Unravelling the Dutch Housing Puzzle

Market Dynamics and Housing Development Delays: Analysing the Role of Market Concentration on the Dutch Housing Market

Dries Kreijns

S1102969

Master's Thesis for the Spatial Planning programme, specialisation in Planning, Land and Real Estate Development

Nijmegen School of Management

Radboud University

July 24

Colophon

Nijmegen School of Management

Spatial Planning

Planning, Land and Real Estate Development

Radboud University

Title: Unravelling the Dutch Housing Puzzle

Subtitle: Market Dynamics and Housing Development Delays: Analysing the Role of Market Concentration on the Dutch Housing Market

Student: D. (Dries) Kreijns

Student number: s1102969

E-mail: dries.kreijns@gmail.com

Supervisor: Prof. Dr. E (Erwin) van der Krabben

Second Reader: Dr. Ir. D.A.A. (Ary) Samsura

Date: 05 July 2024

Abstract

The Dutch housing market has been plagued by persistent shortages and delays in housing development, prompting increased governmental intervention. This study investigates the role of market concentration in these delays, exploring whether the dominance of a few large firms in the housing market contributes to inefficiencies and slower project completion. Using municipal-level data from 2015 to 2021, this research uses two datasets and combines them to measure market concentration and its effects on various stages of housing development, including the number of homes in the pipeline, permitted, under construction, and newly built.

The findings reveal that while market concentration alone does not significantly affect the number of homes in the pipeline, it interacts negatively with housing demand. In highly concentrated markets, the positive impact of rising housing prices on housing development is diminished, suggesting that dominant firms may delay development to maximize profits. This study contributes to the understanding of housing market dynamics in the Netherlands, providing valuable insights for policymakers aiming to reduce market inefficiencies and accelerate housing delivery.

By identifying the mechanisms through which market concentration affects housing development, this research underscores the need for regulatory measures to foster competition and enhance market responsiveness. The results highlight the importance of considering both market structure and demand factors in formulating effective housing policies, aiming to mitigate the current housing crisis and ensure timely project execution.

Table of Contents

1. Introduction

1.1 Introduction

The housing crisis in the Netherlands has been a prominent topic in national politics for years. The government bears the responsibility of ensuring adequate housing. Given the persistent and escalating shortage of homes, which increasingly become unaffordable for certain societal groups, there has been a growing inclination for national governmental intervention (NOS, 2023). Recent years have seen an increased focus on accelerating housing construction. Initially, the emphasis was on increasing the number of new housing plans, but gradually, attention has shifted towards expediting the construction of homes within existing (approved) plans. The Minister of Housing and Spatial Planning, Hugo de Jonge, implemented measures such as the Affordable Rent Act, the Start Construction Impulse, and the Housing Construction Impulse (Ministry of the Interior and Kingdom Relations, 2023a, 2023b; RVO, 2020). The effectiveness of these government measures in reducing the housing shortage and making homes more affordable remains to be seen.

A pivotal aspect of addressing this crisis is the construction of new housing developments. In simple terms, more houses need to be built to reduce the housing shortage. The goal of adding 981,000 homes by 2030 is unlikely to be met. However, what is achievable are the plans for these homes. The planning capacity indicates that by 2030, the number of planned houses will be at 130% of the estimated need (Groenemeijer, 2022). Consequently, there appear to be sufficient plans to address the housing shortage (Groenemeijer, 2021). However, a portion of these planned houses will either be cancelled or face delays. Even among the "solid" plans, which have already received zoning approval, delays are occurring. Previous research by Buitelaar and Schie (2018) demonstrated that for many homes included in official zoning plans, no permit applications had been filed, nor had construction begun. The conclusion was that while zoning approval is a necessary condition, it is not sufficient to ensure actual construction. This finding is also acknowledged by the Dutch government, as stated in the new Housing and Construction Agenda, which emphasizes the need to initially focus on accelerating the construction of homes in established plans (Ploegmakers et al., 2022).

The pertinent question arises as to why delays occur even for projects with approved plans. The production of new construction homes involves several distinct phases. From Soft Plans to Hard Plans: Soft plans refer to preliminary ideas or proposals for new construction projects that have not yet received formal approval or detailed planning. Hard plans, on the other hand, represent a more advanced stage where the project has undergone significant planning and has received formal approval (Ploegmakers et al., 2022). Hard Plans to Building Permit: Once a plan has been solidified into a hard plan, the next phase involves obtaining a building permit. The building permit process can be complex and time-consuming, often involving multiple stakeholders and public consultations. Building Permit to Start of Construction: After securing a building permit, the project moves towards the actual commencement of construction. Start of Construction to Actual Delivery: The final phase encompasses the construction period up to the delivery of the completed homes. Delays can occur at any of these four stages, highlighting the complexity and potential challenges inherent in the construction of new homes.

It is essential to establish what constitutes a normal timeframe between the issuance of a building permit and the commencement of construction. According to CBS, this duration averaged between 21 and 24 months during 2012-2017. A site is considered a 'stalled site' if the duration exceeds 24 months post-permit issuance (Buitelaar & Schie, 2018). The question then emerges: why is the available planning capacity either not utilized or significantly delayed? Various explanations shed light on why zoning plans are not immediately followed by building permits, and why these permits do not promptly lead to actual housing construction. Based on existing literature, four categories of factors can be identified: financial feasibility, location issues, policy and regulation, and landowners and developers (Buitelaar & Schie, 2018). The last factor warrants further exploration. These parties can also pose obstacles. For instance, some landowners may be reluctant to develop or sell their land (Buitelaar et al., 2008).

Developing parties may also engage in strategic land policy and land banking, which can lead to delays. The objective of land banking is to acquire significant amounts of land, thereby ensuring a steady supply of construction projects over an extended period. The primary goal is not necessarily the rapid development of all land (Adams et al., 2009). In fact, from a portfolio strategy perspective, it may yield higher returns to gradually develop land reserves (Ott et al., 2012). Additionally, from the standpoint of individual land holdings, waiting or delaying can be an efficient strategy (Buitelaar & Schie, 2018).

Is the phenomenon of stalled sites a result of an imperfect housing market in the Netherlands? The housing market exhibits characteristics of an imperfect market, with supply lagging behind demand and affordability under pressure. The functioning of the land market influences construction production and, consequently, the performance of the housing market (Krabben, 2021). Buitelaar and Van der Krabben (2023) conducted a study for the Authority for Consumers and Markets (ACM) on the level of market concentration among sellers of new-build homes. This study reveals that just over 50% of municipalities have a highly concentrated market, particularly prevalent in small to medium-sized municipalities with a relatively large new-build market and a high proportion of new construction relative to the existing market. In the United States, Quintero (2022) examined that high levels of market concentration in certain areas have led to changes in the housing stock in a negative sense. Fewer new homes have been added over an extended period of time and there is high price volatility. This issue is not unique to the Netherlands and the United States; the United Kingdom also faces similar challenges. A recent investigation by the Competition and Markets Authority (CMA) in the UK highlighted fundamental concerns in the housebuilding market, indicating high levels of market concentration and its adverse effects on housing supply and affordability (CMA, 2024). The CMA's findings align with issues observed in other countries, suggesting that high market concentration can lead to reduced housing output and increased prices, thereby exacerbating the housing crisis.

1.2 Research problem statement and research aim

The housing crisis in the Netherlands has intensified the focus on the need for an efficient and expeditious housing market. Despite governmental interventions and policies, a significant challenge persists in the delayed execution of approved housing plans. This research, inspired by Quintero (2022), which analyses the effect of market concentration on housing development in the U.S., seeks to examine a similar impact in the Dutch context. The critical question is: is there a discernible connection between market concentration in the housing sector and the number of housing projects that are realized?

The identification of market failure within the housing market is a pivotal starting point for this investigation. Acknowledging the existence of market failure becomes imperative, particularly concerning the disparities between planned housing initiatives and their actual implementation. This study specifically focuses on production-related aspects influenced by market concentration, aiming to uncover the underlying reasons behind delays in the execution of housing plans.

The central inquiry revolves around the causes of these delays in plan implementation. Could market concentration be a contributing factor, acting as a catalyst for inefficiencies and disruptions in the housing production process? Understanding the dynamics of market concentration and its potential impact on project timelines is crucial for unravelling the complexities of the housing market.

By delving into the interplay between market concentration and housing project execution, this research seeks to contribute nuanced insights into the broader discourse on market efficiency and policy formulation. This will also contribute to the scientific literature on this subject, as it has never been investigated within the Dutch context before. The overarching goal is to find out whether market concentration plays a role in hindering the timely realization of housing plans and, if so, to describe the mechanisms through which this influence occurs. Ultimately, this study aims to provide valuable knowledge that can inform evidence-based policy decisions and interventions aimed at reducing market failures and accelerating the delivery of much-needed housing projects in the Netherlands.

1.3 Research question

The main research question of this paper is:

“What is the effect of market concentration on the pace and quantity of housing projects in the Netherlands?”

This main question can be divided into sub-questions. Answering these sub-questions will facilitate the answering of the main question. The two sub-questions investigated are: (I) To what extent is market concentration present? And (II) How does market concentration affect the timing and execution of housing projects in different municipalities in the Netherlands? These questions will be addressed using existing literature and data.

1.4 Relevance of the research

1.4.1 Scientific relevance

This research holds significant scientific relevance within the context of the Dutch housing market, as there is a noticeable gap in empirical studies addressing the repercussions of market concentration on the execution of new housing projects. While numerous studies have analysed the factors, causes and strategic considerations causing delays in housing construction and their impacts, these studies have not extensively examined the relationship between market concentration and housing development delays. Developers, after all, can be expected to make different decisions in a concentrated market. This gap is critical because understanding this relationship could unveil new insights into the market dynamics that contribute to the persistent housing crisis in the Netherlands.

Research in the UK and USA has mostly explored potential supply restrictions. Gyourko and Molloy (2015) studied the regulatory barriers and Saiz (2010) researched the scarcity of buildable land. The shortage of skilled labour is reviewed by Goodman (2018). So, the existing literature primarily focuses on factors such as financial feasibility, location issues, policy and regulation, and the roles of landowners and developers in causing delays. However, the impact of market concentration on these delays remains underexplored in the Dutch context. A study in another country, by Quintero (2022) in the United States, researched the market concentration and the effect on the time to develop building plans. This study serves as a foundation for this research. A similar methodology is employed in Quintero's study and this one; however, this research focuses on the Dutch housing market, whereas Quintero's study investigates the American market. Due to the contextual differences between the United States and the Netherlands—such as differences in regulatory environments, market structures, and cultural factors, see chapter 3.2—Quintero’s conclusions cannot be directly applied to the Dutch housing market. Somerville (1999) uses data on the average size of homebuilder establishments and homebuilder market concentration to test the appropriateness of the idea that homebuilding is a homogeneous, perfectly competitive industry.

Already existing studies in the Netherlands were mainly focused on the time to develop the hard building plans. Ploegmakers et al. (2022) report examined this for three provinces. They further examined explanations for the differences in lead time. (Ploegmakers et al., 2022): "With respect to financial feasibility, it was found that rising housing prices cause construction to proceed at a slower pace. That increases in prices seem to lead to delays is not in line with classical investment theories.

Also, the document where the market concentration in homebuilders is discovered (Buitelaar & Van der Krabben, 2023) is important to mention. This report presents a possible cause of the results of (Ploegmakers et al., 2022) and thus provides an opportunity to combine the two datasets used for the different studies to discover possible correlations.

The combined use of two existing datasets in this study contributes to its scientific significance. By utilizing recently compiled datasets specific to the Dutch context, the research explores aspects that have not been thoroughly examined before. This provides an opportunity to delve into the consequences of the recently identified high market concentration in the Netherlands, offering insights into the intricacies of the housing market and its response to concentration dynamics.

1.4.2 Societal relevance

The societal relevance of this research is paramount, considering the current housing crisis in the Netherlands. With a persistent shortage of housing, the expeditious realization of new construction projects is crucial for addressing the housing deficit. However, numerous challenges and delays have been observed in the execution of approved housing plans, hindering the timely delivery of much-needed homes.

Research conducted on behalf of the Authority for Consumers and Markets (ACM) in 2023 has shed light on the pervasive issue of high market concentration in many municipalities (Buitelaar & Van der Krabben, 2023). This concentration may signify a form of market failure, raising concerns about the efficiency and effectiveness of the housing market. The societal impact of this market concentration becomes evident as it may contribute to delays in the implementation of housing projects.

Understanding the connection between market concentration and the pace of housing project execution is vital for policymakers, stakeholders, and the public. If market concentration proves to be a significant factor causing delays in housing plans, it becomes essential to identify the root causes within the concentration dynamics. This knowledge can inform targeted interventions and policy adjustments in the new housing market to reduce market failures, potentially expediting the realization of housing projects.

