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# The impact of planning intervention on business development: Evidence from the Netherlands

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## Abstract
There has been a growing research interest in measuring the impact of planning and land-use regulations on housing market outcomes, but parallel development of the evidence base for the business sector has yet to occur. This article examines the impact of planning intervention on the amount of building investment taking place at sites allocated for industrial and business development. Measures that capture different dimensions of planning intervention are incorporated into models of industrial building investment. The models are estimated using a novel micro dataset on permit activity that covers a sample of industrial and business sites in the Netherlands. The results provide evidence of some of the expected negative effects of the regulatory role of planning intervention, but also show that proactive, targeted planning policies exert a significant and positive influence on investment activity. Specifically, policy-induced improvements to the physical environment will stimulate both new construction and refurbishment activity.

## Keywords
building investment, industrial sites, planning intervention, regeneration, restrictiveness

## 摘要
衡量规划和土地利用法规如何影响住房市场结果的研究日益增加，但对于它们如何影响商业地产，相关证据尚待发掘。本文考察了规划干预对工业和商业开发用地上建筑投资量的影响。我们在工业建筑投资模式中纳入了衡量规划干预不同维度的指标。我们针对荷兰的一组工业和商业用地样本，运用关于许可活动的一套新微观数据，对这些模式做了估测。结果证明，规划干预的管制作用产生了一些预期的负面影响，但也表明，主动、有针对性的规划政策对投资活动产生了重大而积极的影响。具体来说，由政策引入的物理环境改善会刺激新的建筑和翻新活动。

## 关键词
建筑投资、工业遗址、规划干预、再生、限制性

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## Introduction

Planning systems introduce a range of policy initiatives and instruments in order to influence the level, location and spatial distribution of business activity. In doing so, the planning system in its various guises creates benefits as well as costs for firms. It has been argued that the greatest negative impact of planning on business development is through the restriction of land supply (Cheshire et al., 2015; Henneberry et al., 2005). However, by correcting market failures, the planning system also creates significant benefits for firms. It has long been recognised by policy-makers that direct public intervention is specifically required in regions or urban areas that are underperforming relative to others because business development would not otherwise occur. Policies and strategies designed to regenerate these areas may include the provision of new infrastructure, improvements of the physical environment and the provision of commercial land and property. These activities are seen as an important means to stimulate new investment and to encourage existing businesses to stay or even expand their activities (Ball et al., 1998).

Despite the potentially profound impact of the planning system on the commercial property market, there have been few attempts to empirically explore this relationship. While there is a growing research interest in measuring the impact of planning and land-use regulations on housing market outcomes, parallel development of the evidence base for the business sector has yet to occur. This article attempts to address this lacuna and presents results from a novel micro dataset on permit activity at sites allocated for industrial and business uses in the Netherlands. Such sites accommodate nearly one-third of all jobs in the country (Knoben and Weterings, 2010). The empirical analysis examines the impact of a set of indicators of planning intervention, which reflect the main policy actions and initiatives deployed by local governments so as to influence industrial and business development. To do this, a theoretical model is introduced that combines conceptual frameworks developed in macroeconomic studies of fixed capital investment and the location theory literature.

This article proceeds in the following way. The next section discusses the conceptual and measurement problems that have constrained previous evaluations of planning policies and how we attempt to address these limitations. The following section describes the empirical approach adopted in the analyses of the article and sets out the econometric model. The article then provides detailed descriptions of the core dataset on building investment and the additional variables incorporated. The results of the modelling work are described in the next section. The final section concludes and identifies promising directions for future research.

## Evaluating the impact of planning on property market outcomes

There has been considerable academic debate on the extent to which planning policies restrict new construction and lead to higher property values. This debate has been mainly informed by results from empirical econometric models in the US literature (see Quigley and Rosenthal, 2005 for a review. See Ihlanfeldt, 2007; and Glaeser et al., 2012 for more recent contributions), although recent years have witnessed a growing research interest in the impact of land-use

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regulation and planning in the UK (Bramley, 2013). Nevertheless, there are at least three main limitations in the conceptualisation and measurement of planning policies that appear to have constrained the development of the required evidence base.

The first limitation of existing research is the nearly exclusive focus on the housing sector. While several studies have recently begun to consider the relationship between the planning system and the retail and office sectors (Cheshire and Hilber, 2008; Cheshire et al., 2015; Jackson and Watkins, 2007), similar work addressing the impact of planning intervention on the industrial sector is still largely absent. One attempt has been made by Henneberry et al. (2005), who examine the impact of planning regulations on the industrial property market, along with the office and retail sectors. This is rather disappointing as the impact of restrictions on the supply of land might be particularly large for manufacturing and wholesale distribution because these activities tend to use more space than offices or retail (Nathan and Overman, 2011). This study, therefore, explicitly explores the impact of planning policies on the amount of industrial and business development.

A second shortcoming is that, although the link between planning restrictions and prices appears well established, there have been few attempts to estimate the impact of planning on construction activity directly (see McLaughlin, 2012). The emphasis on the impact of planning upon prices is problematic since price increases may well be because of positive amenities that planning provides for residents, rather than supply restrictions. In addition, while the effects of restrictions on prices will be mediated through the responses of developers (Bramley, 2013), the supply side is (implicitly) rendered neutral by focusing on price effects. The small but growing literature that addresses this deficiency (e.g. Bramley, 1998; Glaeser and Ward, 2009; Green et al., 2005; Quigley and Raphael, 2005) has to date employed metropolitan and city-level data to analyse the impact of planning regulations on investment activity. Various calls have been made to further advance the modelling of planning policies by exploring its effects at lower levels of spatial disaggregation (Meen and Nygaard, 2011; and see Bramley and Kirk, 2005 on industrial planning policies). We seek to address this challenge by using data derived from building permit records, which allows an empirical analysis at the level of individual sites.

Thirdly, the evidence base on the impact of planning has been constrained because most previous research has tended to reduce planning intervention merely to 'development control': the restrictions imposed on new development by land-use plans and regulation. Such a narrow conception ignores the heterogeneous nature of planning. Land-use restrictions are only one form of planning intervention, alongside the supply of building land and new or upgraded infrastructure, fiscal or grant-based incentives and improved coordination and information provision (Tiesdell and Allmendinger, 2005). As such, econometric models of market outcomes need to incorporate a broader range of measures of planning intervention to capture more fully the range of, at times, contradictory actions and initiatives deployed by (local) planning authorities. This study addresses this challenge by investigating the impact of various measures related to planning restrictiveness, in conjunction with indicators that establish the presence of initiatives aimed at regenerating rundown sites. In this respect, it ties into a small literature that seeks to capture the negative as well as the positive effects that planning policy intervention is presumed to produce (see e.g. Jackson and Watkins, 2007).

