.5%**
Occupied rent-free	22.8%	11.0%	2.3%	**15.2%**
Rented	27.8%	31.9%	27.2%	**28.9%**
Owned but not yet paid off	8.1%	16.5%	40.6%	**17.2%**
Owned and fully paid off	36.5%	37.7%	28.8%	**35.3%**
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: WCDHS, 2017

The need for housing in the Western Cape is further expressed in that 11.1% of households live in informal settlements, 6.1% of households live in backyard shacks, and 5.4% of households live in overcrowded[1] homes (WCDHS, 2017).

There are a number of reasons why households within the subsidized and gap markets struggle to obtain houses. Some of these include the following:

Household Indebtedness

The WCDHS (2017) noted that household indebtedness affects the demand for housing in two ways. Firstly non-housing debt repayments squeeze the monthly budget leaving little funds for housing debt repayments. Secondly, a poor credit record makes the household an unattractive option during their application for a mortgage loan. Both of these factors have a negative impact on a household's ability to purchase a home.

According to Eighty20 (2015), 53% of persons within South Africa earning between R3 500 and R10 000 spend 25% of their income on debt repayments and 21% of these individuals spend 75% of their income on debt repayments. Approximately 45% of households earning between R10 000 and R15 000 spend 25% of their income on debt repayments, while 12% of these individuals spend more than 75% on debt repayments. This is an indication of the high levels of indebtedness within the country, which creates further constraints for households to acquire adequate accommodation.

Availability of "Affordable" Homes

The WCDHS (2017) attempted to calculate what house price the gap market households can afford. This is reflected in the Table 3. The table suggests that households earning between R3 500 and R15 000 can obtain a mortgage between R77 015 and R330 065. Property within

[1]A calculated figure based on the standard that a level of more than two people per room (as measured in the 2011 Census) constitutes overcrowding (WCDHS, 2017).

the Western Cape, especially within the City of Cape Town is relatively expensive, leaving few available or desirable homes (outside of Government subsidized properties) for purchase. This leaves even lower prospects for mortgage loans for households earning less than R3 500 per month.

According to the WCDHS (2017) there were around 407 000 units within the Western Cape that costed below R300 000 in 2014. A large proportion of these housing units are Government subsidized homes that are currently occupied by households earning less than R3500. According to the 2011 Census there was however 496 450 gap households and 894 000 subsidy households who would be able to afford this few 407 000 units. This indicates that the market for affordable housing is currently undersupplied within the Western Cape.

Table 3: Gap Market House Price Affordability

Parameters	**Value**
Prime interest rate	10.50%[2]
Risk premium for the gap market applied by Financial Institutions/Banks	2%[3]
Total interest rate	12.50%
Period of loan or mortgage	240 months (20 year)
Maximum share of income dedicated to housing	25%[4]
Affordable loan to lower gap market (from R3 500 – R7 000 monthly income) (without household debt)	**R77 015 – R154 030**
Affordable loan to middle gap market (from R7 000 – R11 500 monthly income) (without household debt)	**R154 030 – R253 050**
Affordable loan to upper gap market (from R11 500 - R15 000 monthly income) (without household debt)	**R253 050 - R330 065**

Source: WCDHS, 2017

The discussion above creates a strong case for the need for Government to assist low-income households to obtain housing, as the demand is not adequately addressed by the private market.

2.2 Housing Policy

The backbone of housing policy in South Africa is the 1996 Constitution section 26, which indicates that:

[2]Prime interest rate at the time of writing, September 2016.

[3] Illana Melzer, Eighty20 Consulting, personal communication, February 2016.

[4] Western Cape Department of Human Settlements. (2013). Policy for managing the disposal of immovable property. The international affordability threshold benchmark for monthly household expenditure is between 25% and 30%. The lower end of the spectrum has been used because many observers feel the threshold is too high for lower gap households in South Africa.

> *"Everyone has the right to have access to adequate housing. The state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of this right."*

Considering the need as discussed in section 2.1 and the responsibility of the State as stated in the Constitution, the Government has implemented a number of housing programmes. These programmes cater to both gap and subsidy market income segments, i.e. households earning R15 000 or less.

Section 26 of the Constitution gave rise to the Housing Act 107 of 1997 which is currently being amended. Section 4.3.1 of the Housing Act indicates that "Housing developments should occur in an integrated manner that creates socially and economically viable communities; and individuals and communities affected by housing development should be meaningfully consulted". These two points have implications for housing developments in the context of this paper. The integration of poor households into socially and economically viable communities is a pre-requisite for housing developments. This means that housing developments should occur in areas which are closer in proximity to job opportunities and services. In some cases, this constitutes that housing developments be built in more affluent areas. This could create NIMBY attitudes among the households of the host community. Furthermore, it is the responsibility of the State to have public participation sessions with these households, as they will be affected by the housing development. This gives these households the opportunity to voice their concerns over the housing development planned within their proximity. In some cases, the opposition was so strong that the projects never came into fruition (Du Preez & Sale, 2013). Considering the housing need as discussed above, NIMBYism could add to Governments constraints in providing the much-needed housing opportunities.

The Act gave rise to a number of other Acts, which aim to further regulate the housing environment. These include the Rental Housing Act No. 50 of 1999, the Social Housing Act No. 16 of 2008, the Prevention of Illegal Evictions and Unlawful Occupation of Land Act No. 19 of 1998 and the Spatial Planning and Land Use Development Act No. 16 of 2013.

It also gave rise to the National Housing Code, which outlines the housing programmes utilised by the South African Government and is outlined in section 2.2.1. The National Housing Code also covers the technical and general guidelines by which the structures should be built. These will not be covered in this paper.

2.2.1 Housing Subsidy Programmes

The following subsidized programmes are those that consist of physical structures and are set out within the Housing Code of 2009. The Housing Code is currently under revision by the National Department of Human Settlements (NDHS), but the existing programmes with the existing structures will be analysed to determine their effects on property values within nearby areas.

The following programmes were all introduced to provide poor households with access to adequate housing. For each of the programmes a description will be provided as well as an indication of the eligibility criteria.

- **Integrated Residential Development Programme**

  The Integrated Residential Development Programme (IRDP) aims to stop low-income settlements from being built on the urban periphery with limited provision of social and economic amenities, such as what occurred within the Apartheid era and continued thereafter. This programme was therefore introduced "to facilitate the development of integrated human settlements in well-located areas that provide convenient access to urban amenities, including places of employment". The IRDP provides for land acquisition, serviced stands for residential as well as other uses such as clinics, schools and commercial properties, and finally the construction of housing for low-income qualifying households (often called RDP or Breaking New Ground (BNG) housing) and sale of stands to non-qualifying households.

  The IRDP subsidy is announced annually by the Director-General of the NDHS. In 2015/16 it remained at a value of R160 573 per unit (Sisulu, 2015) and is provided at no cost to the qualifying households. According to Minister Sisulu (2015) MINMEC has noted that the subsidy quantum will have to remain constant for a while despite inflationary pressures within the housing sector. More efficient building techniques and materials would have to be introduced instead. Developers have however expressed their concern with this. The stationary subsidy quantum has forced some developers to build Nu Tec instead of brick homes. The subsidy recipients have expressed their aversion against this, as their houses are of lower quality than previous subsidy recipients houses are. There are cases where additional funds can be provided to the developer. An example of this is the density allowance provided by the WCDHS, which caters for the building of multi-story IRDP homes where a case for high density sites are made.

  IRDP housing should have a minimum gross area of 40 square meters and have two bedrooms; a separate bathroom with toilet, wash basin and shower; a combined living

area and kitchen with basin; as well as a ready board electrical installation where electricity supply in the area is available. This is therefore a standard home. IRDP houses have been looked down upon for previous cases of low quality houses built that are less aesthetically appealing. Houses are also often built densely with small erf sizes within urban areas, creating a sense of crowding within the areas.

In order to qualify for an IRDP subsidy the applicant needs to have a monthly income of R0-R3500; if single, have financial dependents; and if the applicant has no dependents, must be elderly, disabled or a military veteran. Considering the low income of qualifiers, the IRDP is sometimes perceived to house impoverished persons that make undesirable neighbours.

- **Social Housing Programme**

  The Social Housing Programme (SHP) aims at providing affordable rental units in areas where bulk infrastructure such as sanitation, water and transport may be under-utilised, thus providing urban efficiency. Once again the SHP is provided in areas of economic activity and where urban renewal can be achieved. The affordable rental units also provide security of tenure to households, which prefer the mobility that rental units provide. The units are offered to households who have a household income of no more than R7500.

  The SHP provides grant funding to Social Housing Institutions to develop, hold and administer affordable rental units within restructuring zones. The Social Housing Institutions need to be accredited and be able to access funding from other sources for their respective capital contribution in order to be eligible for the SHP grant.

  The SHP developments are often of higher quality, have landscaping and are aesthetically appealing. Nevertheless they still experience NIMBY attitudes from the host communities.

- **Institutional Housing**

  Much like the SHP this programme also aims to provide affordable rental units with security of tenure to the tenant through the provision of a capital grant to the Social Housing Institution. The difference is that the Institutional Housing Programme (IHP) provides units in areas that are not restructuring zones or areas that are easily accessible to economic opportunities. There was however a need to include rental accommodation in other areas as well, where members of the community are renting in backyards or living in informal settlements. The programme allows for units to be sold to the tenant by the Social Housing Institution after 4 years have lapsed, giving households the opportunity of ownership. This is beneficial as Government rental residents often rent

their units for decades, seldom moving. In order to qualify for an affordable rental unit in an IHP the resident also needs a maximum joint monthly income of R7500.

- **Community Residential Units**

  The SHP and IHP do not provide rental accommodation to the very poor because of the high cost of high level units and the resultant high rental cost. For this reason the Community Residential Units (CRU) programme was developed. The CRU programme provides stable secure rental tenure for low-income households. It makes provision for tenants earning between R800 and R3500. The rentals provided are public hostels that are owned by Provincial Departments or Municipalities. The programme also provides for the management and rehabilitation of existing public sector rental accommodation.

  Existing CRU's suffer similar negative perceptions as in the case of the IRDP. The developments sometimes consist of overcrowded units, experiencing high levels of poverty and crime. Government makes little in rental income as tenants fail to pay their rent on a regular basis. Government is not a land lord in its core function, making it experience difficulty to manage the CRU's.

- **Individual Subsidy Programme**

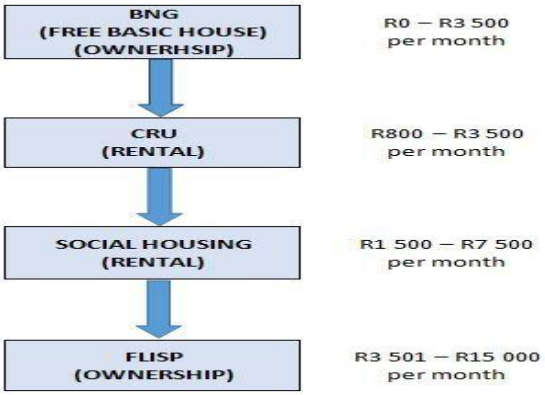
  The Individual Subsidy Programme involves the provision of state assistance to qualifying households in order to purchase plots or houses, linked to a housing contract or mortgage loan. These could be houses or plots on the normal secondary housing market, or houses that have been developed outside of national housing programmes. The programme encourages the growth of the secondary housing market, which is one of the objectives of the Department within the Comprehensive Plan for the Creation of Sustainable Human Settlements.

  The Finance-Linked Individual Subsidy Programmes (FLISP) is used for the purchasing of houses within affordable "gap" housing developments not provided within the national housing programmes. The FLISP is provided to households who are able to afford a mortgage loan. The subsidy is linked to a mortgage loan, which is provided by a financial institution. The qualifying beneficiary will receive a subsidy of between R20 000 and R87 000 based on a sliding scale for the level of income. Qualifying applicants receive an income of between R3 501 and R15 000 per month.

  Gap housing developments are generally new developments, consisting of relatively small, yet quality homes. Gap market housing often experiences less NIMBYism, due to the relatively higher earnings of residents and the decent appearance of the units.

Figure 1 displays the income bands for the different housing programmes as discussed above.

Figure 1: Housing Programmes in South Africa



Source: del Monte, 2016

2.2.2 Land Release for Subsidized Housing Projects

The decision of what to do with land depends on the relative costs and benefits of the different options of use for the parcel of land. Options include using the land for an IRDP, social housing or affordable housing project, holding the land or selling it at a market rate to a developer (Botha et al., 2010).

A discussion with Matthew Jason (2017), Senior Property Inspector at the WCDHS indicated that land selection is done through policy analysis. An analysis of the Spatial Development Framework of the Municipality and the District Plan determines the type of housing that can be developed in various areas; the future development patterns; and what kind of development is needed for growth in the area.