The societal relevance lies in the potential implications for homeowners, aspiring residents, and the broader economy. A thorough investigation into the effect of market concentration on the pace of housing projects will not only contribute to academic knowledge but will also provide actionable insights for policymakers, allowing them to make informed decisions to address the housing crisis effectively. By pinpointing the relationship between market concentration and project delays, this research aims to contribute substantively to discussions surrounding housing policies and interventions necessary to create a more efficient and responsive housing market in the Netherlands.

2. Literature review

Quintero (2022) posits that increased market concentration among homebuilders leads to reduced housing production and greater price volatility. This is due to the oligopolistic nature of the market, where fewer players have more control, potentially leading to strategic behaviours that slow down or limit housing development. This theoretical framework can be a cornerstone for analysing the Dutch housing market, considering its market concentration dynamics and how they might influence housing supply and prices.

2.1 Definition of market concentration

Market concentration, a fundamental concept in the field of industrial organization, refers to the extent to which market share is dominated by a few firms. This phenomenon has profound implications across various industries, including housing development.

According to Porter (2003), market concentration arises when few firms have significant control over a market, often leading to oligopolistic conditions. Porter argues that such concentration can stem from various sources, including economies of scale, barriers to entry, and capital requirements. In the context of housing development, this translates to a scenario where a handful of developers or firms control a substantial portion of the market. Porter's analysis goes beyond mere market share, focusing on the competitive strategies employed by dominant firms. In the housing market, this might manifest as strategic land acquisition (land banking) and phased development to maximize returns.

Coiacetto (2009) extends the discussion of market concentration into the realm of spatial markets, particularly relevant to real estate and housing. He underscores how geographic factors contribute to market concentration, particularly in land and property markets. Coiacetto posits that spatial characteristics of land, such as location and land-use regulations, inherently limit the number of players who can effectively participate in the market. This limitation can lead to a concentration of market power in the hands of a few large developers or firms that have the capital and expertise to navigate complex regulatory landscapes and manage large-scale projects. In housing development, these spatial constraints, combined with regulatory frameworks, create barriers to entry for smaller firms. Consequently, larger firms, which often have more resources and better access to funding, can dominate local or regional markets. Restrictive zoning and complex approval processes can exacerbate market concentration by favouring established players who have the resources to comply with these requirements. This scenario often results in a market that is less responsive to changes in housing demand and preferences, potentially leading to issues like housing shortages, affordability crises, and reduced diversity in housing options (Coiacetto, 2009).

2.2 Measurements of market concentration

Market concentration in housing development can be measured using several established indices. The Herfindahl-Hirschman Index (HHI) and the Concentration Ratio Index (CR_4) are commonly used metrics.

The HHI is calculated by summing the squares of the market shares of all firms in the market. This results in a value between 0 and 1 (or 0 to 10,000 if using percentages), where 0 indicates perfect competition and 1 (or 10,000) indicates a monopoly. Buitelaar and Van der Krabben (2023) applied the HHI to the Dutch housing market to determine the level of concentration, categorizing markets as non-concentrated (HHI < 10), moderately concentrated (HHI 10-20), and highly concentrated (HHI > 20). For the interpretation of the measurement outcomes, certain rules of thumb are employed. The European Commission has established guidelines regarding competition in the context of mergers and acquisitions, utilizing the Herfindahl-Hirschman Index (HHI) as a tool. According to these guidelines, the European Commission is unlikely to identify horizontal competition concerns in cases where the HHI is below 10 (0.1), or when the HHI ranges between 10 and 20, provided that the delta resulting from a merger or acquisition is less than 2.5, and when the HHI exceeds 200, with a delta less than 1.5, unless exceptional circumstances are present (Buitelaar & Van der Krabben, 2023).

The CR_4 measures the total market share of the four largest firms in a market. It ranges from 0 to 100%, with thresholds defining market concentration: below 25% indicates a non-concentrated market, 25-50% indicates moderate concentration, 50-75% indicates high concentration, and above 75% indicates an oligopoly. This index provides a clear view of the dominance of the largest players in the market.

Calculation examples (Buitelaar & Van der Krabben, 2023):
Calculation HHI:
Suppose:
- • Marktaandeel bedrijf 1: 40%
- • Marktaandeel bedrijf 2: 30%
- • Marktaandeel bedrijf 3: 15%
- • Marktaandeel bedrijf 4: 15%

The HHI is:
$0{,}40^2 + 0{,}30^2 + 0{,}15^2 + 0{,}15^2 = 0{,}295$ (29,5)
Calculation CR_4:
Suppose:
- • Marktaandeel bedrijf 1: 33%
- • Marktaandeel bedrijf 2: 26%
- • Marktaandeel bedrijf 3: 15%
- • Marktaandeel bedrijf 4: 10%

The CR_4 is:
33% + 26% + 15% + 10% = 84%

2.2.1 Implementation for the housing market

In their analysis of the Dutch housing market, Buitelaar and Van der Krabben (2023) used both the HHI and CR_4 to measure market concentration. They found significant concentration in the housing development sector, highlighting how a few large firms control a substantial portion of the market, potentially affecting competition and housing supply dynamics. Quintero (2022) utilized the number of firms accounting for 90% of housing production in a given market-year as a measure of competitive intensity. This approach focused on active market participants, excluding small firms building highly customized luxury housing. The study demonstrated that increased market concentration led to reduced housing production and greater price volatility, emphasizing the significant impact of market power on housing supply.

2.3 Potential impact of market concentration

Market concentration can significantly influence various market dynamics, including pricing, supply, and innovation. In the United States, the housing market has seen a growing dominance of large firms in local markets. This trend is highlighted by a study showing that "the largest homebuilders in the US now account for about half of all new single-family home sales" (Quintero, 2022). This concentration is not just a reflection of market power but also influences the dynamics of housing availability and affordability. Quintero's research also shows a strategic shift post-Great Recession, with fewer firms due to bankruptcies and mergers, leading to a more consolidated market. The implications of this concentration are profound. This consolidation resulted in several key impacts: (I) Quintero’s study revealed that increased market concentration leads to lower housing production volumes. The strategic behaviour of oligopolistic firms, which involves controlling the timing, volume, and pricing of new constructions, has resulted in fewer units being built. (II) Higher market concentration has been associated with greater price volatility. With fewer firms controlling the market, pricing strategies become more aggressive, leading to significant fluctuations in housing prices. (III) According to Quintero (2022), market concentration significantly affects the number of homes in the pipeline. This phenomenon is largely due to the strategic behaviours of dominant firms in concentrated markets. These firms tend to control the supply and timing of housing projects to maximize their profits, often delaying the commencement of new projects to create artificial scarcity and drive up prices. Specifically, his study estimates that from 2006 to 2015, increased concentration led to the production of $106 billion less housing per year, equivalent to 3.4% of the value of private fixed investment in 2015. This concentration also resulted in approximately 150,000 fewer housing units being built annually, with price volatility increasing significantly due to decreased competition (Quintero, 2022).

Furthermore, a study on the impact of market concentration in China's real estate industry found similar effects. Mi (2015) analysed the impact of market concentration on housing prices in China, using panel data from 30 provinces. The study found that higher market concentration significantly increased housing prices. The results suggest that regulatory oversight is essential to prevent the abuse of market power by dominant firms, which can exacerbate housing affordability issues.

The UK housing market presents a similar pattern of concentration. An influential report, the Barker Review of Housing Supply, raised concerns about market concentration affecting the pace and quality of housing development (Barker, 2004). The report suggested that "market concentration of a few large firms can impact the tempo and quality of new housing construction" (Leishman, 2015). This concentration has implications for the diversity and innovation in housing projects, as a limited number of firms exert significant control over what is built and where. It also raises questions about the inclusivity and sustainability of housing developments, as market concentration can limit choices for consumers and potentially stifle innovation in sustainable housing solutions.

The economic and cultural context in the Netherlands, with its unique land use policies and consumer preferences, can significantly influence housing market dynamics. Dutch land use policies are known for their stringent planning and zoning regulations, which can impact housing supply and market concentration differently than in the U.S., China, and the UK. The economic and cultural context in the Netherlands, with its unique land use policies and consumer preferences, can significantly influence housing market dynamics. Dutch land use policies are known for their stringent planning and zoning regulations, which can impact housing supply and market concentration differently than in the U.S., China, and the UK. According to Ball (2013), the regulatory environment plays a crucial role in shaping the structure of the housebuilding industry. Ball highlights that countries with stringent land-use planning, like the UK, tend to have higher market concentration among housebuilders due to the competitive advantage larger firms have in navigating complex planning systems. Similarly, Buitelaar and Van der Krabben (2023) discuss how the Dutch planning system's rigid regulations lead to a concentration of market power among a few large developers who can manage the high costs and long timelines associated with securing building permits. This concentration can limit competition and reduce the responsiveness of the housing market to changes in demand, as smaller developers struggle to compete. These insights underline the critical influence of regulatory frameworks on market dynamics, reinforcing the need to consider the specificities of the Dutch context when analysing housing market concentration.

2.4 Causes of market concentration

Market concentration in the housing development sector is influenced by a variety of interrelated factors that collectively shape the competitive landscape. Understanding these causes provides insight into why certain firms dominate the market and how this dominance impacts housing supply and development timelines. These causes of market concentration for this specific topic will not be further investigated.

2.4.1 Economies of scale

One of the primary drivers of market concentration is the advantage of economies of scale. Larger firms benefit significantly from reduced per-unit costs as their production volume increases. This cost efficiency arises from various factors such as bulk purchasing of materials, more efficient use of labour, and the ability to spread fixed costs over a larger number of units. Porter (2003) explains that these efficiencies allow large developers to offer competitive pricing and absorb market fluctuations better than smaller firms. Consequently, smaller developers, unable to match these efficiencies, struggle to compete, leading to a higher concentration of market power among larger firms. Mändle and Schmid (2018) conducted a study on German housing companies and found that economies of scale are a significant factor in market concentration, with larger firms enjoying substantial cost advantages over smaller competitors.

2.4.2 Barriers to entry

High barriers to entry further contribute to market concentration. These barriers include substantial capital requirements, complex regulatory environments, and the need for extensive industry expertise. In the Netherlands, the housing market is characterized by stringent zoning laws and extensive planning processes that favour well-established developers. Coiacetto (2009) argues that these barriers are particularly daunting for new entrants who lack the financial resources and bureaucratic acumen to navigate such a challenging landscape. As a result, the market tends to consolidate around a few large players who have the resources to overcome these barriers. Karakaya (2002) also highlights that cost advantages and capital requirements are among the most significant barriers to entry in industrial markets, further emphasizing the challenges new entrants face in competing with established firms.

2.4.3 Strategic land acquisition

Strategic land acquisition practices, such as land banking, play a significant role in increasing market concentration. Land banking involves purchasing large tracts of land with the intention of controlling future supply. This practice is common among large developers who seek to ensure a steady pipeline of projects over time. Adams et al. (2009) highlight that land banking allows developers to manage their portfolios strategically, often delaying development to maximize financial returns. This strategy not only secures the developer's future projects but also creates a scarcity of available land for other potential developers, reinforcing the concentration of market power. This is also the case in Hong Kong, where strategic land acquisition and prefabrication requirements have led to reduced competition and increased market concentration in public housing projects (Chiang et al., 2006).

2.4.4 Regulatory frameworks

Regulatory frameworks, particularly stringent planning, and zoning regulations, also contribute to market concentration. The regulatory environment in the Netherlands requires developers to comply with extensive documentation, environmental assessments, and multiple rounds of public consultation.

Boelhouwer and Heijden (1992) note that these rigorous requirements favour larger developers who have the resources to meet regulatory demands efficiently. Smaller firms, on the other hand, may find these hurdles insurmountable, thereby reducing competition and increasing market concentration. The ability of large firms to navigate complex regulations more effectively consolidates their market position and limits the entry and growth of smaller competitors. Lutz et al. (2010) found that regulatory barriers, such as government rules and standards, significantly impact market entry and consolidation, often favouring established firms that can manage these requirements more effectively.

2.5 Delays in building production

Delays in housing development, particularly in markets with high concentration, are often linked to strategic behaviours and regulatory challenges. Real Option Theory provides a useful framework for understanding these delays. This theory, originating from finance, treats land and development projects as options, offering developers the flexibility to delay construction until market conditions are favourable (Dixit & Pindyck, 1994).

Housing companies decide when to build homes, considering competition and changing market conditions. Imagine a few companies that can build houses at two different times. They must choose when to build, knowing that land will be cheaper but demand lower at the first time point, and land will be more expensive but demand higher at the second time point. They use land and materials to build houses and want to sell them at a profit (Ploegmakers et al., 2022). This theory is particularly relevant in scenarios where developers must decide on the timing and scale of projects, balancing costs against future market potential (Grenadier, 1996). In the Dutch context, it helps in understanding decisions related to project timing, considering fluctuating land prices and demand. In the Netherlands, this approach is crucial due to specific market conditions such as land scarcity and strict planning regulations (Boelhouwer & Heijden, 1992). Developers use real option theory to optimize the timing and location of their projects, responding to these unique market factors.