## Existing industrial planning policies and their evolution

As the previous section has highlighted, planning is an activity of considerable breadth, which cannot readily be reduced to 'development control' alone. Environmental regulations concerning permissible levels of pollution, which are largely implemented through land-use plans in the Netherlands, influence firm location decisions and development activity and so do transport policies, through the delivery of (local or national) transport infrastructure. However, the main focus of this article will be on land-use regulations and regeneration policies, as these are the primary means by which local authorities seek to influence industrial and business development.

Land-use regulation is common throughout the world, but there are significant differences in the way that real estate development is regulated and controlled. On the one hand, there are regulatory systems that judge individual applications on their own merits. On the other hand, there are those that require all developments to conform to some standards or norms, which have been laid down in advance. The Netherlands, and much of Continental Europe, operates in the second tradition, while the first discretionary approach is evident in the UK. The Dutch system is essentially decentralised, with the main decisions resting primarily with elected, local governments (municipalities). The main instrument by which municipalities seek control over what can be built on any site is the local land-use plan (*bestemmingsplan*), which is legally binding (Needham, 2007). Since land-use plans normally cover only parts of the administrative area of a municipality, land for industrial and business purposes will be made available through a number of different land-use plans.

Although municipalities are primarily responsible for land-use planning, they must conform with national planning policies and guidelines. Over the past two decades the primary objective of the national government has been to ensure a suitable supply of land on sites for industrial and business development, as this was considered a vital support towards achieving employment growth (EZ, 1995, 2004; EZ and VROM, 2008). However, during the second half of the last decade, environmental interest groups began to express concerns about the negative impacts of what they perceived as an excess supply of industrial sites. These groups managed to attract considerable media coverage and attention from academics, policy-makers and politicians. The national government responded by establishing the *Task Force (her)ontwikkeling bedrijventerreinen* (THB, 2008). The Task Force argued for a more restrictive approach towards the development of new sites and recommended the creation of regional cooperation arrangements between municipalities in order to improve the coordination of local land provisions.

This heralded a broadening of the goals articulated in key national policy statements. An appropriate land supply was still seen as essential to meet the space needs of expanding firms, but this should not be at the expense of landscape and environmental quality. To achieve this twofold objective, a new instrument was introduced in 2011: the so-called *SER-ladder*. This is a sequential test, which only allows greenfield development to be considered if all other possible sites have been ruled out. Prospective developers have to demonstrate that suitable sites are not available and, subsequently, that sites cannot be made available through redevelopment before proposing to develop a new site. However, even before the introduction of this sequential test, supply was already severely constrained in particular areas such as the Green Heart, which refers to the less urbanised area between the four major Dutch cities (Olden, 2010). In this article, we exploit these variations in the severity of local supply constraints to estimate the impact of planning regulations.

Industrial sites have been targeted by regeneration initiatives since the late 1980s. These initiatives typically put in place projects aimed at the physical improvement of the site and may encompass investments in road infrastructure and the public realm, relocation of undesired activities and in some instances the acquisition and demolition of obsolete properties and provision of building land. These activities are normally undertaken by municipalities. Over the years, they could rely on specific grant programmes from the national government and provinces to finance physical improvements of these sites. The most recent regeneration spending round, which ended in 2014 and involved a substantial increase in budget, reflected the response of the national government to another of the Task Force's recommendations to target 15,800 hectares of core regeneration sites by 2020.

There are two basic channels through which the planning policies, reviewed above, might affect investment activity at industrial sites. The first channel is the restriction of land for industrial and business development. Supply restrictions will directly influence the amount of new development by reducing the number of business premises that can be built in a particular locality. The resultant shortages of business space are also likely to increase the cost of space by pushing up the prices of land and property. In addition, by allocating land in particular areas, planning policies will dictate firm location and the actual pattern of industrial development. These locations need not be optimal from the point of view of operating costs or revenues.

The second channel is the impact on the physical environment of policy-induced improvements associated with regeneration initiatives. Physical regeneration will improve the economic conditions of industrial sites, making it easier to conduct business. For example, on-site street improvements will enhance the efficiency of truck transport and thus the competitiveness of local businesses. As a result, firms are expected to change their investment behaviour, by locating at the site, by expanding their operations or by maintaining and improving their premises. Regeneration initiatives are often explicitly justified on the basis of such economic arguments (see Ploegmakers and Beckers, 2015).

We therefore test the following two hypotheses. The first hypothesis is that locally variable restrictions on land availability influence investment activity at industrial sites. Specifically, we expect that the spatial pattern of investment activity will be influenced by allocations of land for industrial development. In addition, investment will be less likely in areas with a more restrictive regulatory stance towards new industrial development. The second hypothesis is that regeneration funded improvements have a positive impact on investment activity.

## Data

The empirical analysis of this article is conducted at the level of industrial sites and covers locations included in the *Integraal Bedrijventerreinen Informatie Systeem* (IBIS). IBIS is an annual survey that gathers information from individual municipalities on all industrial sites in the Netherlands. Industrial sites are particularly important to manufacturing industries and warehousing, the traditional occupants of industrial space. Other activities like wholesale, services (e.g. ancillary office) and repair and maintenance often have similar property and locational requirements and increasingly end up being located on the same sites. In addition, local land-use plans often permit office uses and retail warehouses on land allocated for industrial and business uses. Thus, the boundaries between the traditional sectors of the commercial property market become increasingly blurred at this level (see Ball et al., 1998).

Data on investment activity come from building permit records of individual municipalities. Building permit applicants have to report information on the location (street address), type and estimated costs of the proposed construction works. Although a building permit is not required for all construction works, any substantial alteration will require a permit (Needham, 2007). As these data are not readily available, we have contacted municipalities to obtain annual extracts of their building permit records. The selection of municipalities included all municipalities with at least one industrial site within their administrative boundaries in 2008. Information from building permits issued in the period 2004–2008 has been assembled for a sample of 57 municipalities.[1]

Since we are interested in investment activity by firms located on industrial sites, we have merged the building permit records to the LISA (*Landelijk Informatiesysteem van Arbeidsplaatsen en Vestigingen*) database. LISA is a longitudinal dataset that contains detailed information on the number of jobs, industry type (NACE-codes) and the exact street address of all business establishments in the Netherlands. We matched LISA addresses with the building permit data using street names, numbers, any additions and zip codes.[2] In order to identify whether establishments are inside or outside the boundaries of an industrial site, we plotted business establishments on GIS maps of the industrial sites included in IBIS.[3] Through these matching procedures we were able to obtain building permit information for a total of 557 distinct sites.

