Office Space Supply Restrictions in Britain: The Political Economy of Market Revenge

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Abstract

Office space in Britain is the most expensive in the world. Even in a struggling, medium sized city, like Birmingham, costs are more than 40 percent higher than in Manhattan although construction costs half as much. Taken together with research showing a significant negative net welfare effect of planning constraints in the residential sector, regulatory constraints are the obvious explanation. To investigate this we first explore the meaning of Glaeser et al's (2005) Regulatory Tax (RT) and then estimate values for 14 British office locations. Even on the most conservative assumptions this shows a very substantial cost of regulation in Britain - orders of magnitude greater than estimates for Manhattan condominiums. Having values going back more than 40 years allows us to investigate the political economy of the regulatory restrictions. Britain has a fiscal disincentive for communities to permit commercial development since business rates are a national tax. In all but two locations, residents control development and their main incentive to allow development is unemployment. The useful exceptions are the City of London and Docklands, controlled by business interests, and, in the City's case, with a unique fiscal incentive to allow development. The City is also the only office location in Britain where the RT value has fallen over time, seemingly related to an explicit loosening of planning restrictiveness in the 1980s triggered by competition from other locations. Exploiting the cross sectional panel data allows us to test these hypotheses and the results provide strong support.

JEL classification: H3, J6, Q15, R52.
Keywords: Land use regulation, regulatory costs, business taxation, office markets.

1 Introduction: The Problem in an International Perspective[1]

The cost of constructing a m^2 of office space in Birmingham, England, in 2004 was approximately half that in Manhattan[2]. This is not very surprising since Birmingham is a struggling, medium sized city on the flat plains of the British Midlands and Manhattan is big, topographically constrained, prosperous and highly dynamic. If we were looking for an American equivalent to Birmingham, maybe, St Louis, Missouri would pop up. When we couple the cost of construction with the costs of occupation of that same m^2, however, we do get a shock. In the same year the total occupation costs per m^2 were 44 percent higher in Birmingham than they were in Manhattan (KingSturge, 2004). Something very odd must be going on. The obvious anomaly is the intensity and restrictiveness of land use controls in the UK and this paper sets out to investigate the economic costs of these restrictions and what drives them.

In the past few years US urban economists have become interested in the analysis of land use regulation and concerned about increasing regulatory restrictions influencing the supply and costs of housing[3] and perhaps sorting between cities[4]. Glaeser *et al* (2005) for example conclude that regulatory restrictions increase housing prices in the most tightly constrained metro areas by some 50 percent and by considerably more in Manhattan. This is potentially of concern because not only is the effective tax substantial but it has been rising over time. However, no researcher has yet reported a significant effect of regulatory constraint on the costs of commercial space in the US. This is no great surprise given the fiscal incentives to local communities to allow commercial development.

The situation in the UK, however, is several orders of magnitudes more restricted. This is partly because land use regulation in the UK takes the form of universal growth constraints: and growth constraints applied not just to the total area of urban land take for each city but individually to each category of land use within each city. So urban 'envelopes' are fixed by growth boundaries but within these envelopes the area of land available for retail, offices, warehouses and industry is all tightly controlled. Although not entirely inflexible, Greenbelts surrounding cities have been more or less sacrosanct since they were established, out of town retail is effectively prohibited[5], and local planning authorities have been extremely reluctant to expand the area of commercial space. There are, moreover, a raft of preservation designations

[1] We thank Robin Goodchild and Colin Lizieri for helpful comments and suggestions. We are grateful to Robin Goodchild from LaSalle Investment Management, Peter Damesick from UK CB Richard Ellis and Simon Rawlinson from Davis Langdon for kindly providing data. Gerard Dericks provided excellent research assistance. The remaining errors are the sole responsibility of the authors.

[2] This uses the ratio of Birmingham office construction costs to those in London from Davis Langdon (see Section 3 of this paper), the ratio of Davis and Langdon's London construction cost estimates to those from Gardiner and Theobald to apply to Gardiner and Theobald's construction cost data for New York offices to estimate figures on a comparable basis for both Birmingham and New York.

[3] See, for example, Brueckner (2000); Evenson and Wheaton (2003); Glaeser and Gyourko (2003); Glaeser *et al* (2005); Mayer and Somerville (2000); Mayo and Sheppard (2001); Phillips and Goodstein (2000); or Song and Knaap (2003).

[4] See Gyouko *et al* (2005).

[5] On two different grounds: to maintain the economic strength of city centres and to reduce car use. Whether either objective is actually served by this policy and, in so far as it is, at what cost – is unclear.

and height controls on buildings. The present pattern of regulation was essentially set in aspic in 1947 so has been in place for two generations.

Any reluctance of local communities to allow expansion of commercial space may be at least significantly explained by the fact that they have strong tax incentives not to. Taxes on commercial real estate (the business rate) accrue to national not local government (and account for some 5 percent of national tax revenues) but local authorities have to provide services to commercial property. The only interesting (and for us useful) exception is the City of London which, when the 'Uniform Business Rate' (UBR) was introduced in 1989, was granted a unique exception and allowed to retain 15 percent of revenues raised. In addition to the property tax implications, there are other costs to local voters associated with development. Together, these generate very strong NIMBY pressures. As the retiring political head of the planning authority for one of the office locations analysed in this paper said when asked what had been his major achievement in office:

> [our main achievement was that] "…not a single new major office development has been approved. We managed to keep development down." (*Reading Chronicle, 1989*).

As we argue below, with the important and helpful exceptions of the City of London and London Docklands, the only incentive for local communities to permit commercial real estate development is local voters' fears of unemployment.

A further factor is that constraints and growth controls in the UK have been being applied since 1947. The nearest equivalent form of regulation in the USA, in Portland Oregon, still much less restrictive than applies in the UK, has been in force only since 1973 - not much more than half that time. Because regulatory constraints only affect new construction (at least directly – as we see in the UK they produce strong incentives, if tight enough, to induce conversion of older stock to multi-occupation on a large scale) they influence real estate prices with a significant lag. As was noted in Cheshire and Sheppard (2004) their impact on housing prices only began to be observable from about ten years after they were introduced, that is from 1955 or so.

The result is that the economic effects of land use regulation are orders of magnitude greater in the UK than they are in the US. Using data for 1984 and using quite conservative assumptions, Cheshire and Sheppard (2002) estimated that the net welfare costs[6] of restrictions on land supply in a prosperous community in southern England, Reading, were equivalent to nearly 4 percent as an annual income tax. In 2003, at the outer boundary of permitted development in Reading, housing land was some £3,000,000 per hectare (Cheshire and Sheppard, 2005). A few feet away agricultural land, not within the urban envelope, was worth perhaps £7,500 per hectare. As Muellbauer (2005) commented, such price distortions are 'grotesque'. The constraints on the housing market have become so significant that the British Treasury and the Department of Communities and Local Government (formerly the Office of the Deputy Prime Minister) have now commissioned two separate enquiries (Barker, 2003; 2004 and 2006).

[6] Net in the strict sense that benefits were also quantified and so the measure was the excess value of total costs over benefits measured in terms of equivalent income variation.

Office space in London, according to commercial data (KingSturge, 2003 to 2005) is not just more expensive than anywhere else in the world; it is some three times as expensive as the next most expensive city in Europe, Paris, and more than three times as expensive as in Manhattan. Even more telling, perhaps, are the costs of office space in British provincial cities. Birmingham was the next most expensive European city after Paris, and Glasgow, Edinburgh and Manchester were all more expensive than Manhattan; office space costs almost twice as much in any of those smaller and not very prosperous British cities as it does in San Francisco – a city which not only is highly prosperous and has some of the tightest regulatory constraints on housing in the US but also has topographical constraints on land supply. Office space in Birmingham cost 124 percent more than in fast growing, twice as big and land strapped Singapore.

The story in the retail sector seems to be even more extreme. The most important determinants of land prices in a city, in the absence of regulatory restrictions, will be the size of the city and its income level. Other factors, such as differences in expected rates of urban growth, topography and transport systems, may also play a part, as will environmental qualities or the quality of local public goods such as schools and security (see, for example, Gyourko and Tracey, 1991). So if we want to find a worthwhile indicator of the role of regulatory restrictions we should try to standardise for such differences. Cheshire and Sheppard (1986) provided evidence on land prices in US comparator cities, matched as closely as possible with UK cities (Reading and Darlington) for all except environmental and local public goods. Land prices for all use classes (except industry in deindustrialising Darlington) were orders of magnitude higher in the two UK cities. The most extreme case was the most expensive retail land in the prosperous UK city (Reading) compared to its US counterpart (Stockton, CA). In Reading the most sought after land available for retail use cost almost 250 times as much per acre as its equivalent in Stockton.

To date there has been rigorous quantification of the economic effects of land use constraints on the UK housing sector but not for any category of commercial property, although concerns in government departments with economic responsibilities have now reached the point that a new investigation into their effects on the supply of commercial space has been launched (Barker, 2006). The purpose of this paper is to begin to address this gap in our knowledge and investigate the costs of land use regulation for commercial property in the UK in a rather more rigorous way than the broad comparisons of rents and occupation costs provided by real estate intermediaries.

An obvious problem in analysing the economic impacts of land use planning is identifying exactly what element in total occupation costs – the cost of space to economic agents - may reasonably be attributed to ‘planning’ restrictions. This is because i) such restrictions take many forms over and beyond restricting the supply of land or space; and ii) it is difficult to offset for the normal factors such as city size etc, that urban economic theory tells one should be expected to influence the price of land and space. Furthermore, if we want to estimate the economic impact of any measured increase in space costs resulting from regulation, we would need to go a second step – not included in this research. We should estimate the impact on output, employment and incomes generated by the increase in space costs produced by regulatory constraints. Then offset those costs against any benefits regulation produced.

In the context of the residential sector, an elaborate and theoretically rigorous methodology was set out in Cheshire and Sheppard (2002) for estimating both the gross and the net costs of regulatory restrictions on the supply of residential land and so the net welfare cost these had. The methodology involved estimating implicit prices for housing and garden space and planning produced amenities; then by matching these to a household income survey, estimating both the structure of demand for these housing and planning 'goods' and the indirect utility function of households. If it was assumed that urban housing markets were in equilibrium (for which there was reasonable empirical evidence) these could be combined to estimate the *de facto* supply of space released by the planning system within the housing market concerned (Reading) since equilibrium requires that all available space be consumed. It was then possible to estimate via the indirect utility function and estimated demand system, the impact on welfare, in terms of equivalent variation in incomes, of changes in the supply of both planning amenities and housing space consequent on a more - or less - restrictive supply of urban space and consequent supply of planning amenities. Because the analysis built up from observations of individual households it was also possible to estimate the distributional consequences of land supply restrictions and the trade off of planning produced amenities for private space.

This, however, is demanding on data and research time and depends on being able to explicitly identify and estimate the economic impacts of the goods/amenities generated by planning, the impact of regulation on supply and the indirect utility functions of residents/citizens. Even if it were not so data intensive, it is not clear such a methodology could be adapted to estimating the economic and welfare impacts of regulation of the supply of non-residential property because of the difficulty - perhaps impossibility - of estimating the relevant production function.