2.5.1 Stalled sites

Stalled sites are a critical issue in urban development, representing planned housing projects that face delays or cessation. These interruptions are often the result of various factors, including economic downturns, planning disputes and market volatilities. Particularly in the Dutch landscape, the complexity of regulatory frameworks and environmental legislations significantly contributes to the stalling of projects, underlining the nuanced challenges within the country’s urban planning and housing sector (Adams & Tiesdell, 2012).

The implications of stalled sites extend far beyond mere project delays, impacting housing supply chains and broader urban development strategies. They mirror complex economic and policy-oriented challenges within both local and international housing markets, such as land speculation practices, funding limitations and the evolving demands of the market (Adams & Tiesdell, 2012).

Addressing the dilemma of stalled sites has led to the proposal of various strategies aimed at revitalising these developments. Among these, public-private partnerships stand out as a collaborative approach to leverage both public oversight and private sector efficiency. Regulatory reforms and financial incentives are also crucial in fostering an environment conducive to development. Specifically, in the Netherlands, innovative policy measures like flexible zoning laws and the streamlining of environmental assessments have been pivotal in mitigating the stalling of housing projects, suggesting a forward-thinking approach to urban planning and development (Monk et al., 2005) (Boelhouwer, 2017).

These efforts highlight the multifaceted approach required to tackle the issue of stalled sites, emphasizing the need for adaptive policies that can navigate the complexities of modern urban development.

2.5.2 Causes of delay

Delays in housing production are a multifaceted issue that can significantly impact the timeline of construction projects. Various factors can contribute to these delays, including regulatory hurdles, financial feasibility, and other relevant issues identified in existing literature.

Regulatory Hurdles

Regulatory hurdles are a significant cause of delays in housing production. Regulatory requirements are designed to ensure that construction projects comply with safety, environmental, and zoning regulations. However, the complexity and length of these processes can significantly slow down project progress. Bahadir and Mykhaylova (2014) noted that regulatory delays significantly impact housing market dynamics. Their study found that delays in obtaining building permits and approvals can extend project timelines by several months, leading to increased costs and uncertainty. Similarly, Buitelaar and Schie (2018) emphasized that zoning approval, while necessary, is not sufficient to ensure actual construction, as additional permits and compliance with regulations can introduce significant delays.

In the Netherlands, the regulatory environment is particularly stringent, with developers required to navigate complex approval processes and adhere to numerous regulatory requirements. This complexity is intended to ensure high standards of safety and environmental protection, but it also introduces significant delays. According to Ploegmakers et al. (2022), delays in the Dutch housing market are often attributed to the intricate and prolonged nature of the regulatory approval process. Furthermore, Boelhouwer and Heijden (1992) noted that each stage of the planning process, from initial application to final approval, can be time-consuming due to the need for comprehensive documentation and adherence to rigorous standards.

Financial Feasibility

Another critical factor contributing to delays in housing production is the financial feasibility of development projects. Rising housing prices, fluctuations in interest rates, and the availability of capital can all influence the financial feasibility of a project. Developers often face challenges in securing sufficient capital, especially during periods of economic uncertainty. This can lead to a slowdown in the approval and initiation of new projects as developers struggle to balance the financial aspects with regulatory and market demands (Ball, 2011). Rising housing prices might initially seem beneficial for developers, but they can also lead to increased costs for materials and labour, thereby complicating the financial planning of projects. Fluctuations in interest rates are another significant factor; higher interest rates increase the cost of borrowing, making it more expensive for developers to finance their projects. Gyourko and Saiz (2006) noted that the financial feasibility of housing projects is closely tied to broader economic conditions. During economic downturns, for instance, the availability of capital may decrease, and lenders may become more cautious, further complicating financing efforts for developers. This can lead to significant delays as projects are put on hold until economic conditions improve. Buitelaar and Schie (2018) also pointed out that developers might delay construction to secure additional financing or modify projects to meet regulatory requirements.

Land Acquisition and Ownership Issues

Land acquisition and ownership issues also play a crucial role in causing delays in housing production. Research by Adams et al. (2009) highlights how strategic land acquisition can create delays. Developers often purchase large tracts of land with the intention of controlling the supply and timing of new housing projects. This practice can lead to delays as developers wait for optimal market conditions to commence construction. In the Dutch context, land banking and other strategic land acquisition practices can exacerbate delays, particularly in areas with high land value and demand. Buitelaar et al. (2008) and Van der Krabben and Needham (2008) also noted that strategic land policies and land banking are significant factors contributing to the delays in housing production.

Other Causes

Besides the mentioned causes, other factors can also contribute to delays in housing production. Goodman (2018) emphasizes the impact of skilled labour shortages on housing production. In markets where there is a shortage of skilled workers, construction projects can be delayed significantly, as developers struggle to find the necessary workforce to complete the projects on time. Additionally, supply chain disruptions, as highlighted by Chiang et al. (2006), can lead to delays in the availability of materials, further impacting project timelines.

3. Conceptual framework

3.1 Conceptual framework

This study builds upon the empirical framework established by Quintero (2022), who conducted a comprehensive analysis of market concentration and its impact on housing development in the United States. Quintero's analysis examined the relationships between market concentration and various dependent variables including production volume, pricing and production volatility, and the forthcoming supply within the development pipeline. Quintero used the number of firms accounting for 90% of housing production in a given market-year as a measure of competitive intensity. This approach focused on active market participants, excluding small firms building highly customized luxury housing. The demand for housing in a particular region is measured by using the number of jobs accessible from the market as a proxy for housing demand. Specifically, he calculated the number of jobs within fifty miles of the housing market, excluding jobs within the same county to avoid endogeneity issues between economic activity and housing construction. This approach ensured that the measure of demand was exogenous to competitive intensity in the local housing market. Quintero applied market and year fixed effects in his model to control for unobserved heterogeneity across different markets and time periods. This approach helped isolate the impact of market concentration on housing outcomes. His methods included a series of instrumental variable (IV) regressions to address endogeneity concerns, demonstrating the causal impact of market concentration on housing outcomes. Luis Quintero includes construction costs as a control variable separately in his analysis to account for differences in the cost of construction across various markets. This ensures that the observed effects are due to market dynamics rather than differences in the cost environment across locations.

Building upon Quintero's framework, this study aims to investigate the impact of market concentration on the homes in the pipeline in the Netherlands. The conceptual model posits that market concentration directly affects the number of homes in the pipeline. This relationship is further influenced by various factors such as economic indicators, regional characteristics, and industry-specific variables. For instance, economic indicators like interest rates and GDP per capita reflect the broader economic environment's impact on housing development. Regional characteristics, such as population and demand for housing, influence the regional dynamics of housing markets. Housing demand is reasoned differently in this study. It does not look at the amount of jobs available in a given region, as Quintero did, but looks at housing price change. The house price index (HPI) is used to observe the extent to which housing prices in a region have increased or decreased from the previous year. An increase in the HPI indicates rising housing demand in that region, while a decrease suggests reduced demand (Case et al., 2005). Industry-specific variables, such as building costs, directly affect the construction industry's capacity and efficiency. As with the Quintero study, most of these influencing factors are included in the analysis by adding fixed effects. The fact that Quintero includes construction costs separately is not necessary in the Dutch context. He did it to include regional differences in construction costs, which occur in a large vast country like the United States. However, this is not necessary in the Netherlands. Here there are generally no regional differences in construction costs, and they are the same throughout the country. Figure 1 shows the original conceptual framework of this study but also the adjusted conceptual framework. Due to contextual differences between the US and the Netherlands explained in chapter 3.2, an adjustment of the original framework was necessary.

Figure 1:Original Conceptual framework and Adjusted conceptual framework.

The hypotheses tested in this study aim to determine whether market concentration influences the quantity of housing projects. The null hypothesis (H0) posits that market concentration does not affect rising housing demand on the number of homes in the pipeline. The alternative hypothesis (H1) suggests that there is a higher market concentration reduces the positive impact of rising housing demand on the number of homes in the pipeline. If H1 is supported, it would suggest that higher market concentration correlates with to fewer homes being added to the pipeline, potentially due to strategic behaviours by dominant firms to control supply and maximize profits.

3.2 Contextual framework

This chapter explores the applicability of Quintero (2022) analysis of the United States housing market to the Dutch context. Specifically, it evaluates whether similar outcomes regarding market concentration and housing project delays could be observed in the Netherlands, considering the unique aspects of Dutch planning culture and regulatory environment.

His study highlights the impact of market concentration on housing supply and price volatility in the US. This phenomenon could be paralleled in the Netherlands, given the similar trends in market concentration. However, the regulatory and economic landscapes of the Netherlands, which govern land use and building permissions (Gyourko & Molloy, 2015), might modulate these effects differently than in the US.

Additionally, cultural factors and population density differences (Saiz, 2010) play a significant role in housing demand and supply dynamics. The Dutch market's response to oligopolistic homebuilders could also be influenced by these unique factors. Furthermore, Goodman (2018) emphasizes the role of broader economic conditions in shaping housing markets, a factor that might yield different outcomes in the Dutch context compared to the US.

The Dutch housing market is distinguished by a rigorously structured and regulation-dense planning system, sharply contrasting with the more market-driven, decentralized approach typical of the U.S. In the Netherlands, a comprehensive, top-down planning strategy predominates, wherein government entities exert significant influence over land-use planning and development. This centralized approach includes restrictive planning policies and early selection of development locations.

The Dutch government plays a proactive role in the early selection of development locations. This process is typically guided by regional development frameworks which align national goals with local needs. The selection process is highly participatory, involving various stakeholders including municipalities, developers, and the public. This ensures that all interests are considered in the development of areas designated for housing, which helps in the mitigation of potential conflicts and speeds up the development process once plans are set in motion (Van der Krabben & Needham, 2008).

This early selection and large-scale nature of development projects could influence market concentration. First, there can be a barrier to entry for smaller developers. Large-scale projects generally require significant capital and expertise, creating a high barrier to entry and often favouring larger, well-established companies. This dynamic can restrict the number of competitors in the market, enhancing market concentration (Priemus & Louw, 2003). The need for large-scale developments often results in close collaborations between the government and large developers, potentially solidifying these firms' market positions and making it challenging for new entrants to compete. While large-scale developments bring efficiencies and economies of scale, they also reduce competition, which can provide dominant firms more pricing power, potentially negating the benefits of lower development costs (Boelhouwer & Heijden, 1992). Large-scale projects are typically better equipped to meet the extensive regulatory requirements in the Dutch planning system, which can be a significant burden for smaller developers (Van der Krabben & Needham, 2008).

As said before, the planning system in the Netherlands is known for its structured and stringent regulatory framework. This influences the development times of homes. The restrictive nature of planning policies often leads to prolonged development timelines. Each stage of the planning process, from initial application to final approval, can be time-consuming due to the need for comprehensive documentation and adherence to rigorous standards. This is particularly evident in projects involving significant environmental or public interest considerations, where multiple rounds of public consultation and revision may be required (Boelhouwer & Heijden, 1992).

The costs associated with complying with stringent planning regulations can lead to delays as developers seek additional financing or modify projects to meet regulatory requirements. These delays can be further exacerbated by the Dutch system's emphasis on consensus-building, which, while promoting stakeholder engagement and public acceptance, can also prolong the planning process (Van der Krabben & Needham, 2008).

In contrast to the Dutch model, the U.S. housing market is characterized by a freer approach to land use and development. Planning in the U.S. is more decentralized, with significant authority vested in local governments. This leads to a wide variation in planning policies and outcomes across different states and municipalities. While this can sometimes result in quicker responses to market demands, it also leads to issues like urban sprawl and less coordinated infrastructural development (Fischel, 2001).

In conclusion, the contextual differences between the US and the Netherlands necessitate an adjusted conceptual framework for this study. In the US, project developers primarily drive the planning and development process, directly influencing the creation and progression of housing projects. This makes it pertinent to investigate the relationship between market concentration and the initiation of new housing plans. Conversely, in the Netherlands, the planning authority lies predominantly with the municipalities and government entities. This centralized approach, characterized by stringent regulatory frameworks and participatory planning processes, dictates the development pipeline. Therefore, it is more relevant to examine the effect of market concentration on the entire development pipeline, with housing demand being the most crucial factor influencing the number of houses in the pipeline in the Netherlands.

4. Methodology framework

4.1 Research philosophy

The questions of research philosophy relate to the nature of reality (ontology), the relation between the research and the 'what can be known' (epistemology) and how the researcher can go about finding this reality (methodology).

