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Offices Scarce but Housing Scarcer: Estimating the Premium for London Office Conversions

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Abstract
The British system of land use planning is one of the most restrictive in the world. It substantially increases the costs of office space (Cheshire & Hilber, 2008; Cheshire & Dericks, 2020) and, especially in London, increases house prices (Hilber & Vermeulen, 2016; Carozzi *et al*. 2019). Partly in response to the crisis in housing supply, with effect from 30 May 2013, government introduced an automatic right to change the use of offices to residential except in some areas in central London and Manchester deemed to be important office locations. This paper exploits the resulting boundary discontinuities these exceptions produced to estimate the impact on office prices of the new right to convert to residential use. Using a panel data set of some 2,000 office transactions between 2009 and 2016, we find a significant increase in the price of offices eligible for this automatic conversion: a premium of some 50 percent (depending on specification). This demonstrates that while from other sources there was a known shortage of office space from supply restrictions, the restrictions on the supply of housing were substantially more severe.

Key words: housing supply; restrictive regulation; office markets
JEL Codes: R310, R330, R380

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I. Introduction

This paper examines the impact on office prices of the granting, in 2013, of new rights to convert office buildings to housing without the need to seek explicit permission. The background to this was, and is, the severe and longstanding constraint on the supply of housing in Britain in general and London, in particular. Constraints on the supply of housing, indeed all development, derive from the very restrictive system of land use regulation operational in England and Wales since the 1947 Town and Country Planning Act but tightening from 1955 with the introduction of the first Green Belt around London. That covered an area extending from the North Sea to Aylesbury, 60 kms North West of London, effectively preventing all new development over the whole area.

Cheshire and Sheppard, 2002, had already shown that in more restrictive communities in South East England there was a substantial net welfare loss, estimated to be equivalent to an income tax rate of nearly 4 percent[1], with the costs mainly deriving from 'containment policies'. Their analysis has been updated and supplemented by further studies such as that by Hilber and Vermeulen (2016) and Koster and Zabihidan (2019). Both these confirm the basic finding that restrictive planning policies constrain the supply of land and of housing, substantially raising its price and, in the case of the Koster and Zabihidan study, reducing welfare.

Underpinning the English system is the separation of the right to develop from other rights associated with freehold tenure. The 1947 Act expropriated these development rights so they were controlled by the state. Control of development is exercised by political committees of local government (Local Planning Authorities - LPAs) making discretionary decisions. So, unlike Zoning in the US or the European Master Planning system, all decisions concerning significant development proposals are individual and, within the framework set by legislation, unpredictable. The English system relies on legally defined 'use classes' and changing any property's use class is legally defined as 'development' and requires specific permission. So building on a previously undeveloped site or converting an office into apartments requires a formal proposal and explicit permission from the LPA.

There are national planning guidelines, as, for example set out in the National Planning Policy Framework (2012) or policies identifying 'Green Belts', National Parks, Areas of Outstanding Natural Beauty or Sites of Special Scientific Interest - on which all development is effectively prohibited. Green Belts, in particular, restrict the supply of land around major cities where demand is highest (see Cheshire, 2018). Most policies, however, including Green Belt designation, are at the discretion of the lowest tier of government, the Local Authority.

The power of LPAs to refuse proposals for development is a powerful influence restricting supply. Hilber and Vermeulen (2016) concluded that if the South East (the most tightly regulated English region) had accepted the same proportion of proposals as the North East of England (less regulated, but still restrictive by world standards), house prices in the South East would have been some 30% lower in 2015. Moreover, these are lower bound estimates for several reasons, including the fact that restrictions were already affecting prices in their base year, 1974. Overall real house prices – but not real incomes – have grown faster in the UK over the last 40 years than in any other OECD country (Hilber and Vermeulen, 2016).

Given that the planning system operates on the basis that all development requires explicit permission from the LPA then the opportunity to develop without permission might be expected to have a

[1] See Cheshire and Sheppard, 2002, Table 6.2.

significant impact. This is what a change introduced in 2013 (DCLG 2013a) did. It permitted the conversion of offices into housing without permission, introducing a new 'permitted development right (PDR)'. While this new PDR applied to most of the country, helpfully zones in central London and Manchester, traditional office centres, were excluded. This makes it possible to estimate with some precision the impact the new PDR had on the price of offices.

In what follows we apply a spatial difference in difference approach to estimate the price premium for office buildings entitled to the PDR. To do this we use data for some 2,000 office sales over the period 2009 to 2016, bridging the introduction of the PDR. We find that the new ability to convert offices to housing without need for planning permission increased the price of such offices by some 50 percent. Previous research (Cheshire and Hilber, 2008; Cheshire & Dericks, 2020) has already shown that the price of office space in London has been substantially increased by planning imposed supply restrictions. Cheshire and Hilber (2008) estimated that the mean Regulatory Tax (measured as the percentage mark-up of price over construction cost per unit area) for the period 1999 to 2005 was between 330 and 810 percent in London office zones to which the PDR was not applied. In the comparatively unrestricted contexts of New York or Brussels, comparable values were 50 and 68 percent respectively. Most relevant for the present results, in the London Borough of Hammersmith, an area to which the PDR when introduced in 2013 did apply, the Regulatory Tax had still been estimated at 220 percent, implying a substantial restriction on the supply of office space (see Cheshire and Hilber, 2008, Table 2) in even this subsidiary London office location.

The estimated 50 percent premium conferred on offices eligible to convert to housing use by the new PDR demonstrates, therefore, that while the supply of office space in London might have been restricted by the planning system, it was very much less restricted than was the supply of housing. Moreover it strongly suggests that it was primarily planning restrictions which caused the higher price of housing since the change only affected the ability to by-pass those restrictions. This has to be somewhat qualified, however, since the housing created in the former offices to which the PDR applied did not have to conform to design requirements that would have applied had standard planning procedures been in operation.