We estimate here, just the first of these elements: a measure of the total cost of regulatory constraints on the price of office space expressed as a 'tax' – that is as a percentage of construction costs. To do this we adapt the methodology first developed and applied to the Manhattan condominium market by Glaeser *et al* (2005). The value of this measure and its interpretation is the subject of section 2 of this paper. The Glaeser *et al* (2005) methodology has the considerable attraction that it is intellectually coherent, resting on established microeconomic theory, and it is not demanding with respect to data and estimation techniques. It can be applied to any category of space so long as a unit of space in an additional story is a more or less perfect substitute for an additional unit of space obtained via a larger building footprint. Thus, it can be applied to offices or hotels, as well as high rise blocks of flats, but more doubtfully to industrial, retail or warehouse space. Its downside is that it is a 'black box' number in that it does not differentiate between costs that are imposed by different aspects of regulation. Rather it is an aggregate measure of the gross cost of regulatory constraints limiting the height of buildings and – more indirectly – the supply of land for the use in question. So it reflects the costs of restrictions on land supply, space by floor area ratios or height restrictions, or common forms of conservation designation. It is far less plausible to argue that it captures costs imposed by compliance complexity or delays in decision making. In addition, it only gives a 'cost' not a **net** welfare or **net** impact on output measure. As is well known, there are measurable benefits from some aspects of regulation and, since space is substitutable to a degree both in production and consumption, the effects on output or welfare can only be estimated if both the benefits and the extent of substitutability are known. So the regulatory tax estimates are a lower bound estimate of a gross cost of land use regulation in any location.

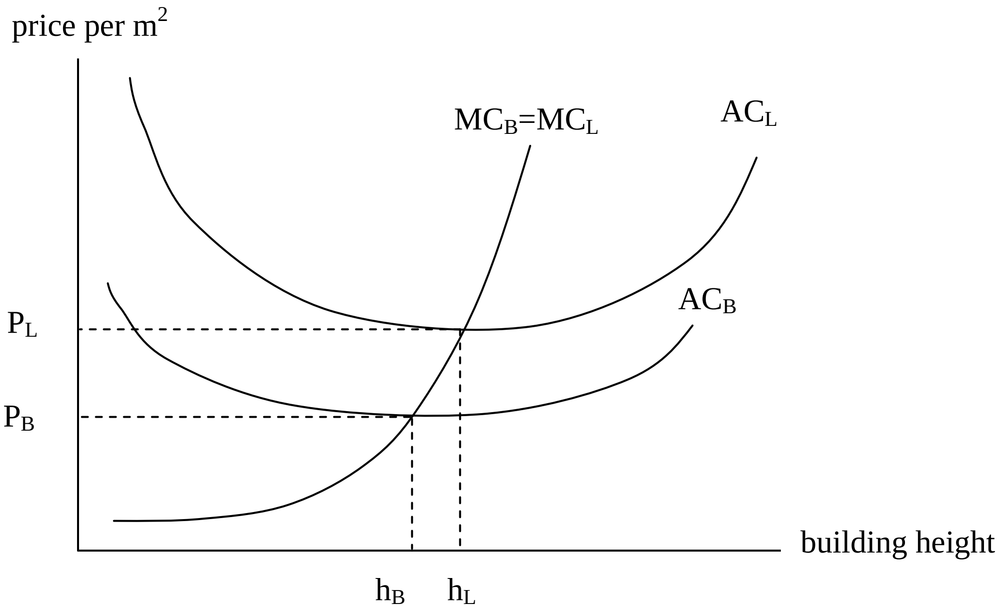
Glaeser *et al* (2005) report their results for Manhattan apartments as a price to construction cost ratio (rather than as a quasi-tax rate; regulatory tax to construction cost). For the most recent year they had data for, 2002, this ratio was 2.07. In our tax-rate measure, this would translate to a value of 1.07. They also investigated other data which suggested that the value of the regulatory tax on housing was higher in some West Coast urban areas, such as the Bay Area and Los Angeles, than it was in the New York urban area as a whole (it was much higher in Manhattan itself than it was in the New York metro area) although it was still substantial in the New York area. However, in 10 of the 21 urban areas investigated there was no measurable impact of regulation on house prices. Nor was there any indication of a ‘regulatory tax’ on office property in Manhattan. This provides some standard against which to evaluate the results for office property in the British cities reported below.

2 An Interpretation of the Regulatory Tax (RT) as a Measure of the Costs of Restrictions

The key idea of the Regulatory Tax (RT) approach is simple; in a world with competition among property developers and free market entry and exit (both reasonable assumptions), price will equal (minimum) average cost since this includes ‘normal’ profit. Marginal cost rises with building height so in the absence of restrictions on heights, buildings should rise to a point where the marginal cost of adding an additional floor equals its market price. If building higher is less profitable per m^2 than building over a greater area, still we should expect the marginal cost of an extra floor to be equal to price: buildings would just be lower on average but the overall urban land take would be greater. Bertaud and Brueckner (2005) demonstrate the formal equivalence of height restrictions compared to land supply restrictions. The gap between the observed market price and the marginal construction cost can be interpreted, therefore, as a ‘regulatory tax’ – the additional cost of space resulting – in aggregate – from the system of regulation in that particular market. If the sales price of an additional floor of office space exceeded the marginal cost of building this additional floor then developers would have an arbitrage opportunity. The difference between the price of floor space and its cost of construction must be due to some form of regulation.

This is illustrated in Figure 1 which depicts the cost curves of representative competitive developers in (by assumption) two unregulated markets; one relatively prosperous and ‘attractive’ office market, say, London (L) and one less prosperous and ‘attractive’ market, say, Birmingham (B). For illustrative convenience we assume that the marginal (construction) cost curve is identical in both markets implying that wages, materials and other variable costs do not vary regionally. We also assume – quite reasonably – and that buildings of a given type have an optimal floor plan to height ratio (given the price of land).

Figure 1: A Developer's Cost Curves without Space Restrictions



In a competitive market P=MC=AC and is given. The demand curve that the firm faces is flat. The regulatory tax RT is P-MC=0 in both cases.

In Figure 2 we illustrate the economic rent of land for the two markets.

Figure 2: Land Rent

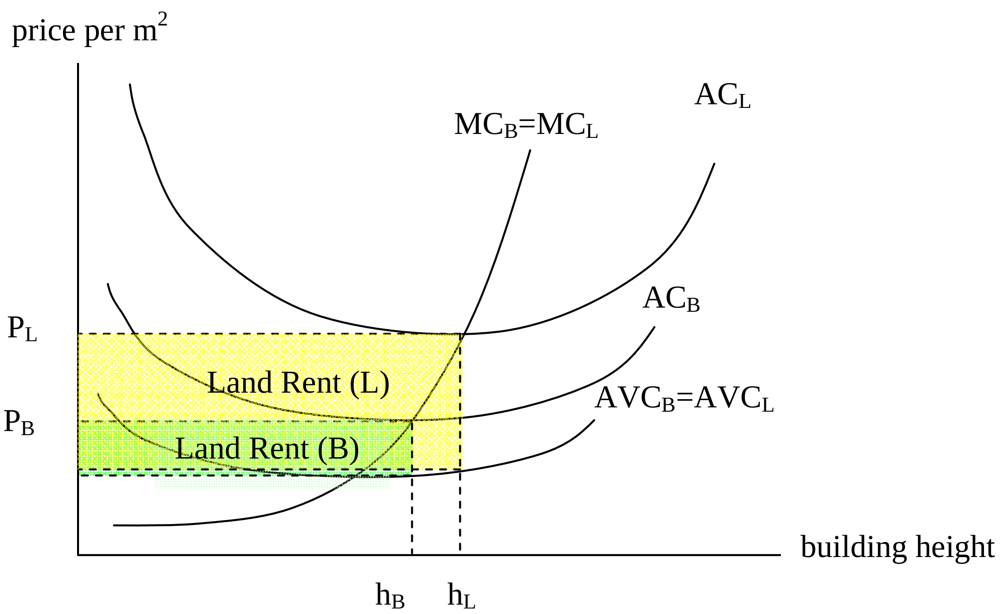


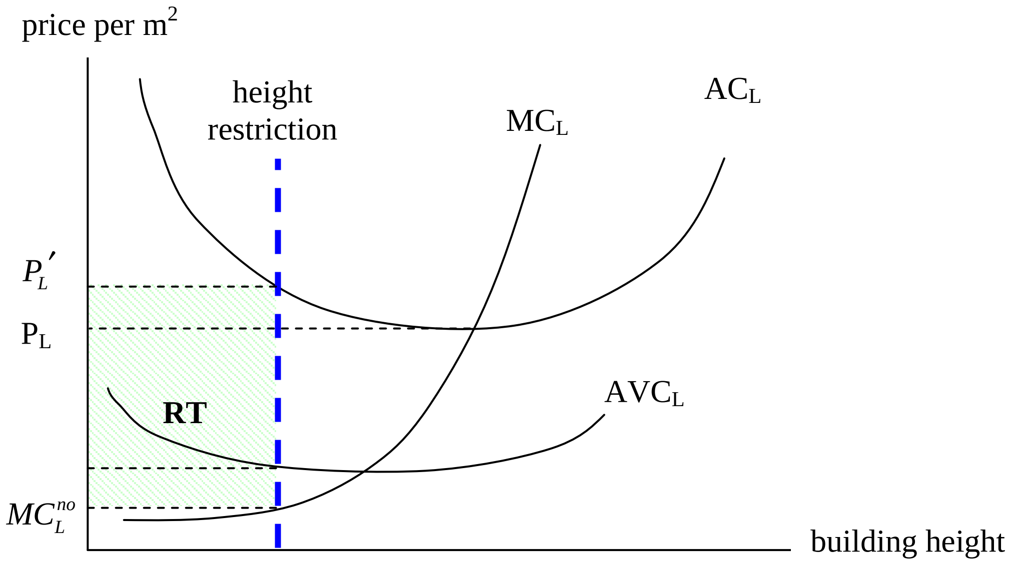
Figure 2 additionally depicts the average variable cost curve, AVC, which covers all inputs except land. The average cost curves, AC, additionally include the costs of the fixed factor, land. The differences between the price and the average variable costs at the optimal building height can be interpreted as land rents (subject to site preparation and infrastructure costs). The illustrated cost curves imply that building heights will be higher and so MC will be also higher in London. Underlying ‘pure’ land values are relevant in the sense that, given different input costs, the optimal capital to land ratio will be different in different markets. The land rent is greater for London than for Birmingham so buildings are higher but the difference in land rents between the two markets does not affect the value of the RT. In the absence of restrictions, RT will be zero.

We can think about this in more detail by considering two cases. Case F is the unregulated situation while Case R is the regulated one.

Case F: Suppose we have an unregulated world with a competitive development and office market and the cost of an additional floor rises with building height: then building heights rise until, per m^2 Marginal Cost of Construction (MC)=Marginal Revenue(MR)=Average Cost of Construction (AC)=Price(P)=Average Revenue (AR). In such a market, therefore, the price per m^2 includes all costs for a given building; construction + land + normal profit. Suppose we then add a hypothetical additional floor. The MC per m^2 is higher for this additional floor than for the existing highest floor but price is not (or not perceptibly). The ‘land’ is already paid for in the existing building, part of fixed costs and included in AC. There is, then, no appreciable RT.