4.1.1 Post-positivism

This study follows an empirical-analytical approach, rooted in (post-)positivist research philosophies. Positivism, originally grounded in natural sciences, views reality as observable and aims to create generalized laws (Saunders et al., 2009). It emphasizes separating objective data from researcher influence, promoting value-free research to ensure objectivity and replicability, which are seen as indicators of truth (Guba & Lincoln, 1994).

However, maintaining a strict positivist stance is challenging due to the inherent human elements in most research subjects (Saunders et al., 2009). Ignoring qualitative aspects can overlook significant factors affecting the analysis, leading to the rise in post-positivist approaches. Post-positivism adopts a reductionist and deterministic method, focusing on empirically testing hypotheses derived from existing literature (Creswell, 2006). It involves a critical perspective on the relationship between knowledge and reality, acknowledging that findings are provisional and subject to change upon new evidence (Saunders et al., 2009). This approach suits the complex nature of reality and emphasizes continuous testing and refinement of hypotheses.

4.2 Methodological choice

Following the research design guidelines outlined by Saunders et al. (2009), the key methodological consideration is determining the type of data to be analysed, which can be qualitative, quantitative, or a combination of both. Typically, post-positivist research philosophies lean towards the use of quantitative data. This preference is due to its suitability for systematically exploring the relationships between variables within a naturalistic framework. Additionally, when the goal is to identify causal relationships, quantitative data is more conducive to generalization. This is because it allows for the aggregation of data, a process that is more straightforward with quantitative datasets compared to qualitative ones.

4.3 Research strategy

While research methods are often mistaken for research strategies, it's crucial to understand that a research strategy is the application of a research philosophy into specific research methods, as elucidated by van Thiel (2014). This strategy represents a logical progression from the research objective and foundational assumptions to the chosen methods. Ensuring alignment between the research design and the methods is critical for maintaining the internal validity of the research. The selection of a particular strategy is influenced not only by the research objective but also by factors like the extent of existing literature on the topic and the quantity of observable units of study available for inclusion in the analysis (van Thiel, 2014).

In this research, the adopted strategy aligns with an experimental approach. This study aims to evaluate a hypothesis concerning the causal relationships between several independent variables and a dependent variable, specifically examining the interplay between market concentration and the time required for development. This is done through quantitative research using a multiple regression analysis.

According to Saunders et al. (2009), the fundamental goal of an experimental approach is to either confirm or refute the hypothesized relationship between two variables. This process begins with the establishment of a null hypothesis, which posits that there is no significant correlation between the variables under investigation. The heart of the experiment lies in conducting statistical analysis to generate a probability value, which serves as an indicator of how well the collected data aligns with the null hypothesis. This probability helps in determining the likelihood of the observed relationship occurring by chance.

4.3.1 Reliability

The reliability refers to the consistency of the results obtained from the research. In this study, there are two different data sets used. The data sets are used in different studies, so they are stable and reliable. To ensure the reproducibility of the study the steps of the analysis need to be made clear so that they can be replicated by other researchers. The data verification is also important for the reliability of the study. To ensure this a cross-check data for accuracy and completeness, especially when combining datasets from different sources, will be conducted.

However, several points could affect the reliability of the study. Firstly, the measurement of market concentration can be questioned. The data from Buitelaar and Van der Krabben (2023) study, which serves as the basis for this research, delineates the market at the municipal level. This geographic delineation might not fully capture market concentration as it could differ if another delineation was used. For example, if market concentration were assessed at a regional or national level, the results might vary significantly. This potential discrepancy highlights the importance of considering the appropriate geographic scope when measuring market concentration. Secondly, the assumption that the new construction market operates independently of the existing housing market is another point that might impact reliability. The research from Buitelaar and Van der Krabben (2023)argues that the new construction market is distinct from the existing housing market due to different dynamics and regulatory influences. This distinction could influence how market concentration affects housing supply and prices. If the interaction between the new and existing housing markets is more significant than assumed, it could lead to different conclusions regarding market concentration and its impacts.

4.3.2 Internal- & external validity

To strengthen the internal validity of the research the following aspects are important to consider. The assumed causal relationship between market concentration and the pace of housing projects is clearly articulated. Also, the statistical methods and the confounding variables.

To make sure that the external validity is matched, the generalizability and the contextual relevance is important. So, the findings need to be discussed how it can be generalizable and how the results can inform broader housing policy discussions in the Netherlands.

5. Empirical specification

For the empirical specification, modifications will be made to Quintero (2022) research approach to ensure relevance and feasibility for this study.

5.1 Data description

5.1.1 Market Concentration

The first dataset concerns municipal-level market concentration, compiled and employed in the study by Buitelaar and Van der Krabben (2023): “For our analysis, we utilize a file containing approximately 2,100 urban and suburban potential development sites. This information is publicly available.” In this study, the determination of market concentration was done using the Hefendahl-Hirschman Index (HHI) and the Concentration Ratio Index (CR4). Both are widely used measures of market concentration. The HHI is calculated by summing the squares of the market shares of all firms active in a given market. This sum yields a number between 0 and 1 (if calculated with decimals) or between 0 and 100 (if calculated with percentages). Here, the higher the index, the higher the degree of market concentration. The CR4 measures the combined market share of the four largest companies in an industry. This leads to a percentage between 0 and 100%. Market concentration is measured in the new construction market and thus considered separately from the rest of the housing market.

The average HHI for all municipalities in all time periods (2015-2016, 2017-2018, and 2019-2021, rounded) is 22% (Buitelaar & Van der Krabben, 2023). Figure 2 shows the HHI per municipality by time period. This excludes transactions where the municipality acted as the seller and municipalities with fewer than 50 registered transactions per time period. This choice was made to avoid a distorted view. In very small municipalities with few transactions, those few transactions were likely conducted by the same developer, resulting in an extremely high market concentration in those areas. The geographical maps show a heterogeneous picture, with many municipalities exhibiting high HHI on average. This pattern is fairly consistent across all three time periods. Additionally, we observe that the measured concentration in many municipalities varies by period: a moderately concentrated market in one period may become highly concentrated in the next period (and vice versa). This could be caused, for example, by the completion of a new construction project in one period or the start of a new project in the following period. This effect is particularly significant in small and medium-sized municipalities where only one or two housing development sites are being developed. Municipalities with exceptionally high market concentration (HHI > 50) are mainly those with relatively few new construction transactions (Buitelaar & Van der Krabben, 2023).

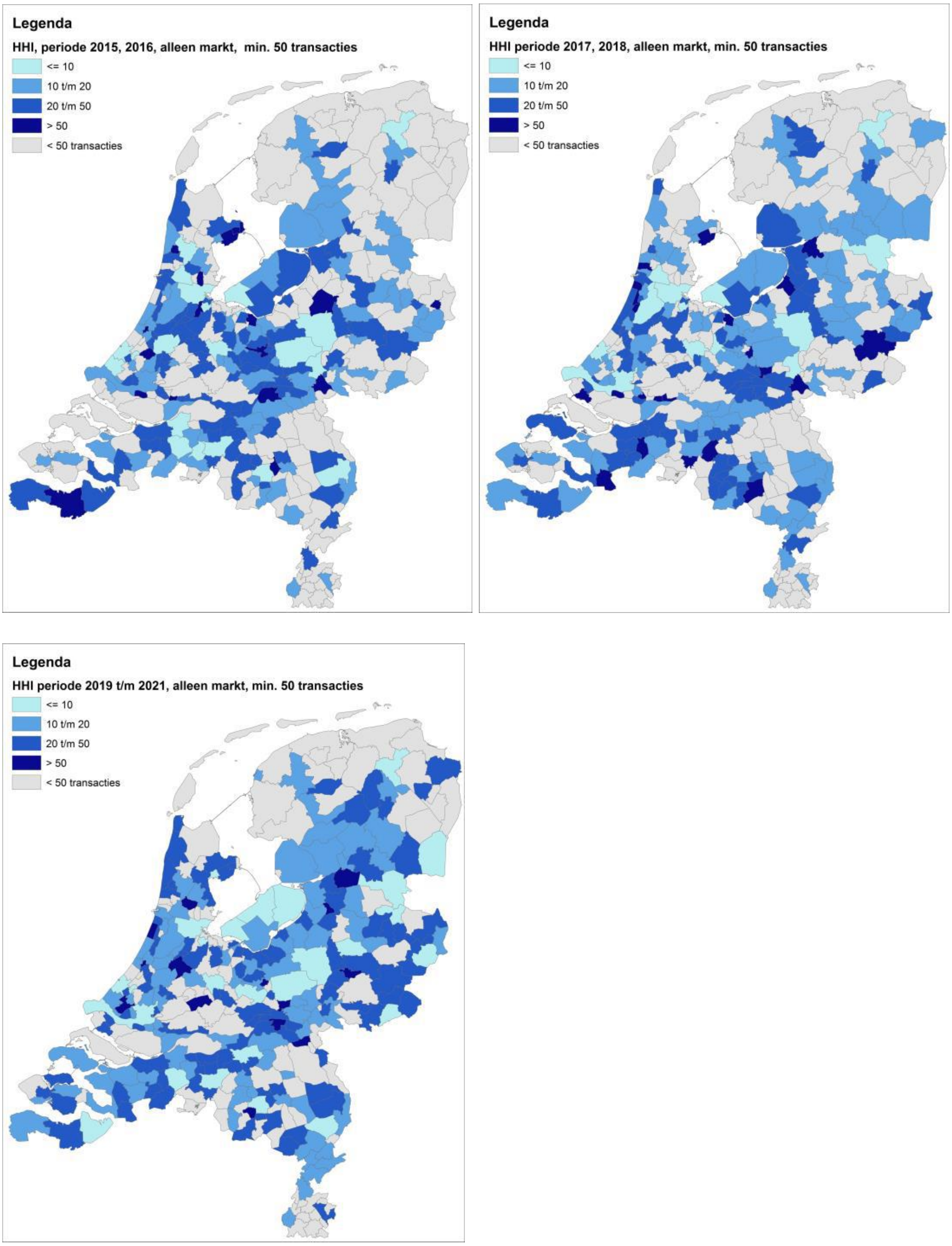

Figure 2: Market concentration measured by HHI in the period 2015 to 2021 in the Netherlands, excluding municipalities < 50 transactions (Buitelaar & Van der Krabben, 2023).

5.1.2 Homes in pipeline

Additionally, a dataset about the homes in pipeline is used. CBS has provided insight for each month and each municipality into how many residential properties are in the pipeline to be built. This dataset offers details on the location and the numbers of how many newly built houses are in plans. It is divided into; total in pipeline, in pipeline where construction is started and in pipeline where a permit is given. There is also a division for the time period; in total, greater than 2 years and greater than 5 years. The data is collected and reported by the CBS (CBS, 2024b). Table 1 shows the different variables of homes in the pipeline, along with the definition and average. Nationwide, there is an average of 457.20 homes in the pipeline per municipality, per municipality, there is an average of 193.05 housing units for which construction has started and 264.15 residence objects for which a building permit has been issued.

Table 1. Definitions and means of homes in pipeline

Variable	Definition	Mean
Total in Pipeline	The number of residence objects with a granted building permit or with a notification of "construction started".	457,20
Construction started in Pipeline	The number of residence objects with a notification of 'construction started'.	193,05
Permitted in Pipeline	The number of residence objects with a granted building permit but without notification of 'construction started'	264,15

5.1.3 Demand for Housing

An important factor is the demand for housing. As described in Chapter 3, housing demand is measured by changes in housing prices, specifically using the house price index (HPI). An increase in the HPI indicates rising housing demand in that region, while a decrease suggests reduced demand (Case et al., 2005). Table 2 presents the summary statistics for the HPI. When this HPI is linked to the size of the municipalities, a relationship emerges, as shown in Figure 3. The figure shows the average HPI for the period 2015-2021 per municipality size. It reveals that the HPI increases as the population size of the municipality grows. This indicates that in municipalities with larger populations, housing prices have risen more sharply during the period from 2015 to 2021. In the context of this study, this means that there is greater demand for housing in larger cities than in smaller towns.