General town planning principles are also considered in the assessment of the land by looking at the natural and physical elements that can affect the proposed site. This assessment will inform the Department or Municipality if there are any environmental constraints subject to the site.

Furthermore, in accordance with the Housing Code of 2009, the amenities within the proposed area for the housing development are taken into consideration. It has to be determined if important amenities are within a 2km radius of the proposed site. These amenities include schools, churches, shopping centres, public transport systems, main, national and regional roads, health care, police stations, as well as job opportunities. The housing need within the area is also determined i.e. whether there is a need for low income, higher income, or social housing. Lastly, the size of the land is an important factor for consideration. For example, one hector allows for only 80 housing units. Any piece of land smaller than this would therefore not be suitable for a housing development.

The use of the land is subject to a public participation process. If there is opposition to the use of the land for a subsidized housing development, the validity of the claims are analysed. NIMBY claims cannot be considered as valid. The project will therefore most likely proceed. It is only in cases where environmental destruction or heritage destruction is possible, that a project will be discontinued. The other possibility of a project being discontinued occurs where a private development such as a shopping mall is in competition with a public service such as a housing development or hospital. The decision of whether or not to proceed with the project will be based on priority and need within the surrounding area.

2.3 NIMBYism Defined

NIMBY is a phrase often used to express opposition to the development of low-income housing (Bratt, 2015). According to Fischel (2000), however NIMBYism does not only refer to opposition against subsidized housing, but extends to other forms of land use and developments as well. It creates a problem for land use regulation and delays the implementation of land use developments in the immediate area of NIMBY's. These include residential developments, industrial development and the placement of necessities such as landfills and power plants. For the purpose of this paper, NIMBYism with respect to subsidized housing will be the focus.

Proponents of subsidized housing include non-profit advocacy groups as well as an increasing number of local governments. These local governments see the negative effects of a concentration of poverty and the opportunities missed by the poor. Integration into higher income communities would thus be beneficial for these households (Braun and Duffley, 2009). NIMBY's, or opponents to subsidized housing developments can take the form of local politicians, planning and zoning officials, proximate neighbours or the general public (Obrinsky and Stein, 2007). Their behaviour is often based on underlying negative attitudes, which lead to action. These actions can be anything from private calls to local officials, voicing opinions at public hearings, contacting the media, protesting or picketing against the proposed site. Local officials may also display NIMBY behaviour when denying applications for building permits even though jurisdiction allows such developments. Laws and policies may also create difficulties for subsidized housing projects to come into fruition (Obrinsky and Stein, 2007).

NIMBY's often express concerns with the likelihood of negative impacts of subsidized housing on their communities. The negative impacts include increases in traffic, overcrowded schools, increases in crime resultant from a concentration of poverty, lower government revenues from property rates, greater burden on public infrastructure, environmental degradation, change of neighbourhood character and as the focus of this

paper, the possibility of a decline in property values (Obrinsky and Stein 2007; Bratt 2016; Fischel 2000; Nguyen 2005). These concerns are often based on a perception of the impact of the low income housing on their areas, as opposed to factual evidence to this effect. Bratt (2016) indicated that proponents of subsidized housing developments criticize NIMBYism as a mask for underlying racial bias.

NIMBY's may appear irrational as they sometimes express far-fetched anxieties and stubbornly fight projects where the effect on the neighbourhood is expected to be small. Fischel (2000) is however of the opinion that NIMBYism might not be as irrational as proponents believe. NIMBY's are usually homeowners. Their homes are often their highest valued asset. These homeowners can be insured against the risk of fires, adverse weather conditions, theft and so forth, but they cannot be insured against the risk of a decline in the values of their properties due to new developments in their immediate area. This uninsured risk may be what is causing their opposition. Fischel (2000) suggests that NIMBYism might better be viewed as a risk-averse strategy. Possibly insuring NIMBY's against this currently uninsured risk of property value decline may open them to subsidized housing developments in their proximity (Fischel, 2000).

Obrinsky and Stein (2007) is however of the opinion that NIMBYism stems from a lack of information, inaccurate perceptions, or unfounded fears of the negative impact of projects. Misperceptions of the project can occur in terms of the type of housing project or the perceived quality of houses built by the developer. Misperceptions can also occur in terms of the residents that will be occupying the subsidized housing. Nguyen (2005) also brought up this point, as NIMBY's were concerned with the entrance of ''undesirables" into the neighbourhood. Stereotypes of the kind of people that will be taking occupancy may already be established. These stereotypes include that these low-income residents are lazy and irresponsible (explaining why they are poor), and engage in crime, graffiti, ill-maintenance of property and loud parties (Obrinsky and Stein, 2007). All of which are believed to diminish the quality of the community and property values alike.

NIMBYism is also present in South Africa. After an analysis of the socio-economic context of the country, the Comprehensive Plan for Sustainable Human Settlement was drawn up in 2004. This plan shifted the focus to "improving the quality of housing and housing environments by *integrating* communities and settlements'' (NDHS, 2009). This integration is what is bringing about NIMBYism within the more affluent communities. Nevertheless, irrespective of the reason why NIMBY's exist, they do pose a problem for the development of subsidized housing, which is highly necessary considering the large portion of low-income households in the country who cannot otherwise afford housing. NIMBYism further

exacerbates social, racial and housing inequalities and is of concern for policy makers and planners who see the benefits of integration (Woo et al., 2015).

2.4 NIMBYism and Subsidized Housing Development Effects in the South African Context

There are cases in which South Africans have expressed opposition against subsidized housing developments taking place in their vicinity. Williams (2014) made mention of the Summer Greens mega housing project which was to take place within the Nelson Mandela Bay Metropolitan Municipality. This project was to consist of affordable housing (FLISP), social housing and IRDP housing and significantly cut down the housing backlog in the City. Unfortunately, this project was met with opposition from the surrounding affluent areas. Lindile Petuna, the Executive Director at the DHS, presented a report on the 6 priority projects running to 2019 and said,

> *"I'm sure the location of the projects will be a sore point which people will object to, but we need to integrate communities – it's government's policy. Of course, we need to be sensitive about it because some people say that their property values will go down. But we're saying we have not seen that building RDP and social houses has dropped the values of property." (Williams, 2014)*

Some of the comments posted online are reflected in the text box below.

Charles Lumley

December 1, 2014 at 10:23 am

It's not about WHITE or BLACK!!!It is nothing to do with RACE! Many of the people in Summerstrand who have worked hard to save up for a house ARE Black or Coloured or Indian! Why should you save and do without to buy a nice home only to have it devalued by building cheap R.D.P. houses nearby? Everywhere in the world without exception in EVERY country the poor live in certain areas and the rich live in other areas! I notice that they NEVER want to build where A.N.C. politicians live in their mansions?

Claire

December 1, 2014 at 9:07 am

Integration of social economic groups is important, but not at the expense of the people in those groups. If the poor have to struggle harder to reach resources, it has failed, if the wealthy move away from the city because their property has devalued and their tranquility vanished – it has failed. Wealthy people, no matter what colour, do not want to have RDP houses on their doorstep. They create quiet, green, manicured areas where they can escape the chaos of their work and find tranquility, Poor areas with resident of any colour,

nationality or creed are usually bustling, busy, noisy areas of high energy – the complete opposite. Tranquil areas cannot survive next to high energy, noisy areas.

Zuku

November 29, 2014 at 4:58 pm

They are right. Prices will not go down. The problem is that the houses will never be sold because no one wants to buy and stays next to low cost housing. Another government plan that can and never will work. Put your low cost housing next to RDP house and try and uplift that community.

Source: Williams, 2014

The Western Cape also experiences its own share of opposition. These occur in the form of protests. Examples are the protest against the Belhar Gardens social housing project, or the proposed Sea Point Tafelberg site project, or the proposed Rosebank project. Opposition is also apparent at public participation process gatherings and there have been instances in which households move out of their areas once they become aware of an RDP housing projects being planned for their community. In a response against the opposition against the Tafelberg site, a proponent said that if the residents of Sea Point are willing to trust poor people to work in their homes as domestic workers or gardeners, why are they not willing to allow these poor people to live in their areas as well (Carte Blanch, 2017)?

The different projects and even phases experience different kinds of NIMBY attitudes. There are instances of RDP house recipients expressing NIMBY attitudes towards serviced sites being built in their areas. Serviced sites are plots, which come with sanitation and water services. The plots are provided to persons earning between R3500 and R7000, on which they are able to build a house at their own cost. The RDP house recipients therefore express NIMBY attitudes towards the service site recipients (even though these households earn more) because they are afraid that the service site recipients will build homes that are unattractive or of bad quality.

On the other hand, houses that are in close proximity to an informal settlement may have a positive attitude towards the Upgrading of Informal Settlement Programme, in which Phase 4 consists of the building of houses. If the informal settlement now consists of houses instead of shacks, it may instead have a positive effect on house prices.

Furthermore, there may be heavy opposition to the first phase of a project within an area, but once households have become used to the presence of a subsidized housing development within their proximity, they may be more open to further subsidized housing developments being implemented in their community. This was the case in Delft. The first houses consisted of mortgaged homes within the Voorbrug area. Since then there have been

multiple projects implemented within Delft and in close proximity to the Voorbrug area. While the Voorbrug households at first complained about the subsidized houses, their opposition has started to dwindle over time. The Delft community has also gained access to many services and facilities, most likely as a result of the exponential growth of the population. They have received recreational pools, a police station, clinics, additional schools, additional libraries, shops, and soon a shopping centre, which is currently under construction. These facilities seem to be having a positive impact on property prices, despite the negative impact that the subsidized housing developments may have had.

The greatest concern however is the lack of integration. Where Government has attempted to create subsidized housing developments within areas of greater economic opportunity i.e. usually more affluent areas, they have experienced opposition. It is thus important to determine the actual impact of subsidized housing projects on property values, among other factors.

Du Preez and Sale (2013) are one of few authors whom attempted to address this issue and analyse the impact of subsidized housing on house prices within South Africa. The authors employed a left hand Box-Cox hedonic pricing model to determine the effect of a social housing project on nearby housing prices. They did this by considering the prices of 170 single-family homes in the Walmer township of Nelson Mandela Bay Metropolitan Municipality, as a function of their proximity to a low cost housing development. The authors conducted interviews with the home-owners in order to obtain the characteristics of the houses and the distances were determined by means of Google Maps. The Walmer Township is a normal private development but was used as a proxy for a social housing development due to its similar characteristics.

Results from the model suggest that the distance from the Walmer Township is priced at R234.49 per meter holding all other variables constant. The authors also included a dummy variable for houses located within the impact area. This allowed the authors to estimate that the average household would be willing to pay between R10 092 and R48 459 to move 200m further away from the social housing development. Overall it was concluded that a social housing development would indeed have a negative impact on the property values of houses within its vicinity.

Firstly, it is cautioned that these results cannot be generalised to other areas within South Africa. Secondly, it should be noted that the Walmer Township contains informal dwellings, which could skew the results. Thirdly, a relatively small dataset was used. Fourthly, the study does not contain a pre and post analysis. The Walmer Township could for example have emerged in an area close to houses that were already relatively low-priced. This is

generally what we would expect. We can therefore not attribute the price difference based on distance as reflecting the effect of the Walmer Township alone. To do this we need a pre-post analysis, which will be attempted within this paper. Finally, the use of a proxy area in the analysis may not be a valid comparison. This paper will therefore use actual subsidized housing developments to estimate the effects. In light of the issues presented above, there is still room for analysing the impacts of subsidized housing developments on property prices within South Africa.

3. LITERATURE REVIEW

This section reviews previous papers regarding the impact of affordable housing on property values. Firstly, the determinants of house prices are reviewed to determine if external factors such as subsidized housing affect house prices. Secondly, the chapter outlines what the term affordable housing means within literature, before finally analysing the impacts of affordable housing on the property values of nearby areas. This will provide a greater understanding of the possible impact that the South African Governmental subsidized housing programmes may have on the property values of nearby areas, the methods that may be employed to estimate these impacts as well as the gaps in the literature, which can be addressed within this paper.

3.1 The Determinants of House Prices

This section analyses the determinants of house prices in an effort to determine all the characteristics of a house which has an impact on its price, as well as to determine the methods in which these can be analysed. This is relevant in this study's attempt to assess whether house prices have changed in response to the shock of the building of the house.

Literature suggests that the price of real estate is largely determined by the characteristics thereof. These can be characteristics internal to the house, as well as external factors. The characteristics can have either a positive impact on the price of the house or a negative impact.

Jiang et al. (2014) makes note of the heterogeneity of houses. Houses have varying characteristics and differ by location, ownership, size, indoor and outdoor facilities. These differences result in differing prices across houses and areas and even period of time. The authors also suggest that the quality of houses changes over time, as materials, design, utilities and construction technologies are continuously improving. Older homes may deteriorate and therefore have some depreciating effect on the property value (Nagaraja et al. 2009; Jiang et al. 2014).