Now consider the regulated world of Case R in which there is a supply constraint on building heights. We have an existing building and a competitive development and office market, but it is no longer true that building heights rise to the point at which MC=MR. They could profitably be higher but this profit is capitalised into the price paid for land so profits are still ‘normal’. Land is a fixed cost included, therefore, in average costs. If we now add a hypothetical floor to an existing building there is no extra land cost – these are already ‘paid for’ in the existing building and included in AC. The marginal cost is only the extra construction cost but the price reflects the constrained supply, now without land rents having to be paid for, so price exceeds MC and the difference represents the gross cost of regulation - or the RT. This is illustrated in Figure 3.

Figure 3: A Developer’s Cost Curves with Height Restrictions (London only)



In essence Case F and Case R are identical and land is eliminated from the RT measure because it is already paid for in the existing building. The fact that the price of the extra space in Case R is higher has nothing to do with paying for the land but reflects the constraint, including scarcity of space. Although the RT measure eliminates the impact of land costs in the current regulated market conditions IF the market were unregulated land costs per m^2 would be lower: so the observed MC in a regulated market are unlikely to be the same as they would be in an unregulated market.

However, not all regulatory constraints are as simple as height restrictions. There may be cases where the specific form of the regulations influences the costs of construction and the shape of the cost curves. Take an extreme example of hypothetical land use regulations. Suppose there were **no** controls on building heights but rigid controls on the amount of land made available for (office) construction and rigid constraints on the size of the floor plan relative to the size of the site. In such a situation there would still be a market demand for total office space and building heights would still rise until the point at which MC=AC=P. So estimated RT would be zero.

This would not mean, however that the regulatory system imposed no costs. Since costs per floor rise with the number of floors, to get a given total quantity of space, buildings would have to be much higher so the AC and MC curves would, in effect, be shifted to the left and upwards. To provide 36,000 m^2 of space (a large office building) with a floor plan of 1,200 m^2 would imply a 30 storey building and so a height of, say, 100 metres: to get the same space if the restriction allowed only 25m^2 per floor would imply 1,440 stories – a building some 4.75 kilometres high.

Now consider another extreme of hypothetical regulation: suppose that there are no constraints on building or land availability at all, but stringent compliances costs related to, say, permits, but such costs are a function **only** of individual buildings. Once the compliance process has been completed, the agreed building can be constructed with no further compliance costs at all. In such a case the costs of compliance will appear as a fixed cost and, if the results related to the incidence of Impact Fees are applicable (Ihlanfeldt and Shaughnessy, 2004) will be fully capitalised into land prices. Thus, there could be no impact on marginal costs or on the price of space. There will be a deadweight loss, but this loss will fall uniquely on the price of land although given that the profitability of transferring land from agricultural to urban use will be reduced it could reduce the overall supply of urban land and so have some affect on space costs.

What these examples suggest is that the relationship between measured RT and the actual gross costs of regulation (if these could be measured exactly) is, in principle, a variable one and will depend on the precise form the regulatory constraints take. So long as at least an element of the regulatory constraints takes the form of restrictions on the height of buildings, however, for those types of uses in which vertical space is a more or less perfect substitute for horizontal space, the measured RT will be strongly and positively correlated with the actual gross costs of regulatory constraints. The RT measure will, however, be a lower bound estimate of the gross costs because, for example, some of the regulatory constraints may relate to compliance costs or costs of delay.

Need this concern us particularly in the case of British offices? Restrictions on building heights take several forms but are applied in all British markets. In the City of London, for example, no less than eight separate 'view corridors' of St Paul's cathedral (both foreground and background) are protected from building above some 55 metres and five 'view corridors' of the Monument are similarly protected as are four street blocks around the Monument (City of London, 1991). There are, in addition, extensive 'Conservation Areas' within which very limited changes to the external appearance of buildings is possible – obviously including height - and, throughout the City – as in all British cities – there are floor area ratio restrictions, known in the UK as 'plot ratios'. These are set at 5.1:1 in the City (City of London, 1991, para. 16.42). There are, in addition, other regulations affecting the design of buildings which limit height and space within them. Planning policies in London's West End are substantially more restrictive than those in the City, since very large areas – most of Mayfair and Belgravia – are designated Conservation Areas where it is not possible to build higher than the existing structure, where external, and if the buildings are listed (which many are) even internal, alterations are prohibited[7]. Such historic conservation regulations undoubtedly generate amenity values, not included in a measure of RT.

In summary, then, the RT measure of the gross costs of regulatory constraints on buildings is something of a black box in that it will incorporate the cost of restrictions on the supply of land for the use in question and restrictions on building heights. These may arise from various sources but are imposed in all our office locations with at least 'plot ratio' controls (floor area ratios in the US). Since land use planning is a national system in the UK it seems likely that compliance costs and costs of delay do not vary significantly across locations but such costs will not be fully captured in the RT measure and may not be captured at all. So we can conclude that estimated RT

[7] An interesting outcome in the very high end of the residential market in London's West End is a very restricted supply of large floor plan flats. Listed building designation is applied even to internal connecting doors between adjoining structures so it is impossible to construct flats with larger floor plans than existing 18th and 19th Century structures. The result is a large premium per square metre for the few large floor plan flats available.

values will be strongly and positively correlated with actual gross costs of regulatory constraints but in absolute terms are likely to be lower bound estimates.

3 Data

In order to estimate regulatory tax values we need ‘price’ and ‘marginal construction cost’ data. Our empirical analysis builds on the best available data for the British office market and a number of continental European cities. After careful and detailed discussion to agree how best to measure *marginal costs of construction* (i.e., the estimated cost of adding an additional hypothetical floor to an existing building) Davis Langdon estimated time-series data for the agreed definitions by market (per square foot or square metre). Davis Langdon are the leading UK producers of construction cost data for the building industry and produce the Spon Handbooks used by quantity surveyors and architects (Davis Langdon 2005). See Appendix A for a detailed description of the methodology Davis Langdon used to derive the marginal cost of construction. Gardiner and Theobald (2006) – Davis Langdon’s major competitor – provides (average) construction cost data for our sample of continental European cities. Unfortunately, comparable time-series data on the market *price* of office space in the sense of capital values is not readily available, only data on rents, yields and rent free periods can be obtained. CB Richard Ellis, CBRE, the largest property consultancy in the UK, provided the relevant data for British markets. Similar data (although estimated on a different basis) were also provided by Jones Lang LaSalle (JLL) for a number of our British locations and all the continental European ones we report estimates for. We used the common British locations to make the best adjustment we can to a common basis.

Only rental not capital values are available because office buildings are treated as income producing assets that are typically leased (rather than sold) floor by floor. Given this complication, we need to impute the market price of an additional floor of office space (the ‘capitalised value’) using the available information on rents, yields, rent-free periods and vacancy rates. The estimation procedure is briefly described below and explained in more detail in Appendices B to D. Since we do not observe transaction prices but must rely on estimates, we carry out a quite extensive sensitivity analysis using the most ‘conservative’ and ‘radical’ assumptions which are defensible. These provide an upper and a lower bound estimate, in addition to a central, perhaps most plausible, value. Finally we provide some more tentative estimates for the regulatory tax imposed on office space in some continental European cities for which there are data from JLL and Gardiner and Theobald.

Our data for the RT estimates for British office locations come from four different sources. CBRE (which incorporates the former CB Hillier Parker and before that Hillier Parker, the first agency to publish rental and yield data including the Investors Chronicle Hillier Parker reports) provided us with (headline) prime rents and equivalent yield and rent-free period data for 14 local office markets in the UK (see Table 1 for a list of the markets). Both time-series cover all 14 local markets. Most time-series go back to 1973 with two series (those for the City of London and London West End) reaching back to 1960. CBRE also provided us with total occupation cost data, although only for 2004 and 2005 and for 8 of the 14 relevant markets. We obtained the matching marginal construction cost data for all 14 markets from Davis Langdon, based on actual construction projects in those markets also going back to

1960. Finally, we obtained regional vacancy rate information from the Office of the Deputy Prime Minister (ODPM) and national rental void data from IPD.

The data for the RT estimates for European office locations comes from two additional sources. JLL provided us with prime rent and equivalent yield data from 1990 to 2005 (continental European cities) and for 1987 to 2005 (British cities). These allow us to compute hypothetical capital values (so called 'Peter Pan values') based on the assumption that the buildings are permanently renewed. Unfortunately, JLL does not provide us with information on voids or vacancies, so we use the ratio of the CBRE to JLL estimated values where we have common locations (for six British locations) to obtain as comparable a set of capital values for all locations, British and continental European. Gardiner and Theobald's (2006) 'International Construction Cost Survey' provides *average* construction cost data back until 1999 so we can estimate RT values from 1999 to 2005. We use the ratio of marginal to average costs from Davis Langdon and Gardiner and Theobald to estimate the hypothetical marginal cost of construction for the continental European office locations. More detail is given in Appendix E.

Imputing Missing Values

Our raw data come in different time-intervals. The prime rent data, for example, are quarterly for the City of London and London's West End back to 1960; however, they are quarterly, monthly, half-annually and annually for the other 12 markets (with the exception of three markets back to 1973). Similarly, the yield data come in various time intervals. The construction cost data are annual. Hence, in order to make our data comparable, we use annual numbers when available and compute annual numbers (averages from the available monthly, quarterly or half-annual data) when not.

Even though we use annualised data we still have missing values for a number of variables and markets. For example, we only obtained *rent-free period data* for two markets (the City of London and London's West End) and only between 1993 and 2006. For the remaining years and other markets we need to impute the rent-free periods using the available data (see Appendix B for details). Similarly, we need to impute *equivalent yields* prior to 1973 using the available data. The methodology is described in Appendix C. The imputed values obviously introduce an additional degree of uncertainty into estimates prior to 1972 (1972 Hillier Parker yields were available and these are believed to be comparable to the CBRE data series). We also have to impute *vacancy rates* from relatively short time-series of regional data from ODPM and longer time-series data from IPD. The methodology is described in more detail in Appendix D. Imputing values of yields could, we believe, have a significant impact on the final estimates of RT. So we should be very cautious with respect to any interpretation of estimated values of the regulatory tax or trends in that tax prior to 1972. The absolute differences to estimates resulting from any plausible alternative values of rent free periods and vacancy rates are, however, comparatively small. We are confident, therefore, that while the need to impute values for such data is not entirely satisfactory, the additional margin of error it may introduce into the estimates is small in absolute terms.

We have to impute *missing rental values* using national rent-index data from Hillier Parker (today CBRE). The Hillier Parker ICHP national rent-index data is available back to 1965 but only for three years. This does allow us to impute missing rental values between 1965 and 1972 but for missing years we assume a linear trend.

Finally, we impute total occupation cost by assuming a constant scaling factor to fully adjusted prime rents using the ratio: average of the total occupation cost for each market 2004 and 2005 divided by fully adjusted prime rent. We can match prime rent and total occupation costs for 8 of the 14 markets. For the remaining 6 markets we assume the ratio of the geographically closest market for which data are available.

4 Methodology Used to Compute the Regulatory Tax (RT)

Our goal is to estimate, as accurately as possible, the magnitude of the RT over time for the 14 local office markets. The RT can be expressed as:

$$RT_{jt} = V_{jt} - MCC_{jt} \tag{1}$$

where V_{jt} is the market value of an additional square metre of office space in market j at time period t and where MCC_{jt} is the corresponding marginal construction cost of adding one square metre of an additional floor.