Table 2. Summary statistics HPI

Statistic	Value
Count	2408
Mean	120.38
Standard Deviation	18.26
Minimum	95.80
25th Percentile	103.30
Median	116.80
75th Percentile	133.78
Maximum	172.50

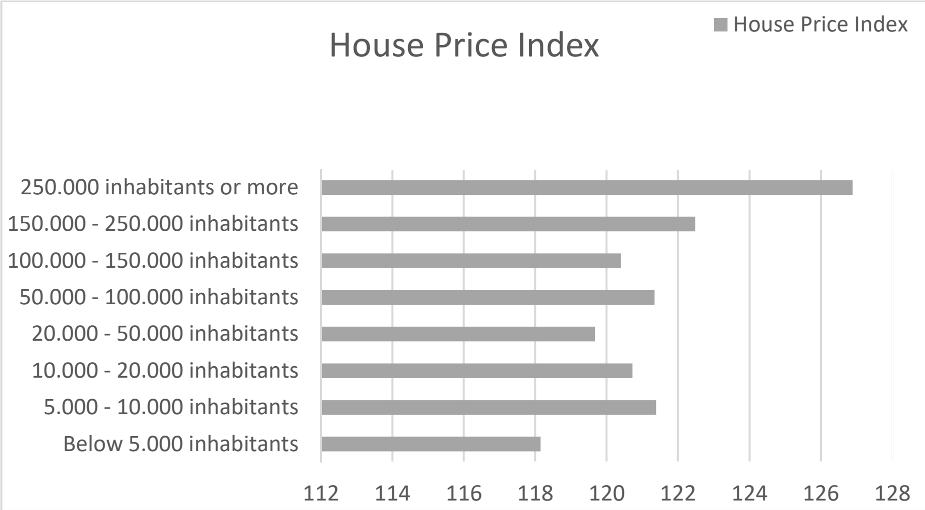

Figure 3: Average HPI (2015-2021) per municipality distributed among population classes.

5.1.4 New build homes

The variable for new build homes is also utilized to determine the effect on completed housing. The data is sourced from the Basic Registration of Addresses and Buildings (BAG) and is published by CBS (2024a). It is updated monthly. The definition of new build is houses added to the housing stock through new construction.

5.2 Model Design

5.2.1 Dependent Variable

The primary dependent variable in this study is the number of new-build homes in the pipeline per region. This variable captures the various stages of new construction from plan to realization, i.e. soft building plans but not yet hard building plans, hard plans but no building permit granted yet, building permit granted but construction not yet started and also the homes that are completed. The "homes in the pipeline" category is thus divided into (i) Total in Pipeline, (ii) Permitted in Pipeline, (iii) Construction started in Pipeline and (iv) New Build Homes. The definitions of the soft and hard plans are the same as those previously mentioned in chapter 1.1.

5.2.2 Independent Variable

The main independent variable is market concentration, quantified using the Herfindahl-Hirschman Index (HHI). The HHI is a widely used measure of market concentration, calculated as the sum of the squares of the market shares of all firms in the market. Higher HHI values indicate higher market concentration. As for the robustness test, the Concentration Ratio (CR4) is also used, which measures the total market share of the four largest firms in the market.

5.2.3 Control Variable and fixed effects

A crucial control variable in the analysis is the demand for housing, measured using the Housing Price Index (HPI). The HPI reflects changes in housing prices and serves as an indicator of housing demand. Other relevant variables, such as population, income per capita and building costs, are incorporated into the analysis through fixed effects. These fixed effects account for variables that do not change significantly over time, ensuring that the study focuses on the relationship between market concentration and housing development.

- Year Fixed Effects: These control for time-specific effects and broader economic trends that may influence housing development across all regions.
- Market Fixed Effects: These account for region-specific characteristics that remain constant over time, such as geographical and socio-economic factors.

By incorporating these fixed effects, the model can isolate the impact of market concentration on housing development while controlling for other influencing factors.

5.2.4 Interaction term

Interaction term is included in the model to explore how the relationship between market concentration and housing supply varies with the demand for housing which is. An interaction term between the Herfindahl-Hirschman Index (HHI) and HPI was introduced, allowing the effect of market concentration to change depending on the level of demand for housing in that specific market. This approach provides a more nuanced understanding of how market dynamics interact with economic conditions to influence housing supply. As explained by Pickery (2008), interaction effects can reveal whether the effect of one variable on the outcome depends on the level of another variable, which is critical in understanding complex economic relationships.

6. Empirical Results

This chapter presents the empirical findings of the study, investigating the relationship between market concentration and newly built homes in the pipeline. By employing regression analysis, this study aims to elucidate how market concentration influences the development pipeline. Different model specifications were tested to ensure robust results. The analysis focuses on explaining the rationale behind the use of fixed effects, interaction terms, and clustering, and interprets the significance and implications of these methodological choices on the outcomes. Comparisons and differences with the study by Quintero (2022) are also discussed to provide context and depth to the findings.

6.1 Results

Table 3 provides a detailed analysis through four regression models, each focusing on a different aspect of housing development. The first model examines the total number of homes in the pipeline, offering insights into the overall volume of planned housing projects. The second model narrows its focus to the number of homes in the pipeline that have received building permits, highlighting the subset of projects that have progressed past the initial planning stages. The third model further focuses on the number of homes where construction has started, providing a snapshot of projects that are actively being built. Finally, the fourth model looks at the number of newly completed homes, capturing the result of the development process.

Each of these models incorporates several critical variables. The Herfindahl-Hirschman Index (HHI) is included to measure market concentration, offering an indicator of how competitive or monopolistic the market is. The Housing Price Index (HPI) is also included, indicating changes in housing prices. This variable is an indicator of the demand for housing in a region, as explained in Chapter 5.1.3. Additionally, an interaction term between HHI and HPI is considered, allowing for the exploration of how these two factors might jointly influence housing development. To account for time-specific effects, the models include fixed effects for each year from 2015 to 2021. Together, these models provide a nuanced and comprehensive view of the various stages of housing development, influenced by market concentration and housing prices over a span of several years.

Table 3. Regression results with four different models

	Total in Pipeline	Permitted in Pipeline	Construction started in Pipeline	New build
hhi_mean	0.000	0.000	0.000	0.000
HPI	22.547***	12.884***	9.664*	4.400***
	(7.475)	(4.806)	(5.182)	(1.360)
hhi_mean # HPI	-0.183***	-0.091**	-0.092**	-0.054***
	(0.055)	(0.039)	(0.039)	(0.011)
year=2016	-49.546***	-42.255***	-7.292	9.054
	(17.292)	(11.288)	(13.493)	(6.524)
year=2017	-111.017**	-71.447**	-39.570	14.980
	(49.480)	(29.612)	(36.163)	(11.322)
year=2018	-222.314**	-146.459***	-75.856	0.203
	(95.381)	(56.062)	(73.103)	(24.672)
year=2019	-398.092***	-270.659***	-127.433	-11.560
	(151.846)	(93.485)	(103.9927)	(30.698)
year=2020	-530.716***	-337.542***	-193.175	-40.316
	(198.025)	(122.126)	(135.859)	(39.455)
year=2021	-729.449***	-462.732***	-266.717	-76.717
	(280.456)	(170.527)	(195.269)	(60.769)
Intercept	-1333.030**	-788.713**	-544.317	-132.795
	(599.442)	(376.704)	(410.983)	(121.454)
Observations	2408	2408	2408	2408
R^2 (Within)	0.132	0.055	0.073	0.055

Standard errors in parentheses.
All specifications include market and year fixed effects.
$* \ p < 0.10$, $** \ p < 0.05$, $*** \ p < 0.01$

In these models, the coefficient for HHI is not directly reported because it is included as part of the interaction term with HPI and is thus omitted because of collinearity. The interaction term provides insight into how the effect of market concentration changes with varying housing prices. In Appendix B table B1 is the basic relationship between the HHI and the homes permitted in the pipeline. The coefficient for HHI is not statistically significant, indicating that market concentration alone does not have a significant effect on the number of homes in the pipeline.

The coefficient for HPI is positive and significant across all models, indicating that higher demand for housing thus higher housing prices is associated with an increase in the number of homes in the pipeline, homes permitted, and new homes completed. This suggests that as demand for houses rises, there is a greater incentive for developers to build more homes. Summary of Effects:

- Total in Pipeline: For each unit increase in HPI, there are 22.55 more homes in the pipeline, with high statistical significance.
- Permitted in Pipeline: For each unit increase in HPI, 12.88 more homes receive building permits, with high statistical significance.
- Construction Started in Pipeline: For each unit increase in HPI, 9.66 more homes begin construction, with moderate statistical significance.

- New Build: For each unit increase in HPI, 4.40 more new homes are completed, with high statistical significance.

The interaction term between HHI and HPI is negative and significant in all models. This indicates that the positive effect of housing demand on housing supply diminishes as market concentration increases. In other words, in more concentrated markets, the rise in housing demand does not translate as effectively into increased housing supply. The effect of market concentration decreases as plans progress through the development pipeline. The effect is greatest in the "total in pipeline" stage and least in the "new build" stage. This is because dominant firms often control the initial planning phases through strategic land acquisition practices, such as land banking. In the initial stages, it is easier for these firms to delay applying for building permits to create artificial scarcity. However, the effect of market concentration is least pronounced when examining the number of new builds completed. By the time projects reach this stage, the developers are focused on completing the construction to realize their profits. Summary of Interaction Effects

- Total in Pipeline: For each unit increase in HHI, the positive effect of HPI on the total number of homes in the pipeline is reduced by 0.183 units, with high statistical significance.
- Permitted in Pipeline: For each unit increase in HHI, the positive effect of HPI on the number of permitted homes is reduced by 0.091 units, with moderate to high statistical significance.
- Construction Started in Pipeline: For each unit increase in HHI, the positive effect of HPI on the number of homes where construction has started is reduced by 0.092 units, with moderate to high statistical significance.
- New Build: For each unit increase in HHI, the positive effect of HPI on the number of new homes completed is reduced by 0.054 units, with high statistical significance.

The year dummy variables show significant negative coefficients for the later years, particularly from 2018 onwards. This suggests a general downward trend in the number of homes in the pipeline and new builds over time, possibly reflecting broader economic or policy changes affecting housing development.

6.1.1 Fixed effects

Fixed effects were utilized to control for unobserved heterogeneity across different markets and time periods. This approach helps to isolate the impact of market concentration on housing supply by accounting for factors that do not change over time within each market but vary between markets. By including market and year fixed effects, the model controls for all time-invariant differences between markets and year-specific shocks, thereby providing more accurate estimates of the effects of interest Quintero (2022). “Including fixed-effects for geographical regions is in line with existing empirical works, such as Somerville (2001), Bulan et al. (2009) and Cunningham (2007); Cunningham (2006).” (Beckers, 2021).

6.1.2 Clustering

Clustering was used to provide robust standard errors, which correct for potential correlations within clusters of observations, such as markets. This method ensures that the standard errors of the coefficient estimates are not underestimated, which could lead to incorrect inferences about the statistical significance of the results. Clustering by market accounts for the possibility that observations within the same market are more similar to each other than to observations in different markets, thus providing more reliable statistical inference (Quintero, 2022).

6.2 Robustness Analysis

In this subsection, we delve into the sensitivity analysis conducted to assess the robustness of the main results. Sensitivity analysis is an essential step in empirical research as it tests the reliability and stability of the findings under different assumptions or conditions. According to Saltelli et al. (2008), sensitivity analysis helps to identify how the variation in the output of a model can be attributed to different sources of variation in the input and can provide insights into the dependability of the conclusions drawn from the model. The results of the regression models are shown in Appendix C.

6.2.1 Purpose of Sensitivity Analysis

The primary reason for conducting a sensitivity analysis in this study is to verify the robustness of the results obtained from the main analysis. By examining how sensitive the outcomes are to changes in the measurement of market concentration, we can determine the reliability of the findings. Specifically, this analysis substitutes the Herfindahl-Hirschman Index (HHI) with the Concentration Ratio (C4) as the measure of market concentration. This substitution allows us to observe whether the impact of market concentration on housing development varies when a different but related metric is used.

6.2.2 Context and Rationale for Using C4

The Concentration Ratio (C4) measures the total market share of the four largest firms in a market, providing a different perspective on market concentration compared to HHI. While HHI considers the market shares of all firms, C4 focuses on the dominance of the top four firms, which can be particularly relevant in markets where a few firms hold significant power. The choice to use C4 in the sensitivity analysis is motivated by the need to explore whether the concentration effects observed with HHI are consistent when a different concentration measure is applied. Differences between HHI and C4 might arise because HHI is more sensitive to the market shares of all firms, whereas C4 highlights the influence of the largest firms.

6.2.3 Results of the Sensitivity Analysis

Table 4 presents the results of the sensitivity analysis, comparing the effects of market concentration using C4 instead of HHI on the various stages of housing development.