Evidence demonstrating the impact of regulatory constraints on land prices and housing affordability is not confined to the UK. It is also well documented in the US, especially on the East and West coasts (Glaeser and Gyourko 2003, Glaeser *et al*., 2005, Quigley and Raphael, 2005, Albouy and Ehrlich, 2018, or Turner *et a*l., 2014). The impact in Britain appears to be even more substantial, however. Moreover the evidence showing that supply restrictions imposed by the planning system also impact the price of office space, the form of offices (Cheshire and Dericks, 2020) or the supermarket sector (Cheshire *et al*., 2015) appears to be confined to Britain. The findings reported here add to this evidence showing that the economic effects of restrictive land use regulation in Britain are extreme and spread to more sectors of real estate than is the case elsewhere in the world.

The paper is structured as follows: we start by explaining in more detail how the British planning system works and how, within this system, the Permitted Development Rights to convert some office structures to residential use, worked. We then define and describe the data used. The next sections discuss some theoretical considerations and our methodology and then set out the model we test. Section VI then describes the main results followed by a section describing some of the robustness tests and alternative specifications we ran. Section VIII concludes.

II. The British Planning System: Permitted Development Rights

The British planning system differs from the rules-based systems commonly implemented elsewhere[2], such as the USA's zoning system or the continental Europe's Master Planning system. In Britain, the Town and Country Planning Act of 1947 expropriated landowners of the right to develop, redevelop, or change the legal use of the land or buildings[3] they owned without the explicit approval of the state (Evans and Hartwich, 2005). The probability that any application to develop will be approved varies systematically across the country (Hilber and Vermeulen 2016). If a project is rejected this can be appealed in a quasi-judicial process first to the Planning Inspectorate and ultimately to the government minister responsible for the planning system. Thus all decisions about development are uncertain because they are political decisions, so subject to lobbying and the personal tastes or prejudices of local representatives: moreover, only a minority of LPAs in fact have an up to date local plan and such plans are not binding (see Cheshire and Carozzi, 2019). So not only are all decisions uncertain but they are also gameable. Appeals or lobbying involve further investment of time, resources, and money and there is no guarantee of success. This introduces additional risk and uncertainty to the development process: risks which further reduce housing supply (Mayo and Sheppard 2001).

'Permitted development rights' (PDR) refer to those changes between use classes that Parliament permits as a right. Such changes of use, therefore, do not need individual project approval. In January 2013, (DCLG 2013(a)), the Government announced the introduction of new PDR allowing change of use from office[4] to residential (Smith 2015). The rights were initially temporary[5], for a period of three years from May 30th 2013 (CBRE Planning 2013). They were applicable across England but fortunately for this paper there were areas of exemption, notably in some specific areas of London and Manchester deemed to be key office locations. To improve our estimates of the impact the new PDR had on values, we focus just on exempt and entitled buildings in central London, thereby improving likely matching and reducing, so far as possible, the potential for geographical factors to skew results.

London's exempt areas where the PDRs did not apply are shown in Figure 1[6]. These exemption areas followed idiosyncratic boundaries and were supposed to protect selected highly agglomerated commercial clusters and to prevent the loss of core office stock in prime markets. As with all PDRs, local authorities had the right to appeal against the change of use by applying for a so-called 'Article 4 direction' to remove the entitlement. These were difficult to obtain, however[7]. There is no systematic data allowing us to account for such cases where the PDR was overridden, although a CBRE study

[2] British-style discretionary systems have been exported to some countries formerly dependent on the U.K. New Zealand's planning system, for example, embodies many of the same features and generates similarly unaffordable housing. Housing in Auckland (surrounded by an extensive containment or green belt zone) competes to be the most unaffordable in the world (Cox and Pavletich, 2019).

[3] There are legally defined 'use classes' and changing the use of any land or building from one use class to another legally constitutes development so requires explicit permission from the LPA.

4 The use class 'office space' is defined as B1(a), which refers to all office space excluding that which is occupied for research and development, industrial, or banks, buildings societies, and other services which the public generally have access to. Residential is defined as C3, which refers to buildings where 6 or fewer people live together as a single household (ARUP 2014).

5 The rights were made permanent in October 2015.

6 Map taken from CBRE Planning 2013, and reproduced with the written permission of the CBRE Planning department.

7 The reluctance of the government to approve Article 4 directions is clear from the following written statement made by the former planning minister Nick Boles (2014): *"Ministers are minded to cancel Article 4 directions which seek to re-impose unjustified or blanket regulation, given the clearly stated public policy goal of liberalizing the planning rules and helping provide more homes… Ministers wish to send a clear message to the housing industry that we will act to provide certainty, confidence and clarity, and that we are supporting their investment in these new homes to bring under-used property back into productive use as housing."*

(CBRE Planning 2013) reports a very low success rate of appeals, suggesting that the results reported here will be little affected by the potential Article 4 direction.

III. Data

Data on office characteristics and transactions are taken from the CoStar Group. This source is widely used commercially and has been used in previous academic studies of commercial property (for an early example, see Eicholtz *et a*l., 2010). CoStar's data (CoStar. 2017) contains transaction, leasing, and building information for each commercial building, and is widely regarded as a consistently updated and reliable source of information.