The computation of the two components V_{jt} and MCC_{jt} is described below.

The market value of a square metre of additional office space is estimated using the 'Equivalent Yield Model', which is probably the most commonly used model to value income producing property in Britain.[8] According to the equivalent yield model, the property value can be expressed as:

$$V_{jt} = \frac{I_{jt}}{y_{jt}} + \frac{R_{jt} - I_{jt}}{y_{jt}\left(1+y_{jt}\right)^{n_{jt}}} \tag{2}$$

where V_{jt} is the value of the property (in location j at time period t), y_{jt} is the corresponding equivalent yield, R_{jt} is the so called 'current rental value', I_{jt} is the 'passing income' and n_{jt} is the number of years to the next rent review.

The equivalent yield is equal to the internal rate of return (IRR) of two cash flow streams (a stream of 'passing incomes' up to the rent review and then a stream of current rental values, assumed to be constant (in real terms) in perpetuity). The 'passing income' (which is expressed in nominal terms) only includes the rents that the tenants 'pass' on to their landlord. Tenants that are still in their rent-free period or non-rented space do not contribute to the passing income. Hence, in order to get from the (headline) prime rent to the passing income, adjustments for rent-free periods and vacancies have to be made as follows:

8 See for example Brown and Matysiak (2000) for a more detailed discussion of the 'Equivalent Yield Model'.

$$I_{jt} = Prime\ Rent_{jt} \times \left(1 - \frac{Rent\ Free\ Period_{jt}}{Typical\ Contract\ Length}\right) \times \left(1 - \frac{Vacancy\ Rate\ in\ \%_{jt}}{100}\right). \qquad (3)$$

The ‘current rental value’ is measured in real terms and is assumed to remain constant in perpetuity. The capitalised value of the current rental value reflects the reversion value at the time when the current lease expires.

If we make the reasonable assumption that the current rental value (in real terms) equals the passing income, then the property value can be expressed as

$$V_{jt} = \frac{I_{jt}}{y_{jt}}. \qquad (4)$$

Using equation (3), the estimated value can finally be expressed as:

$$V_{jt} = \frac{\text{Prime Rent}_{jt} \times \left(1 - \frac{\text{Rent Free Period}_{jt}}{\text{Typical Contract Length}}\right) \times \left(1 - \frac{\text{Vacancy Rate in }\%_{jt}}{100}\right)}{y_{jt}}. \qquad (4.1)$$

The main advantage of using the equivalent yield model to estimate the capitalised value of office space is that it requires estimates of only two unknown variables, namely, an estimate of the passing income and the equivalent yield. The equivalent yield can be estimated from comparable properties in the local market place that have recently been sold (i.e., it can be derived through ‘reverse engineering’ using transaction prices and rental income information).

Although the equivalent yield model is simplistic and obviously has a number of serious economic shortcomings, it provides surprisingly accurate valuations. This is probably for some combination of two reasons: First, professional valuers[9] are familiar with subtle changes in the market that will influence the choice of yield; and second, valuers’ valuations – based on the equivalent yield model – are the basis for transactions (‘deals’). Hence, even if a valuation does not reflect the ‘true value’ of a property (reflecting all future cash flows discounted at the ‘correct’ rate), as long as buyers and sellers use the same valuation model, they will end up agreeing on a (transaction) price that reflects the model’s predicted value.

As discussed above we commissioned Davis Langdon to get the best possible estimate of the true marginal construction cost of adding an additional floor, with a time series going back to 1960. The estimating method is described in more detail in Appendix A.

The RT is computed as the estimated market value per square metre (fully adjusted for rent-free periods and vacancy rates) minus the marginal construction cost data provided by Davis Langdon. Rather than reporting the regulatory tax directly, we report a quasi-tax rate, the regulatory tax relative to marginal construction cost:

[9] 'Appraisers' in the US.

$$RT\ Rate_{jt} = \frac{RT_{jt}}{MCC_{jt}} = \frac{V_{jt} - MCC_{jt}}{MCC_{jt}} = \frac{V_{jt}}{MCC_{jt}} - 1 . \quad (5)$$

These regulatory tax rates are reported for all 14 markets and for all time periods with available data (see Figures F1-F4).

Given that the RT is not directly observed but must be estimated making various assumptions, it is sensible to carry out a robustness check of results altering the underlying assumptions: specifically, we estimated regulatory tax values for three different sets of assumptions. The alternative sets of assumptions are as follows:

1. Upper Bound: Assume that 50% of the difference between total occupation cost and prime rent is due to a regulatory tax and assume a 10% rent-premium for top floor space.
2. Use the fully adjusted prime rent as the basis (as in the central estimate) but assume a 10% premium for top floors.
3. Lower Bound: Use the fully adjusted prime rent as the basis (as in the central estimate) but assume a 0.5 percentage point higher yield than reported by CBRE.

5 Results and their Interpretation

The results are summarised in Tables 1 to 3. Table 1 shows the markets investigated. Table 2 illustrates the sensitivity of the results to alternative assumptions (as outlined above); and Table 3 reports the mean value of the ‘regulatory tax’ and other descriptive statistics for each year from 1961 to 2005. The markets were selected to cover as wide and representative a range as possible including the main office locations in Scotland.

It is clear from Table 2 that there are no realistic assumptions which eliminate a substantial regulatory tax. The mean value, at 2.37, even for the most conservative lower bound estimate, is more than twice that estimated for Manhattan housing by Glaeser *et al* (2005).

Table 3 shows the annual mean values. We should largely discount values before 1973 since these are i) weighted to the two London markets; and ii) we are uncertain as to the reliability of the estimated yields prior to 1972.

It is immediately clear that the estimated size of the regulatory tax moves with the real estate cycle. This is because real estate prices are substantially more cyclically volatile than are construction costs although, of course, one effect of regulatory restrictions would be to constrain supply and so reduce its elasticity in the upswing and increase the volatility of the cycle. Indeed, the high point of 4.01 for the mean value, reached in the boom of 1973, has not been exceeded since although this is partly a weighting issue: in 1973 the London markets had a greater weight in the mean. Nevertheless, the basic message is clear: the value of the estimated regulatory tax on office space averaged across all British office markets is an order of magnitude higher than in the most highly regulated sector of the most regulated market in the US.

It is more revealing, however, to look at the time series data for the individual markets reported in the Appendix Figures F1-F4 – this discussion is in terms of the central estimate. The most revealing point of all is the contrast between the City and West End of London and the role of Canary Wharf and the development of the Docklands. Until the early 1980s, the City office market dominated supply and the City was the dominant location, with a quasi-monopolistic control. It had a highly restrictive planning policy both in terms of height restrictions (which still endure) and historic designation. Even as late as in 1981, 22 conservation areas, affecting 28 percent of its land area were designated (Fainstein, 1994). The British property industry was significantly protected from international competition and supply was constrained. The response to the expansion in demand for office space from the 1960s was a rapid rise in prices reflecting both the actual limits on supply and supply restriction. The estimated value of the regulatory tax reached a high point in 1973, only just below a value of 18 (a 'tax rate' of 1800 percent). This fell back to just more than 5 in the downturn of the mid-1970s.

Another difference between the City and all other office locations except London's Docklands – a special case controlled by the Docklands Development Corporation set up in 1981 to regenerate the rundown area of the near East End abandoned by port activity from the 1960s – is that of the political economy of the control on planning. In all locations other than the City (and Docklands), voting, and so political control, rests with the resident adult population. As has been cogently argued by Fischel (2001), depending on rates of owner occupation which are high in the UK, this produces a pressure to restrict development to protect house owners' asset values. This is likely to be re-enforced by the asymmetry of the incidence of costs and benefits of physical development with the costs - both short term and in terms of asset value losses - being very localised while benefits are thinly and widely spread. In the City of London, however, political control of the planning system rests with the City Corporation which is controlled by the local business community and its interests[10]. While these include property owners and real estate investors, the business community is dominated by other groups who have a mutual interest in retaining the City as a successful and competitive location for their businesses.

As is explained by Fainstein (1994) the threat of the deregulation of financial services, actually introduced in 1986, concentrated the City fathers' minds wonderfully.

> "….once the economic benefits of restricting growth ended, attitudes towards physical change easily became more flexible….Financial firms that already possessed space adjacent to the Bank of England benefited from their monopoly position and had no motivation to favour expansionary policies. Financial deregulation and competition changed the stakes. Competitive office development in the nearby Docklands threatened the interests of… the City. If the City refused to accommodate expansion when deregulation was prompting accelerated financial sector activity, firms already located there risked losing their locational advantage as the center of gravity moved eastwards….Once the decision to reverse the previous conservationist attitudes had been made, the City's officers embarked on an active promotional effort. The planning director solicited advice

[10] This goes back to the ancient privileges of the medieval city and the leverage its tax revenues gave it in negotiating a high degree of independence and local control from the crown.

> from firms concerning their space needs and encouraged developers…to accommodate them…until the 1980s the City did not have a planning officer but only an architect who concerned himself with design approvals…new developable land was designated…and floor area ratios were modified to…permit an average of 25 percent expansion in the size of buildings." Fainstein (1994, page 40)

The planning system in the City is likely, therefore, to be responsive to the interests of commercial tenants and threats to local competitiveness. Such threats were visible by the early 1980s. By the time of the property market recovery of the second half of the 1980s, and despite the growth of the financial services sector, the City was already under threat from both Docklands and other financial centres (including satellite centres such as Reading in which more office space was constructed during the early 1980s than in the City itself) and its planning policies were becoming notably more relaxed. Its Unitary Plan, lodged in 1991 (City of London, 1991), but drawn up in the second half of the 1980s, identified as its first policy "To encourage office development in order to maintain and expand the role of the city as a leading international financial and business centre" (para. 3.19). By the end of the 1980s there were already large scale modern developments in the City, built to the highest international standards. Broadgate, for example, opened in 1991, provided 3 900 000 square feet (360 000 m^2) of new office space.

Moreover there was a radical change to the taxation of business property introduced in April 1990. Before then business property taxes (the business rates) had been set by local governments and - subject to standard procedures for 'rate equalisation' across the country - the revenues had accrued to local communities. There was concern in the then conservative government that anti-business, left wing local councils were boosting revenues and attempting to run re-distributive local policies funded by setting ever higher local business rates. This, it was thought, would hinder the long term competitiveness of British business. So in 1990 the UBR was introduced with national rate-setting and with revenues accruing to central government. There was one exception, however, the City Corporation (self-evidently not anti-business!) was allowed to add its own 'precept' to collect its own revenues. Thus from 1990 there has been a strong negative fiscal incentive for any local government in Britain, except the City of London, to permit any commercial development.

While the value of the regulatory tax in the City rose during the later 1980s as property values rose rapidly in the boom, it never reached the high of 1973. Indeed, in contrast to the rest of Britain, the regulatory tax estimate for the City has been on a downward trend since 1973. We can see from the evidence that is available for the Docklands that the regulatory regime was far less restrictive there, with an estimate of the regulatory tax never exceeding 4 – though that still represents a quasi-tax rate of 400 percent. The West End, where there is political control by residents and a negative fiscal incentive for development, a market which specialises in sectors other than financial services and with much stronger planning protection for conservation reasons with height restrictions which are impossible to breech (unlike in the City where, outside the conservation areas, employing a 'trophy architect' has been an emerging mechanism for building higher) has, in contrast, experienced a steady increase in estimated RT with its high value of 1973 exceeded in 2000 and with an estimated value of 7.9 over the past six years – almost twice that in the City.