We have filtered permit data on the basis of the descriptions of construction activity provided by their applicants. First, we have restricted our sample to buildings for business purposes.[4] Second, permits were discarded if they were issued for demolitions, construction work on structures other than buildings and construction work of a temporary nature or if the estimated construction costs were not recorded. Third, we distinguish between two broad categories of building investment: investment in new construction and investment in existing structures (such as modernisation, remodelling, replacement and additions) respectively. The latter category is henceforth termed ‘refurbishment’.

We start our description of the explanatory variables with the measures that capture planning interventions as these are central in this study. The first group of planning indicators relates to the extent to which local plans and regulations are restrictive for new industrial development. The indicators of planning restrictiveness used in this analysis are based on quantitative measures of land availability and have been obtained from the IBIS file. IBIS registers the total amount of land available on each industrial site. This enables us to establish supply at the site level. We also derive a measure of the amount of land that is annually available for development at the municipal level from this dataset. This indicator is expressed as a share in the total stock of land for industrial uses, which is a measure of the size of the local market since it also includes all industrial land already taken up by firms.

Measures of land availability are employed in this study for two main reasons: one is their salience in policy debates and the second is that Bramley and Watkins (2014), who review measures of planning restrictiveness, conclude that the amount of land made available through the planning system is the preferred indicator of planning restraint. Many studies, especially in a UK context, have employed the proportion of planning applications that are approved as a measure to capture regulatory restrictiveness. While this may be regarded as an obvious indicator of the discretionary planning system operated in the UK, it is a less effective measure for the Dutch planning system, which is characterised by a pre-defined mode of development regulation. This implies that all applications that meet the requirements laid down for a particular area must be granted planning permission and those that do not conform must be rejected.

In addition to our measures of planning restrictiveness, we incorporate a variable that captures the presence of policies designed to improve the physical environment of the site. The data were derived from a survey among municipal officials which was largely administered in 2009. The municipalities that responded coincide with those for which building permit data is available.[5] Amongst the 557 distinct sites included in the sample, 101 have been designated as a regeneration area in the period of interest. The survey was used to collect information about the occurrence and the start and end dates of regeneration initiatives for each site included in the IBIS dataset. The start date assigned to regeneration sites is the first year that projects were implemented and the end date is the last year of project implementation. This permits us to analyse the impact of the actual timing of funded projects on building investment. The average duration of regeneration initiatives was 4.8 years, but on more than 50% of all regeneration sites all projects were competed within a time span of three years.

In addition to these data, we have used LISA to derive information about the firms located on the site, including the shares of five broad industry categories, the proportion of large firms and the total number of firms. We also include a number of variables that measure the attributes of the site and its environment. The first measure relates to the age of the site and is deduced by visually inspecting historical maps for the period 1950–1990. Second, we create two variables that define the location of the site in relation to the motorway network: travel time (in minutes) to the nearest motorway junction and location next to a motorway. Third, we add two variables that capture the potential influence of surrounding land uses, distinguishing between housing and undeveloped land. Finally, we have obtained data relating to the municipality within which the site is situated. This includes the share of all developable land that was already developed, the share of conservative-liberal votes in the 1998 national election, manufacturing employment growth and the industrial structure, which is determined by dividing the number of manufacturing jobs by total local employment. Summary statistics of all variables are provided in Table 1.

## Model description

Underlying our empirical analysis of the impact of planning policies on business activity is a stock adjustment model. According to this model, investment takes place to close the gap between the current stock and a desired or optimal stock. We employ this theoretical framework because investment in industrial buildings, at least in the Netherlands, can be best treated as a firm 'investment' decision (Wheaton and Torto, 1990). An inventory by Stec Groep and NVB (2005) indicates that almost two thirds of all industrial and business space is owned directly by the users themselves. This suggests that most buildings on industrial sites have been built or commissioned by the occupants directly and that the share of properties built speculatively for rent is very small. Most of the existing empirical work that has modelled aggregate construction activity in the industrial sector has also used stock adjustment models (Tsolacos, 1995; Wheaton and Torto, 1990).

In this article, it is assumed that the optimal capital stock reflects the firm's goal to

**Table 1.** Summary statistics.

| Variable | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|
| *Dependent variables* | | | | |
| New construction (€ x 1000) | 482.72 | 2073.55 | 0.00 | 50,159.50 |
| Refurbishment (€ x 1000) | 234.36 | 952.01 | 0.00 | 31,000.00 |
| New construction (dummy) | 0.30 | 0.46 | 0.00 | 1.00 |
| Refurbishment (dummy) | 0.45 | 0.50 | 0.00 | 1.00 |
| *Planning indicators* | | | | |
| Land supply at site level (hectares) | 2.07 | 8.20 | 0.00 | 134.43 |
| Regeneration site (dummy) | 0.19 | 0.39 | 0.00 | 1.00 |
| During regeneration (dummy) | 0.07 | 0.26 | 0.00 | 1.00 |
| After regeneration (dummy) | 0.04 | 0.20 | 0.00 | 1.00 |
| *Firm characteristics* | | | | |
| Number of establishments | 47.46 | 66.55 | 1.00 | 534.00 |
| Share active in manufacturing (%) | 30.68 | 21.91 | 0.00 | 100.00 |
| Share active in financial services (%) | 17.20 | 16.06 | 0.00 | 100.00 |
| Share active in logistics (%) | 24.08 | 18.42 | 0.00 | 100.00 |
| Share active in public sector (%) | 3.13 | 9.22 | 0.00 | 100.00 |
| Share of large firms (%) | 10.78 | 17.82 | 0.00 | 100.00 |
| Share active in consumer services (%) | 24.91 | 20.51 | 0.00 | 100.00 |
| *Site attributes* | | | | |
| 2000 onwards (dummy) | 0.07 | 0.26 | 0.00 | 1.00 |
| 1990–1999 (dummy) | 0.17 | 0.38 | 0.00 | 1.00 |
| 1980–1989 (dummy) | 0.16 | 0.36 | 0.00 | 1.00 |
| 1970–1979 (dummy) | 0.18 | 0.39 | 0.00 | 1.00 |
| 1960–1969 (dummy) | 0.18 | 0.38 | 0.00 | 1.00 |
| Before 1960 (dummy) | 0.24 | 0.43 | 0.00 | 1.00 |
| Heavy environmental impact (dummy) | 0.47 | 0.50 | 0.00 | 1.00 |
| Location next to a motorway (dummy) | 0.20 | 0.40 | 0.00 | 1.00 |
| Travel time to motorway junction (minutes) | 5.32 | 5.19 | 0.52 | 38.87 |
| Surrounding land use: residential (hectares) | 15.55 | 15.62 | 0.00 | 71.61 |
| Surrounding land use: undeveloped land (hectares) | 22.28 | 18.69 | 0.00 | 74.43 |
| *Municipality-level characteristics* | | | | |
| Land availability (% of total), 1998–2008 | 0.11 | 0.07 | 0.00 | 0.37 |
| Share of developed land in 1996 | 0.26 | 0.17 | 0.05 | 0.82 |
| Industrial structure in 1998 | 0.25 | 0.09 | 0.00 | 0.50 |
| Manufacturing employment growth, 1998–2008 | 1.13 | 0.59 | 0.43 | 3.38 |
| Share of conservative-liberal votes in 1998 | 0.24 | 0.06 | 0.10 | 0.41 |