The dataset used in the analysis is a panel, spanning twelve London boroughs from 2009 to 2016. The areas covered are shown in Figures 1 and 2. The sample period, from 1st January to end 2016, gives a near symmetric timeframe either side of the policy announcement and reduces various other problems including the cyclicality of the commercial property market. Data were extracted for every commercial building registered on CoStar wholly or partly designated as office space (either B1 or A2 use)[8]. Each observation has a field for transaction date and price, address, and many individual building characteristics, including a CoStar specific measure: the 'star rating'. This measure grades buildings from 1 to 5 according to an overall assessment of their physical attributes, including performance, construction, energy efficiency and design. This is a useful control, as it proxies for a large number of difficult to observe building characteristics. The star rating is independent of location, so it can be included in the regression without introducing multicollinearity.

Samples and variables are defined in Table 1 and descriptive statistics for the 'Core' sample in Table 3. Over the period of interest, 2009 to 2016, there were 14,875 recorded building 'transactions' with office space in them across all boroughs and years. Only a minority of these transactions had a recorded price, however, so dropping those with no price reduced the sample size to 3,842. The spatial distribution of the groups of observations by borough is shown in Table 2. Column (1) relates to the whole sample; column (2) to all observations with a recorded price. Columns (3) to (4) show the same information for respectively those observations with complete information including price (the 'full sample'), omitting those buildings which were not in sole office use (for example, had retail or residential premises within them) and finally the 'core' sample, excluding buildings officially Listed as of historic interest or outstanding architectural merit. These are excluded since they are subject to stringent controls preventing any changes either external or internal, so making conversion to residential use a very different commercial proposition, indeed perhaps impossible.

Buildings exempt from the PDR were identified manually, using maps of each borough which defined the exemption zone boundaries (DCLG 2013(b)). Each observation was located on a digital map by postcode and matched to the relevant boundary map. A binary variable 'Entitled' was constructed, with a value of 1 assigned to buildings exempt from the PDR entitlement. Some boroughs (City of

[8] The data does not define which of these observations are B1(a), Offices, so subject to the PDR, as compared to A2, premises of Banks, Building Societies or Professional services. If we are able to assume that other buildings in the sample experienced similar trends between the control and treatment groups over the period in question, the only effect the inclusion of this data will have is to negatively bias the magnitude of the coefficient on the exemption effect. In other words, since there is no reason to believe that other buildings should have displayed divergent trends within what happens to be the exemption zone for B1(a) buildings, their inclusion will only underestimate the premium found in this study. A better dataset, which extracted only B1(a) buildings, might therefore be expected to yield even stronger relative value increases for entitled buildings.

London and Kensington & Chelsea) were entirely exempt, and so all observations were assigned a value of 1 instantly. However other boroughs, notably Westminster, Hackney, Islington and Tower Hamlets, had exemption zones intended to identify less economically significant office locations (Figure 1), and so were more cumbersome to assign. While this made assignment more difficult, it created a quasi-experimental setting, with greater geographic mixing of exempt and non-exempt buildings. Furthermore, a BCO (2015) report states that the exemption boundaries were sometimes determined by legal or practical factors, rather than solely economic ones. This enables closer matching of exempt and entitled buildings, as economic factors will be more highly correlated with transaction price than legal or practical ones.

Finally, some neighbourhood level controls were identified to explain some of the transaction price variation. The refusal rate of major residential projects as a measure of planning restrictiveness across boroughs was used by Hilber and Vermeulen 2016, and was found to be an important causal influence on variations in house prices across LAs. It is included here, interacted with entitlement, to see whether the premium for the PDR was greater for office buildings in more restrictive boroughs where the relative restriction on housing supply might have been greater. A number of studies (see Cheshire and Dericks, 2020, for example) have found office prices are higher, the higher is the local density of office based employment. So that, too, is included using data from (Nomis 2011). The borough level unemployment rate (London Poverty Profile 2015) is also included in some models as an indicator of local prosperity although, given that the spatial limits of London's housing market extend widely, prosperity at the borough level may not be significant. In addition, fixed effects are included for the Postcode 'outcode' level: that is the area defined by the part of the alphanumeric British Postcode before the space. We have observations in 119 outcodes

IV. Theoretical considerations

If the real estate market were in equilibrium and uses were freely interchangeable, then one would expect that at the margin, prices of office and housing space would be equal. That would be true independently of whether on average it costs more to build housing than offices or *vice versa* once costs of conversion had been taken into account. Given; however, that uses are not interchangeable because of the way in which the British Planning system works, a price differential could emerge. The supply of space for each category of use is independently determined by administrative fiat and does not take account of their relative prices, so if the balance of demand and supply for the categories differs, then a price differential will arise at the margin of use whether that margin refers to a spatial boundary or a 'quality' margin. The size of any such price differential would reflect the relative scarcity of the two categories of space.

We have independent evidence of a restriction on the supply relative to demand of both office and housing space in London (Cheshire and Hilber, 2008; Hilber and Vermeulen, 2016) so a priori we cannot say whether the entitlement to the PDR would or would not generate a premium. If office space was in relatively more restricted supply, there would be no impact on the price of office space since there would be no incentive to convert it to residential use (subject to the proviso that the office space in question was fit for purpose). If housing space is more restricted relative to demand than is office space then when the PDR was introduced a premium for office buildings entitled to be converted should emerge. It is thus an empirical question and the measurement of any premium for the PDR-entitled office space, provided it is robustly and consistently estimated, would be evidence that the shortage of housing in London was even greater than that of offices: its size would be an indicator of the extent of that differential shortage.

Entitled buildings in areas which have more pronounced shortages of residential supply relative to commercial supply could benefit from an even higher value growth than similar entitled buildings in areas where the difference in supply shortages of residential and commercial space is narrower depending on the elasticity of substitution in London's housing market across boroughs.

Finally, subject to conversion costs, office space should only be lost to residential use to the point where it is valued equally to residential use, and competing land uses are in equilibrium. Over time this should moderate any major, prolonged imbalances as developers have both greater incentive and ability than policy makers to respond to value changes.