The pattern outside the London locations is much as would be expected. The estimated RT was much lower until quite recently and in Newcastle in the 1970s was negative for a short time. In a representative, prosperous, satellite centre such as Reading (discussed in more detail in Section 7), which was a major recipient of the back office move from London from the late 1960s, the value of the regulatory tax was high during the late 1970s and early 1980s but fell back somewhat as the market expanded. By 2000 the local market was quite specialised in hi-tech companies and the value of the regulatory tax fell below 2 as the dot.com boom collapsed. It has been creeping up since 2002/2003. The absolute value varies in provincial centres, with Edinburgh, Birmingham and Leeds seemingly the most restrictive. But it has been tending to rise in all centres since the mid 1990s and has only been consistently below a value of 2 in Newcastle, in the relatively depressed North East.

All these numbers relate to our 'central' estimate but, of course, values of measures on alternative assumptions follow similar trends – just absolute values differ. Perhaps the salient fact is that even on the most conservative of all assumptions there is a significant estimated value for the regulatory tax in all locations for recent years. The lowest – Newcastle – has a value of more than 1.6 and most major provincial centres are around 2; London's West End has had an estimated value of between 4 and 9 since the early 1970s and has a current value of 8. These are estimated on the most conservative assumptions, so are lower bounds, and compare with a value not significantly different from zero for offices in Manhattan (Glaeser *et al* 2005). Moreover there may be a degree of endogeneity between construction costs and planning restrictiveness. In areas like the City or the West End developers may need an expensive design and a 'trophy architect' to get planning permission for buildings offering more rentable space per unit area of the site. In Newcastle, the local community may be so pleased that any developer wants to build that it is correspondingly easier to get permission and *de facto* the planning regime imposes a lower regulatory tax. This possible endogeneity will mean that our central estimate systematically tends to understate the value of the regulatory tax rather than overstate it, however, and this should be borne in mind in interpreting the alternative estimates and selecting the most plausible.

6 International Comparison of Regulatory Tax Values

In order to put the results for the British office markets into an international context, we also estimated RT values for a number of cities across Europe; Amsterdam, Barcelona, Brussels, Frankfurt, London City, London West End, Milan, Paris City, Paris La Défense and Stockholm. We use essentially the same methodology as described above but use different data sources (JLL instead of CBRE and Gardiner and Theobald instead of Davis Langdon) and have to make a number of additional adjustments – described in Appendix E – to compute comparable RT values.

We report RT values for two office markets – the City of London and London West End – that are also reported in our across-UK comparison above. This 'overlap' allows us to check whether our RT estimates for British office markets and continental European ones are comparable. There is a relatively small difference in estimated RT values (average of 1999 and 2005) for the two markets; 4.5 versus 4.9 for the City and 8.0 versus 9.0 for the West End. Overall the relatively small differences suggest that our RT estimates for the various continental European markets are quite comparable to our RT estimates for the British office markets.

When we compare our RT estimates for the various European office markets the first results that catches one's eye is the fact that the two London Markets top the 'league table' with the West End's RT estimate of 8.0 (the average of the RT estimates for 1999 and 2005) being more than twice as large as any other continental European city except Frankfurt with 4.4. Stockholm and Milan also appear to have comparatively high RT values with 3.8 and 3.1. This is consistent with anecdotic evidence for these markets. For example, Milan is a very tightly regulated city with strict height restrictions in place. Not surprisingly, edge cities have started to develop outside Milan; first Milano 2 and Milano 3 in the late 1960s and 1970s and now Milano Santa Giulia. The latter city is being built in a municipal district in the southeast part of the city between Rogoredo and Linate which has been derelict for some years. The city is being built on the area where the Montedison factories and a part of the Redaelli steel mills once stood. Local politicians there – not surprisingly – are happy to welcome new development projects. As in London, the estimated RT values in Paris differ quite substantially within the metro area; they are much higher in the 'historic' City of Paris with 3.0 compared to La Défense with 1.7. Finally, the city that we had expected to have the lowest RT is indeed at the bottom of the 'league table'. Belgium is well known to have a flexible land use regulation system which imposes little constraint on supply. In Brussels we estimate a commensurately low RT of 0.7, although this value is still much higher than that estimated by Glaeser *et al* (2005) for the office market of Manhattan.

Overall, the RT comparison for the 10 European office markets suggests (a) that the British office market is by orders of magnitude more supply constrained by regulation than most other office markets in Europe and (b) that European cities generally seem to be subjected to higher RT values than is found in the United States. Below, we turn again to the British office market in an attempt to explain the determinants of its restrictiveness.

7 Quantifying the Political Economy of Planning Restrictiveness

If the estimated value of the RT really represents a measure of the costs of regulatory restrictiveness – we should be able to model its determinants. As noted above, in areas where there is control of planning policy by local residents – overwhelmingly owner occupiers – we should expect a strong resistance to development. Not only are there short run costs to local residents from large scale construction but there are likely to be environmental costs and losses of amenity values. Benefits – in the form of more jobs or higher wages – are likely to accrue as much to non-residents as to residents given the small size of local government areas in the UK. In addition – at least since the introduction of the UBR in 1990 – there will be a powerful fiscal disincentive; and even before 1990, the impact on local budgets of business property development was probably unfavourable because of the high proportion of local revenues coming from central government and rate equalisation across local communities. The only incentive for local residents to allow the development of additional commercial real estate would presumably be fear of falling local economic prosperity. This is likely to be most plausibly formulated as fear of job loss and unemployment.

We should expect the City of London and Docklands to behave rather differently, however, since in these jurisdictions business interests control planning policy. In the case of the City, the planning authority is its unique local governing body, the Corporation of the City of London. This is an historic entity and it has been exempt from all the major reforms of local government in the modern era, in particular both from the Municipal Corporations Act of 1835 and the legislation in 1969 which abolished the 'business' vote. The City is, in effect, a Central Business District with a few thousand residents, so the business electorate (including land owners and property companies but dominated by financial and other businesses located in the City) controls the Corporation which is the planning authority for the area. Business voting power is weighted by the number of employees. The London Docklands Development Corporation (LDDC) was established in 1981 with the brief to regenerate the large – a total of 8.5 square miles - derelict port area immediately to the east of the City of London. The LDDC was responsible for all the major planning for the area until it was abolished in 1998 when planning responsibilities reverted to the local Boroughs of London. However, by then, the whole area had been transformed with the most notable development being Canary Wharf. In total 25 million square feet of office and industrial floor space had been developed.

Given, therefore, their different controlling interests we should expect these two planning authorities to be less restrictive of development, other things equal[11], and much more responsive to local economic conditions than resident-controlled planning authorities. For any given (change in the) level of local prosperity the business controlled LAs would be expected to relax their constraints on development substantially more than in the case of resident controlled communities. We might, furthermore, expect to observe a change in regulatory restrictiveness as a result of the introduction of the UBR in early 1990, with all other British office locations becoming more restrictive relative to the City of London.

The best measure of 'local economic prosperity' would seem to be the unemployment rate of residents. Not only is this the most immediately observable and widely reported measure but the fear of job insecurity seems likely to be a concern for voters, and thus an influence on local politicians. It has the additional advantage that it is measurable[12].

[11] But of course other things are not equal since the restrictions (in terms of plot ratios, for example) is more or less constant across locations but demand for space is not so a given restriction is more binding where demand is greater. This is reflected in the larger location fixed effects observed in the City (Table 5) than in other locations.

[12] Although with considerably more difficulty than might be imagined. There are two basic sources of data on unemployment in the UK: survey based data, conforming to ILO norms, available from 1973; and 'registration' data available since the early 20th Century. The problem is that the sample for the survey based data is too small to give reliable results for local planning authority jurisdictions; and the registration measure is highly sensitive to both the incentives to register and rules governing who is actually counted. As unemployment rose from the late 1970s politicians could not resist manipulating the unemployment figures (registration data is released very quickly and is what the media focus on) by frequently changing both the incentive to register and the rules governing who was counted. Every one of the more than 100 changes had the effect of reducing measured 'registered' unemployment. However we have used the method described in Appendix G to estimate a consistent survey equivalent measure for each community controlling planning policy in our 14 office locations.

Table 5 shows the results from our first specification, pooling all 480 observations and including both year and location fixed effects. We estimate the following:

$$RT_{jt} = \beta_0 + \beta_1 \times U_{jt} + \varepsilon_{jt} \tag{6}$$

$$RT_{jt} = \beta_0 + \beta_1 \times \left(U_{jt} \times D_B\right) + \beta_2 \times \left(U_{jt} \times D_R\right) + \varepsilon_{jt} \tag{7}$$

Where:

RT = estimated value of Regulatory Tax
U = estimated British Labour Force Survey-equivalent unemployment rate
D = dummies for $_B$, business controlled, and $_R$, resident controlled local government
$_{j,t}$ refer to the location and year

We show results for two separate versions of the specification stated in equation (7); in column 2 of Table 5 we use values of the local unemployment rate for the actual nearest equivalent areas for which data could be estimated. In column 3 we substitute the estimated unemployment rate for the whole Greater London area for the three office locations in central London, the City, Westminster and Docklands. The logic for this is that the workforces and businesses based in those locations operate over a wide area and draw their labour forces from the wider London region; moreover, particularly in the City, there are very few residents relative to employees. For the two suburban London office locations, Hammersmith and Croydon, we use the Borough unemployment rate in both models, Boroughs in London being the local planning authorities. More detail on how the unemployment rate time-series are created is given in Appendix G.

The results in Table 5 show a significant negative relationship between local unemployment and our measure of planning restrictiveness – the Regulatory Tax. Moreover, as expected, the estimated value of the parameter is much larger in the business controlled compared to the resident controlled locations: the estimated value of the coefficient is more than twice as great in absolute terms in the business controlled locations (in both specifications reported in columns 2 and 3 of Table 5) and an F-test shows that these values are significantly different in statistical terms. The results in column 3, using unemployment in the wider London area for the City, West End (Westminster) and Docklands are very similar to those in column 2, using local unemployment rates. Most location and year fixed effects are statistically significant. A White-test cannot reject the null-hypothesis of homoskedasticity, hence we report normal standard errors.

One problem with these results is that estimated values of RT become possible at different dates for different locations, with estimates for the first few years only being available for the City and the West End. That is, our sample is unbalanced. Thus the composition of the sample and the implicit weight of different locations within it changes over time. So the rest of the analysis, reported in Tables 6 to 9, is restricted to the 11 locations for which there is annual data on a continuous basis since 1973 (see Table 1 for a list of these 11 locations). Tables 6 and 7 report the results of fitting similar models but to this balanced sample of 363 observations, first without year fixed effects and, then, in Table 7, including both location and year fixed effects. As might be expected the results are significantly stronger, with the difference in the estimated coefficients for business as compared to resident controlled locations much larger and statistically different (at the 1 percent level).