*Notes*: The number of observations is 2664.

maximise profits. Profits are not observable, but we assume that they are influenced by the attributes of the site and its environment and by the characteristics of the firm (see Bartik, 1985; Carlton, 1983). The basic econometric specification is as follows:

$$I_{jt} = \alpha + \beta X_{jt} + \gamma Z_{jt} + \varepsilon_{jt} \quad (1)$$

where $I_{jt}$ is the optimal level of building investment on site $j$ in year $t$; $X_{jt}$ is a vector of variables that reflect the characteristics of the firms located on the site; $Z_{jt}$ denotes a vector of specific quality and locational attributes of the site, which can affect profits from both the cost and revenue sides; and $\varepsilon_{jt}$ is the random error term. Following

Equation (1), our empirical baseline specification to estimate the impact of planning policies on investment activity is:

$$I_{jt} = \alpha + \beta X_{jt} + \gamma Z_{jt} + \delta(\textit{land availability})_{jt} + \theta(\textit{regeneration site})_{j} + \rho(\textit{during regeneration})_{jt} + \psi(\textit{after regeneration})_{jt} + \eta_t I_t + \varphi_m W_m + \varepsilon_{jt} \quad (2)$$

where $W_m$ is a series of municipality fixed effects and $I_t$ a set of year fixed effects. The variable *regeneration site* is a dummy variable that takes a value of 1 if the site is designated as a regeneration area. This variable captures baseline, unobserved differences between sites designated for regeneration and other sites. The variable *during regeneration* takes value 1 for all years that regeneration projects were implemented on the site, whereas the variable *after regeneration* is coded 1 for all years subsequent to the completion of all regeneration projects on the site. These coefficients capture the impact of regeneration. In essence we are, therefore, using a difference-in-difference estimator.

Two separate equations with distinctive dependent variables will be estimated: investment in refurbishment and investment in new construction. This choice is motivated by the fact that planning policies might have differential impacts on distinct types of investment activity. Both variables are in natural logarithms and the explanatory variables in all three models are the same. The nature of the dependent variables motivates two different empirical model specifications. The first is a Tobit model, which we use to explain the level of expenditure on sites. We propose this model to deal with the censoring of the dependent variables: for many sites zero expenditure is reported in particular years.[6] As a result, Ordinary least squares regressions may provide biased estimates. Existing work that has investigated property investment at the individual building or neighbourhood level has also made use of Tobit models (see Gyourko and Saiz, 2004; Helms, 2003; Melzer, 2017). The second model is a Probit model, which only distinguishes between instances in which $I_{jt}>0$ and $I_{jt} = 0$. We use this model to explain the probability that any investment activity occurred at all on the site in a particular year.

## Results

### Planning policies at the site level

This section presents the results of the Tobit and Probit estimations for building investment on industrial sites from 2004 to 2008. As noted above, the analysis is based on the estimation of two separate equations with distinctive dependent variables. Table 2 presents the results of the Probit estimation and Table 3 the results of the Tobit estimation. In both tables, the first four columns report the results of the estimations with investment in refurbishment as the dependent variable, and the last four columns present the results of the estimations with new construction as the dependent variable. For the Probit models, we present marginal effects, calculated at the mean of the independent variables. In the Tobit specifications, unconditional marginal effects are reported. The degree of fit of the models is rather low. This is common for this type of micro-level modelling and reflects the presence of considerable noise and discontinuities in the annual data. Despite their low explanatory power, all models are highly significant overall and the signs of the independent variables are mainly as expected. The separate estimations for refurbishment and new construction show considerable variation in the effects of the explanatory variables, which are generally in line with expectations. The relevance of distinguishing between different types of investment in empirical analyses is highlighted by these results.