V. Methodology

Entitlement to the PDR is a binary characteristic which applies to some, but not all buildings in the sample. As such, difference in difference methods can be employed to estimate its value. The exemption zones, with their somewhat idiosyncratic boundaries, create an environment where the policy is geographically discontinuous, thereby creating a quasi-experimental setting with distinct treatment and control groups. The treatment group consists of all buildings entitled to the rights, and the control group consists of all buildings without such entitlement. The data spans approximately 3 to 4 years either side of the policy announcement and introduction, and by measuring trends in transaction prices between treated and untreated buildings, one can identify any change in trend observed post treatment either to the announcement, or the introduction of, PDR.

The policy was formally announced on January 24th 2013 and introduced on May 30th 2013. Given the forward-looking nature of investors, a bigger response might be expected following announcement than introduction. It is known from studies of other related phenomena that expected future values of relevant variables are capitalised into land prices: see for example, Cheshire and Sheppard, 2004 or Mense and Kholodilin, 2014. However, there was necessarily uncertainty as to the exact delimitations of exemption zones and timings; indeed there could have even been uncertainty as to whether the policy would be introduced at all. This would at least have reduced any value investors might have attached to the potential value of the new PDR when formally announced. Indeed, to further complicate the identification of a clear cut date for the policy to have had an impact on prices, it had been announced, in principle, nearly a year earlier in the March 2011 Budget (DCLG 2012). The result is that the announcement effect may have been graduated over time as belief in the reality of the policy increased as, too, did knowledge of its details.

In light of these considerations we further focus on the introduction date of May 30th 2013. However, identifying the appropriate 'treatment' date is complicated by the financial and administrative lags inherent in commercial property transactions, which cause transactions to be completed (and therefore be recorded) up to several months after a transaction price has been offered and agreed. Taking a crude average lag between offer and completion dates of eight weeks, we therefore, select July 25th 2013 as the most plausible treatment date. If eight weeks is a good estimate of the mean period between accepted offer and legal completion, the average building recorded by CoStar as being sold on or after July 25th will have been under offer on or after May 30th. We have also experimented with other possible 'treatment' dates including eight weeks after the announcement date: the results of this alternative treatment date are reported in Table 5 while the main results, those for a treatment date of July 25th 2013 are shown in Table 4.

The fundamental specification is given below. The natural log of the most recent transaction price is regressed on the interaction of the dummy variables 'Post' and 'Entitled' - which takes a value of 1

only when a building is both entitled to the PDR and sold after the chosen treatment date. This interaction isolates the effect of entitlement, and is consequently called the 'entitlement effect'. The specification also includes a dummy variable 'Post' which takes a value of 1 for all buildings transacted after the treatment date, and therefore identifies the time trend in the price of all buildings, and a dummy variable 'Entitled', which takes a value of 1 if the building is entitled to the PDR. This coefficient therefore estimates the price differential of the treated buildings without controlling for time. A range of controls is included, and the error term is denoted by ε_{it}.

$$\log(Price_{it}) = \beta_0 + \beta_1 EntitlementEffect + \beta_2 Post + \beta_3 Entitled + \{Controls\} + \varepsilon_{it}$$

A fixed effects model is employed on the panel data, with transactions observed across 12 boroughs and 8 years. As noted above fixed effects are defined at the Postcode 'outcode' level. This is a small enough area for the office buildings within it to be reasonably similar in unobservables (consistent with this judgement is the fact that no outcode area contains both entitled and non-entitled buildings). On the other hand outcodes are large enough for each to contain sufficient observations. As prices in two adjacent outcodes may be jointly affected by proximate unobservable characteristics, standard errors are clustered at the 'Exempt' level. The controls can be divided into three distinct categories: neighbourhood level, individual level, and time trends. Neighbourhood level controls include factors that vary by boroughs, such as planning restrictiveness, office based employment, and the unemployment rate. Individual level controls include age, star rating, rentable building area, typical floor size, percentage leased, number of elevators and number of floors. Only the results for the main controls are reported in the tables.

Additionally dummy variables for each year were included to control for time trends in commercial property and the wider economy, and quarterly dummies were included to control for within-year seasonality of transactions.

VI. Results

Table 4 details the main results, with an identical specification run on three samples. The variable 'Entitlement effect' measures the causal impact on value growth of being entitled to the PDR. This impact is very highly positive and statistically significant in all samples, with a 52 percent higher value associated with buildings entitled to the PDR in the full sample (1) and a 51 percent increase if buildings not in sole office use are excluded (2). The core sample (3) removes all transactions of buildings which are excluded from the PDR even in entitled zones, which could confound the analysis. The finding in this sample is a 46 percent higher growth rate for entitled buildings, statistically significant at the 10% level. Weaker significance is to be expected due to the decreased number of observations. All else equal, buildings qualifying for the PDR exhibited a premium following their introduction.

On the whole, coefficients on the remaining regressors perform as expected. There are substantial, statistically significant higher transaction prices associated with selling the building after March 2013, as suggested by the findings for the variable 'Post'. This is consistent with the strengthening of the commercial market typical of a post-recession recovery period. All else equal, entitled buildings were found to sell for 70 to 100 percent less, consistent with the diagnosis that the PDR buildings tended to be in secondary locations and/or have other negative but unobserved characteristics so be subject to a discount. The level of local authority restrictiveness, as measured by the refusal rate, although both here and in the results reported in Table 6 mainly has the expected sign, is never statistically significant.

Local office based employment has a very high, positive, and statistically significant effect on transaction prices across all samples. This is intuitive given that higher office based employment in a borough will be an indicator of localised agglomeration economies.