Tables 8 and 9 now show the results of testing for the introduction of the UBR. As explained above, this change substantially increased the fiscal disincentive to permit development for all local communities except the City of London. The new basis for business property taxation came into force in April 1990, although it may have been partly anticipated. We chose the end of 1989 as the break point.[13] There are two obvious ways to test whether this made local communities become relatively more restrictive than the City. We can include a dummy for all markets except the City from the end of 1989. The results are reported in Table 8, again, first without a distinction for the impact of unemployment on the value of the RT in business controlled as opposed to resident controlled locations, and then, in columns 2 and 3, adjusting for the type of local control. Compared to previous models we now include an additional dummy for all locations after 1989, implicitly assuming the effect of the change in the fiscal incentive was uniform. The model continues to perform well but we now observe a significant across the board increase in estimated planning restrictiveness in all locations compared to the City of London and compared to before 1990.

The results reported in Table 9 permit the local response to vary across all locations. We see that the City appeared to become significantly less restrictive – as expected – while 6 out of 10 of the other locations became significantly more restrictive. For all other locations, except Reading, we find no significant change in RT from 1989. In Reading, however, we observe an apparently anomalous reduction in restrictiveness, significant at the 5 percent level. Reading is an unusual jurisdiction. It is about 60 kms to the west of London and a high speed train service opened up in 1976, with services taking only 22 minutes to the London terminus. This triggered its development as a satellite back office location producing a large demand shock relative to its then stock of office space. Prices and our estimate of the RT rose quickly in the second half of the 1970s. This expansion was initially supported by the local government. But during the 1980s the Trotskyite left, which strongly opposed office development, took political control. However, the recession of 1989-91 hit the local economy very hard and moderates regained control. Moreover in reaction to the perceived anti-business thrust of local government, the wider region within which Reading then lay – Berkshire in particular – teamed up with local business interests and the University to set up the Thames Valley Economic Partnership (TVEP) in 1991. The explicit intent of this was to make the local area more business friendly and to encourage business expansion. Perhaps it is the change in political control from radical left to moderate, and the lobbying activities of TVEP, which had some impact in reducing Reading's planning restrictiveness from 1990. The individual coefficient is estimating the post-1989 change in the RT. In most jurisdictions there were factors in addition to the introduction of the UBR that might have had an influence on planning restrictiveness and our estimates of RT. But in Reading it is plausible to believe that there were

[13] However, results do not change significantly if we choose one year earlier or one year later as break point.

factors (other than the UBR) which both increased the measure of the RT in the pre-1989 period and may have reduced it in the post-1989 period.

Overall, however, these results seem to provide strong support for the interpretations offered and reinforce our confidence in the RT as a reasonable measure of the impact of planning restrictiveness on the costs of office space. The effects of political control seem to have the expected impacts as do fiscal (dis)incentives for local communities to permit development. Moreover, as is discussed in the conclusions, there is evidence that markets do get their revenge.

8 Conclusions

The Regulatory Tax measure of the gross costs of land use regulations for occupiers of property seems to be a useful one. Although it will not reflect certain forms of regulatory constraint, such as heavy compliance costs or costs associated with delays and is, therefore, a lower bound measure, the ease with which it can be estimated is a very substantial advantage. In this paper we provide the first estimates for commercial office buildings in British cities and compare these with estimates for a range of continental cities. Despite using different data sources the results seem to be very comparable. Moreover where we can get values for British locations using the alternative data sources again the values seem consistent. The conclusion is that supply in the British office market, like the British residential sector, is highly constrained by regulation and this costs business occupiers a substantial amount. It is, in effect, a tax on office users. Unless space is perfectly substitutable in production, therefore, there will be further costs in terms of output and employment.

We argue that such a level of regulatory restriction – an order of magnitude greater than observed in the most restricted sector, in the most restricted markets in the US – is to be expected given the aims of British planning policy, the form of its instruments, the fragmented geographical scale of decision making (which internalises costs associated with development but not benefits), and the fiscal disincentive to local communities to allow commercial development. In this context we would expect differences in regulatory constraints between those authorities controlled by business interests compared to those controlled by residents. We are fortunate that the historical anomaly of the City of London – controlled by business interests since the middle ages and exempt from all the major reforms of local government of the modern age, allows us to test this proposition. We find strong evidence that business control makes a significant difference to the tightness of regulatory constraints on office building and on the reaction of restrictiveness to local economic prosperity measured by the unemployment rate.

It is also possible to test the hypothesis that regulatory restriction responds to fiscal incentives and that, in particular, changes in the incentives to allow commercial development resulting from the introduction of the UBR early in 1990, led to even more restrictive land use regulation. This, again, is because the City of London was in large measure, protected from the change and continued to be able to levy its own rate on business property. Again we find strong evidence that the elimination of any fiscal incentive to permit commercial development was associated with an increase in the value of the RT outside the City of London. By further restricting the supply of office space costs were increased.

Together these findings support our confidence that the RT measure is really capturing – or at least closely correlated with – the gross costs imposed by land use regulation.

One of the interesting speculations this prompts is about unintended consequences. As discussed above, the 1980s Conservative government perceived left wing local authorities as engaged in a concerted effort to frustrate its efforts to increase incentives, privatise state industries, sell off social housing and reduce the total tax take. To finance these efforts to offset the adverse and regressive impact central government actions were perceived as having, local government was (perceived to be) increasing their tax revenues from the business rate, perhaps as part of a punitive anti-business crusade. Central government's response was to introduce the UBR. This removed control of business property taxes from local communities, effectively turning business property taxes into a national tax. It managed, therefore, to eliminate all tax revenue gains to local communities from commercial real estate development although local governments continued to have a legal obligation to provide services to local businesses. So it produced a powerful fiscal disincentive for local communities to permit any commercial development.

Over time, our results suggest, this has restricted the supply of offices and pushed up the value of the Regulatory Tax. The increase in business costs this represents may more than offset any costs that might realistically have been imposed by old-style left wing councils raising money from local property taxes; especially given the demise of old-style left wing councils that occurred between 1989 and the present.

Indeed, we can quantify this effect because of the fortunate fact that the City of London alone was given a partial exemption from the UBR. Table 10 shows some indicative numbers. We choose an office of 1,500 m^2 – enough to accommodate a medium size firm with 200 employees. In the London Borough of Camden in 2005, such a building had a rateable value of £112,250[14] so, with the rate multiple set at 42.6p, that meant the occupants would be paying a UBR of £47, 819 a year. If the RT increased in Camden to the average extent it did across the rest of the country, then the implied increase in its annualised cost was £76,360. Moving to a UBR, to avoid local communities levying extortionate taxes on business, seems likely to have resulted indirectly in a larger financial burden by way of the RT, than the total cost of business rates themselves.

[14] 7/8 Greenland Place, London, NW1 0AP.

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Tables

TABLE 1
Investigated UK Office Markets and Data Availability

Office Market	Years with Available Data	14 Market Sample (Unbalanced)	11 Market Sample (Balanced)
City of London	1961-2005	Yes	Yes
London West End	1961-2005	Yes	Yes
London Docklands (Canary Wharf Tower)	*1998*-2005	Yes	No
London Hammersmith (Inner Suburban London)	*1991*-2005	Yes	No
Manchester (North West)	1973-2005	Yes	Yes
Newcastle (Upon Tyne)	1965-2005	Yes	Yes
Croydon (Outer Suburban London)	1965-2005	Yes	Yes
Edinburgh (Scotland)	1965-2005	Yes	Yes
Glasgow (Scotland)	1965-2005	Yes	Yes
Maidenhead (South East)	*1984*-2005	Yes	No
Reading (South East)	1965-2005	Yes	Yes
Bristol (South West)	1973-2005	Yes	Yes
Birmingham (West Midlands)	1965-2005	Yes	Yes
Leeds (Yorkshire and Humberside)	1973-2005	Yes	Yes

TABLE 2
Summary Statistics: Regulatory Tax relative to Marginal Construction Cost

Variable: Ratio: Regulatory Tax / MCC	Obs	Mean	Std. Dev.	Min	Max
Specification:					
Based on prime rent (*no adjustment*)	480	3.70	2.92	0.13	22.06
Prime rent *partially adjusted* for rent-free periods	480	3.03	2.66	-0.05	19.81
Prime rent *fully adjusted* for rent-free periods and vacancy rates (**central estimate**)	480	2.64	2.37	-0.14	17.55
Upper bound: Assume 10% premium for top floor plus 50% of fully adjusted total occupation cost markup	480	3.88	3.10	0.15	23.95
Based on fully adjusted prime rent plus 10% premium for top floor	480	3.01	2.60	-0.05	19.41
Lower bound: As central estimate but assume 0.5 percentage point higher yield	480	2.37	2.15	-0.18	15.78

Data Sources: CBRE (prime rent, yield and total occupation cost information), Davis Langdon (marginal construction cost information), IPD (national void rate index) and ODPM (regional vacancy rates).

TABLE 3
Summary Statistics: Relative Regulatory Tax over Time (1961-2005)
(Central Estimate)

Year	Obs	Mean	Std. Dev.	Min	Max
1961	*2*	*2.93*	*0.33*	*2.70*	*3.16*
1962	*2*	*3.07*	*0.12*	*2.98*	*3.15*
1963	*2*	*3.13*	*0.24*	*2.96*	*3.31*
1964	*2*	*2.99*	*0.20*	*2.85*	*3.13*
1965	*8*	*1.68*	*1.04*	*0.42*	*2.96*
1966	*8*	*1.85*	*1.13*	*0.53*	*3.37*
1967	*8*	*2.02*	*1.24*	*0.64*	*3.83*
1968	*8*	*2.36*	*1.63*	*0.73*	*4.97*
1969	*8*	*2.69*	*2.33*	*0.71*	*7.27*
1970	*8*	*2.69*	*3.22*	*0.39*	*9.98*
1971	*8*	*2.88*	*3.42*	*0.37*	*9.99*
1972	*8*	*2.58*	*3.36*	*0.20*	*9.63*
1973	11	4.01	5.08	0.62	17.55
1974	11	2.86	4.49	0.00	15.57
1975	11	1.87	1.81	0.14	6.37
1976	11	2.43	1.53	0.80	5.36
1977	11	2.86	2.29	1.06	7.38
1978	11	3.00	2.30	1.14	7.65
1979	11	3.13	2.64	1.12	8.70
1980	11	2.06	2.24	0.27	7.12
1981	11	2.42	2.42	0.34	8.08
1982	11	2.34	2.45	0.36	8.51
1983	11	2.16	2.37	0.16	8.13
1984	12	2.08	2.19	-0.07	7.85
1985	12	2.18	2.32	-0.07	8.13
1986	12	2.20	2.54	-0.11	8.90
1987	12	2.61	3.79	-0.12	13.35
1988	12	2.73	3.66	-0.14	11.79
1989	12	3.10	3.36	0.20	11.36
1990	12	2.95	2.88	0.42	9.27
1991	13	2.61	1.97	0.60	7.61
1992	13	2.24	1.32	0.54	5.46
1993	13	1.91	1.03	0.46	4.60
1994	13	2.63	1.35	0.78	6.02
1995	13	2.96	1.65	0.99	7.13
1996	13	3.24	1.91	1.12	7.99
1997	13	3.30	2.14	1.10	8.46
1998	14	3.23	2.15	1.02	8.58
1999	14	3.21	2.16	1.06	9.18
2000	14	3.45	2.41	1.10	10.22
2001	14	3.09	2.17	0.86	8.73
2002	14	2.56	1.64	0.81	6.90
2003	14	2.07	1.26	0.63	5.69
2004	14	2.17	1.53	0.67	7.05
2005	14	2.63	1.91	0.99	8.89