Table 4. Regression results for the Robustness Analysis

	Total in Pipeline	Permitted in Pipeline	Construction started in Pipeline	New Build
C4_mean	0.000	0.000	0.000	0.000
	49.693***	27.863**	21.830*	10.265***
HPI	(14.710)	(11.116)	(11.497)	(2.387)
C4_mean #	-0.397***	-0.214**	-0.183*	-0.093***
HPI	(0.120)	(0.099)	(0.095)	(0.020)
	-53.127***	-44.799***	-8.328	8.732
year=2016	(15.880)	(10.788)	(13.721)	(6.783)
	-120.423***	-77.870***	-42.553	15.345
year=2017	(45.827)	(28.270)	(36.724)	(12.075)
	-239.886***	-157.965***	-81.921	-0.207
year=2018	(88.097)	(53.501)	(74.504)	(26.344)
	-427.999***	-291.026***	-136.974	-11.622
year=2019	(141.257)	(89.277)	(106.175)	(32.161)
	-569.744***	-363.668***	-206.076	-41.349
year=2020	(184.178)	(117.009)	(138.529)	(40.472)
	-784.002***	-499.012***	-284.989	-78.369
year=2021	(260.907)	(162.880)	(199.274)	(63.856)
	-1441.172***	-858.584**	-582.588	-136.674
Intercept	(555.4163)	(359.988)	(419.343)	(126.076)
Observations	0.237	0.105	0.117	0.071
R^2 (Within)	2295.000	2295.000	2295.000	2295.000

Standard errors in parentheses.
All specifications include market and year fixed effects.
$*$ $p < 0.10$, $**$ $p < 0.05$, $***$ $p < 0.01$

The sensitivity analysis using C4 as the measure of market concentration confirms the main findings obtained with HHI. Both measures indicate that market concentration negatively interacts with housing prices to influence housing development. Higher market concentration reduces the responsiveness of housing supply to increases in housing demand.

In examining the similarities and differences between HHI and C4, a clear narrative emerges. Both the HHI and the C4 reveal a significant negative interaction with the demand for housing (HPI) across all models. This finding indicates that higher market concentration tends to reduce the positive impact of housing demand on the housing supply. The consistency in the significance levels and the directions of the coefficients for HPI and the interaction terms suggests a robust relationship that holds regardless of whether HHI or C4 is used in the analysis.

However, there are differences between the two measures. The magnitude of the interaction terms varies, with C4 generally exhibiting a larger negative effect on the responsiveness of housing supply to changes in housing demand. This disparity underscores the differing sensitivities of the housing market to these measures of market concentration. The distinct aspects captured by HHI and C4 are reflected in the varying coefficients, highlighting how each index provides unique insights into market dynamics and the influence of market concentration on housing development.

In conclusion, the sensitivity analysis validates the robustness of the main findings and underscores the importance of considering market concentration in housing market analyses. The consistency of results between HHI and C4 reinforces the conclusion that higher market concentration impedes the positive effects of rising housing demand on housing supply, necessitating policy interventions to promote competitive market conditions. There is a clear and significant positive effect of housing demand, as measured by the Housing Price Index (HPI), on housing in the pipeline. Higher housing demand corresponds to an increase in the number of homes planned, permitted, and under construction.

6.3 Discussion of the Empirical Results

To conclude, the empirical analysis reveals several critical insights into the dynamics of market concentration and housing development. The analysis indicates that market concentration alone does not have a significant effect on the number of homes in the pipeline. When housing demand is included as an interaction effect, it significantly influences the relationship between market concentration and housing in the pipeline. Specifically, the positive effect of housing demand on housing development decreases as market concentration increases. In municipalities with high housing demand and high market concentration, the increase in housing in the pipeline is less pronounced compared to municipalities with lower market concentration. This suggests that in highly concentrated markets, dominant firms may engage in strategic behaviours that limit the responsiveness of the housing supply to rising demand. Such behaviours could include delaying development and controlling the release of new housing units to maximize profits.

The hypotheses posed in Chapter 3 can now be evaluated based on the empirical findings:

Null hypothesis (H0): Market concentration does not affect rising housing demand on the number of homes in the pipeline. This hypothesis is rejected.

Hypothesis 1 (H1): Higher market concentration leads to fewer homes being added to the pipeline due to strategic behaviours by dominant firms. This hypothesis is supported.

The robustness of the results is confirmed through sensitivity analysis using the C4 as an alternative measure of market concentration. The findings remain consistent, reinforcing the conclusion that higher market concentration reduces the positive effect of housing demand on housing development. The results show that the effect is greater when using C4 as an indicator compared to HHI. This may be because C4 specifically measures the market share of the top four firms in the market. This focus on the largest players highlights the dominant influence of these firms more sharply than HHI, which considers the market shares of all firms, including smaller ones.

6.3.1 Comparison

Comparing the results with Quintero (2022), both studies utilize fixed effects and interaction terms to control for unobserved heterogeneity and explore complex relationships. However, Quintero focuses on a broader range of variables and uses instrumental variables (IV) to address endogeneity. This approach allows for a comprehensive analysis of the factors influencing housing development, including economic conditions, regulatory environments, and market dynamics. In contrast, this study focuses specifically on the Dutch housing market, using HHI and the C4) to measure market concentration. The primary method involves examining the interaction between market concentration and housing demand, causing an interaction term to be used. The other variables named by Quintero are included in the market and year fixed effects in this study. However, in this study, it cannot be asserted, as Quintero does, that market concentration leads directly to fewer housing units in the pipeline. Instead, the impact is indirect due to the contextual differences described in Chapter 3.

7. Conclusion and recommendations

7.1 Answer to research questions

This thesis investigates the impact of market concentration on the pace and quantity of housing projects in the Netherlands, highlighting the role of market concentration as a critical factor in housing development delays. The study connects market dynamics to the efficiency and responsiveness of housing projects, emphasizing the strategic importance of competitive market conditions for timely housing delivery. It assesses these dynamics by answering two research questions: (i) To what extent is market concentration present in the Dutch housing market? and (ii) How does market concentration affect the timing and execution of housing projects in different municipalities in the Netherlands? The main research question can be answered by addressing these research questions: "What is the effect of market concentration on the pace and quantity of housing projects in the Netherlands?" To investigate these questions, the study employs a robust empirical framework, utilizing municipal-level data on market concentration and housing development from 2015 to 2021. The primary measures of market concentration used are the Herfindahl-Hirschman Index (HHI) and the Concentration Ratio (CR4). Housing development is assessed through various stages, including homes in the pipeline, homes permitted, construction started, and new builds. Housing demand is measured using the Housing Price Index (HPI).

The study finds that market concentration alone does not have a significant direct effect on the number of homes in the pipeline. However, when housing demand is included as an interaction effect, it significantly influences the relationship between market concentration and housing development. Specifically, the positive effect of housing demand on housing development diminishes as market concentration increases. This suggests that in highly concentrated markets, dominant firms may engage in strategic behaviours that limit the responsiveness of the housing supply to rising demand, such as delaying development and controlling the release of new housing units to maximize profits. This effect is consistent across various stages of housing development, from homes in the pipeline to new builds. These findings underscore the importance of considering both market concentration and housing demand when formulating policies aimed at addressing housing shortages. Policymakers need to be aware that interventions to stimulate housing demand might be less effective in highly concentrated markets without measures to ensure competitive market conditions.

7.2 Scientific contribution

This thesis makes a significant contribution to the literature on housing market dynamics by providing a nuanced analysis of the impact of market concentration on housing development in the Netherlands. The study builds on existing research, particularly the work of Quintero (2022), which examined the effects of market concentration on housing development in the United States. While Quintero's study highlighted how high levels of market concentration can lead to a reduced number of plans for new housing and increased price volatility, this research extends these findings to the Dutch context, offering new insights and emphasizing regional specificities. By applying Quintero’s analytical framework to the Netherlands, this thesis provides a comparative perspective that enhances our understanding of how market concentration impacts housing markets in different regulatory and cultural environments. Unlike the more decentralized and market-driven approach in the U.S., the Netherlands features a highly regulated housing market with stringent planning policies and significant government intervention. Hereby, the initiative for new housing lies with the municipality. This difference is crucial as it influences how market concentration affects housing development timelines. Consequently, a different relationship was examined in this study compared to Quintero's study. While both this study and Quintero's research indicate that market concentration negatively moderates the relationship between housing demand and supply, the specific impacts observed differ due to contextual variations. In the U.S., Quintero found that high market concentration leads to significantly lower number of plans for new housing and greater price volatility. In contrast, this thesis shows that in the Netherlands, the high market concentration primarily reduces the responsiveness of housing development to rising demand rather than causing outright reductions in housing production. This difference can be attributed to the Netherlands' regulatory environment, which may mitigate some of the more extreme effects of market concentration seen in less regulated markets. In summary, this thesis not only extends the existing literature by applying established theories to a new context but also provides empirical evidence that deepens our understanding of the mechanisms through which market concentration affects housing development. The unique insights into the Dutch housing market and the comparison with Quintero's findings enrich the broader discourse on housing policy and market dynamics, offering a foundation for future research to explore these complex interactions further.

7.3 Recommendations for practice

To address the challenges posed by market concentration and improve the efficiency of housing development in the Netherlands, several strategic measures could be implemented. Firstly, it is crucial to conduct regular assessments of market concentration levels across various municipalities. These assessments will help identify areas with high concentration and potential market power abuses. By systematically evaluating market dynamics, policymakers can better understand where intervention is needed to promote fair competition. Additionally, implementing robust antitrust measures is essential to prevent dominant firms from engaging in strategic behaviours that delay housing development. This includes the stricter enforcement of competition laws and the imposition of penalties for anti-competitive practices, ensuring that the market remains competitive and dynamic.

Promoting public-private partnerships can significantly enhance housing development efforts. Collaborative development initiatives leverage the strengths of both the public and private sectors. Public entities can offer land and regulatory support, while private developers bring in expertise and financial resources. Such collaborations can accelerate project timelines and improve overall efficiency. Furthermore, designing partnership models that share risks and rewards between public and private stakeholders is vital. These models ensure that both parties are incentivized to complete projects on time and within budget, fostering a cooperative and productive development environment.

Increasing transparency in the housing development process is another critical step. Developers should be required to publicly report on project timelines and progress. This transparency helps hold developers accountable for delays and ensures that projects are completed promptly. Additionally, developing performance metrics to evaluate the efficiency and effectiveness of housing policies and interventions is essential. Regular monitoring and evaluation of these metrics can identify areas for improvement, ensuring that policies are achieving their intended outcomes and contributing to a more efficient housing market.

By implementing these recommendations, policymakers can create a more competitive, transparent, and accountable housing market, addressing current inefficiencies and meeting the housing needs of the population effectively.

In conclusion, this thesis underscores the significant impact of market concentration on housing development in the Netherlands, highlighting the importance of competitive market conditions for timely housing delivery. The study provides valuable insights for policymakers and stakeholders, emphasizing the need for targeted interventions to reduce market concentration and enhance housing market efficiency. The findings contribute to the broader discourse on housing policy and market dynamics, offering a foundation for future research to explore the complex interplay between market concentration, housing demand, and development timelines.

7.4 Limitations

Despite the significant insights and contributions of this study, several limitations must be acknowledged. Recognizing these limitations is crucial for contextualizing the findings and guiding future research in this domain. The research covers the period from 2015 to 2021. While this timeframe allows for an examination of recent trends, it may not fully capture long-term dynamics in the housing market. Factors such as economic cycles, policy changes, and evolving market conditions over a longer period could influence the outcomes observed. Future research could benefit from extending the analysis to include a more extended timeframe to better understand these long-term effects.

The regulatory environment in the Netherlands is unique and highly influential in shaping housing market dynamics. This study acknowledges the role of stringent planning and zoning regulations but may not fully account for all institutional factors and their interactions with market concentration. Differences in local governance, policy enforcement, and public-private partnerships can vary significantly across regions, potentially affecting the generalizability of the findings.

While the study explores the interaction between market concentration and housing demand, other potential interaction effects remain underexplored. Factors such as developer financing conditions, construction labour availability, and technological advancements in construction methods could also interact with market concentration to influence housing development outcomes. Future research should consider these additional dimensions to provide a more comprehensive understanding.

In conclusion, while this thesis makes significant contributions to understanding the impact of market concentration on housing development in the Netherlands, it is essential to consider these limitations. Addressing these limitations in future research will help build a more nuanced and comprehensive understanding of housing market dynamics and inform more effective policy interventions.

References

Adams, D., Leishman, C., & Moore, C. (2009). Why not build faster?: Explaining the speed at which British house-builders develop new homes for owner-occupation. *Town Planning Review*, *80*, 291-314. https://doi.org/10.3828/tpr.80.3.4

Adams, D., & Tiesdell, S. (2012). *Shaping Places: Urban Planning, Design and Development*. https://doi.org/10.4324/9780203105665

Bahadir, B., & Mykhaylova, O. (2014). Housing market dynamics with delays in the construction sector. *Journal of Housing Economics*, *26*, 94-108. https://doi.org/https://doi.org/10.1016/j.jhe.2014.09.005

Ball, M. (2011). Planning Delay and the Responsiveness of English Housing Supply. *Urban Studies*, *48*(2), 349-362. https://doi.org/10.1177/0042098010363499

Ball, M. (2013). Spatial regulation and international differences in the housebuilding industries. *Journal of Property Research*, *30*(3), 189-204. https://doi.org/10.1080/09599916.2013.791338

Barker, K. (2004). *Review of Housing supply*. http://www.andywightman.com/docs/barker_housing_final.pdf

Beckers, P. (2021). *Time to develop* [Master Thesis, Radboud University].