A unitary increase in the star rating raises building value by 65 to 68 percent across samples and is always statistically significant at the 1 percent level. Age, which would also be expected to have an impact, is negligible and not statistically different from zero, but the benefits of a newer building are likely to be largely captured by the star rating variable. The effects of the rentable floor area is significant in the anticipated way but the number of floors is not, although it is positive and significant in some of the alternative specifications, independently of the building's floor area, echoing results from the emerging 'tall buildings' literature (see Koster *at al*., 2014 or Ahlfeldt and Mcmillen 2018). There is also evidence to suggest the number of elevators independently raises transaction price. Building occupancy, as measured by percent leased, displays a small, negative impact on transaction price, which is counterintuitive. The explanation may be that CoStar provides the current occupancy of each building, not the percentage leased at the time of sale.

VII. Robustness

Having obtained the main body of results, the next step is to investigate how these findings hold under a variety of changes to the specification. The main robustness checks are changing the treatment date, excluding various controls, and excluding the most central and peripheral observations.

Table 5 presents the findings when the treatment date is changed from July 25th 2013 (8 weeks after the introduction) to March 22nd 2013 (8 weeks after the announcement) for each sample. As expected, the findings generally suggest a smaller price effect, as the policy was not a surprise to the industry when it was formally announced, and uncertainties still remained as to the exact boundaries of the zones which would be entitled. In the full sample entitled buildings experienced 36 percent higher value growth, statistically significant at the 1% level, while in the core sample entitled buildings experienced 23 percent higher value growth, although this finding is statistically insignificant. The main specifications were repeated using a randomised treatment date (as in Votsis and Perrels, 2016). No statistically significant coefficient was found for β_1, the variable of interest, indicating that the value divergence recorded post 2013 was not a temporal coincidence.

The main specification was adjusted to exclude certain controls and test alternative methods for controlling for time fixed effects. Results for the full 2009-2016 and core samples are presented in Table 6. Columns (1) and (3) exclude several individual level controls which reduces both the magnitude and statistical significance of the findings for both the full and the core samples. Therefore even though the excluded controls were only weakly significant or insignificant in earlier specifications, in combination they contributed to some building-level variation in price. On the other hand, controlling for time trends by interacting quarter and year dummies, as in columns (2) and (4), yields results very similar in magnitude and significance to the main findings, a 46 to 48 percent premium for PDR-entitled buildings, statistically significant at the 1 percent.

The final adjustment which is undertaken is to remove sections of the sample which might be least matched to other observations. The most central buildings are likely to have the most substantial location value, and therefore their potential entitled value may not be accurately represented by the outer-middle observations. Similarly, the most peripheral observations do not realistically provide a

fitting counterfactual for boundary locations. The most central and the most peripheral outcodes are dropped from the basic sample, ensuring that observations are closer to the boundary, and therefore more closely matched. Table 7 presents results for each of the full and core samples when inner city observations are removed, when peripheral observations are removed, and when both are removed, leaving a 'circular band' of observations (Figure 2). Entitlement causes high value growth in all three cases across both samples, with mixed levels of statistical significance (likely to be due to inadequate sample sizes, especially in the case of the core sample). The magnitude of the finding falls when the innermost observations are dropped, and rises when peripheral observations are dropped, suggesting that the residential-commercial land price differential is highest in central locations. The sample of adequate size and the least geographical variation amongst its observations – column (3) – yields an estimated 54 percent premium for entitled buildings, statistically significant at the 5 percent level.

VIII. Conclusion

The main findings of this paper indicate that buildings that became entitled to the PDR to convert from office to residential use experienced an economically and a statistically significant increase in value compared to those that were not. Our estimates of this conversion premium vary according to specification but is around 50 percent in our main results. In other specifications of varying plausibility they span this value. So, results are relatively stable.

There is independent evidence that the supply of office space is severely restricted in London (see Cheshire and Hilber, 2008). For the zones covered by our sample of offices here, the regulatory tax they estimated varied by location and with the property cycle but the mean value for the period 1999 to 2005 as a percentage mark-up on marginal construction costs ranged from 219 (Hammersmith) to 809 (West End). While the evidence is that the supply of office space in London was restricted, the evidence we have analysed here suggests the supply of residential space was very much more strongly restricted. The 50 percent premium we estimate as being paid for those offices which became subject to the right to convert them into residential use without planning permission being required, is evidence of that.

The 50 percent premium was a direct measure of the value of the right to convert but two further factors need to be taken into account when interpreting it as the 'price of housing relative to office space shortage'. On the one had the developer was buying a right to convert but still had to incur significant construction and financing costs to physically convert and market the structures. On the other hand, since it was not necessary to apply for planning permission both the quality – so costs of construction – may have been reduced and the uncertainty associated with the process of applying for planning permission was eliminated. So it was much easier for a developer to forecast the returns from the premium paid. These two factors will have opposite effects on the value of the premium paid for PDR-entitled buildings but we do not know their respective sizes, so cannot judge the precise extent to which they offset each other.

This study has significant implications for planning policy. Its results reinforce the findings of the existing literature to demonstrate the degree of planning restrictiveness on housing supply: especially in London, and especially since the shortage of office space is itself most significant in London. Clearly there is scope for further investigation: it should be possible to test and quantify the extent to which housing units generated by the PDR were discounted compared to 'normal' housing space in comparable locations. It would also be of interest to see if there were further value changes as a result of making the rights permanent in April 2016. Nevertheless the results reported in this paper fit into a clear pattern of the causes of the housing affordability crisis in Britain with its epicentre in London.