**Table 2.** The impact of planning policies on the probability of building investment.

| | Refurbishment | | | | New construction | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| *Planning indicators* | | | | | | | | |
| Land supply at site level (hectares) | 0.003 | 0.002 | 0.001 | 0.000 | 0.008*** | 0.007*** | 0.004** | 0.004** |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| Regeneration site (dummy) | 0.230*** | −0.005 | −0.037 | −0.056 | 0.126*** | −0.005 | 0.014 | 0.021 |
| | (0.061) | (0.063) | (0.062) | (0.060) | (0.044) | (0.042) | (0.042) | (0.044) |
| During regeneration (dummy) | 0.269*** | 0.231*** | 0.216*** | 0.220*** | 0.219*** | 0.173*** | 0.146*** | 0.124** |
| | (0.079) | (0.085) | (0.082) | (0.078) | (0.061) | (0.058) | (0.055) | (0.057) |
| After regeneration (dummy) | 0.153 | 0.116 | 0.104 | 0.149 | 0.260*** | 0.228*** | 0.191*** | 0.182*** |
| | (0.094) | (0.094) | (0.094) | (0.096) | (0.065) | (0.061) | (0.060) | (0.067) |
| *Firm characteristics* | | | | | | | | |
| Number of establishments | | 0.007*** | 0.006*** | 0.006*** | | 0.002*** | 0.002*** | 0.002*** |
| | | (0.001) | (0.001) | (0.001) | | (0.000) | (0.000) | (0.000) |
| Share active in manufacturing (%) | | 0.002** | 0.002** | 0.001* | | 0.002*** | 0.001* | 0.001 |
| | | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) | (0.001) |
| Share active in financial services (%) | | 0.001 | 0.001 | 0.001 | | 0.000 | 0.000 | 0.001 |
| | | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) | (0.001) |
| Share active in logistics (%) | | 0.001 | 0.000 | 0.000 | | 0.001* | −0.001 | –0.000 |
| | | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) | (0.001) |
| Share active in public sector (%) | | −0.001 | −0.001 | −0.001 | | −0.002 | −0.001 | –0.000 |
| | | (0.002) | (0.002) | (0.002) | | (0.002) | (0.002) | (0.001) |
| Share of large firms (%) | | 0.000 | −0.001 | −0.001 | | −0.001* | −0.001* | –0.001* |
| | | (0.001) | (0.001) | (0.001) | | (0.001) | (0.001) | (0.001) |
| *Site attributes* | | | | | | | | |
| 1990–1999 (dummy) | | | 0.082 | 0.101** | | | −0.091* | –0.145*** |
| | | | (0.054) | (0.050) | | | (0.054) | (0.051) |
| 1980–1989 (dummy) | | | 0.037 | 0.048 | | | −0.161*** | –0.184*** |
| | | | (0.060) | (0.053) | | | (0.056) | (0.056) |
| 1970–1979 (dummy) | | | 0.079 | 0.095* | | | −0.104** | –0.143*** |
| | | | (0.060) | (0.055) | | | (0.053) | (0.053) |
| 1960–1969 (dummy) | | | 0.106* | 0.123** | | | −0.081 | –0.125** |
| | | | (0.061) | (0.057) | | | (0.056) | (0.056) |

*(continued)*

**Table 2.** Continued

| | Refurbishment | | | | New construction | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Before 1960 (dummy) | | | 0.103* | 0.126** | | | −0.148*** | –0.189*** |
| | | | (0.058) | (0.053) | | | (0.053) | (0.055) |
| Heavy environmental impact (dummy) | | | 0.069** | 0.080** | | | 0.092*** | 0.081*** |
| | | | (0.031) | (0.031) | | | (0.025) | (0.025) |
| Location next to a motorway (dummy) | | | 0.044 | 0.043 | | | 0.058* | 0.069** |
| | | | (0.038) | (0.044) | | | (0.034) | (0.034) |
| Travel time to motorway junction (minutes) | | | −0.000 | 0.002 | | | 0.001 | 0.003 |
| | | | (0.003) | (0.006) | | | (0.003) | (0.006) |
| Surrounding land use: residential (hectares) | | | −0.006*** | −0.004*** | | | −0.005*** | –0.005*** |
| | | | (0.001) | (0.001) | | | (0.001) | (0.001) |
| Surrounding land use: undeveloped land (hectares) | | | −0.004*** | −0.004*** | | | −0.000 | −0.001 |
| | | | (0.001) | (0.001) | | | (0.001) | (0.001) |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Municipality fixed effects | No | No | No | Yes | No | No | No | Yes |
| **Observations** | 2664 | 2664 | 2664 | 2664 | 2664 | 2664 | 2664 | 2664 |
| **Pseudo $R^2$** | 0.063 | 0.234 | 0.253 | 0.296 | 0.077 | 0.154 | 0.189 | 0.228 |
| **LR chi2** | 99.736 | 191.294 | 302.622 | 549.303 | 130.037 | 224.435 | 373.647 | 597.589 |

*Notes*: Average marginal effects with robust standard errors (clustered at the industrial site level) in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

**Table 3.** The impact of planning policies on the log of building investment.

| | Refurbishment | | | | New construction | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| *Planning indicators* | | | | | | | | |
| Land supply at site level (hectares) | 0.046* | 0.025 | 0.017 | 0.013 | 0.103*** | 0.088*** | 0.054*** | 0.047** |
| | (0.026) | (0.019) | (0.017) | (0.018) | (0.027) | (0.023) | (0.021) | (0.019) |
| Regeneration site (dummy) | 2.988*** | 0.866 | 0.220 | 0.244 | 1.738*** | 0.212 | 0.372 | 0.469 |
| | (0.678) | (0.588) | (0.557) | (0.560) | (0.579) | (0.502) | (0.487) | (0.523) |
| During regeneration (dummy) | 2.432*** | 1.338* | 1.066* | 1.023* | 2.541*** | 1.742*** | 1.434** | 1.163* |
| | (0.719) | (0.702) | (0.591) | (0.562) | (0.694) | (0.612) | (0.558) | (0.601) |
| After regeneration (dummy) | 1.622* | 0.459 | 0.343 | 0.115 | 3.014*** | 2.217*** | 1.803*** | 1.604** |
| | (0.921) | (0.855) | (0.713) | (0.770) | (0.716) | (0.680) | (0.621) | (0.721) |
| *Firm characteristics* | | | | | | | | |
| Number of establishments | | 0.033*** | 0.021*** | 0.024*** | | 0.022*** | 0.016*** | 0.017*** |
| | | (0.003) | (0.003) | (0.003) | | (0.002) | (0.002) | (0.003) |
| Share active in manufacturing (%) | | 0.023** | 0.020** | 0.013 | | 0.029*** | 0.014* | 0.010 |
| | | (0.010) | (0.010) | (0.010) | | (0.009) | (0.008) | (0.008) |
| Share active in financial services (%) | | 0.031*** | 0.025** | 0.022* | | 0.012 | 0.009 | 0.015 |
| | | (0.011) | (0.011) | (0.011) | | (0.012) | (0.012) | (0.012) |
| Share active in logistics (%) | | 0.025** | 0.006 | 0.005 | | 0.020** | −0.004 | −0.003 |
| | | (0.010) | (0.010) | (0.010) | | (0.009) | (0.009) | (0.009) |
| Share active in public sector (%) | | −0.019 | −0.017 | −0.013 | | −0.027 | −0.009 | −0.005 |
| | | (0.023) | (0.022) | (0.020) | | (0.028) | (0.022) | (0.018) |
| Share of large firms (%) | | -0.012 | −0.029*** | −0.024*** | | −0.019** | −0.019* | −0.019** |
| | | (0.010) | (0.010) | (0.009) | | (0.009) | (0.010) | (0.009) |
| *Site attributes* | | | | | | | | |
| 1990–1999 (dummy) | | | 0.939 | 1.101** | | | −1.140* | −1.697*** |
| | | | (0.609) | (0.556) | | | (0.646) | (0.604) |
| 1980–1989 (dummy) | | | 0.838 | 0.988* | | | −2.026*** | −2.304*** |
| | | | (0.672) | (0.588) | | | (0.671) | (0.661) |
| 1970–1979 (dummy) | | | 1.261* | 1.447** | | | −1.386** | −1.831*** |
| | | | (0.672) | (0.627) | | | (0.631) | (0.633) |
| 1960–1969 (dummy) | | | 1.490** | 1.606** | | | −1.074 | −1.580** |
| | | | (0.679) | (0.638) | | | (0.667) | (0.665) |