TABLE 4
Estimates of Regulatory Tax for Selected European Cities

	Estimated Regulatory Tax		
City	1999	2005	Average
London West End	7.62	8.37	8.00
London City	4.68	4.31	4.49
Frankfurt	5.44	3.31	4.37
Stockholm	4.28	3.30	3.79
Milan	2.07	4.11	3.09
Paris: City	2.35	3.75	3.05
Barcelona	2.23	3.16	2.69
Amsterdam	2.12	1.92	2.02
Paris: La Defense	1.41	1.93	1.67
Brussels	0.52	0.84	0.68

Notes: Estimates are based on data provided by Jones Lang LaSalle (JLL) Investment Management (capital value data) and Gardiner and Theobald (construction cost data). The data from JLL are hypothetical capital values based on mid-point yields and prime rent information. The provided values assume that buildings are permanently renewed (so called Peter-Pan buildings). We adjusted the value by a scaling factor to predict actual capital values. The scaling factor is derived by using prime rent, prime yield, vacancy rate and rent-free period information from CBRE. The computation method for the scaling factor is described in more detail in Appendix E. The estimated scaling factor is 0.697. That is, actual capital value = 0.697 * capital value based on the assumption that the building is permanently renewed and ignoring rent-free periods and vacancy rates. The average construction cost estimates from Gardiner and Theobald are adjusted by another scaling factor to get marginal construction costs. The scaling factor is derived by using marginal construction cost information from Davis Langdon. The estimated scaling factor is 0.827. That is, the marginal construction cost of an additional hypothetical floor (excluding fixed cost) = 0.827 * average construction cost (including fixed cost). The computation method for the scaling factor is described in more detail Appendix E.

TABLE 5
Explaining the Regulatory Tax—*Unbalanced Sample with Year Fixed Effects*
(Fixed Effects Model, 1961-2005, all Locations)

	Dependent Variable: Regulatory Tax		
Explanatory Variable	(1)	(2)	(3)
Unemployment rate in local office market	-14.989 (3.599)***		
Unemployment rate (measure 1) * business controlled (b_{B1})		-29.646 (5.274)***	
Unemployment rate (measure 1) * resident controlled (b_{R1})		-12.392 (3.612)***	
Unemployment rate (measure 2) * business controlled (b_{B2})			-29.223 (5.301)***
Unemployment rate (measure 2) * resident controlled (b_{R2})			-12.121 (3.752)***
City of London	6.407 (0.267)***	7.520 (0.396)***	7.516 (0.399)***
London West End	5.500 (0.267)***	5.596 (0.264)***	5.601 (0.265)***
London Docklands (Canary Wharf)	2.561 (0.467)***	3.928 (0.586)***	3.931 (0.587)***
London Hammersmith (Inner Suburban London)	1.523 (0.362)***	1.451 (0.357)***	1.548 (0.360)***
Manchester (North West)	0.504 (0.289)*	0.537 (0.284)*	0.547 (0.285)*
Croydon (Outer Suburban London)	0.326 (0.269)	0.380 (0.266)	0.235 (0.284)
Edinburgh (Scotland)	1.086 (0.278)***	1.158 (0.274)***	1.166 (0.276)***
Glasgow (Scotland)	0.960 (0.259)***	0.953 (0.255)***	0.952 (0.256)***
Maidenhead (South East)	1.138 (0.386)***	1.242 (0.381)***	1.267 (0.385)***
Reading (South East)	1.332 (0.317)***	1.464 (0.314)***	1.477 (0.319)***
Bristol (South West)	0.151 (0.310)	0.224 (0.306)	0.239 (0.308)
Birmingham (West Midlands)	1.062 (0.262)***	1.088 (0.258)***	1.091 (0.258)***
Leeds (Yorkshire and Humberside)	0.513 (0.298)*	0.566 (0.294)*	0.579 (0.296)*
Year Fixed Effects	*Yes*	*Yes*	*Yes*
Constant	-2.922 (0.865)***	-3.485 (0.865)***	-3.488 (0.867)***
Observations	480	480	480
Number of locations (unbalanced)	14	14	14
R-squared: within	0.32	0.34	0.34
between	0.081	0.32	0.33
overall	0.033	0.0014	0.0020

Notes: Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%. F-tests reject null-hypotheses b_{B1}=b_{R1} and b_{B2}=b_{R2} with 99 percent confidence. White-tests cannot reject the null-hypothesis of homoskedasticity.

TABLE 6
Explaining the Regulatory Tax—*Balanced Sample without Year Fixed Effects*
(Fixed Effects Model, 1973-2005, 11 markets)

	Dependent Variable: Regulatory Tax		
Explanatory Variable	(1)	(2)	(3)
Unemployment rate in local office market	-8.828 (1.957)***		
Unemployment rate (measure 1) * business controlled (b_{B1})		-44.691 (6.153)***	
Unemployment rate (measure 1) * resident controlled (b_{R1})		-5.209 (1.954)***	
Unemployment rate (measure 2) * business controlled (b_{B2})			-44.691 (6.154)***
Unemployment rate (measure 2) * resident controlled (b_{R2})			-5.286 (1.990)***
Location Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	No	No	No
Constant	3.327 (0.159)***	3.335 (0.151)***	3.333 (0.151)***
Observations	363	363	363
Number of locations (balanced)	11	11	11
R-squared: within	0.055	0.15	0.15
between	0.0040	0.48	0.48
overall	0.017	0.19	0.19

Notes: Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%. F-tests reject null-hypotheses $b_{B1}=b_{R1}$ and $b_{B2}=b_{R2}$ with 99 percent confidence. White-tests cannot reject the null-hypothesis of homoskedasticity.

TABLE 7
Explaining the Regulatory Tax—*Balanced Sample with Year Fixed Effects*
(Fixed Effects Model, 1973-2005, 11 markets)

	Dependent Variable: Regulatory Tax		
Explanatory Variable	(1)	(2)	(1)
Unemployment rate in local office market	-16.980 (3.997)***		
Unemployment rate (measure 1) * business controlled (b_{B1})		-53.896 (6.596)***	
Unemployment rate (measure 1) * resident controlled (b_{R1})		-11.289 (3.834)***	
Unemployment rate (measure 2) * business controlled (b_{B2})			-53.610 (6.611)***
Unemployment rate (measure 2) * resident controlled (b_{R2})			-11.196 (3.994)***
Location Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Constant	4.384 (0.376)***	4.303 (0.352)***	4.299 (0.353)***
Observations	363	363	363
Number of locations (balanced)	11	11	11
R-squared: within	0.20	0.30	0.30
between	0.0040	0.45	0.46
overall	0.052	0.095	0.099

Notes: Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%. F-tests reject null-hypotheses $b_{B1}=b_{R1}$ and $b_{B2}=b_{R2}$ with 99 percent confidence. White-tests cannot reject the null-hypothesis of homoskedasticity.

TABLE 8
Explaining the Regulatory Tax—*Balanced Sample with Post 1989 Dummy*
(Fixed Effects Model, 1973-2005, 11 markets)

	Dependent Variable: Regulatory Tax		
Explanatory Variable	(1)	(2)	(3)
Unemployment rate in local office market	-8.654 (1.901)***		
Unemployment rate (measure 1) * business controlled (b_{B1})		-44.691 (5.951)***	
Unemployment rate (measure 1) * resident controlled (b_{R1})		-5.017 (1.891)***	
Unemployment rate (measure 2) * business controlled (b_{B2})			-44.691 (5.956)***
Unemployment rate (measure 2) * resident controlled (b_{R2})			-4.930 (1.928)**
Dummy variable: Post 1989, all markets except City of London	0.635 (0.135)***	0.640 (0.128)***	0.634 (0.128)***
Location Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	No	No	No
Constant	3.034 (0.166)***	3.041 (0.158)***	3.030 (0.158)***
Observations	363	363	363
Number of locations (balanced)	11	11	11
R-squared: within	0.11	0.20	0.20
between	0.095	0.48	0.49
overall	0.0030	0.16	0.16

Notes: Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%. F-tests reject null-hypotheses $b_{B1}=b_{R1}$ and $b_{B2}=b_{R2}$ with 99 percent confidence. White-tests cannot reject the null-hypothesis of homoskedasticity.

TABLE 9
Explaining the Regulatory Tax—*Location Specific Post 1989 Dummies*
(Fixed Effects Model, 1973-2005, balanced sample, 11 markets)

	Dependent Variable: Regulatory Tax		
Explanatory Variable	(1)	(2)	(3)
Unemployment rate in local office market	-5.936 (1.738)***		
Unemployment rate (measure 1) * business controlled (b_{B1})		-13.497 (6.728)**	
Unemployment rate (measure 1) * resident controlled (b_{R1})		-5.396 (1.798)***	
Unemployment rate (measure 2) * business controlled (b_{B2})			-13.497 (6.727)**
Unemployment rate (measure 2) * resident controlled (b_{R2})			-5.478 (1.817)***
City of London * Post 1989	-3.774 (0.368)***	-3.461 (0.456)***	-3.461 (0.456)***
London West End * Post 1989	1.739 (0.368)***	1.717 (0.369)***	1.720 (0.369)***
Manchester * Post 1989	1.354 (0.362)***	1.360 (0.362)***	1.359 (0.362)***
Newcastle * Post 1989	0.334 (0.365)	0.351 (0.365)	0.348 (0.365)
Croydon * Post 1989	-0.103 (0.368)	-0.126 (0.369)	-0.182 (0.365)
Edinburgh * Post 1989	0.991 (0.362)***	0.999 (0.362)***	0.998 (0.362)***
Glasgow * Post 1989	0.382 (0.363)	0.393 (0.363)	0.391 (0.363)
Reading * Post 1989	-0.877 (0.361)**	-0.874 (0.361)**	-0.874 (0.361)**
Bristol * Post 1989	0.615 (0.361)*	0.617 (0.361)*	0.617 (0.361)*
Birmingham * Post 1989	1.151 (0.361)***	1.153 (0.361)***	1.152 (0.361)***
Leeds * Post 1989	0.796 (0.361)**	0.800 (0.361)**	0.799 (0.361)**
Location Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	No	No	No
Constant	2.998 (0.147)***	3.001 (0.147)***	3.001 (0.147)***
Observations	363	363	363
Number of locations (balanced)	11	11	11
R-squared: within	0.38	0.38	0.38
between	0.22	0.27	0.28
overall	0.0016	0.012	0.013

Notes: Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%. F-tests reject null-hypotheses b_{B1}=b_{R1} and b_{B2}=b_{R2} with 75 percent confidence. White-tests cannot reject the null-hypothesis of homoskedasticity.

TABLE 10
Quantitative Effect of Introduction of Uniform Business Rate in 1990 on a Medium Size Office Firm with 1500m^2 Space Usage

	Change in Annual Occupation Cost	
Office Market	in 1989 £	in 2005 £
London West End	58928	89097
Manchester	47911	72440
Newcastle	56074	84783
Croydon	61854	93522
Edinburgh	35982	54404
Glasgow	37572	56808
Reading	46544	70374
Bristol	44848	67809
Birmingham	41078	62109
Leeds	41360	62535
Average (all markets)	50503	76360

Notes: A floor plan of 1500 m^2 is typically considered sufficient for up to 200 employees. The values are calculated by using the coefficient on the dummy variable ‘Post 1989, all markets except City of London’ reported in Table 8. Market specific estimated regulatory tax rates and marginal construction cost estimates from Davis Langdon are used for 1989 to compute the capitalized value of the effect of the introduction of the Uniform Business Rate in 1990. Market specific yields from CBRE for 1989 are used to compute annualised values.