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TABLES

Table 1: Sample and Variable Definitions

Sample	
Full (2009-2016)	All transactions with a recorded transaction price on buildings with any office use between January 2009 and February 2016
Sole Use (2009-2016)	All transactions between same dates excluding any buildings with a secondary use such as retail or residential
Core (2009-2016)	All transactions between same dates excluding transactions of both listed buildings and buildings with a secondary use
Variable	
Entitlement Effect	A binary variable with a value of 1 if the transactions was on a PDR-entitled building and occurred after chosen pivotal date
Post	A binary variable with a value of 1 if the transaction took place after the chosen pivotal date, and 0 otherwise
Entitled	A binary variable with a value of 1 if the building was entitled to the PDR, and 0 otherwise
Refusal Rate	The percentage of major residential projects which were refused planning permission between 1979 and 2008 in each borough
Office Based Employment	The number of jobs in the information and communication, financial and insurance, real estate professional, scientific and technical, and administrative and support service industries as a percentage of total employment in each borough
Age	Number of years since the building was built, or, if a renovation has taken place, since the building was last renovated
Star Rating	A rating between 1 (poor) to 5 (strong) based on an overall assessment of a building's physical attributes, including performance, construction, energy efficiency and design
Rentable Floor Area	The total area of the building in thousands of square foot) which can be rented
Percent Leased	The percentage of the building that was leased as at the date of data extraction (March 2016)
Number of Floors	The number of floors in the building
Number of Elevators	The number of elevators in the building

Table 2: Sample Sizes

	(1)	(2) 2009 to 2013	(3)	(4)
	Original	Cleaned	Sole Use	Core
Camden	2,212	523	245	212
City of London	1,325	692	466	413
Hackney	878	168	77	72
Islington	1,328	381	179	175
Kensington & Chelsea	876	113	46	43
Lambeth	594	98	47	43
Newham	287	23	14	14
Southwark	1,040	288	128	118
Tower Hamlets	684	129	80	73
Wandsworth	579	76	33	33
City of Westminster	4,391	1,216	650	568
Hammersmith & Fulham	681	135	72	71
Total	**14,875**	**3,842**	**2,037**	**1,835**

Table 3: Summary Statistics for Core Sample

Variable	Mean	Standard Deviation	Minimum	Maximum
Last sale price (£)	79,200,000	201,000,000	40,000	1,700,000,000
Refusal rate (%)	19.17%	4.38%	12.31%	29.87%
Office Based Employment (%)	43.39%	21.10%	9.89%	81.07%
Star rating	3.41	0.71	1	5
Mean floor area (sq ft)	6,746	8,827	120	74,099
Percent leased (%)	92.76%	23.39%	0.00%	100.00%
Number of elevators	1.48	2.53	0	26
Number of floors	7.03	3.99	1	62

Table 4: Main Results	Dependent variable: log of transactions price: Treatment date = 25/07/2013		
	(1)	(2)	(3)
Sample	2009-2016	Sole Use	Core
Entitlement effect	0.5235***	0.5126**	0.4632*
	(0.1601)	(0.2116)	(0.2500)
Post	0.4924***	0.5596***	0.4639***
	(0.1282)	(0.1190)	(0.1478)
Entitled	-0.7258**	-0.6790*	-1.0391***
	(0.3622)	(0.3480)	(0.3227)
Refusal rate	0.1825	-0.6719	0.9939
	1.6363	(1.5538)	(1.4866)
Office based employment	3.4685***	3.8264***	3.6555***
	(0.7696)	(0.8238)	(0.8567)
Age	0.0000	-0.0005*	-0.0004
	(0.0004)	(0.0002)	(0.0003)
Star	0.6662***	0.6455***	0.6765***
	(0.0675)	(0.0471)	(0.0498)
Rentable floor area	0.0071***	0.0064***	0.0065***
	(0.0006)	(0.0003)	(0.0004)
Percent leased	-0.0037***	-0.0029***	-0.0033***
	(0.0005)	(0.0006)	(0.0006)
Number of floors	-0.0091	0.0060	0.0010
	(0.0063)	(0.0098)	(0.0103)
Number of elevators	0.0322***	0.0142*	0.0183**
	(0.0080)	(0.0087)	(0.0085)
Other Controls	YES	YES	YES
Within R^2	0.4346	0.4543	0.4609
Between R^2	0.43331	0.402	0.4124
Overall R^2	0.4098	0.394	0.4004
Number of observations	2,210	1,939	1,743
Number of groups	114	112	112
Average number of observations per group	19.4	17.3	15.6

Notes: Fixed effects model at Postcode 'outcode' level: Specification includes quarter and year dummies Robust Standard errors clustered at the 'Entitled level in parentheses: *, ** & *** Statistically significant at respectively 10, 5 and 1 percent levels.

Table 5: Treatment Date Adjustment	Dependent variable log of transaction price Treatment date = 22nd March 2013		
	(1)	(3)	(4)
Sample	2009-2016	Sole Use	Core
Entitlement effect	0.3575***	0.3158**	0.2257
	(0.1250)	(0.1571)	(0.1840)
Post	0.1656	0.3032	0.2370
	(0.1339)	(0.1942)	(0.2403)
Entitled	-0.6022*	-0.4766	-0.8895***
	(0.3660)	(0.3480)	(0.2987)
Refusal rate	0.0802	-0.9973	1.0033
	(1.6320)	(1.6026)	(1.4331)
Office based employment	3.5775***	4.0009***	3.8259***
	(0.7639)	(0.8271)	(0.8661)
Age	0.0001	-0.0004*	-0.0003
	(0.0004)	(0.0002)	(0.0003)
Star	0.6677***	0.6485***	0.6776***
	(0.0692)	(0.0491)	(0.0506)
Rentable floor area	0.0072***	0.0065***	0.0065***
	(0.0006)	(0.0003)	(0.0004)
Percent leased	-0.0038***	-0.0029***	-0.0034***
	(0.0005)	(0.0006)	(0.0006)
Number of floors	-0.0109	0.0036	-0.0008
	(0.0065)	(0.0096)	(0.0100)
Number of elevators	0.0313***	0.0141*	0.0189**
	(0.0081)	(1.0363)	(1.1123)
Other controls	YES	YES	YES
Within R^2	0.4288	0.4472	0.4555
Between R^2	0.4254	0.3898	0.4015
Overall R^2	0.4018	0.3824	0.3904
Number of observations	2,210	1,939	1,743
Number of groups	114	112	112
Average number of observations per group	19.4	17.3	15.6