*(continued)*

**Table 3.** Continued

| | Refurbishment | | | | New construction | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Before 1960 (dummy) | | | 1.058 | 1.272** | | | −1.926*** | −2.385*** |
| | | | (0.648) | (0.596) | | | (0.639) | (0.658) |
| Heavy environmental impact (dummy) | | | 1.613*** | 1.589*** | | | 1.365*** | 1.226*** |
| | | | (0.332) | (0.327) | | | (0.321) | (0.313) |
| Location next to a motorway (dummy) | | | 0.468 | 0.550 | | | 0.791** | 0.920** |
| | | | (0.367) | (0.420) | | | (0.396) | (0.397) |
| Travel time to motorway junction (minutes) | | | −0.030 | 0.010 | | | 0.008 | 0.028 |
| | | | (0.038) | (0.069) | | | (0.032) | (0.070) |
| Surrounding land use: residential (hectares) | | | −0.079*** | −0.070*** | | | −0.075*** | −0.072*** |
| | | | (0.013) | (0.014) | | | (0.013) | (0.014) |
| Surrounding land use: undeveloped land (hectares) | | | −0.060*** | −0.063*** | | | −0.009 | −0.018 |
| | | | (0.011) | (0.012) | | | (0.011) | (0.012) |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Municipality fixed effects | No | No | No | Yes | No | No | No | Yes |
| **Observations** | 2664 | 2664 | 2664 | 2664 | 2664 | 2664 | 2664 | 2664 |
| **Pseudo $R^2$** | 0.020 | 0.059 | 0.076 | 0.089 | 0.029 | 0.054 | 0.072 | 0.087 |

*Notes*: Unconditional marginal effects with robust standard errors (clustered at the industrial site level) in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Our key variables of interest are those that measure land supply at the site level and the dummies that capture the presence of regeneration initiatives. In our preferred specification for new construction (8), where all control variables are included, the number of hectares available for new development on an industrial site has a positive and significant effect. Sites with a large amount of land available for development are more likely to experience new construction activity. Also, construction expenditures are likely to be higher, as can be seen from column (8) in Table 3 which reports the preferred model for the Tobit estimation. This variable is, however, only significant at the 5% level. The consistently insignificant coefficients in our preferred models for refurbishment reported in column (4) of Tables 2 and 3 suggest that the available land supply on the site does not influence investment activity in existing premises, as we would expect.

As already explained, the model also looks at the impact of regeneration initiatives that fund physical improvements of the site, which are expected to have a positive effect on private sector investment activity. The significant and positive coefficients in columns (1) and (5) suggest that regeneration areas experience more building investment activity, even before they are actually targeted, than sites not designated for regeneration. This highlights the value of controlling for other site characteristics and pre-existing levels. The results in Table 2 consistently demonstrate that building investment is more likely to take place in the period that regeneration projects are being implemented on the site, when compared to comparable sites that are not subject to regeneration. However, for new construction this effect is statistically only significant at the 5% level in the preferred model (8). Upon completion of all projects on the site, the effect on refurbishment disappears, as evidenced by the insignificant coefficients for the post-regeneration dummy in column (4) of Table 2. The coefficients for the post-regeneration dummy are, however, significant and positive for new construction, which might be explained by the fact that it takes more time to conceive a scheme for a new construction project.

The findings, thus, suggest that physical regeneration initiatives may act as a catalyst to private sector investment, and that it is the actual timing of publicly funded projects that stimulates investment by firms in their own premises. Interestingly, the impact of regeneration is only marginally significant in most Tobit specifications, with only the coefficient for the post-regeneration dummy being significant at the 5% level. As a robustness check, we have explored whether our findings relating to planning policies are sensitive to using a different dependent variable that divides the amount of investment on the site by the stock of land already in use to capture the varying size of industrial sites. The key results are generally unaffected by the use of this alternative measure of investment.

We now turn to consider the impact of the variables that are not related to planning interventions. As expected, the number of firms located on an industrial site is a strong predictor of investment activity in both the Tobit and the Probit regressions. Investment will also be higher on sites that accommodate firms with a large environmental impact, although this effect is statistically insignificant when we use the proportion of firms with a large environmental impact. This is probably due to the specific qualities of these sites, which might also affect profit opportunities for other firms. The coefficient of the share of large firms on the site is only significant in the preferred model (8) of Table 3, which implies that sites with a prominent presence of large firms experience lower levels of building investment when it does occur. Finally, none of the variables that control for the sector shares on the site was found to be statistically significant at the 5% level in the preferred specifications (columns 4 and 8).

Many of the age band variables are significant in both the Tobit and Probit specifications for refurbishment, when compared to the base age (2000 onwards). However, the magnitude and significance of the coefficients does not support the contention that refurbishment activity progressively increases with older age bands. This would be expected if it were to occur to make up for depreciation of older structures. Perhaps it is an illustration of the fact that commercial buildings reach the end of their functional or economic life span well before they reach the end of their physical lives (Dunse and Jones, 2005). All the age band variables exhibit a consistently negative and highly significant effect on new construction. Sites that have been developed prior to 2000 are less likely to experience extensive new construction activity, attesting to a preference among firms for new locations, which are generally of higher quality. The presence of a motorway has a significant and positive effect in both estimations for new construction. This suggests that firms tend to locate close to the motorway network. In contrast, this variable has an insignificant effect in the refurbishment models, which implies that it does not affect investment activity at the current location. The travel time to the nearest motorway junction, which was expected to have a negative coefficient, is insignificant in all of the models. We also included the inverse of this variable in order to test for a non-linear relationship with investment, but this variable was also statistically insignificant.