The price of a house or the value of the bundle of characteristics is only observable once the house is sold (Nagaraja et al., 2009). A number of studies have attempted to predict the price of a house or develop a housing price index [5]. Jiang et al. (2014) found that the literature is

[5] A summary of the housing market which can be used to monitor changes overtime (Nagaraja et al., 2009).

dominated by two methods i.e. the hedonic pricing method and the repeat sales method. According to the authors, the hedonic pricing method assumes that the price of a house is determined by a summation of the utility-bearing attributes thereof. A linear regression model is then employed to estimate the observed price of houses based on the characteristics of each house in the dataset, as well as their corresponding sales price. This method is however criticized as the characteristics employed in the model is limited to the availability of data (Jiang et al. 2014; Lisi & Iacobini 2013) and the fact that results can be different dependent on the characteristics which the researcher employs.

Unlike the hedonic pricing method which uses all sales data, the repeat sales method only uses houses sold in the market multiple times. Jiang et al. (2014) indicates that this method attempts to avoid the problem of heterogeneity by looking at the different sales prices of the same house. Because no characteristic variables are needed, this approach also avoids the difficulty of choosing hedonic variables. The authors stated that the repeat sales method is however criticized, because it only encompasses a small portion of sales in the market, which can create sample bias in the results. Nagaraja et al. (2009) highlighted the additional criticism that the model assumes that the characteristics of the houses remain the same with repeat sales. Houses in which the characteristics have changed are meant to be removed from the dataset, but it is often difficult to detect these changes. A changed dataset will also therefore not manage to be a true reflection of the change in house prices overtime if used in a housing price index. The repeat sales method may mostly be used within housing price indices, but it may also be useful to determine the change in the value of a house before and after the implementation of a subsidy housing development within its vicinity.

Lisi and Iacobini (2013) used the hedonic pricing method to estimate house prices. The dependent variable is the sales price and is used across studies and across the estimation models discussed below. According to Lisi and Iacobini (2013) the size of the property is a continuous regressor, but is combined with other ordered and unordered categorical variables. In addition to the lot size, other independent variables used in Lisi and Iacobini's study include the number of bedrooms, the number of bathrooms, the number of stories excluding the basement, the number of garages as well as whether the house has a driveway, recreational room, basement and central air conditioning. The authors also included a dummy variable for whether the house uses gas for hot water heating as well if it is located within a preferred neighbourhood of the city. The authors further found that this standard model does not account for price differentials between two houses with similar characteristics. They found that standard market (where a better good is sold for a better price) and non-standard markets (where the opposite is true) situations exist. They therefore created an extended model which includes that standard and non-standard market and found

that the extended hedonic pricing model better describes the price differentials, which cannot be attributed to the house characteristics.

Jiang et al. (2014), in their study instead uses a hybrid model, which employs both pricing models in order to create a real housing price index. The authors indicate that while the hedonic pricing method may have specification bias, and the repeat sales method may have sample selection bias, a hybrid of these two may have less sample and selection bias. Jiang et al. (2014) also covered an extended period from 1995 to 2014 of residential property prices in Singapore, which therefore covers periods of fluctuating market prices. The authors were thus able to pinpoint times of housing booms, more specifically Q4 2006 to Q1 2008. The authors found that specification bias has larger implications within the model than sample bias. Jiang et al. (2014), however only used the property type, location, and type of ownership as the property characteristics within their model, which may explain why specification bias exists. The authors conversely indicate that they had similar results when using more characteristics and for the purposes of the model decided to use only these three independent variables.

Nagaraja et al. (2009) made use of an autoregressive approach to house price modelling and utilized three housing characteristics in order to maintain simplicity within the model. These characteristics include the sales price, time of sale and the location of the property. The model was applied to data for the time period 1985 to 2004. The authors' model proved to have better predictive abilities as compared to the hedonic pricing and repeat sales pricing methods.

Peterson et al. (2006) applied an Artificial Neural Network (ANN) hedonic pricing model in order to estimate real house prices. The author believes that while hedonic pricing models are easier to use and therefore more popular by researchers, they also have greater pricing errors as opposed to the ANN which is a non-linear model. Peterson et al. (2006) suggests that the ANN has greater relative pricing precision. The author used the following housing characteristics in order to estimate the price of a house- the age of the property, the number of stories, heated area, the number of bathrooms and a dummy variable, which indicated the exterior composition of the property. This is highly similar to the variables employed by Lisi and Iacobini (2013) with the exception of exterior composition.

A number of the studies meant to estimate house prices exclude the use of external locational factors within their studies. There are however studies that were employed to determine the effect of locational factors. In addition to the traditional hedonic characteristics discussed above, these studies also looked at crime rates, the proximity to transport facilities, recreational parks and shopping centres to name a few. Another location

factor to be analysed within this paper has also been addressed by various authors, which is the proximity to subsidized housing.

Table 4 provides a summary of housing characteristics that are believed to have an effect on the price of a house. Note that the characteristics employed is not an exhaustive list as the variables used in the studies were highly dependent on what was available from the researchers' respective data sources.

Table 4: Determinants of house prices

Determinant	**Effect**
Lot size	Positive
House size	Positive
Number of bedrooms	Positive
Number of bathrooms	Positive
Number of stories	Positive
Pool	Positive
Number of garages	Positive
Driveway/Carport	Positive
Gas water heater	Positive
Air conditioning	Positive
Age of property	Negative
Exterior composition	Dependent on the material used
Time of sale	Dependant on the periods
Property type	Dependent on the property type
Ownership type	Dependent on the ownership type
Standard market situation	Positive
Location within a preferred neighbourhood	Positive
Proximity to subsidized housing	Mixed results
Crime rates	Negative

3.2 Affordable Housing

Affordable Housing means something different across different countries. It is therefore important to establish what is meant by the term affordable housing before looking at the empirical evidence of the effects of affordable housing on property values. Different types or definitions of affordable housing could have different effects within the studies, hence it is necessary to establish these differences before reviewing the empirical evidence.

The majority of the literature presented within this chapter consists of research conducted within the United States of America (US). The US definition of affordable housing will therefore be determined before discussing the definition within South Africa.

Within the US, affordable housing is defined by the Department of Housing and Urban Development (HUD) as a household that pays no more than 30% of its annual income on housing (Nguyen, 2005). This definition therefore refers to the economic ability of a household to afford housing. It is however not sufficient for the purposes of this study as it can refer to any household income bracket (even the rich), as long as the household cannot afford the house. Nguyen (2005) indicates that other terms such as *below-market* or *low-income* housing has been suggested as better alternatives to the term *affordable* housing. According to the author these two terms are also problematic, as the Section 8 government subsidized rental vouchers are not necessarily used for *below-market* properties, and the *low-income* markets suggests that once again an income cap would have to be introduced for what constitutes a low-income household and may also be as arbitrary as the 30% marker. These terms are however much more relevant within South Africa as each of the housing programmes cater for low income earners and caps are introduced for each programme.

The studies that are presented in section 3.3 nevertheless have different definitions as to what constitutes affordable housing, but each considers housing programmes which aim at making housing more affordable to households. The word *subsidized* housing will thus be more fitting across the studies.

The subsidized housing programmes in the US include units for which mortgage loans are offered at below market interest rates, rental vouchers, homeownership vouchers, below-market rental apartment blocks and government housing assistance to low-income older adults. The South African housing programmes however includes programmes where houses are provided for free to low income households, where apartments are rented at low cost and where grants are provided which can be used in the purchase of homes, among others.

All of these programmes are provided to assist low-income households to gain access to the housing market. These are however very different to the subsidized housing programmes within the US, especially that in which free houses are provided as the US does not provide property at absolutely no cost to the beneficiary. The results from the empirical findings of the US studies and other country studies can therefore not necessarily be considered applicable for the South African housing market as well.

3.3 Impact of Subsidized Housing on Neighbouring Property Values

Ellen (2007) in her study made reference to five effects that subsidized housing developments may have on the prices of nearby houses. These are discussed below:

Removal Effect

A subsidized housing development can have an effect on a neighbouring community due to what it removes from that community, as a result of its construction. It could remove dilapidated or boarded-up property, or a piece of vacant land where crime may have taken place, in which case the construction of the subsidized housing development may have a positive effect on nearby property values. In the case where the subsidized housing development replaces something desirable, such as a park or an attractive set of older buildings, then it could instead have a negative impact on property values of houses within its vicinity.

Physical Structure Effect

This effect proposes that the appearance of a constructed property has an effect on the property values of neighbouring houses. If the property is viewed as unattractive and not fitting in with the character of the existing community, then it will have a negative effect. On the other hand, if the subsidized development is well-designed, fits in with the existing community and is well managed, then it will have a positive effect on neighbouring property values.

Market Effects

Ellen (2007) indicated that developers sometimes avoid investing in blighted locations out of fear that their investments will not be profitable. This may indeed be the case if the subsidized housing caters only for low-income rentals, which could crowd out unsubsidized, private investment. It could however have a positive effect if market rate housing is also included within the units produced, which may signal to investors that it could attract additional investment.

Population Growth Effect

The construction of a subsidized or any housing development will result in an increase in the population size within the area. If it is within a relatively sparsely populated area then it could result in safer streets and bring in additional commercial activity. In this case it will have a positive effect on property values. In the case that it is built within a densely populated area, it could lead to traffic, overcrowded schools and strained local infrastructure and services. This may therefore have a depressing effect on the host neighbourhood's property values.

Population Mix Effect

This effect suggests that it is not only how many people move into an area that has an impact on property values, but also the characteristics of the people that move in. For example,

research has shown that as the black population increases in a community, it may encourage white flight among existing households. Where subsidized rentals are built, it could also result in a more stable community, because residents of subsidized rentals tend to live in their homes for longer.

Studies on the impact of subsidized housing on neighbouring property values are done in various ways. Earlier studies made use of test versus control community analysis and are often criticized for having design flaws, such as its inability to determine causality or distinguish between existing trends versus the effects of the subsidized housing development; and data flaws such as the small sample sizes used which limits one's ability to generalise the results (Nguyen, 2005). This ultimately diminishes the impact of their results and findings on NIMBY perceptions even if no negative effect is found. Table 5 displays the results of some of these studies as compiled by Nguyen (2005). These results were largely positive or no effect was found. A negative effect was observed in only two cases, namely for a below market interest rate development and a Section 236 development. A Section 236 development occurs where the HUD subsidizes the interest on a beneficiary's mortgage bond, and where a basic rent is set within the development to ensure the affordability of the units.

Table 5: Test versus Control Study Results

Author(s)	Year	Sample Size	Study Area	Program	Relationship with Property Values
Nourse	1963	3 sites	St. Louis, Missouri	Public housing	2 sites: None 1 site: (+)
Schafer	1972	132 units	Los Angeles, California	Below-market interest rate (BMIR)	None
DeSalvo	1974	62 housing projects	New York	Mitchell-Lama housing projects	(+)
Saunders and Woodford	1979	50-unit housing project	Jefferson County, Colorado	Section 236	None
Baird	1980	4 subsidized housing projects	Fairfax County, Virginia	50-unit public housing	(+)
				92 townhouse mixed-income complex	(+)
				37-unit subsidized apartment complex	(+)
				204-unit Section 236 development	(–)
Sedway and Associates	1983	4 affordable housing developments	Marin County, California	75-unit low-income rental development, owner-built affordable housing development, market rate with inclusionary units development, inclusionary rentals and below-market-rate condos	None
Warren, Aduddell, and Tatalovich	1983	4 subsidized housing sites	Chicago and Cook County, Chicago	Section 8, Section 23, Section 236, Section 221 (d)(3), and public housing	(+)
Babb, Pol, and Guy	1984	22 subsidized housing sites	Memphis, Tennessee	Section 8, Section 23, Section 236, Section 221 (d)(3), and public housing	None
Rabiega, Lin, and Robinson	1984	6 sites	Portland, Oregon	Public housing	(+)
Guy, Hysom, and Ruth	1985	4 sites	Fairfax County, Virginia	BMIR	(–)

Source: Nguyen, 2005

Studies conducted within the 21st Century however contained more sophisticated multiple regressions based on hedonic pricing models using large datasets in order to analyse the relationship between subsidized housing and property values (Nguyen, 2005). These studies determine the impact by controlling for a number of characteristics of the house or neighbourhood. After a review of the literature conducted by Nguyen, the author established that no definitive conclusions can be made regarding this new wave of studies as there appears to be a multitude of factors that determine the effect of subsidized housing on property values. These include the design and management of the development, its compatibility with the host neighbourhood and the concentration of thereof. Duffley and Braun (2009) in their review of the literature also did not get definitive results of the impact of subsidized housing and confirmed that the extent to which property values are affected ultimately depends on a variety of factors.