Boelhouwer, P. (2017). The role of government and financial institutions during a housing market crisis: a case study of the Netherlands. *International Journal of Housing Policy*, *17*(4), 591-602. https://doi.org/10.1080/19491247.2017.1357399

Boelhouwer, P., & Heijden, H. (1992). Housing systems in Europe. Part I: A comparative study of housing policy.

Buitelaar, E., & Schie, M. v. (2018). Bouwen niet verboden. https://www.ruimteenwonen.nl/bouwen-niet-verboden

Buitelaar, E., Segeren, A., & Kronberger, P. (2008). *Stedelijke transofrmatie en grondeigendom*. N. Uitgevers. https://www.rivm.nl/bibliotheek/digitaaldepot/Stedelijke_transformaties_en_grondeigendom.pdf

Buitelaar, E., & Van der Krabben, E. (2023). *Woningbouw en marktconcentratie: Een analyse van de structuur van de grond- en woningbouwmarkt*. https://www.acm.nl/system/files/documents/woningbouw-en-marktconcentratie.pdf

Bulan, L., Mayer, C., & Somerville, T. (2009). Irreversible Investment, Real Options, and Competition: Evidence from Real Estate Development. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.354800

Case, K. E., Quigley, J. M., & Shiller, R. J. (2005). Comparing Wealth Effects: The Stock Market versus the Housing Market. *Topics in Macroeconomics*, *5*(1). https://doi.org/doi:10.2202/1534-6013.1235

CBS. (2024a). *Voorraad woningen en niet-woningen; mutaties, gebruiksfunctie, regio* https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81955NED/table?fromstatweb

CBS. (2024b). *Woningen en niet-woningen in de pijplijn* (https://opendata.cbs.nl/#/CBS/nl/dataset/82211NED/table

Chiang, Y., Chan, E., & K.L, L. (2006). Prefabrication and barriers to entry - A case study of public housing and institutional buildings in Hong Kong. *Habitat International*, *30*, 482-499. https://doi.org/10.1016/j.habitatint.2004.12.004

CMA. (2024). *Housebuilding market study*. https://assets.publishing.service.gov.uk/media/65d8baed6efa83001ddcc5cd/Housebuilding_market_study_final_report.pdf

Coiacetto, E. (2009). Industry Structure in Real Estate Development: Is City Building Competitive? *Urban Policy and Research*, *27*. https://doi.org/10.1080/08111140802499080

Creswell, J. (2006). *Qualitative Inquiry and Research Design: Choosing among Five Approaches [with CD-ROM]. Second Edition*.

Cunningham, C. (2007). Growth Controls, Real Options, and Land Development. *The Review of Economics and Statistics*, *89*, 343-358. https://doi.org/10.1162/rest.89.2.343

Cunningham, C. R. (2006). House price uncertainty, timing of development, and vacant land prices: Evidence for real options in Seattle. *Journal of Urban Economics*, *59*(1), 1-31. https://doi.org/https://doi.org/10.1016/j.jue.2005.08.003

Dixit, A. K., & Pindyck, R. S. (1994). *Investment under Uncertainty*. Princeton University Press. https://doi.org/10.2307/j.ctt7sncv

Fischel, W. A. (2001). *The Homevoter Hypothesis: How Home Values Influence Local Government Taxation, School Finance, and Land-Use Policies*. Harvard University Press. https://doi.org/10.2307/j.ctv1p6hp64

Goodman, L. S. (2018). What is holding back housing? *Business Economics*, *53*(2), 79-85. https://doi.org/10.1057/s11369-018-0075-3

Grenadier, S. R. (1996). Leasing and credit risk. *Journal of Financial Economics*, *42*(3), 333-364. https://EconPapers.repec.org/RePEc:eee:jfinec:v:42:y:1996:i:3:p:333-364

Groenemeijer, L. (2021). Slechts beperkte verhoging woningproductie nodig. https://esb.nu/wp-content/uploads/2022/11/jufm4j4iJdvcYY3IAFat4ScbKHI.pdf

Groenemeijer, L. (2022). *Inventarisatie Plancapaciteit*. https://open.overheid.nl/documenten/ronl-625b3c3bd4808027fb3250a913c12da7310577e1/pdf

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In *Handbook of qualitative research.* (pp. 105-117). Sage Publications, Inc.

Gyourko, J., & Molloy, R. (2015). Chapter 19 - Regulation and Housing Supply. In G. Duranton, J. V. Henderson, & W. C. Strange (Eds.), *Handbook of Regional and Urban Economics* (Vol. 5, pp. 1289-1337). Elsevier. https://doi.org/https://doi.org/10.1016/B978-0-444-59531-7.00019-3

Gyourko, J., & Saiz, A. (2006). CONSTRUCTION COSTS AND THE SUPPLY OF HOUSING STRUCTURE*. *Journal of Regional Science*, *46*(4), 661-680. https://doi.org/https://doi.org/10.1111/j.1467-9787.2006.00472.x

Karakaya, F. (2002). Barriers to entry in industrial markets. *Journal of Business & Industrial Marketing*, *17*(5), 379-388. https://doi.org/10.1108/08858620210439059

Krabben, E. v. d. (2021). *De werking van de grondmarkt; gevolgen voor woningbouw en functioneren woningmarkt*. https://www.acm.nl/sites/default/files/documents/de-werking-van-de-grondmarkt.pdf

Leishman, C. (2015). Housing Supply and Suppliers: Are the Microeconomics of Housing Developers Important? *Housing Studies*, *30*(4), 580-600. https://doi.org/10.1080/02673037.2015.1021767

Lutz, C. H. M., Kemp, R. G. M., & Gerhard Dijkstra, S. (2010). Perceptions regarding strategic and structural entry barriers. *Small Business Economics*, *35*(1), 19-33. https://doi.org/10.1007/s11187-008-9159-1

Mändle, M., & Schmid, H. (2018). Measuring Economies of Scale in German Housing Companies. In *25th Annual European Real Estate Society Conference*. Reading, UK.

Mi, L. (2015). An Empirical Analysis of the Market Concentration of China's Real Estate Industry and Its Impact on Housing Prices. *Humanities & Social Sciences Journal of Hainan University*, *2015*(2), 71-77. https://caod.oriprobe.com/articles/44708932/An_Empirical_Analysis_of_the_Market_Concentration_of_China_s_Real_Esta.htm

https://www.semanticscholar.org/paper/An-Empirical-Analysis-of-the-Market-Concentration-Mi/6a33cb0ffdea42fb86dd0318a6d82796993d000e#related-papers

Ministry of the Interior and Kingdom Relations. (2023a). *Startbouwimpuls*. Ministry of the Interior and Kingdom Relations. https://www.volkshuisvestingnederland.nl/onderwerpen/startbouwimpuls

Ministry of the Interior and Kingdom Relations. (2023b). *Wet betaalbare huur*. https://www.volkshuisvestingnederland.nl/onderwerpen/wet-betaalbare-huur
Monk, S., Crook, T., Lister, D. L., Rowley, S., Short, C., Whitehead, C., & Rowntree Foundation, J. (2005). Land and finance for affordable housing The complementary roles of Social Housing Grant and the provision of affordable housing through the planning system.
NOS. (2023). *Woningtekort stijgt fors naar 390.000, pas vanaf 2028 minder krapt*. NOS. https://nos.nl/artikel/2482485-woningtekort-stijgt-fors-naar-390-000-pas-vanaf-2028-minder-krapte
Ott, S., Hughen, W., & Reas, D. (2012). Optimal Phasing and Inventory Decisions for Large-Scale Residential Development Projects. *The Journal of Real Estate Finance and Economics*, *vol. 45(4)*, 888-918. https://doi.org/DOI: 10.1007/s11146-011-9299-y
Pickery, J. (2008). *De interpertatie van interactie-effecten in regressiemodellen* (SVR-Technisch rapport, Issue. https://publicaties.vlaanderen.be/view-file/4986
Ploegmakers, H., Beckers, P., & Fooladi, B. F. (2022). De realisatie van goedgekeurde plannen: inzicht in de doorlooptijden en factoren. *Real Estate Research Quarterly*, *21 - 2*, 73-87. https://www.vogon.nl/wp-content/uploads/2023/01/VOGON_RERQ_2022_nummer_2.pdf
Porter, M. (2003). The Economic Performance of Regions. *Regional Studies*, *37*, 545-546. https://doi.org/10.1080/0034340032000108688
Priemus, H., & Louw, E. (2003). Changes in Dutch Land Policy: From Monopoly towards Competition in the Building Market. *Environment and Planning B: Planning and Design*, *30*, 369-378. https://doi.org/10.1068/b12982
Quintero, L. (2022). Fewer Players, Fewer Homes: Concentration and the New Dynamics of Housing Supply. *Johns Hopkins Carey Business School Research Paper*, *No. 18-18*. https://doi.org/https://dx.doi.org/10.2139/ssrn.3303984
RVO. (2020). *Woningbouwimpuls (WBI)*. https://www.rvo.nl/subsidies-financiering/woningbouwimpuls
Saiz, A. (2010). THE GEOGRAPHIC DETERMINANTS OF HOUSING SUPPLY. *The Quarterly Journal of Economics*, *125*(3), 1253-1296. http://www.jstor.org/stable/27867510
Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students*. Prentice Hall. https://books.google.nl/books?id=u-txtfaCFiEC
Somerville, C. T. (1999). The Industrial Organization of Housing Supply: Market Activity, Land Supply and the Size of Homebuilder Firms. *Real Estate Economics*, *27*(4), 669-694. https://doi.org/https://doi.org/10.1111/1540-6229.00788
Somerville, T. (2001). Permits, Starts, and Completions: Structural Relationships Versus Real Options. *Real Estate Economics*, *29*, 161-190. https://doi.org/10.1111/1080-8620.00006
Van der Krabben, E., & Needham, B. (2008). Land readjustment for value capturing: A new planning tool for urban redevelopment. *Town Planning Review*, *79*, 651-672. https://doi.org/10.3828/tpr.79.6.4
van Thiel, S. (2014). *Research Methods in Public Administration and Public Management: An Introduction*. Routledge. https://books.google.nl/books?id=4rDOngEACAAJ

Appendixes

Appendix A: Variable definitions

Tabel A1. Variable definitions

Variable	Definition
Total in Pipeline	The number of residence objects with a granted building permit or with a notification of "construction started".
Construction started in Pipeline	The number of residence objects with a notification of 'construction started'.
Permitted in Pipeline	The number of residence objects with a granted building permit but without notification of 'construction started'
Total in Pipeline > 2 years	The number of residence objects with a granted building permit or with a notification of "construction started," the permit granted, or construction started notification was made at least 2 years ago.
Construction Started in Pipeline > 2 years	The number of residence objects with a notification of "construction started," the notification was made at least 2 years ago.
Permitted in Pipeline > 2 years	The number of residence objects with a granted building permit but without notification of "construction started", the building permit was granted at least 2 years ago.
Total in Pipeline > 5 years	The number of residence objects with a granted building permit or with a notification of "construction started," the permit granted, or construction started notification was made at least 5 years ago.
Construction Started in Pipeline > 5 years	The number of residence objects with a notification of "construction started," the notification was made at least 5 years ago.
Permitted in Pipeline > 5 years	The number of residence objects with a granted building permit but without notification of "construction started", the building permit was granted at least 5 years ago.
Demand for Housing	Measured by changes in housing prices, specifically using the House Price Index (HPI).
New Build Homes	Added to the housing stock through new construction.
Market Concentration	Measured using the Herfindahl-Hirschman Index (HHI), calculated as the sum of the squares of the market shares of all firms in the market.
CR4	Concentration Ratio measures the total market share of the four largest firms in the market.
Population	Used to indicate regional characteristics that influence the housing market.
Year Fixed Effects	Controls for time-specific effects and broader economic trends influencing housing development across all regions.
Market Fixed Effects	Accounts for region-specific characteristics that remain constant over time.