Finally, the negative coefficients for the variable that captures encroachment by residential uses indicate that the likelihood and level of expenditure decrease when the amount of housing in the vicinity increases. This is not surprising since expansion possibilities for growing firms will be limited on such sites. In addition, the sites might become less profitable because environmental regulations require substantial investments in pollution abatement equipment. Finally, traffic congestion is likely to be higher in densely populated areas.[7] The negative coefficients for the amount of undeveloped land in both the Tobit and Probit models for refurbishment are rather unexpected. We would expect a positive relationship as sites with large amounts of undeveloped land in their vicinity tend to be less congested and provide more opportunities for expansion. In the case of new construction, firms might also benefit from lower land prices in these areas. Interestingly, this negative relationship is insignificant for new construction, where we would expect a more pronounced positive effect. Taken together, the results for the variables related to the surrounding area of the site suggest that firms, when deciding to construct a new building, favour sites at or near the edge of cities over more peripheral locations.

### *Planning policies at the municipal level*

The findings reported in the previous section suggest that planning decisions, in the form of allocations of land for industrial development, affect firm's decisions about where to invest. However, these results do not answer whether restrictions on land availability have affected overall expenditure in industrial property in the municipalities under consideration, since they do not take into account that investment activity may have increased at other industrial sites situated within the municipality. It is, therefore, particularly interesting to explore the impact of the overall amount of land available for industrial development at the municipal level. Such an analysis could also provide evidence on the extent to which restrictions on greenfield development affect the level of development activity taking place in existing urban areas. The link between the supply of greenfield land and the decay of existing urban areas has been recognised by the THB (2008) and by many other commentators in the Netherlands – and indeed elsewhere (see e.g. Barker, 2006; Brueckner, 2000) – but has not been explored empirically.

The actual amount of land that is made available will be dependent on the way in which the local regulatory stance towards new development interacts with physical constraints on long-term land availability (Bramley and Watkins, 2014; Saiz, 2010). For this reason, we also include a measure of the scarcity of developable land. This measure is defined as the share of all developable land that was already developed in 1996. We also include controls for the industrial structure and manufacturing employment growth at the municipal level, which have been shown to influence industrial property development at more disaggregated levels of analysis (Henneberry et al., 2005; Tsolacos, 1995). In addition, we add local labour market (COROP) fixed effects, as well as the site-specific controls from equation (2). COROPs not only encompass local labour markets but also correspond with localised business property market areas, as more than 90% of all relocating firms move within these areas (Knoben and Weterings, 2010).

Our measure of overall land availability, like other measures of planning restrictiveness such as approval times and refusal rates, is endogenously determined. One concern is that it will be affected by fluctuations in the economic cycle, with municipalities releasing more land in times of high demand. We average the share of available land in the overall supply of land for industrial uses (including land already in use) over the period 1998–2008 to address this particular concern. However, other potential sources of endogeneity still remain. In more depressed local economies, municipalities might be more eager to attract new investment because of job creation benefits and make correspondingly more land available for industrial development. This potential endogeneity would mean that the value of our measure of supply constraints is systematically understated.

Our identification strategy follows that first proposed by Bertrand and Kramarz (2002) and exploits exogenous variation in the share of votes for conservative-liberal parties at the 1998 national election as an instrument. These voters tend to be highly educated with above average income and, therefore, are more concerned with the downgrading effects on housing values of new industrial developments, rather than the associated benefits in terms of job creation. Hence, we expect municipalities with a largely conservative-liberal electorate to release less land for industrial development. A national election outcome is chosen since, compared to local elections, it is less likely to be influenced by specific concerns related to local market conditions or new industrial development projects (also see Hilber and Vermeulen, 2016; Sadun, 2015). In addition, a significant share of locally elected councillors represents local political parties that tend to cover the whole political spectrum. This makes it difficult to establish the political composition of the electorate by using local election outcomes.

We report the results of analysing the impact of variation in regulatory stance between municipalities in Table 4. In columns 1 and 2, we present the results for the probability that refurbishment activity takes place on the site, whereas columns 5 and 6 display the results for the likelihood that new construction will occur. The table also reports results for the amount of refurbishment spending (columns 3 and 4) and new construction expenditure respectively

**Table 4.** The impact of planning policies at the municipal level on investment activity.

| | Refurbishment | | | | New construction | | | |
|---|---|---|---|---|---|---|---|---|
| | Probit (1) | IV Probit (2) | Tobit (3) | IV Tobit (4) | Probit (5) | IV Probit (6) | Tobit (7) | IV Tobit (8) |
| Land supply at site level (% of total) | −0.135* | −0.136* | −1.458* | −1.413* | 0.264*** | 0.253*** | 3.304*** | 3.196*** |
| | (0.072) | (0.071) | (0.852) | (0.853) | (0.085) | (0.087) | (0.990) | (1.036) |
| Land availability (% of total), 1998–2008 | 1.381*** | **1.468**** | 14.078*** | **11.332** | 0.731*** | **1.439**** | 7.831*** | **15.393***** |
| | (0.321) | **(0.720)** | (3.279) | **(8.527)** | (0.272) | **(0.563)** | (3.009) | **(5.864)** |
| Share of developed land in 1996 | −0.327 | −0.344 | −4.818** | −4.228 | 0.034 | −0.112 | 0.572 | −0.987 |
| | (0.224) | (0.269) | (1.926) | (2.732) | (0.232) | (0.211) | (2.703) | (2.397) |
| Industrial structure in 1998 | 0.010 | −0.018 | −0.441 | 0.446 | 0.520** | 0.293 | 6.799** | 4.451* |
| | (0.274) | (0.355) | (2.589) | (3.497) | (0.251) | (0.228) | (2.923) | (2.362) |
| Manufacturing employment growth, 1998–2008 | 0.080 | 0.077 | 0.637 | 0.763 | 0.105** | 0.073* | 1.132** | 0.795* |
| | (0.065) | (0.073) | (0.527) | (0.745) | (0.043) | (0.038) | (0.482) | (0.445) |
| COROP and year fixed effects (and site-specific controls) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Pseudo $R^2$ | 0.286 | | 0.086 | | 0.215 | | 0.082 | |
| First-stage regression. Dependent variable: Land availability (% of total), 1998–2008 | | | | | | | | |
| Share of conservative-liberal votes in 1998 | | −0.834*** | | −0.834*** | | −0.834*** | | −0.834*** |
| | | (0.246) | | (0.246) | | (0.246) | | (0.246) |
| Controls and FEs | | Yes | | Yes | | Yes | | Yes |
| Observations | 2649 | 2649 | 2649 | 2649 | 2649 | 2649 | 2649 | 2649 |

*Notes*: Bold coefficients are instrumented. Average marginal effects are reported in the Probit specifications. Unconditional marginal effects are reported in the Tobit specifications. Robust standard errors (clustered at the municipality level) in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

(columns 7 and 8). The uneven columns in the top panel provide results where we do not account for potential endogeneity in our restrictiveness measure. In the even columns, we switch to the second stage of the instrumental variables (IV) models where we use national election results as instruments. We also report results for the municipal-level controls and the land supply at the site level. For ease of comparison, the latter is expressed as a share of all land allocated or already taken up by industrial uses on the site. The results of the first stage of the IV models are reported in the bottom panel of the table and show that the share of conservative-liberal votes is indeed negatively and significantly correlated with local land availability.