Galster et al. (1999) analysed the impact of Community Development Corporations (CDC) (non-profit organisations which aim to renovate low-income communities and provide homes) on urban areas. The authors did this by means of an econometric trend method to compare the price increase and price appreciation rates of the impact area, with that in other low income areas only. A database of all property sales data from 1989 to 1999 was used to do the analysis. The database contains the sales price, unit structural characteristics, address and sales date as well as neighbourhood characteristics. The econometric analysis is then used to determine the contribution of a unit's structural characteristics and neighbourhood amenities to the house price. A dummy variable is included in the regression which indicates whether a development took place before, after or during a CDC. A dummy variable was also included for if the unit is within, near to or part of a CDC intervention.

The authors also did a qualitative study in the form of interviews of CDC stakeholders. Five CDC developments were analysed in different cities. The CDC's appeared to have a positive effect on neighbouring property values with an increase in property values observed in all 5 cities. This was also mostly corroborated with the interview evidence.

In their analysis of mixed income, multi-family rentals impact on surrounding neighbourhoods' property values, Pollakowski et al. (2005) also used a hedonic pricing model. Comparative housing price indices were created for the impact areas and control areas (the remainder of the host economy) in order to compare how the housing price values have changed over time. The authors used a dataset of all house sales transactions from 1987 to 2003 and most transactions between 1983 and 1986. The explanatory variables used, consists of the house size, the lot size, the number of bedrooms and bathrooms, as well as the year in which the house was built. Seven case study towns within Boston were used. The results suggest that large-scale high density mixed income rentals had no effect on the

neighbouring property values, thus the authors concluded that the NIMBY fears are misplaced.

Ellen (2007) also did a review of subsidized rental housing analysis of developments within New York City. The results suggests that the Section 202 (subsidized housing for the elderly) and Low Income Housing Tax Credit programmes benefitted the host communities, but that the Section 8 (housing voucher) and Public Housing programmes had a negative impact on neighbouring property values, albeit only initially. More specifically the authors found that the structure type of the project was not very important in terms of the effect on property values, but that the scale of the developments, the location thereof, the characteristics of the tenants and the nature of ownership and management of the development has a larger effect. Bratt (2015) in his review of existing literature concluded that subsidised rental housing fails to support fully the NIMBY fears. The author therefore suggests that the development should be well-designed, fit in with the surrounding neighbourhood and be well managed. This is in line with Duffley and Braun's (2009) findings, which indicates that the quality of design and management of the subsidized housing determines the impact on the property values of neighbourhoods within its vicinity.

Obrinsky and Stein (2007) in their study of three subsidized housing developments looked at large dense multifamily rentals, Section 42 developments and tax credit rental housing. There was no negative impact observed for large dense multifamily rentals. The authors found that if these developments are well-located and have attractive entrance ways and landscaping then the negative effects are minimised or could even produce a positive overall effect on property values. The tax credit rental housing also had little or no impact on neighbouring property values as it performed the same as normal market demand and supply. Obrinsky and Stein (2007) also found that Section 42 developments i.e. tax credits to builders and operators of affordable rental housing, do not cause property values to decline. This was observed across all neighbourhoods in the study with the exception of Wisconsin where other areas' property values appreciated faster. The magnitude of the effect was however found to be small.

Table 6 shows the results from various hedonic pricing models as summarised by Nguyen (2005). As noted the effects were largely positive and in certain cases no effect was found. As with Obrinsky and Stein (2007), Nguyen (2005) also found that across the studies reviewed, if there were negative effects they were typically small. The internal characteristics of the house appear to have a greater effect on the value of the property compared to the presence of subsidized housing. The neighbourhood composition was also found to be important. Nguyen (2005) concluded that more studies on the topic will however be necessary.

Table 6: Hedonic Pricing Model Study Results

Author(s)	Year	Sample Size	Study Area	Program or Type	Relationship with Property Values
Cummings and Landis	1993	2 developments	San Mateo County, California	42-unit condominium project for families and seniors	None
			San Francisco County, California	96-unit condominium project for families	Mixed: Not significant if located within 1/8 or 1/4 mile but (–) effect at 1/2 mile
Lyons and Loveridge	1993	120 projects	Ramsey County, Minnesota	Section 8 EV, Section 236, below-market interest rate (BMIR)	None
				Section 221(d)(3)	(+)
				Public housing	(+)
				Section 8 NC&R	Mixed
Goetz, Lam, and Heitlinger	1996	100 projects with 3,600 units	Minneapolis, Minnesota	Community Development Corporations (CDC)-developed subsidized housing	(+)
				Privately owned and publicly subsidized housing, public housing	(–)
Briggs, Darden, and Aidala	1999	7 developments	Yonkers, New York	Scattered-site public housing	None
Galster, Tatian, and Smith	1999	4,969 sites	Baltimore County, Maryland	Section 8 certificate and voucher	Aggregate Data: (+) 6+ sites within 500 feet: (–)
Lee, Culhane, and Wachter	1999	not provided	Philadelphia, Pennsylvania	Public housing, scattered-site public housing, Section 8 certificate and voucher, LIHTC	(–)
				FHA housing, PHA home ownership programs, Section 8 NC&R	(+)
Santiago, Galster, and Tatian	2001	167 sites	Denver, Colorado	Dispersed rehabilitated public housing	(+)

Source: Nguyen. 2005

Unlike the other authors presented within the section, Genova et al. (2009) instead did a qualitative analysis of effects of section 40B housing developments and neighbouring property values. The authors interviewed 40 people across four projects within Massachusetts. The interviewees consisted of town officials, developers, residents, property managers, abutters and any other persons who were involved in the permitting process. The results suggested that many of the fears expressed before project implementation were not realised to the extent that was originally feared. In fact, due to negotiations on community concerns beforehand and mitigations implemented, some developments actually brought some benefits to the communities in which they were situated. By the completion and occupation of the developments, most of the controversy and opposition had evaporated. The authors conclude that the fears of subsidized housing are more myth than reality, but make note that each of the projects are unique and therefore results cannot necessarily be generalised for all section 40B developments.

3.4 Gaps in the Literature

There is a paucity of studies analysing the impact of subsidized housing on neighbouring property values within the South African context or even other developing countries. The results displayed above are a representation of the US market and should not be generalised for that of South Africa. The characteristics and subsidized housing programmes of South Africa are much too different to assume US results would be applicable. It is therefore necessary to determine the impact of subsidized housing on neighbouring property values within South Africa specifically.

A key contribution of this study is the use of the DD approach to identify the effect of the subsidized housing projects on prices. This will use a combination of the test and control method as well as the hedonic pricing model, making the most of both methods to do the analysis. It extends on the test and control method, through the use of house pricing over time allowing it to account for trends, which the test and control method is unable to do. It extends on the HPM through the inclusion of the DD variables which allows for a test versus control group and pre versus post analysis. The study will further contribute through its separate analysis of the building of the development as well as the occupation of the development as it has been noted that different phases of a project may have different effects on house prices.

Most of the studies observed made use of quantitative methods to analyse the impact. This is understandable as one would want to use objective studies to determine if NIMBY perceptions hold in order to either show that they are wrong, or prove them right. Quantitative studies are however not able to determine what would make NIMBY's change their mind about subsidized housing. A qualitative study may be better equipped to address their fears. It may be able to answer questions of why NIMBY's react the way they do, what exactly they are afraid of and what is necessary for their fears to be tamed by posing these questions directly to the NIMBY's themselves.

As a first step this study made use of quantitative methods in order to establish whether the NIMBY notion holds within the South African context. A qualitative study is however suggested, as a follow up to this research project so that the above-mentioned questions may also be answered.

4. RESEARCH METHODS

This chapter presents the research methodology for estimating the effects of subsidized housing on the property prices of houses in the vicinity. The research methods will be discussed, followed by a description of the data that will be used in the analysis, and will end off with an outline of the limitations to the model.

4.1 Research Methodology

This study will make use of a quantitative analysis to determine the impact of subsidized housing on proximate house prices. This is largely to steer away from findings that are based on people's opinions of the effects, as would be the case in a qualitative analysis. NIMBYism is after all based on the perception that the house prices will drop as opposed to factual evidence to this effect. The study by Du Preez and Sale (2013) aimed to estimate the effect of social housing on neighbouring house prices, but the results cannot be generalised across all subsidy programmes or all areas within the country. The study also contained a proxy for a social housing project instead of an actual housing project. It therefore remains beneficial to further analyse the effects of subsidized housing developments on property prices within its vicinity.

Most of the negative perceptions about Government housing projects have been aimed towards social housing and RDP housing projects. For this reason, this study will attempt to determine the effects of these two types of subsidized housing developments on houses within its vicinity. The case study approach will be used for the analysis. The effects of one social housing project and one RDP housing project will be analysed.

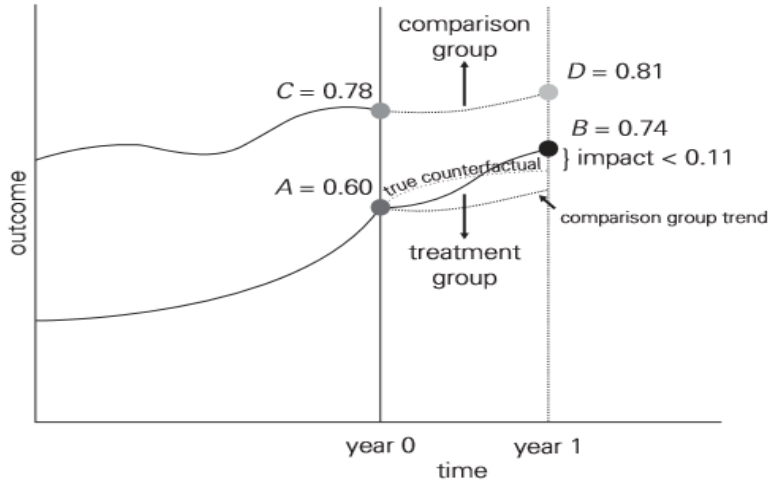
The study will make use of an impact analysis of the two housing projects. An impact analysis attempts to answer cause and effect questions, such as what the effect is of a programme on an outcome of interest (Gertler et al., 2010). In this case there is an attempt to answer the question of what the impact of a social housing and RDP housing development is on the property prices of houses within its vicinity. The social housing project of concern is the Belhar Gardens social housing development located within the Belhar suburb of the City of Cape Town. The RDP housing project that will be analysed is the Heideveld Infill RDP project located within the Heideveld Suburb of the City of Cape Town.

Different forms of impact analysis can be used to answer cause and effect questions. The impact analysis best suited to answer this specific research question is the DD method. The DD method compares the changes in outcomes overtime between a population that has been

directly affected by the programme (the treatment group) with the outcome of a similar population that has not been affected by the programme (control group).

In this study the treatment group is the Belhar suburb for the social housing project and the Heideveld suburb for the RDP project. The suburbs chosen as the control groups are Ravensmead and Steenberg, respectively. These suburbs are also located within the City of Cape Town, have similar house price trends, have no subsidized housing projects within its vicinity and are far enough away from these housing developments to be unaffected. The DD analysis will thus in **Case A** compare the changes in the house prices before and after the Heideveld RDP project came into effect, within Heideveld and Steenberg. **Case B** represents the DD analysis for the Belhar Gardens social housing project, comparing the changes in the house prices before and after the Belhar Gardens social housing project came into effect, within Belhar and Ravensmead. The illustration of the DD analysis is presented in Figure 2.

Figure 2: Illustration of a DD Analysis



Source: Gertler et al., 2010

Point A represents the average house prices of the treatment suburb during the year (Year 0) at which the building of the development commenced. Point B represents the average house prices within the treatment suburb in 2017 (Year 1). The difference between point B and point A (B-A) is the first difference and controls for factors that are constant over time in the treatment group. Point C represents the average house prices within the treatment suburb during Year 0. Point D on the other hand, represents the average house prices within the control suburb during Year 1. The difference between point D and point C (D-C) is the second difference and controls for other time varying factors, as the control group is subject to the same environmental conditions as the treatment group. The difference between the first difference and second difference i.e. the difference-in-difference thus represents the

impact of the housing development on the house prices of the treatment group. The DD impact is represented by the following equation:

DD impact = (B-A)-(D-C)……..…Equation 1

Using an econometric analysis the equation would be computed as follows:

$$\boldsymbol{Price_{it} = a + b_1(Post_t) + b_2(Treat_i) + b_3(Post_t * Treat_i) + \epsilon_{it}}$$……..Equation 2

Where $\boldsymbol{Price}$ refers to the estimated house price; $\boldsymbol{a}$ represents the constant or intercept term which is the average price of the house when all other explanatory variables are equal to zero; $\boldsymbol{Post}$ is a dummy variable (a variable that only assumes values of one and zero) for the period after the development has been built or occupied, while coefficient $\boldsymbol{b_1}$ estimates the effect on house prices in the post build or post occupation period of development; $\boldsymbol{Treat}$ is a dummy variable for the suburb in which the development has taken place, while it's coefficient $\boldsymbol{b_2}$ estimates the effect on house prices of being located within the treatment suburb; and $\boldsymbol{b_3}$ is the coefficient of concern representing the DD impact or an estimation of the effect on house prices of selling ones house in the treatment area after the subsidized housing development's building or occupation has commenced. Proximity to a subsidized housing development is estimated to have a negative impact on house prices if $\boldsymbol{b_3 < 0}$. Proximity to a subsidized housing development is estimated to have a positive impact on house prices if $\boldsymbol{b_3 > 0}$. If $\boldsymbol{b_3}$ is statistically insignificantly different from zero then the effect is estimated to be neutral. Finally, $\boldsymbol{\epsilon_{it}}$ represents the error term or residuals.