Notes: Fixed effects model at Postcode 'outcode' level: Specification includes quarter and year dummies Robust Standard errors clustered at the 'Entitled level in parentheses: *, ** & *** Statistically significant at respectively 10, 5 and 1 percent levels.

Table 6: Specification Adjustments Dependent variable is log of transaction price: Treatment date used is 25//07/2013

	(1)	(2)	(3)	(4)
Sample	2009-2016	Core		
	Quarter & year dummies	Quarter dummies interacted with years	Quarter & year dummies	Quarter dummies interacted with years
Entitlement effect	0.3012**	0.4883***	0.3170	0.4667**
	(0.1416)	(0.1620)	(0.2007)	(0.2266)
Post	0.5133***	0.8391**	0.4800***	0.8491**
	(0.1604)	(0.3064)	(0.1592)	(0.3370)
Entitled	-0.66644*	-0.7366*	-1.1706***	-0.9912***
	(0.4056)	(0.3974)	(0.3003)	(0.3173)
Refusal rate	0.0128	0.3572	1.5712	0.8461
	(2.0204)	(1.8923)	(1.4661)	(1.4993)
Office based employment	2.5292***	3.4521***	2.2938***	3.7000***
	(0.4069)	(0.7320)	(0.5758)	(0.8307)
Age	-	0.0001	-	0.0006*
		(0.0005)		(0.0003)
Star	0.6602***	0.6677***	0.6993***	0.6741***
	(0.0576)	(0.0633)	(0.0378)	(0.0481)
Rentable floor area	0.0073***	0.0072***	0.0068***	0.0065***
	(0.0005)	(0.0006)	(0.0005)	(0.0004)
Percent leased	-	-0.0039***	-	-0.0036***
		(0.0004)		(0.0005)
Number of floors	-	-0.0099*	-	0.0000
		(0.0058)		(0.0115)
Number of elevators	0.0209***	0.0313***	0.0099	0.0177**
	(0.0067)	(0.0061)	(0.0092)	(0.0078)
Other controls	YES	YES	YES	YES
Within R^2	0.4304	0.4460	0.4602	0.4721
Between R^2	0.5157	0.4365	0.5116	0.4174
Overall R^2	0.4447	0.4231	0.4547	0.4095
Number of observations	2,326	2,210	1,835	1,743
Number of groups	116	114	114	112
Average number of observations per group	20.1	19.4	16.1	15.6

Notes: Fixed effects model, at the Postcode outcode level; Clustered robust standard errors at the 'Entitled' level in parentheses
*, ** & *** Statistically significant at the 19 5 and 1 percent level.

Table 7: Exclusion of Outcodes: treatment date = 25th July 2013

Sample	(1)	(2)	(3)	(4)	(5)	(6)
	2009-2016			Core		
	Dropped Inner City	Dropped Periphery	Dropped Inner City & Periphery	Dropped Inner City	Dropped Periphery	Dropped Inner City & Periphery
Entitlement effect	0.3725**	0.7229***	0.5441**	0.2711	0.6272*	0.4174
	(0.1741)	(0.2535)	(0.2487)	(0.2578)	(0.3701)	(0.3560)
Post	0.6259***	0.5102***	0.6568***	0.6805**	0.4664***	0.6974**
	(0.2160)	(0.1272)	(0.2162)	(0.2721)	(0.1520)	(0.2860)
Entitled	-0.5368	-0.7822**	-0.5790*	-0.7753**	-1.0800***	-0.8208**
	(0.3478)	(0.3498)	(0.3395)	(0.3538)	(0.3385)	(0.3749)
Refusal rate	0.2720	-0.1233	-0.0109	0.6929	0.7557	0.5657
	(1.5739)	(1.6378)	(1.5490)	(1.7888)	(1.5351)	(1.8618)
Office based employment	3.1396***	3.4505***	3.1292***	3.2886***	3.6498***	3.2433***
	(0.8916)	(0.7716)	(0.8746)	(1.1345)	(0.8480)	(1.1190)
Age	0.0004	0.0000	0.0002	-0.0002	-0.0005	-0.0003
	(0.0008)	(0.0005)	(0.0008)	(0.0007)	(0.0003)	(0.0007)
Star	0.6490***	0.6724***	0.6673***	0.6379***	0.6771***	0.6445***
	(0.1142)	(0.0690)	(0.1158)	(0.0786)	(0.0508)	(0.0822)
Rentable floor area	0.0082***	0.0072***	0.0085***	0.0065***	0.0066***	0.0068***
	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0004)	(0.0007)
Percent leased	-0.0045***	-0.0038***	-0.0049***	-0.0036***	-0.0034***	-0.0039***
	(0.0011)	(0.0005)	(0.0012)	(0.0012)	(0.0006)	(0.0012)
Number of floors	0.0252	-0.0116*	0.0212	0.0650***	0.0000	0.0632***
	(0.0189)	(0.0062)	(0.0180)	(0.0094)	(0.0105)	(0.0094)
Number of elevators	0.0940***	0.0279***	0.0804***	0.0631**	0.0141*	0.0488*
	(0.0236)	(0.0083)	(0.0211)	(0.0269)	(0.0083)	(0.0263)
Other controls	YES	YES	YES	YES	YES	YES
Within R^2	0.4675	0.4391	0.4747	0.5103	0.4644	0.5181
Between R^2	0.5247	0.3209	0.4408	0.4964	0.2902	0.3792
Overall R^2	0.4482	0.3985	0.4430	0.4673	0.3809	0.4526
Number of observations	1,210	2,137	1,137	917	1,683	857
Number of groups	78	95	59	76	95	59
Average number of observations per group	15.5	22.5	19.3	12.1	17.7	14.5