It can be seen from the last four columns of the top panel that both land supply measures have a significant and positive impact on new construction expenditure and that the municipal-level effect is larger in magnitude. Although the amount of available land is essentially associated with new construction projects, renovation appears to be significantly influenced by overall land availability as well. This suggests that our measure of local planning restrictiveness is closely related to the local regulatory stance towards improvements of the existing industrial stock. We have explored the robustness of these findings by using two different measures of land availability. The first measure uses the actual amount of available land averaged over the period 1998–2008, controlling for the amount of industrial land taken up each year in this period. The second measure is identical to the first one except that we take the average over a longer time horizon (1991–2008). Finally, we replicated the analysis but used population density at the municipal level as an alternative measure to capture long-term land availability. This measure takes into account that new development will be built to a higher density in areas that face a genuine scarcity of developable land. Results are rather similar in all cases.

## Conclusions

While there is a growing body of empirical studies that investigates the impact of planning policies on housing market outcomes, parallel development of the evidence base for the business sector has yet to occur. In this article, we explicitly examine the relationship between planning intervention and building investment on sites for industrial and business development. We use two unique datasets: the first contains information on individual building permits and the second dataset consists of a range of indicators that capture different dimensions of planning intervention. As such, the aim of the analysis is to address two further limitations of existing research, namely insufficient attention for the micro level of supply and inadequate consideration of the potentially varied impact of different planning interventions on land and property markets.

Our empirical analysis provides evidence of some of the expected negative effects of the regulatory role of planning intervention. The amount of land available at both the site and municipal level, which we take to be a proxy for the local regulatory stance (see Bramley and Watkins, 2014), appears to be influencing new industrial development. In this respect, our results our broadly consistent with the findings in a more aggregated UK analysis, in which Henneberry et al. (2005) show that the supply of business space decreases when the local planning regime becomes tighter. Our findings are also consistent with the results of Bramley and Kirk (2005) from an examination at the level of postcode districts, who find that the amount of land available for industrial and business development has a positive effect on actual land take-up. Our results imply that decreasing levels of greenfield land supply, as suggested by many commentators in the Netherlands, will not necessarily assist in reversing the processes of decay of older industrial areas. Refurbishment activity even appears to be positively correlated with the amount of available land at the municipal level in most specifications. It should be noted that our findings do not mean that this relationship does not exist at all; it may also reflect that municipalities with a more restrictive stance towards new development are equally restrictive towards improvements of the existing industrial stock.

The findings suggest that proactive, targeted planning interventions have a positive impact on investment. Jackson and Watkins (2007) come to similar conclusions based on their examination of the relationship between proactive planning policies and the performance of the retail property market. Our results differ, however, from the more closely related study of Lester (2014), who finds that the incidence and timing of TIF-funded physical improvements does not have a significant effect on commercial building activity. There are several explanations for these contradictory findings. One is that reliance on aggregated data of building investment masks variations in the impact on different types of investment. We observe the strongest and most significant effects in the estimations for investment in new construction. Another explanation is that physical regeneration projects have a differential impact depending on the purpose of the projects and the type of the area that is targeted. Whereas Lester does not discriminate between different types of regeneration projects or urban areas, this article considers initiatives that fund physical improvement projects in industrial and business areas, which have a clear focus on local economic development.

Although the empirical findings do yield some interesting insights into the impact of planning intervention, there remains considerable scope for future research. In particular, further work should seek to establish a longer time series of data. Our analysis only covers the period 2004–2008, but the effects of planning policies may take time to build up. In addition, this study does not cover all industrial sites in the Netherlands, although our data come from a fairly representative sample of Dutch municipalities that reflect a range of supply and demand conditions. Similar work should be undertaken for other urban areas and property markets. It would also be interesting to explore the impact of other measures of planning restrictiveness such as density restrictions and approval times, notwithstanding that land availability has figured most prominently in Dutch planning debates. Unfortunately, such data is not readily available. Finally, the designation of a site as a regeneration area will be non-random and related to the characteristics of the site (as shown by Ploegmakers and Beckers, 2015). Although we employ a difference-in-difference estimator and include a rich set of controls that might affect both investment activity and the incidence of regeneration, it is therefore likely that our results underestimate the positive effects of regeneration initiatives because these policies will generally target underperforming sites.

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## Declaration of conflicting interests

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## Notes

1. The format of the data made available by the municipalities varied. Some municipalities provided extracts that covered all issued permits for a certain period, while others gave access to a subset of building permits issued for streets located on industrial sites. For other municipalities, research assistants traced back all relevant building permits pertaining to specific streets in the original records.
2. We have employed several procedures to ensure that address spelling was compatible, including manual adjustments to street names. We also performed three additional rounds of matching with different criteria that added a modest number of matches. Building permit information was either unavailable or inconsistent for quite a large number of streets. This may be because no building permits have been submitted for these streets in the period of interest, but it might also be related to the procedures of data collection. These streets have therefore been dropped from the analysis.
3. We have geocoded the LISA addresses so that they could be mapped. The geocoding process is described in Appendix C of Beckers et al. (2012).
4. This category includes single and multitenant building types like production plants, industrial sheds, warehouses, offices, service stations, petrol stations, show rooms and other shops. We have preserved permits for structures that combine commercial and residential uses.
5. One municipality was not able to provide the requested information about regeneration and we added this information by making use of municipal documents and the official website.
6. Construction works that do not require a building permit often involve minor alterations. Small building investments are therefore absent from our database. The smallest observed value for the dependent variable is 500 euros and we therefore impose $ln(499)$ as the censoring limit.
7. We experimented with an alternative density measure based on the number of addresses near the site. Results are similar if we include this variable.

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