The problem with this standard DD model is that it assumes that the POST price change (b_1) is common across all years for treatment and control suburbs. This may not be the case, therefore it is crucial to allow for year specific shocks such as inflation or other macro shocks, to the price of all houses. The year dummies λ_t are therefore added to Equation 2 above to create Equation 3.

$$Price_{it} = a + b_2(Treat_i) + b_3(Post_t * Treat_i) + \lambda_t + \epsilon_{it}$$……..Equation 3

In cases where there are multiple groups within the treatment suburb, such as Belhar which has 23 extensions, we want to allow each extension to have its own intercept and not a common intercept as imposed by a and b_2. So in these cases an additional group is added to represent location specific effects (λ_i).

$$Price_{it} = a + b_2(Post_t * Treat_i) + \lambda_t + \lambda_i + \epsilon_{it}$$……...Equation 4

These specifications above are applied to both Case A and Case B. In the case of Case B it is also possible to analyse the effect of the Belhar Gardens social housing project on house

prices within Belhar. Given information on the location of houses within Belhar, a treatment group is defined as $Dclose$, which is a dummy variable representing extensions that are 1600m or less from the Belhar Gardens social housing development. Revising equation 4 to include $Dclose$ we get the following:

$$Price_{it} = a + b_2(Post_t * Dclose_i) + \lambda_t + \lambda_i + \epsilon_{it}$$ .....Equation 5

In this case, the coefficient b_2 estimates the effect of the housing project on house prices in suburbs closest to the Belhar Gardens development relative to those more distant.

The study may go further and attempt to determine if the distance in meters ($Distance$), to the subsidized housing development (where available) has an effect on house prices. The inclusion of the distance variable produces the following equation:

$$Price_{it} = a + b_2(Distance) + b_3(Post_t * Distance_i) + \lambda_t + \lambda_i + \epsilon_{it}$$ .....Equation 6

The coefficient b_2 estimates the effect of the distance from the subsidized housing development on the price of the house; and b_3 as the coefficient of concern estimates the marginal additional effect on house prices of distance from the development in the period after the building or occupation commenced. A negative impact of the housing development on surrounding areas will be revealed by a positive coefficient on b_3. If $b_3 < 0$ then the housing development can be interpreted as having a positive effect on neighbouring house prices.

These equations however do not control for differences in household characteristics that could possibly affect the price of the house. For this reason the DD model will be extended to include hedonic pricing variables as discussed in Chapter 3. The hedonic variables to be included is the erf size in meters squared ($erfext$); the number of bedrooms (bed); the dummy variable for if the house has a garage or carport ($garcport$); the dummy variable for if the house has a pool ($pool$); the dummy variable for if the house has a servants quarters ($servquart$); and a dummy variable for if the property is of average or good quality ($quality$).

For the purposes of the analysis the dependent variable $Price$ and the explanatory variables $erfext$, $dwellext$, bed and $Distance$ will be logged while the dummy variables will remain the same. The purpose of using the log of each variable is to ensure that these variables are normally distributed, as well as to make interpreting the variables more substantive in that it will present the effect in percentage terms as opposed to unit changes. This translates to the following equation:

$$LPrice_{it} = a + b_2(Post_t * Treat_i) + b_3(Lerfextent_i) + b_4(Lbed_i) + b_5(garcport_i) + b_6(servquart_i) + b_7(quality_i) + \lambda_t + \lambda_i + \epsilon_{it}$$

……..Equation 7

The coefficients b_2 to b_7 estimate the effect of each of the variables on the price of the house. Incorporating these variables determine the extent to which proximity to a subsidized housing development affects the house price, while controlling for the effects of the characteristics of the house. Furthermore, including these variables would also ensure that differences across the types of houses available at the suburbs do not bias the results.

A linear Ordinary Least Squares (OLS) regression will be employed to estimate the above-mentioned equations. The OLS method of econometric analysis estimates the coefficients (a to b_7) such that the residual sum of squares ($\sum e_i^2$) is as small as possible (Gujarati & Porter, 2010). The estimation will include the White-corrected robust standard errors to correct for the presence of heteroskedasticity within the model.

4.2 Description of the Data

The property price data was obtained from the City of Cape Town's property valuations database. The data ranges from January 2010 to March 2017. It includes the sales prices, estimated value and characteristics of all houses sold in the City of Cape Town since 2010. The house sales data excludes sectional titles and subsidized housing to ensure that the results are not skewed. Properties sold for prices less than R100 000 were also not considered as the estimation values and did not correspond with the sales price. This dataset supplied the data for each variable used within the analysis. Data on the locations of previous subsidized housing projects were obtained from the WCDHS. The data ranges from January 1997 to August 2016. It was thus used to determine the treatment and control suburbs most appropriate for the analysis.

The treatment groups were selected based on the criteria that a project's building and occupation commenced within the period ranging from 2010 to 2017 and that no previous subsidized housing developments exists in the area. The Heideveld RDP and Belhar Gardens social housing projects were thus chosen as the subsidized housing developments to be studied, making Heideveld and Belhar the treatment suburbs.

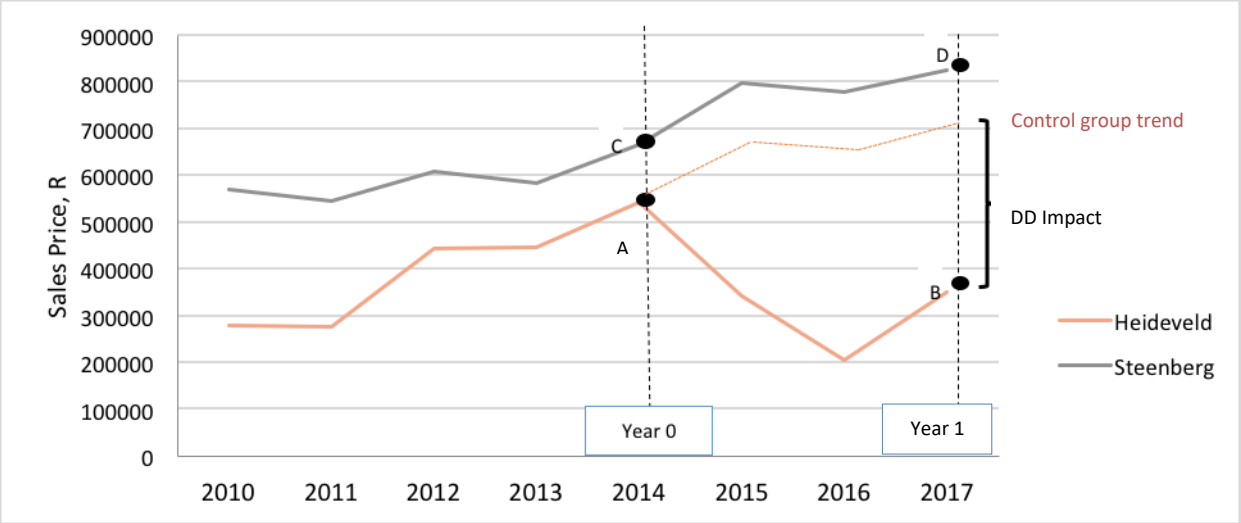
The control group for Heideveld was chosen as Steenberg, because this suburb has no subsidized housing developments in its vicinity that could skew the results, and it has a similar price movement year on year before the commencement of the building of the Heideveld project. The control group for the Belhar suburb is the Ravensmead suburb. This

is largely because it has similar house prices, has a similar mix of both more affluent and less affluent areas and has no subsidized housing developments within its vicinity. The two cases to be studied will be discussed below.

Case A: Heideveld Infill RDP Housing Project

The Heideveld Infill RDP subsidized housing project commenced planning in 2010 but the project was only approved in 2011. The building of the units started in 2014. The occupation of the units took place in April 2016. The project consists of 738, 40m^2 units built at a price of R118 000 per unit. The project is known as an infill project located on the side of the N2 in Heideveld and other pockets of areas between houses within the Heideveld suburb. The houses were designed in such a way that it would integrate well with the surrounding community. The project includes 6 pockets on erven 100570, 101447, 100302, 100594, 101458 and 111038. Steenberg as the control suburb is located 21 kilometres away from Heideveld. While it is more affluent than the Heideveld area, it has similar year on year price movements prior to the commencement of the building of the development. Figure 3 displays the average house price trends of the Heideveld and Steenberg suburbs within the realm of the DD analysis.

Figure 3: Average House Prices in Heideveld and Steenberg, 2010-2017



Source: City of Cape Town Property Sales Database, 2017

Heideveld experienced a general upward trend in average house prices from 2010 to 2014. Prices increased at an average annual rate of 18% over this period. This is much faster than many of the other suburbs within the City of Cape Town. Steenberg grew at an annual average rate of 4% from 2010 to 2014. The houses are however of much higher value than those within Heideveld. While the growth rates differ, the turning points were broadly consistent across the two areas prior to the introduction of the RDP project.

Heideveld experienced a large drop in average house prices in 2014 when the building of the RDP project commenced. The decline continued into 2016, when the beneficiaries took occupancy of the units. From 2014 to 2016 the average house prices dropped by 62%. The average house prices however showed an increase in 2017, based on the one sale recorded up to March of 2017. By contrast Steenberg's increasing trend however continued from 2014 to 2017, increasing from 2014 to 2015 and remaining relatively flat thereafter.

Table 7: Total Sales per Annum for Heideveld and Steenberg, 2010-2017

Year	Heideveld	Steenberg	Total Sales per Annum
2010	16	46	62
2011	24	47	71
2012	43	35	78
2013	31	28	59
2014	37	35	72
2015	33	25	58
2016	89	24	114
2017	1	4	5
Total Sales per Suburb	**274**	**244**	**518**

Source: City of Cape Town Property Sales Database, 2017

Table 7 displays the number of sales per annum or observations for analysis from 2010 to 2017 for Heideveld and Steenberg. The number of house sales has been volatile over the years for both of these suburbs. It is interesting to note that the number of sales in Heideveld almost tripled from 2015 to 2016, during the year of occupancy of the Heideveld RDP development. As per the table there are 518 observations available for study with 274 observations for the treatment group and 244 observations for the control group.

Table 8 provides the summary statistics of the characteristics of the houses within Heideveld and Steenberg. The erf sizes in Steenberg are on average double the size of those in Heideveld, at 402m^2 and 180m^2 respectively. Property sizes in Steenberg ranges between 91m^2 and 4003m^2, whilst Heideveld's ranges between 64m^2 and 619m^2. Similarly the average dwelling size in Heideveld is much smaller than those of Steenberg at 59m^2 and 91m^2 respectively. The majority of houses in Heideveld have two bedrooms whilst the majority of homes in Steenberg have 3 bedrooms.

Table 8 also stipulates the proportion of houses that have a garage or carport, or pool, as well as the number of houses within the suburb that are of good or average quality. Steenberg has a larger proportion of houses with a garage/car port and pool when compared to Heideveld. A larger portion of its houses are of average or good quality. The servants quarters variable was not considered in this analysis as there was only one house among all the observations that had a servants quarters.

Heideveld and Steenberg are, as noted above very different, but their similar movement in prices prior to the building of the RDP development nonetheless makes Steenberg the best candidate as a control group for Heideveld.