Notes:

Fixed effects model, at the outcode level; Robust standard errors clustered at the 'Entitled' level in parentheses

Dependent variable is the natural logarithm of recorded transaction price; *,** & *** Statistically significant at the 0.1, 0.05 & 0.01 level

FIGURES

Figure 1: All Exemption Zones

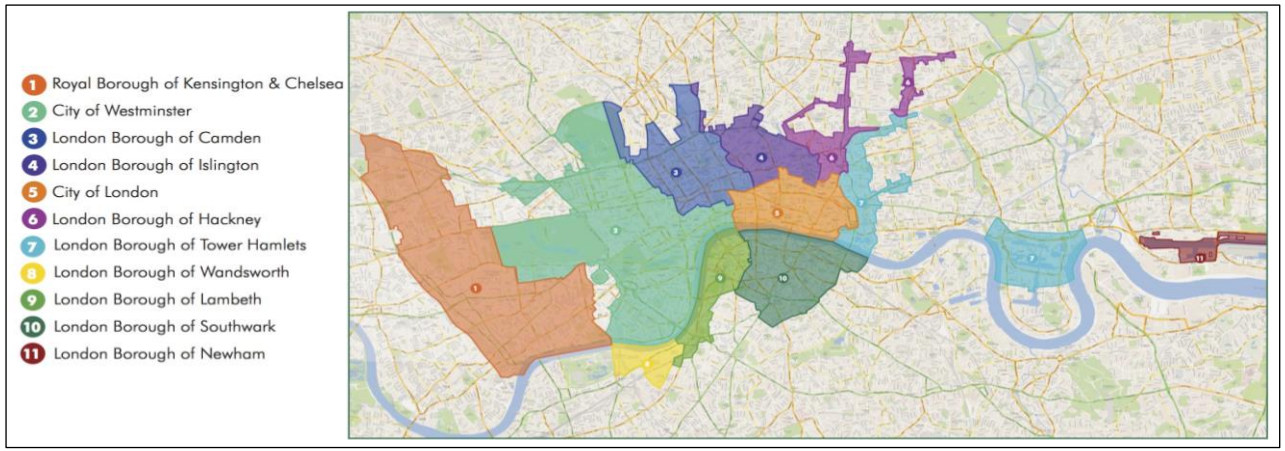
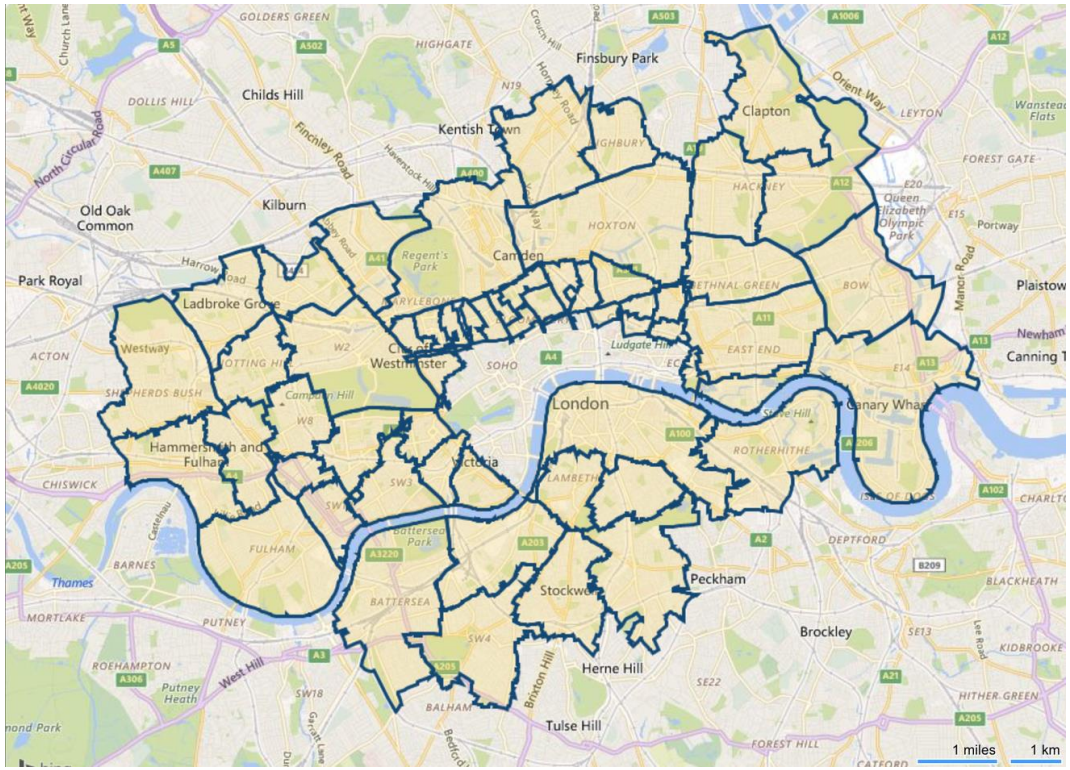


Figure 2: Band of Observations



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