Appendix B: Regression Analysis

This appendix presents the results of the various regression analyses:

Total Homes in Pipeline:

```
Fixed-effects (within) regression               Number of obs     =      2,382
Group variable: gemeentecode                    Number of groups  =        344

R-squared:                                      Obs per group:
     Within  = 0.0001                                         min =          2
     Between = 0.0679                                         avg =        6.9
     Overall = 0.0460                                         max =          7

                                                F(1,2037)         =       0.29
corr(u_i, Xb) = 0.2151                          Prob > F          =     0.5934
```

pijplijn_w~l	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
hhi	-.262162	.4909671	-0.53	0.593	-1.225012	.700688
_cons	432.8002	15.67777	27.61	0.000	402.0541	463.5463
sigma_u	1102.9255					
sigma_e	267.34708					
rho	.94450392	(fraction of variance due to u_i)				

F test that all u_i=0: F(343, 2037) = 113.49 Prob > F = 0.0000

Figure B 1: Simple regression between HHI and total homes in Pipeline.

```
note: hhi_mean omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =      2,407
Group variable: gemeentecode                    Number of groups  =        344

R-squared:                                      Obs per group:
     Within  = 0.1322                                         min =          6
     Between = 0.0977                                         avg =        7.0
     Overall = 0.0993                                         max =          7

                                                F(8,343)          =       6.43
corr(u_i, Xb) = -0.0382                         Prob > F          =     0.0000

                           (Std. err. adjusted for 344 clusters in gemeentecode)
```

pijplijn_woningen_totaal	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
hhi_mean	0	(omitted)				
prijsindex_woning	22.54699	7.474701	3.02	0.003	7.84497	37.24901
c.hhi_mean#c.prijsindex_woning	-.183587	.0553001	-3.32	0.001	-.292357	-.0748171
jaar						
2016	-49.50653	17.2836	-2.86	0.004	-83.50171	-15.51135
2017	-110.9099	49.45576	-2.24	0.026	-208.1846	-13.63512
2018	-222.107	95.33561	-2.33	0.020	-409.6231	-34.59103
2019	-397.7864	151.777	-2.62	0.009	-696.3172	-99.25547
2020	-530.3165	197.9361	-2.68	0.008	-919.6378	-140.9951
2021	-728.3885	280.2547	-2.60	0.010	-1279.623	-177.1543
_cons	-1331.779	599.1748	-2.22	0.027	-2510.298	-153.2591
sigma_u	1049.639					
sigma_e	247.99211					
rho	.94713045	(fraction of variance due to u_i)				

Figure B 2: Regression between HHI with interaction term HPI and total homes in the pipeline.

Homes permitted in Pipeline:

```
note: hhi_mean omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =      2,407
Group variable: gemeentecode                    Number of groups  =        344

R-squared:                                      Obs per group:
     Within  = 0.0546                                         min =          6
     Between = 0.0969                                         avg =        7.0
     Overall = 0.0936                                         max =          7

                                                F(8,343)          =       4.46
corr(u_i, Xb) = 0.0287                          Prob > F          =     0.0000

                                  (Std. err. adjusted for 344 clusters in gemeentecode)
```

pijplijn_woningen_vergund	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
hhi_mean	0	(omitted)				
prijsindex_woning	12.8836	4.805922	2.68	0.008	3.430808	22.33639
c.hhi_mean#c.prijsindex_woning	-.0911466	.0395413	-2.31	0.022	-.1689206	-.0133727
jaar						
2016	-42.22945	11.28163	-3.74	0.000	-64.41933	-20.03957
2017	-71.37872	29.59371	-2.41	0.016	-129.5867	-13.17072
2018	-146.3261	56.02508	-2.61	0.009	-256.522	-36.13009
2019	-270.4636	93.43198	-2.89	0.004	-454.2354	-86.69182
2020	-337.2861	122.0563	-2.76	0.006	-577.3592	-97.21303
2021	-462.0443	170.3692	-2.71	0.007	-797.1443	-126.9444
_cons	-787.9299	376.4979	-2.09	0.037	-1528.465	-47.39455
sigma_u	646.45362					
sigma_e	208.87252					
rho	.90547152	(fraction of variance due to u_i)				

Figure B 3: Regression between HHI with interaction term HPI and permitted homes in the pipeline.

Construction started in Pipeline:

```
note: hhi_mean omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =      2,407
Group variable: gemeentecode                    Number of groups  =        344

R-squared:                                      Obs per group:
     Within  = 0.0735                                         min =          6
     Between = 0.0901                                         avg =        7.0
     Overall = 0.0873                                         max =          7

                                                F(8,343)          =       7.11
corr(u_i, Xb) = -0.1330                         Prob > F          =     0.0000

                                  (Std. err. adjusted for 344 clusters in gemeentecode)
```

pijplijn_woningen_bouwstart	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
hhi_mean	0	(omitted)				
prijsindex_woning	9.663395	5.181891	1.86	0.063	-.5288879	19.85568
c.hhi_mean#c.prijsindex_woning	-.0924404	.0390467	-2.37	0.018	-.1692415	-.0156393
jaar						
2016	-7.27708	13.4882	-0.54	0.590	-33.80707	19.25291
2017	-39.53114	36.14826	-1.09	0.275	-110.6313	31.56901
2018	-75.78097	73.07581	-1.04	0.300	-219.5141	67.95215
2019	-127.3228	103.9535	-1.22	0.221	-331.7893	77.14381
2020	-193.0303	135.8083	-1.42	0.156	-460.1522	74.09157
2021	-266.3442	195.1447	-1.36	0.173	-650.1751	117.4867
_cons	-543.8487	410.8277	-1.32	0.186	-1351.908	264.2101
sigma_u	432.83034					
sigma_e	173.12982					
rho	.86207214	(fraction of variance due to u_i)				

Figure B 4: Regression between HHI with interaction term HPI and construction started for homes in the pipeline.

New Build Homes:

```
note: hhi_mean omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =      2,407
Group variable: gemeentecode                    Number of groups  =        344

R-squared:                                      Obs per group:
     Within  = 0.0551                                         min =          6
     Between = 0.1159                                         avg =        7.0
     Overall = 0.1091                                         max =          7

                                                F(8,343)          =       9.17
corr(u_i, Xb) = 0.0276                          Prob > F          =     0.0000

                             (Std. err. adjusted for 344 clusters in gemeentecode)
```

nieuwbouw	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
hhi_mean	0	(omitted)				
prijsindex_woning	4.399431	1.359349	3.24	0.001	1.725723	7.07314
c.hhi_mean#c.prijsindex_woning	-.0540973	.0107819	-5.02	0.000	-.0753042	-.0328904
jaar						
2016	9.061891	6.524895	1.39	0.166	-3.771952	21.89573
2017	15.00105	11.32273	1.32	0.186	-7.269668	37.27177
2018	.2435354	24.67341	0.01	0.992	-48.2867	48.77377
2019	-11.50015	30.69995	-0.37	0.708	-71.88403	48.88372
2020	-40.23727	39.45542	-1.02	0.309	-117.8423	37.36777
2021	-76.51751	60.77901	-1.26	0.209	-196.064	43.029
_cons	-132.5267	121.4502	-1.09	0.276	-371.4076	106.3541
sigma_u	339.9526					
sigma_e	135.06178					
rho	.86367418	(fraction of variance due to u_i)				

Figure B 5: Regression between HHI with interaction term HPI and total new build homes.

Appendix C: Sensitivity Analysis

This appendix presents the results of the various regression analyses for the sensitivity analysis:

Total Homes in Pipeline:

```
note: C4_mean omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =      2,295
Group variable: gemeentecode                    Number of groups  =        328

R-squared:                                      Obs per group:
     Within  = 0.2366                                         min =          6
     Between = 0.2474                                         avg =        7.0
     Overall = 0.2469                                         max =          7

                                                F(8,327)          =       7.74
corr(u_i, Xb) = -0.0876                         Prob > F          =     0.0000

                          (Std. err. adjusted for 328 clusters in gemeentecode)
```

pijplijn_woningen_totaal	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
C4_mean	0	(omitted)				
prijsindex_woning	49.69255	14.71008	3.38	0.001	20.75421	78.63089
c.C4_mean#c.prijsindex_woning	-.3966609	.1197736	-3.31	0.001	-.6322849	-.1610369
jaar						
2016	-53.12736	15.87952	-3.35	0.001	-84.36626	-21.88846
2017	-120.4233	45.82671	-2.63	0.009	-210.5757	-30.27093
2018	-239.8857	88.09681	-2.72	0.007	-413.1937	-66.57765
2019	-427.9993	141.257	-3.03	0.003	-705.8864	-150.1122
2020	-569.744	184.1783	-3.09	0.002	-932.068	-207.4201
2021	-784.0017	260.9072	-3.00	0.003	-1297.27	-270.7333
_cons	-1441.172	555.4163	-2.59	0.010	-2533.812	-348.5325
sigma_u	982.40955					
sigma_e	238.03916					
rho	.94454577	(fraction of variance due to u_i)				

Figure C 1: Regression between C4 with interaction term HPI and total homes in the pipeline.

```
note: C4_mean omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =      2,295
Group variable: gemeentecode                    Number of groups  =        328

R-squared:                                      Obs per group:
     Within  = 0.1049                                         min =          6
     Between = 0.2508                                         avg =        7.0
     Overall = 0.2395                                         max =          7

                                                F(8,327)          =       5.29
corr(u_i, Xb) = -0.0026                         Prob > F          =     0.0000

                          (Std. err. adjusted for 328 clusters in gemeentecode)
```

pijplijn_woningen_vergund	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
C4_mean	0	(omitted)				
prijsindex_woning	27.86286	11.11596	2.51	0.013	5.995051	49.73068
c.C4_mean#c.prijsindex_woning	-.2136036	.0986548	-2.17	0.031	-.4076818	-.0195253
jaar						
2016	-44.79908	10.7878	-4.15	0.000	-66.02132	-23.57684
2017	-77.86982	28.27037	-2.75	0.006	-133.4846	-22.25508
2018	-157.9646	53.5012	-2.95	0.003	-263.2145	-52.71459
2019	-291.0257	89.27673	-3.26	0.001	-466.6549	-115.3965
2020	-363.6676	117.0091	-3.11	0.002	-593.8532	-133.482
2021	-499.0125	162.8802	-3.06	0.002	-819.4378	-178.5871
_cons	-858.584	359.9878	-2.39	0.018	-1566.768	-150.3998
sigma_u	601.41154					
sigma_e	208.03026					
rho	.89313695	(fraction of variance due to u_i)				

Figure C 2: Regression between C4 with interaction term HPI and permitted homes in the pipeline.

Construction started in Pipeline:

```
note: C4_mean omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =      2,295
Group variable: gemeentecode                    Number of groups  =        328

R-squared:                                      Obs per group:
     Within  = 0.1173                                         min =          6
     Between = 0.2161                                         avg =        7.0
     Overall = 0.2032                                         max =          7

                                                F(8,327)          =       7.82
corr(u_i, Xb) = -0.2026                         Prob > F          =     0.0000

                          (Std. err. adjusted for 328 clusters in gemeentecode)
```

pijplijn_woningen_bouwstart	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
C4_mean	0	(omitted)				
prijsindex_woning	21.82969	11.49677	1.90	0.058	-.7872803	44.44665
c.C4_mean#c.prijsindex_woning	-.1830573	.0950199	-1.93	0.055	-.3699848	.0038701
jaar						
2016	-8.328284	13.72191	-0.61	0.544	-35.32264	18.66607
2017	-42.55348	36.72431	-1.16	0.247	-114.7992	29.69223
2018	-81.9211	74.50366	-1.10	0.272	-228.4881	64.64586
2019	-136.9736	106.1749	-1.29	0.198	-345.8456	71.89837
2020	-206.0764	138.5292	-1.49	0.138	-478.5972	66.44441
2021	-284.9892	199.2737	-1.43	0.154	-677.0095	107.031
_cons	-582.5884	419.3431	-1.39	0.166	-1407.539	242.3624
sigma_u	415.37802					
sigma_e	172.97321					
rho	.85221805	(fraction of variance due to u_i)				

Figure C 3: Regression between C4 with interaction term HPI and construction started for homes in the pipeline.

New Build Homes:

```
note: C4_mean omitted because of collinearity.

Fixed-effects (within) regression               Number of obs     =      2,295
Group variable: gemeentecode                    Number of groups  =        328

R-squared:                                      Obs per group:
     Within  = 0.0710                                         min =          6
     Between = 0.2829                                         avg =        7.0
     Overall = 0.2586                                         max =          7

                                                F(8,327)          =      10.66
corr(u_i, Xb) = 0.1349                          Prob > F          =     0.0000

                          (Std. err. adjusted for 328 clusters in gemeentecode)
```

nieuwbouw	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
C4_mean	0	(omitted)				
prijsindex_woning	10.26495	2.386989	4.30	0.000	5.569157	14.96074
c.C4_mean#c.prijsindex_woning	-.0933319	.0203952	-4.58	0.000	-.1334541	-.0532096
jaar						
2016	8.731688	6.782861	1.29	0.199	-4.611862	22.07524
2017	15.34534	12.07476	1.27	0.205	-8.408678	39.09936
2018	-.207042	26.34418	-0.01	0.994	-52.03251	51.61843
2019	-11.62225	32.16149	-0.36	0.718	-74.89177	51.64728
2020	-41.34892	40.47184	-1.02	0.308	-120.967	38.26911
2021	-78.36912	63.85623	-1.23	0.221	-203.99	47.25174
_cons	-136.6741	126.0755	-1.08	0.279	-384.6955	111.3473
sigma_u	315.0463					
sigma_e	136.85778					
rho	.84124952	(fraction of variance due to u_i)				

Figure C 4: Regression between C4 with interaction term HPI and total new build homes.