Table 8: Summary statistics in Heideveld

Variable	Summary Statistic	Heideveld	Steenberg
Erf size (m^2)	Average	180	402
	Standard Deviation	82	422
Dwelling extent (m^2)	Average	59	91
	Standard Deviation	23	49
No. of bedrooms	Average	2	3
	Standard Deviation	0,63	0,83
Garage or carport	Percentage	7%	41%
Pool	Percentage	0%	5%
Quality	Percentage	61%	73%

Source: City of Cape Town Property Sales Database, 2017

Case B: Belhar Gardens Social Housing Project

The Belhar Gardens Social Housing Project commenced building in February 2015 and occupation of the units commenced in May 2016. The development consists of 629 units. The development was built at a cost of R207 million, R77 million of which was the Government's contribution. The development is located close to public transport, schools and universities, as well as economic opportunities which made it fall within a Restructuring Zone. A shopping centre is also currently under construction opposite the development. The development contains special features such as landscaping, electricity and water efficiency, disability provisions, DSTV installations and the provision of security. The specifications and rental price of the units are presented in Table 9.

Table 9: Units available in Belhar Gardens

Bachelor 30m²			**One Bedroom 33m²**			**Two Bedroom 40m²**		
No. of Units	Upper Levels	Ground Level	No. of Units	Upper Levels	Ground Level	No. of Units	Upper Levels	Ground Level
189	R 720	R 800	230	R 1600	R 1650	210	R 2100	R 2150

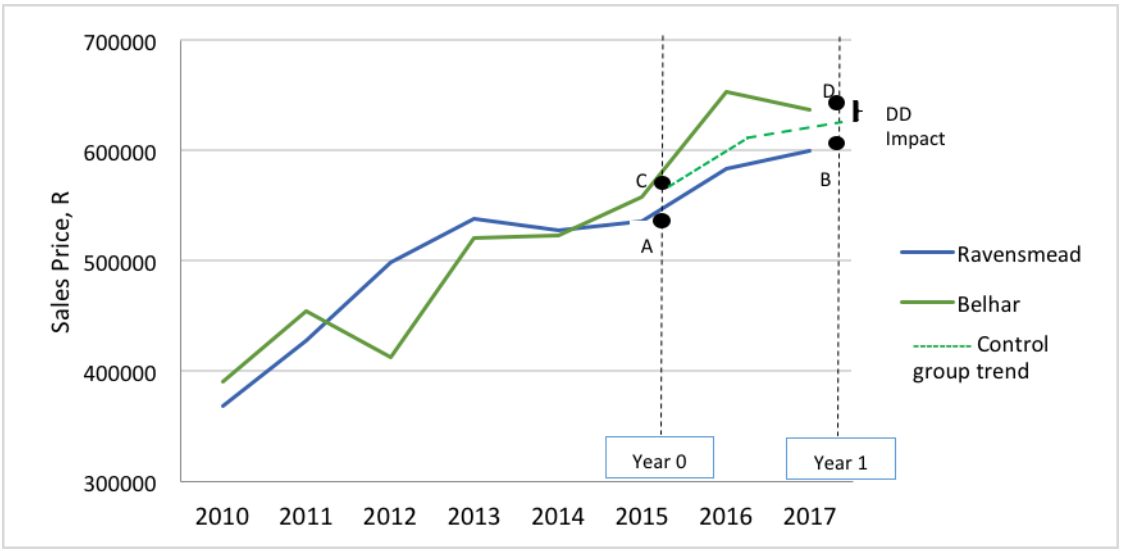
Source: Parliamentary Belhar Social Housing, 2017Visit Oversight Meeting

This social housing development caters to prospective tenants earning between R2 800 and R7 500 at which they can rent properties costing between R720 and R2 150. There are 3 types of units available, i.e. $30m^2$ bachelor units, $33m^2$ one bedroom units and $40m^2$ two bedroom units.

Belhar Gardens is located in Symphony Road, Carmen End, within Extension 8 of the Belhar suburb. Belhar consists of 23 extensions and Erica TWP and is enclosed by the M12, the train line, the R300 and the M10. The DClose dummy variable which includes all extensions within 1 600m of the Belhar Gardens development consists of Belhar extensions 6, 7, 8, 10, 14 and 23. The remaining suburbs range between 1 700m and 3 300m in distance to Belhar Gardens. Ravensmead is located approximately 6 500m away from Belhar. The distances were calculated using Google Maps as the distance in meters from the midpoint of the extension or suburb to Belhar Gardens. Note that the distance variable was not considered within Case A because the Heideveld suburb is not subdivided into separate extensions and there are too many pockets of the project to be able to compute the distances.

The average house prices of Belhar and Ravensmead are reflected in Figure 4. The figure shows that the average prices between Belhar and Ravensmead are similar and that they experienced a similar increasing trend from 2010 to 2017. Belhar experienced slight average house price drops between 2010 and 2011 as well as between 2016 and 2017. The latter is also the period during which the occupation of the units took place and the construction of the shopping centre commenced.

Figure 4: Average House Prices in Belhar and Ravensmead, 2010-2017



Source: City of Cape Town Property Sales Database, 2017

Table 10 displays the number of sales per annum within Belhar and Ravensmead. The number of house sales has been declining year on year from 2010 to 2017 within both suburbs, with the exception of an increase in 2015 within Ravensmead. Ravensmead, as a smaller suburb, had fewer house sales than in Belhar.

Table 10: Sales per Annum in Belhar and Ravensmead, 2010-2017

	Belhar	Ravensmead	Total per Annum
2010	156	48	204
2011	130	40	170
2012	141	33	174
2013	114	32	146
2014	112	27	139
2015	103	37	140
2016	81	12	93
2017	16	1	17
Total per suburb	853	230	1083

Source: City of Cape Town Property Sales Database, 2017

The summary statistics of the hedonic characteristics of houses in Belhar and Ravensmead are presented in Table 11. Note that the average erf size is relatively larger in Ravensmead as compared to Belhar. The erf sizes range between 91 and 2 063m^2 in Belhar and between 109 and 1 031m^2 in Ravensmead. The average dwelling sizes are quite similar within the two suburbs at 90m^2 and 94m^2 respectively. The majority of houses sold within both suburbs have 3 bedrooms.

Table 11: Summary Statistics of Houses in Belhar and Ravensmead, 2010-2017

Variable	Summary Statistic	Belhar	Ravensmead
Erf size (m^2)	Average	347	387
	Standard Deviation	176	115
Dwelling extent (m^2)	Average	90	94
	Standard Deviation	50	49
No. of bedrooms	Average	3	3
	Standard Deviation	0,8	0,95
Garage or carport	Percentage	12%	23%
Pool	Percentage	3%	0%
Servants Quarters	Percentage	1%	2%
Quality	Percentage	82%	77%

Source: City of Cape Town Property Sales Database, 2017

A larger proportion of houses within Ravensmead has a garage/car port or servants quarters, whilst the larger proportion of houses in Belhar have a pool or are of average to good quality.

As noted Belhar and Ravensmead are relatively similar in terms of the characteristics of the houses sold within these suburbs from 2010 to 2017, making it good candidates for the control and treatment suburbs for the social housing project analysis.

4.3 Limitations

The DD analysis is able to incorporate unobserved differences in the houses or suburbs that are constant over time, such as proximity to public transport or a school; or the landscaping of a house, or the view from it. The use of this analysis is beneficial because while these variables affect the price of a house, they will not necessarily be changing over the course of the evaluation period i.e. 2010 to 2017. When using the DD method it therefore assumes that in the absence of the subsidized housing project, the average prices of the house would have moved in tandem for both the treatment and control suburb. The DD method cannot pick up unobserved characteristics if they change within the period. The DD analysis will therefore not be able to pick up that a mall has been built within Belhar in 2016. This may bias the results. It is assumed that a mall in the vicinity of the houses will push up their prices. The average price trends from 2016 to 2017 however show a decline in average house prices within the area instead. It is therefore assumed that it will not have a significant effect on the analysis, but the inability of the model to distinguish the effect of the mall from the occupation of the units should nonetheless be noted. There are also a limited number of observations after the occupation of the units, which could further impact on the result.

While there was an attempt to find comparison suburbs for the suburbs in which the subsidized housing developments took place that are parallel in house price trends, it is possible that biases may still exist. According to Gertler et al. (2011) the reason for this is that a DD analysis attributes to the intervention any differences in trends between the treatment and comparison groups that occur from the time intervention begins. If any other factors are present that affect the difference in trends between the two groups, the estimation will be invalid or biased.

The price that an individual is willing to pay for a house is dependent on their income, thus the model forms part of an indirect utility function. One should therefore control for income within the model as it is also a determinant of house prices. The treatment and control groups for Case A i.e. Heideveld and Steenberg do not have similar average incomes (as can be deduced from the difference in house prices). This difference in income may therefore affect the validity of the control groups chosen. Due to a lack of availability of data it is however not possible to control for the difference in incomes within the model. Note that what matters within the DD analysis is not the level of income, but rather the changes income. With the use of the DD analysis there is an implicit assumption that there is no change in the relative incomes of the two suburbs over the period studied.

As mentioned earlier hedonic variables employed within the model were subject to the availability of data on the characteristics of the house, as opposed to all the characteristics

that may truly have had an effect on the price of the house. This will be evident from the coefficient of determination (R-squared) of the model which estimates the goodness of fit of the estimated house price to the actual house price of each of the observations. A lower R-squared may be present and is an indication that there are other omitted variables that affect the price of the house that are not included in the model. The results of the model are also highly dependent on the variables employed (which were limited to the data available) and could possibly be different if other variables are used. For this reason, different variations of the model were used to determine if the effects remain similar despite the variables chosen.

The analysis is specific to the Heideveld Infill RDP and Belhar Gardens projects within the City of Cape Town. These results cannot necessarily be generalised to other projects or areas as different circumstances may exist. This analysis however provides evidence of such a project previously employed and can be a guide for the possible impact that these subsidized housing projects could have. The analysis would have to be repeated for other projects to determine the true effect of those projects.

5. DATA ANALYSIS

This chapter presents the findings from the analysis of the effects of subsidized housing on the prices of houses within its vicinity. The findings from Case A (the Heideveld Infill RDP Project) and Case B (Belhar Gardens Social Housing Project) will be presented separately taking into account the effects of the commencement of the building of the development as well as the occupation of the units. The chapter will end off with recommendations to the State based on the results.

5.1 Description of the Variables

This section provides a description of the variables and equations that will be estimated and analysed throughout the chapter. The variables consist of continuous variables which will each be logged, as well as categorical or dummy variables. The description of each variable is provided in the table below.

Table 12: Description of the Variables

Variable	Type of Variable	Description
LPRICE	Dependent Variable	Log of the Price of the House
TREATMENT	Categorical	Equals 1 if sold within the Treatment suburb (Heideveld or Belhar) and 0 if sold within the Control suburb (Steenberg or Ravensmead)
DPOST	Categorical	Equals 1 if sold after the commencement of the building or occupation of the development and 0 if sold before then
DCLOSE	Categorical	Equals 1 if sold within 1600m of the Belhar Gardens development and 0 if more than 1600m away from the development
LDISTANCE	Continuous	Log of the distance in meters from the Belhar Gardens development
TREATMENT*DPOST	Categorical	Equals 1 if sold in the treatment suburb after the commencement of building/occupation of the development and 0 if not.
DCLOSE*DPOST	Categorical	Equals 1 if sold within 1600m after the commencement of building or occupation of the development and 0 if not
LDISTANCE*DPOST	Continuous	Log of the distance in meters if sold within Belhar after the commencement of building or occupation of the development and 0 if sold before then.
LERFSIZE	Continuous	Log of the size of the erf
LBED	Continuous	Log of the number of bedrooms

Variable	Type of Variable	Description
GARCPORT	Categorical	Equals 1 if the house has a garage or carport and 0 if not
POOL	Categorical	Equals 1 if the house has a pool and 0 if it does not
QUALITY	Categorical	Equals 1 if the house is of average or good quality and 0 if the house is of fair or poor quality
SERVQUART	Categorical	Equals 1 if the house has a servants quarters and 0 if it does not
D2011 to D2017	Categorical	Equals 1 if sold in year of concern and 0 if sold in any other year
BEL1 to BEL22	Categorical	Equals 1 if sold in the extension of concern and 0 if sold in any other extensions
TREND	Continuous	The year of sale of the house ranging from 2010 to 2017.
TREND*TREATMENT	Categorical	The year of sale of the house if sold within the treatment suburb and 0 if sold within the control suburb

The L ahead of the variables name, for example LPRICE, is an indication that it is a logged variable. When the dependent variable and the independent variable are logged then the coefficient represents the log change in price when the variable increases by one percent, which for small values is equivalent to the percentage change. The actual percentage change is calculated as $\%\Delta = e^{coefficient} - 1$. On the other hand if the dependent variable is logged while the explanatory variable is a dummy variable then the coefficient represents the log change in price if the explanatory variable changes from zero to one. Note that each of these coefficients represents the marginal effect if all other variables are held constant i.e. *ceteris paribus*. This guide will be used in the analysis of each of the variables in the models presented. Any variable that is not significant at the 90% confidence interval is considered insignificant within the estimation results.

5.2 Case A: Findings for the Heideveld Infill RDP Project

This section presents the effect of the Heideveld Infill RDP project on the prices of houses within its vicinity.

5.2.1 Testing the appropriateness of the Treatment and Control Group

Before the analysis can commence, it is necessary to test the appropriateness of the control group Steenberg, for the treatment group Heideveld. A treatment and control group are compatible for a DD analysis if either the house prices are similar or the trend in house prices are similar across the two suburbs before the commencement of building of the development.

To test this, the following equation is estimated in the period prior to the commencement of the building of the development.

.

$$Price_{it} = a + b_0 Treatment_i + b_1(trend_t) + b_2(trend_t * Treatment_i) + b_3(Lerfextent_i) + b_4(Lbed_i) + b_5(garcport_i) + b_6(servquart_i) + b_7(quality_i) + \epsilon_{it}$$

For the common price assumption to hold $b_0 = 0$. For the common trend assumption to hold, $b_2 = 0$. The results below indicate that the mean house prices controlling for characteristics are lower in Heideveld compared to Steenberg ($b_0 < 0$). The first assumption therefore does not hold. However, the common trend assumption cannot be rejected. The results below estimate that the trend in prices is not significantly different. By implication, the control group is an appropriate comparator for the treatment group.

Table 13: Test for Control and Treatment Group Compatibility

LERFSIZE	0.15** (0.08)
LBED	0.35* (0.12)
GARCPORT	0.13*** (0.06)
POOL	0.14[i] (0.18)
QUALITY	0.55* (0.07)
TREND	0.04[i] (0.04)
TREATMENT	-0.59* (0.17)
TREND*TREATMENT	-0.08[i] (0.05)
R-squared	**0.45**
F Statistic	**32**
No. of Observations	**270**
Time period	**2010-2013**
*p<0.01;**p<0.05; ***p<0.1; [i]p>0.1 White heteroskedasticity-consistent standard errors & covariance	

5.2.2 DD Analysis Results: Commencement of Building of the RDP Development

This section presents the findings from the model estimating the effects of the commencement of the building of the RDP development on the price of a house. The building of the development commenced in January 2014. The pre-shock period is therefore from January 2010 to December 2013 and the post shock period is from January 2014 to March 2017. The estimation results are reflected in Table 14.

Table 14: Estimation Results from the Commencement of Building of the RDP Development

Model	(1.1)	(1.2)	(1.3)
	Standard DD	**incl Years**	**incl HPM**
TREATMENT	-0,42* (0,07)	-0,47* (0,07)	-0,33* (0,07)
DPOST	0,36* (0,08)	-	-
TREATMENT*DPOST	-0,62* (0,11)	-0,39* (0,11)	-0,17*** (0,09)
LERFSIZE	-	-	0,28* (0,07)
LBED	-	-	0,23* (0,07)
GARCPORT	-	-	0,14** (0,06)
POOL	-	-	0.09[i] (0.15)
QUALITY	-	-	0,59* (0,05)
Adjusted R-Squared	0,28	0,36	0,62
F Statistic	68,21	33,26	60.26
No. of Observations	518	518	518
*p<0.01;**p<0.05; ***p<0.1; [i]p>0.1 White heteroskedasticity-consistent standard errors & covariance			

The standard DD model (column 1.1) reflects the effects of the RDP development on house prices within Heideveld without taking the characteristics of the houses into consideration. It is estimated that the mean unconditional pre-shock house prices are on average 0.42 log points or 34% lower in Heideveld compared to Steenberg. Relative to the house price increase in Steenberg after the shock (0.36 log points or 43%), house prices in Heideveld fell by 0.62 log points or 46%.

With an adjusted R-squared of only 0.28, it is clear that there are other variables that impact on the price of a house that are not considered within this standard DD model. There may be macro shocks such as house price inflation which occurred in any given year that might have caused a spike or downward trend in house prices. These are not considered within the standard DD model. For this reason the years of sale of the houses were added as dummy variables in this second variation of the model (1.2).

With the inclusion of the year dummies the mean unconditional price pre-shock is greater at an average of 37% (0.47 log points) lower in Heideveld compared to Steenberg. Relative to

the house price increase in Steenberg after the shock however, the mean price in Heideveld is estimated to fall by 32% (0.39 log points).

The hedonic characteristics of a house have been established in literature to also have an effect on the price of a house. The third variation of the model (1.3) thus sees the inclusion of the HPM in the standard DD model. In this case the adjusted R-squared increases to 0.62, indicating it has a much better representation of the variables that affect house prices. With the inclusion of the hedonic characteristics we see that the conditional selling price in Heideveld is only 33 log points lower than in Steenberg prior to the shock, indicating that a major influence in the difference in the prices of the houses sold in Heideveld and Steenberg, is the difference in their characteristics.

Amongst the internal characteristics of the house, it is estimated that the quality of the house has the largest effect on its price. It is to be expected that the price of a house will be lower if it is of poorer quality, because a large sum of money would have to be spent on renovations, thus lowering the amount the buyer is willing to spend on the purchasing of the house. The size of the erf, the number of bedrooms and the presence of a garage or carport is also estimated to have a positive effect on house prices within the two suburbs, whilst the presence of a pool has no significant effect.

In model 1.3 the unconditional mean pre-shock price is on average 28% (0.33 log points) lower in Heideveld compared to Steenberg, even when controlling for house characteristics. Relative to the house price increase in Steenberg after the shock however, the mean price in Heideveld is estimated to fall by 16% (0.17 log points), taking the characteristics of the house into consideration.

The three variations of the model confirms that the commencement of the building of the RDP housing project has indeed had a negative impact on property values of houses within Heideveld, even when accounting for the macro shocks and differing characteristics of the houses sold within the treatment and control suburbs.

5.2.3 DD Analysis Results: Occupation of the RDP Development

This section presents the findings from the model estimating the impact of the occupation of the units of the Heideveld Infill RDP development on the prices of houses in Heideveld. The development was occupied in April 2016. The pre-shock period is therefore from January 2010 to March 2016 and the post shock period is from April 2016 to March 2017. The OLS results from three variations of the model are presented in Table 15.

Table 15: Estimation Results from the Occupation of the RDP Development

Model	(2.1)	(2.2)	(2.3)
	Standard DD	incl Years	incl HPM
TREATMENT	-0,47* (0,05)	-0,53* (0,06)	-0,38* (0,06)
DPOST	0.20[i] (0.15)	-	-
TREATMENT*DPOST	-0,89* (0,17)	-0,73* (0,12)	-0,22** (0,10)
LERFSIZE	-	-	0,28* (0,08)
LBED	-	-	0,23* (0,07)
GARCPORT	-	-	0,14** (0,06)
POOL	-	-	0.10[i] (0.15)
QUALITY	-	-	0,58* (0,05)
Adjusted R-Squared	0,34	0,38	0,62
F Statistic	90,51	36,57	60.37
No. of observations	518	518	518
*p<0.01;**p<0.05; ***p<0.1; [i]p>0.1 White heteroskedasticity-consistent standard errors & covariance			

The Standard DD model (2.1) estimates that there is a large negative effect of occupation on prices in Heideveld at -0.89 log points. However, once the trends in inflation are controlled for (column 2.2) then the effect falls to 0.73 log points. Further controlling for household characteristics, the impact of occupation on Heideveld house prices is estimated at -0.22 log points.

The results across the variations of the model suggest that the occupation of the units of the Heideveld Infill RDP development had a negative effect on the value of the houses within Heideveld. The effect is also estimated to be greater than the commencement of building of the development.

5.3 Case B: Findings for the Belhar Gardens Social Housing Project

This section presents the findings from the Belhar Gardens Social Housing development on the prices of houses within its vicinity.

5.3.1 Testing the appropriateness of the Treatment and Control Group

In this section the appropriateness of the control group Ravensmead, for the treatment group Belhar is tested. A treatment and control group are compatible for the DD analysis if either

the common trend or common price assumption holds across the two suburbs before the commencement of building of the development.

First the common price assumption is tested in the period prior to shock. The results below indicate that the mean house prices controlling for characteristics are insignificant. The first assumption therefore holds. By implication, the control group is an appropriate comparator for the treatment group. The second condition also holds, namely that trends in prices are similar.

Table 16: Test for Control and Treatment Group Compatibility

LERFSIZE	0.38* (0.05)
LDWELLEXT	0.34* (0.06)
LBED	-0.17** (0.07)
GARCPORT	0.08** (0.04)
POOL	0.02[i] (0.09)
SERV_QUART	0.01[i] (0.16)
QUALITY	0.19* (0.05)
TREND	0.08* (0.01)
TREATMENT	0.06[i] (0.08)
TREND*TREATMENT	0.03[i] (0.03)
R-squared	**0.39**
F Statistic	**42.7**
No. of Observations	**689**
*p<0.01;**p<0.05; ***p<0.1 White heteroskedasticity-consistent standard errors & covariance	

5.3.2 DD Analysis: Commencement of the Building of the Social Housing Development

This section presents the findings from the model estimating the effects of the commencement of the building of the social housing development on the price of a house. The building of the development started in February 2015, thus the pre-shock period ranges from January 2010 to January 2015 and the post-shock period ranges from February 2015 to March 2017. The estimation results are reflected in Table 17.

Table 17: Estimation Results of the Commencement of Building of the Social Housing Development- Comparison by Suburb

	(3.1)	(3.2)	(3.3)	(3.4)
Model	**Simple DD**	**Incl Year**	**Incl Suburb**	**Incl HPM**
Variable	**Coefficient**	**Coefficient**	**Coefficient**	**Coefficient**
TREATMENT	-0.05[i] (0.04)	-0.06*** (0.04)	-	-
DPOST	0,20** (0,08)	-	-	-
TREATMENT*DPOST	0.11[i] (0.09)	0.08[i] (0.08)	0.02[i] (0.06)	0.05[i] (0.06)
LERFSIZE	-	-	-	0,31* (0,04)
LBED	-	-	-	0.04[i] (0,04)
QUALITY	-	-	-	0,18* (0,04)
GARCPORT	-	-	-	0,10* (0,03)
POOL	-	-	-	0.05[i] (0.08)
SERV_QUART	-	-	-	-0.04[i] (0.12)
Adjusted R-Squared	0,05	0,09	0,37	0,44
F Statistic	18,01	12,79	22.55	25.20
No. of Observations	1083	1083	1083	1083
*p<0.01;**p<0.05; ***p<0.1; [i]p>0.1 White heteroskedasticity-consistent standard errors & covariance				

Looking first at the basic specification in column 3.1, the commencement of building the Social Housing development is estimated to have no significant impact on house prices in Belhar relative to Ravensmead. This analysis has an adjusted R-squared of only 0.05 indicating that there are other important variables omitted from the model that has an effect on house prices.

The standard DD analysis does not take into account macro shocks. As within Case A, year dummies were added to account for these shocks creating model 3.2. The effect on house prices of the commencement of building of Belhar Gardens within the Belhar suburb however remains insignificant despite the inclusion of year fixed effects to control for the macro shocks.

Belhar consist of 23 extensions that each have different types of houses at different costs. This could therefore also have an impact on the estimated house price. The model has thus been expanded to include intercepts for the extensions within Belhar (the coefficient of each extension is not reflected in the table above). When taking into account the different

suburbs, the impact of the building of the development on surrounding house prices remains insignificant.

These models do not take into account the characteristics of the house, which has also been found to have an effect on the price of a house. With the inclusion of the hedonic characteristics, it is established that the size of the erf and the quality thereof are the most important characteristics in the determination of the price of houses within Belhar and Ravensmead. The number of bedrooms as well as the presence of a pool or servants quarters on the property goes against theory, as it appears to have no significant effect on the price of the house. The coefficient of concern TREATMENT*DPOST once again, remains insignificant. It can thus be concluded that when compared to Ravensmead, the building of the Social Housing development had no significant effect on house prices within Belhar.

Table 18: Estimation Results of the Commencement of Building of the Social Housing Development- Comparison by Extension

Model	(4.1)	(4.2)	(4.3)	(4.4)
	Simple DD	Incl Year	Incl Suburb	Incl HPM
DCLOSE	0.16* (0.05)	0,16* (0.05)(0,05)	-	-
DPOST	0,30* (0.05)	-	-	-
DCLOSE*DPOST	0.02[i] (0.08)	0.01[i] (0.1)	0.04[i] (0.06)	0.04[i] (0.06)
LERFSIZE	-	-	-	0,32* (0,04)
LBED	-	-	-	-0,30[i] (0,18)
QUALITY	-	-	-	0,15*** (0,08)
GARCPORT	-	-	-	0.08** (0.03)
POOL	-	-	-	0.03[i] (0.08)
SERV_QUART	-	-	-	0.04[i] (0.10)
Adjusted R-Squared	0,06	0,1	0,43	0,48
F Statistic	18.85	11.63	22,86	23.85
No. of Observations	853	853	853	853

*p<0.01;**p<0.05; ***p<0.1; [i]p>0.1
White heteroskedasticity-consistent standard errors & covariance

Because Belhar is relatively large in size, the dummy variable DCLOSE was considered. DCLOSE determines if the extensions that are within close proximity of the Belhar Gardens had a greater price effect after the building of the Belhar development, compared to the extensions within Belhar that were further away. Ravensmead is dropped from the sample.

In model 5.1 it is determined that the houses in the extensions that are in closer proximity to the development are of higher value than those that are in extensions located further away. It is also estimated that the commencement of building of the Belhar Gardens had no significant effect on the price of houses in nearby extensions relative to houses in more distant extensions. With the inclusion of the year dummies in model 4.2, the extensions in model 4.3 and the hedonic characteristics of the house in model 4.4, the effect of the building of the Belhar Gardens development on the prices of proximate homes, remains insignificant.

It can thus be concluded that the commencement of building of Belhar Gardens had no significant effect on the house prices of extensions within close proximity to the development relative to those that are further away.

Table 19: Estimation Results from the Commencement of Building of the Social Housing Development- Comparison by Distance

Model	**(5.1)**	**(5.2)**	**(5.3)**	**(5.4)**
	Simple DD	**Incl Year**	**Incl Suburb**	**Incl HPM**
LDISTANCE	-0,31* (0,09)	-0,34* (0,07)	-	-
DPOST	-0.42[i] (1.23)	-	-	-
LDISTANCE*DPOST	0.12[i] (0.17)	0.001[i] (0.01)	-0.001[i] (0.01)	0.0008[i] (0.01)
LERFSIZE	-	-	-	0,32* (0,04)
LBED	-	-	-	-0,29*** (0,18)
QUALITY	-	-	-	0,15*** (0,08)
GARCPORT	-	-	-	0.08** (0.04)
POOL	-	-	-	0.02[i] (0.08)
SERV_QUART	-	-	-	0.04[i] (0.10)
Adjusted R-Squared	0,06	0,11	0,43	0,49
F Statistic	18,03	12.30	22,85	23.83
No. of Observations	853	853	853	853
*p<0.01;**p<0.05; ***p<0.1; [i]p>0.1 White heteroskedasticity-consistent standard errors & covariance				

Finally, there was an attempt in Table 19, to determine if the distance in meters from the development within Belhar has a significant effect on the sales price of the house. The LDISTANCE variable estimates a negative effect between the distance in meters from the development and the price of the house. This indicates that houses that are closer in proximity to the location of the development are on average of higher value. The price of the

house decreases by 0.31% if the distance to the development increases by 1%, *ceteris paribus*. In this model the sale of the house after the shock has no significant effect on the price of the house. The coefficient of concern LDISTANCE*DPOST estimates that the effect of the housing development on house prices is not influenced by the distance from the development after the commencement of the building of the development. This effect remains even with the inclusion of the year dummies, the extension dummies and the hedonic characteristics of the house. Thus it can be concluded that the distance in meters from the development has no significant effect on the price of the house after the building of the development.

The three tables above analyses the effects when the control suburb is used in comparison, when closer extensions are compared to those that are further, as well as when the distance to the development is considered. Each variation of the analysis estimates an insignificant effect in the coefficient of concern. It can thus be confirmed that the commencement of building of the Social Housing development had no significant effect on the price of houses within its vicinity. This is contrary to the protests and concerns raised by the people within the neighbourhood.

5.3.3 DD Analysis: Occupation of the Units within the Social Housing Development

This section presents the findings from the model estimating the effects of the occupation of the units of the Social Housing development on the prices of proximate houses. The occupation of the units took place in May 2016 therefore the pre-shock period is from January 2010 to April 2016 and the post shock period is from May 2016 to March 2017. The OLS estimation results are reflected in Table 20.

Model 6 takes into account the hedonic characteristics of the house, as well as the macro shocks and the location effects in a comparison between Belhar and Ravensmead. The DD coefficient estimates that the occupation of the units had no significant effect on the price of houses in Belhar relative to those in Ravensmead.

Model 7 presents the findings from the model estimating the effects of the extensions that are within 1600m of the development after the occupation of the units within the development. There is still no statistically significant difference between the price of a house sold within 1600m of the development compared to those that are further away, after the occupation of the Belhar Gardens units.

Table 20: Estimation Results of the Occupation of the Social Housing Development- Comparison by Suburb, Extension and Distance

Model	(6)	(7)	(8)
	Suburb	Extension	Distance
TREATMENT*DPOST	0.07[i] (0.08)	-	-
DCLOSE*DPOST	-	-0.05[i] (0.07)	-
LDISTANCE*POST	-	-	0.004[i] (0.01)
LERFSIZE	0,28* (0,04)	0,32* (0,04)	0,32* (0,04)
LBED	-0,12* (0,04)	-0,30*** (0,18)	-0,30*** (0,18)
QUALITY	0,16* (0,04)	0,15** (0,08)	0,15** (0,08)
GARCPORT	0,09* (0,03)	0.08** (0.03)	0.08** (0.03)
POOL	0.01[i] (0.08)	0.02[i] (0.08)	0.03[i] (0.08)
SERV_QUART	-0.04[i] (0.1)	0.04[i] (0.10)	0.04[i] (0.10)
Adjusted R-Squared	0,44	0,48	0,48
F Statistic	24,89	23.84	23,84
No. of Observations	1083	853	853
*p<0.01;**p<0.05; ***p<0.1; [i]p>0.1 White heteroskedasticity-consistent standard errors & covariance			

Model 8 estimates the effect of distance from the development on house prices after the occupation of the units. The DD coefficient however remains insignificant.

Judging from the results of the three models above, it can be concluded that occupation of the units of the Belhar Gardens Social Housing development had no effect on the prices of houses within its vicinity. This too, is contrary to the perceptions and protests of neighbours to the development.

5.4 Summary of Findings and Recommendations

The analysis above estimates that the commencement of building and occupation of the Heideveld Infill RDP development had a negative impact on the prices of houses within the Heideveld suburb. This is the case despite the efforts of the State to make these houses more aesthetically appealing than its predecessors, and their conscious effort to ensure that the design of the houses integrate well with the houses within the existing community. This leads to two possible conclusions for the negative effect:

Firstly, it is possible that the previous negative perceptions on RDP developments still held despite the changes that the State has made to ensure that the RDP development integrates

well with the host community. This therefore had an influence on the sales and sales prices of houses in Heideveld after commencement of the building and occupation of the units;

Secondly, it is possible that it is not the type of houses built that creates the negative impact, but instead the expected inhabitants of the development. Results from the RDP analysis estimates that the occupation of the units had a greater negative effect on proximate house prices compared to the commencement of the building of the development. This indicates that the latter possibility is likely.

Further analysis is therefore necessary to determine if it is the characteristics of the inhabitants of the development that creates the negative impact on house prices. It is possible that the negative effect may be reduced in cases where an RDP development is built in an area where the characteristics of the host community match that of the inhabitants of the development. Note that Heideveld is considered a less affluent suburb within the City of Cape Town, whilst less affluent households are also moving into the development.

With respect to the Belhar Gardens Social Housing development, the results estimate that the building and occupation of the development had no effect on proximate house prices. This indicates that the perceptions of the host community are disproved, considering the concerns raised during their protest against the development during 2016.

It is possible that there is no effect because the development is gated, aesthetically appealing and has landscaping. The development is also well operated and managed by the private Social Housing Institution, which ensures that the development is well maintained. The persons that moved into the development are also more affluent than those that moved into the RDP houses as they earn between R2800 and R7500, compared to an earnings of less than R3500 per month for RDP house beneficiaries.

While the Social Housing development and the RDP development had no effect and a negative effect on house prices, respectively, the results from these cases cannot be generalised to other developments within South Africa. The developments may only be having their effects based on the circumstances present in the location and planning of the development.

Nevertheless the following recommendations can be made to the State:

- Ensure that the design of the development integrates well with the surrounding community;
- Ensure that the development is aesthetically appealing and has landscaping;
- Ensure that these are well communicated with the host community during the public participation meetings. Show the community the plans and allow for comments.

- In cases where social housing is planned, indicate to the host community that this study suggests that no negative impact is present; and
- Undertake further analysis into the causes of the negative impacts of the RDP development, and ensure that these are mitigated in future RDP developments.

6. CONCLUSION

High levels of unemployment and poverty within South Africa creates a high demand for low cost housing. Unfortunately the market is not able to meet this demand. For this reason the State intervenes to provide housing to those households in need. Unfortunately the State's efforts are sometimes met with opposition from the host communities. Host communities express concerns with a possible decline in their property values, due to the building of the subsidized housing developments. The concerns of the host communities are however based on perception as opposed to factual evidence of the negative effects.

This paper attempted to analyse the impacts of subsidized housing developments on proximate house prices. The RDP and Social Housing developments were considered as these have experienced the most opposition in recent years.

In order to estimate the effects, the case study method was employed. The Heideveld Infill RDP development and the Belhar Gardens Social Housing development effects were analysed. A DD impact analysis was employed to do the analysis, which estimates the counterfactual for the change in house price for the treatment suburb (Heideveld and Belhar) by calculating the change in outcome for the control suburb (Steenberg and Ravensmead). The DD analysis was combined with the HPM to ensure that the characteristics of the houses are also accounted for within the estimated price effects. An OLS estimation model was employed to do the analysis.

The results found a negative impact of the Heideveld Infill RDP development on proximate houses prices. The negative effect of occupation was greater than that of the commencement of building of the development. The negative impact confirms the NIMBY fears. While there are various theories and some evidence for the reasons for the effects, these need to be tested. This paper thus opens up opportunities for further research on why the estimated effects took place.

The estimation results for the Belhar Gardens Social Housing Development found no effect on the house prices of proximate houses. The empirical facts therefore do not support the concerns expressed by opponents to the project, as raised within the protests of 2016. Perceptions do not always correspond with reality, and this is why empirical studies such as this are important.

The estimation results were consistent across different variations of the models employed. Note however that these results are specific to the two cases and cannot be generalised to other RDP and Social Housing projects within South Africa. The contribution of this study lies in its ability to determine the causal effects of these subsidized housing developments on the price of houses in close proximity to these developments.

Nevertheless, it is recommended that future developments are aesthetically appealing, have landscaping, are well maintained and are well integrated with the surrounding community. These efforts should also be well communicated to the host communities during the public participation events. Further analysis is required to determine the cause of the negative effects of the RDP development to ensure that these are mitigated in future RDP projects. These may allow the State to provide the much needed housing opportunities, with limited opposition from the host communities.

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Appendix

Test for Multicollinearity

Multicollinearity is a phenomenon in which one explanatory variable in a multiple regression model can be linearly predicted from another with a substantial degree of accuracy (Gujarati & Porter, 2010). This can affect the significance and validity of the model results. This section investigates the presence of multicollinearity within the models presented in Chapter 4 in order to determine the validity of results displayed in Chapter 5. In order to do so, the pairwise correlation figures are analysed. Where coefficients are 0.5 or higher, it can be concluded that strong relationships exist between the respective variables; where coefficients range between 0.3 and 0.5 it displays that a moderate relationship exists; and finally where coefficients are less than 0.3 it indicates that there is a weak relationship between variables.

Table 21 displays the pairwise correlation coefficients between the hedonic variables within Case A as a test for the presence of multicollinearity within the model. The pairwise correlation coefficients shows that there is moderate to low positive relationships amongst the variables. This indicates that multicollinearity is not present within the model.

Table 21: Case A Pairwise Correlation

	LERFSIZE	LBED	QUALITY	GARCPORT	POOL
LERFSIZE	1	0.38	0.42	0.39	0.17
LBED	0.38	1	0.24	0.23	0.13
QUALITY	0.42	0.24	1	0.22	0.08
GARCPORT	0.39	0.23	0.22	1	0.24
POOL	0.17	0.13	0.07	0.24	1

The test for correlation amongst the variables within Case B indicates that there is low positive correlation between all hedonic variables within the model, with the exception of the low negative relationship between the quality of a house (QUALITY) and the presence of a servants quarters on its premises (SERV_QUART). This indicates that there is no multicollinearity present within the model.

Table 22: Case B Pairwise Correlation

	LERFSIZE	LBED	QUALITY	GAR_CPORT	POOL	SERV_QUART
LERFSIZE	1	0.12	0.31	0.29	0.19	0.08
LBED	0.12	1	0.15	0.31	0.11	0.07
QUALITY	0.31	0.15	1	0.17	0.08	-0.002
GAR_CPORT	0.29	0.31	0.17	1	0.13	0.02
POOL	0.18	0.10	0.08	0.13	1	0.08
SERV_QUART	0.08	0.07	-0.002	0.02	0.08	1