Appendix

Appendix A: Detailed Description of Methodology to Derive Marginal Construction Cost

We obtained construction cost data from Davis Langdon. The time-series data contains information for all 14 prime office markets and for time periods between 1961 and 2005. The marginal construction costs are derived from a number of past development projects in each of the last five decades (including the 2000s). These projects include a number of London and non-London urban office buildings. The office development projects in London include: P&O, Euston Square (in the 1960s and 1970s), New Bridge St., Appold St. (in the 1980s) and 60 Queen Victoria, Greycoat, Premier Place, 140 Aldersgate, 280 Bishopsgate (in the 1990s and 2000s). In addition to these projects, Davis Langdon used their '1994 Cost Model' and their '2004 Cost Model' to derive marginal construction cost for the period 1990 to 2005 as appropriately as possible. The non-London urban development projects include office buildings in Hampshire, Cheshunt, Croydon, Manchester, Birmingham (2 projects) (in the 1960s), Oxford, Bracknell, Halesowen, Warrington, Romford (in the 1970s), Hemel Hempstead and Manchester (in the 1980s) and Cardiff, Harlow and Egham (in the 1990s).[15]

The marginal construction costs (per square meter of office space) were calculated for a hypothetical additional top floor on those buildings using standard industry value assumptions. The cost elements are listed in Appendix Table A-1 below.

Appendix Table A-1: Cost Elements

1 Substucture	3C Ceiling Finishes	5L Communication Installations
Superstructure	**4 F&F Services**	5M Special Installations
2A Frame	5A Sanitary Appliances	5N BWIC
2B Upper Floors	5B Services Equipment	5O Builders Profit
2C Roof	5C Disposal Installations	**External Works**
2D Stairs	5D Water Installations	6A Site Works
2E External Walls	5E Heat Source	6B Drainage
2F External Windows & Doors	5F Space Heating	6C External Services
2G Internal Walls	5G Ventilating Systems	6D External Works
2H Internal Doors	5H Electrical Installations	7 Prelims
Internal Finishes	5I Gas Installations	8 Contingencies
3A Wall Finishes	5J Lift Installation	
3B Floor Finishes	5K Protective Installation	

Based on the above information, Davis Langdon produced various estimating models for (a) London office buildings and (b) non-London office buildings and for the various time periods (i.e., (a1) 1960s and 1970s, (a2) 1980s, (a3) 1990s and 2000s;

[15] We also obtained marginal construction cost data from Davis Langdon for a number of business park projects. These projects include: Imperium, Newbury, Wandsworth, Plympton, Plymouth, Powergen, Addison (in the early 1990s) and Oxford, Solent, Admirals Park, B1 Block, RSPCA, Solihull (in the late 1990s). To date we have not used this information in our empirical analysis. However, we may use the data in a subsequent analysis to investigate to what extent construction costs themselves may be influenced by regulation and may further increase our estimates of the 'regulatory tax'.

(b1) 1960s, (b2) 1970s, (b3) 1980s and (b4) 1990s). Since there was no estimating model available for non-London office buildings for the years between 2000 and 2005, we used the model for the 1990s.

Finally, the annual construction cost numbers can be derived by using the above estimating models and applying Davis Langdon's total building cost location factors (for each of the 14 markets; with outer London having a factor of 1) as well as tender price indices between 1961 and 2005. It should be noted that the location factors were only available for 1975, 1980, 1985, 1990, 1995, 2000 and 2005. No location factors were available prior to 1975, however, the location factors vary relatively little over time and hence the location factors for 1975 are used for years prior to 1975. For years with missing location factor information, linear trends are assumed.

Appendix B: Imputing Missing Values for Rent-Free Periods

We obtained *rent-free period data* from CBRE for two markets (the City of London and London's West End) for the years 1993 to 2006. For the remaining years and for the other markets we needed to impute the variable.

A first plot of the data reveals that the rent-free periods at any point in time are not only surprisingly different between the City of London and the West End but their dynamic and their correlation with trends in rents also differ considerably. The negative correlation between the deviation of the observed rent from the trend on the one hand and the rent-free period on the other hand is extremely strong and statistically highly significant for the City (-0.87) but quite low and not statistically significant for the West End (-0.05).[16] These stylized facts are consistent with our observation that the City office market specializes in the financial service sector, which is strongly exposed to general market developments, while the West End specialises in sectors that are more protected from general market trends (e.g. the media, business and legal services) or that may even have anti-cyclical demand for office space (e.g. lobbyists).

We acknowledge this difference between the two markets and impute the rent-free periods for the missing years of those two markets using two different estimating equations. The rent-free periods in the City of London for years with missing observations are estimated as follows:

$$\textit{Rent Free Period}_t = \beta_0 + \beta_1 \times \left(\textit{Deviation Trend-Rent}_t\right) + \varepsilon \qquad \text{(A1)}$$

The adjusted R^2 is 0.73.

In order to estimate rent-free periods in the West End we estimate a different equation that provides a better fit than equation (A1). The estimating equation is as follows:

$$\textit{Rent Free Period}_t = \beta_0 + \beta_1 \times \left(\textit{Annual Growth in Rent}_t\right) + \varepsilon \qquad \text{(A2)}$$

[16] The idea here is that if demand for office space is high (markets are overheating and rents are above the long-term growth path), tenant incentives such as rent-free periods will be quite low. On the other hand, if demand for office space is low (markets are in a declining or bust phase and rents are therefore below trend) then developers will tend to offer generous incentives (high rent free periods) to attract tenants.

The adjusted R^2 is merely .087 but within-sample predictions are all in a reasonably narrow band of +/- 5 months, with the majority of predictions being within a band of +/- 2 months.

Finally, for the remaining 12 markets without any rent-free period data we use the following equation that is estimated using all available observations with rent-free periods (i.e., the City and the West End):

$$\begin{aligned} \text{Rent Free Period}_{jt} = {} & \beta_0 + \beta_1 \times \left(\text{Deviation Trend-Rent}_{jt}\right) \\ & + \text{Dummy West End} + \text{Year Dummies} + \varepsilon \end{aligned} \tag{A3}$$

The adjusted R^2 is 0.22. Within sample predictions (for the City and West End) suggest that the estimated values may be reasonably good approximations of observed rent-free periods.

The existing imputation method for rent-free periods is merely a first attempt to reliable estimate rent-free periods and is subject to further enhancement. However, as a further sensitivity analysis reveals, our results are quite robust towards measurement errors in rent-free periods. Even if we assume the maximum rent-free period ever observed in the City and in the West End (2.8 years) we still end up with substantial estimated values of the regulatory tax as a percent of marginal construction costs.

Appendix C: Imputing Missing Values for Vacancy Rates

We obtained vacancy rate data for relatively short time-series (from 1999 to 2004) for various U.K. regions (East Midlands, East of England, London, North East, North West, South, East, South West, West Midland, Yorkshire & the Humberside) from the ODPM. We first geographically match our 14 local markets to those regions. Next we use national void-rent data from IPD (from 1994 to 2004) to impute vacancy rates back until 1994 by assuming that regional vacancy rates moved with the national trend between 1994 and 1998. We then impute the vacancy rates for remaining missing observations using the following estimating equation for all 14 markets:

$$\begin{aligned} \text{Vacancy rate}_{jt} = {} & \beta_0 + \beta_1 \times \left(\text{Deviation Trend-Rent}_{jt}\right) \\ & + \text{Location Dummies} + \text{Year Dummies} + \varepsilon \end{aligned} \tag{A4}$$

The adjusted R^2 is 0.82. For more than 80 percent of the in-sample observations, the measurement error lies well within +/- 1 percentage point; the maximum error is roughly +/- 2 percent points.

Appendix D: Imputing Missing Values for Yields

Finally, we also attempted to impute equivalent yields for years prior to 1973. We obtained equivalent yield data from CBRE for all our 14 markets, typically from 1973 until 2005. Similarly to the above imputation method, we estimate the equivalent yields as a function of the deviation of rents from the trend, location and year fixed effects. The R^2 is 0.62. The predicted values imply that yields were higher in the 1960s and decreased notably around 1973 but this may be a result of a misspecified estimating equation. Hence, we are, at this point at least, very cautious interpreting results prior to 1973. In future research we intend to either collect information on prices of office space (should such data be available) or to collect information on property yields prior to 1972 (we obtained yield information for 1972 from Hillier

Parker's 'Investors Chronicle – Hillier Parker Rent Index'), or, should that not be feasible, to improve our preliminary method for imputing equivalent yields. One promising direction is to include interest rates and perhaps other macro-variables as further explanatory variables in addition to the deviation of rents from the trend and location dummies. We also intend to experiment with lagged explanatory variables and to do some more elaborate in-sample and out-of-sample testing. For now, however, our results prior to 1973 have to be interpreted with considerable caution, especially since variations in yields are more influential drivers of regulatory tax estimates than are plausible variations in rent free periods or voids.

Appendix E: Methodology Used to Compute Regulatory Tax Values for Continental European Cities

We use prime annual rent data and mid-point yield data from JLL for 10 office locations across Europe (including the City of London and London West End) to compute the 'hypothetical' capital value per m^2 of a so called 'Peter Pan building', that is, a building that is constantly renewed. We adjust the value by a scaling factor θ_1 that is derived as follows:

$$\theta_1 = \frac{\sum_{j=1}^{6} \sum_{t=1999}^{2005} \frac{V_{jt}^{CBRE,central}}{V_{jt}^{JLL,Peter\ Pan}}}{6 \times 7} = 0.679 \qquad \text{(E1)}$$

where $V_{jt}^{JLL,Peter\text{-}Pan}$ is the hypothetical capital value per m^2 of a 'Peter Pan building' in office market *j* in year *t* based on data from JLL and where $V_{jt}^{CBRE,central}$ is the estimated actual value of a prime office building in market *j* in year *t* based on data from CBRE (adjusting for rent-free periods and vacancy rates). The office markets include the City of London, London West End, Birmingham, Edinburgh, Leeds and Manchester. These are all the markets for which we have overlapping data from CBRE and JLL.

The hypothetical actual property value $V_{jt}^{JLL,actual}$ for market *j* in year *t* based on JLL data can be calculated as follows:

$$V_{jt}^{JLL,actual} = \theta_1 \times V_{jt}^{JLL,Peter\ Pan}. \qquad \text{(E2)}$$

We use average construction cost data from Gardiner and Theobald's (2006) publication 'International Construction Cost Survey'. We use another scaling factor θ_2 to get from *average* to *marginal* construction cost. The scaling factor is computed as follows:

$$\theta_2 = \frac{\sum_{j=1}^{2} \sum_{t=1999}^{2005} \frac{MCC_{jt}^{DL}}{ACC_{jt}^{GT}}}{2 \times 7} = 0.827 \qquad \text{(E3)}$$

where MCC_{jt}^{DL} is the marginal construction cost per m^2 provided by Davis Langdon per m^2 (for market j and year t) and where ACC_{jt}^{GT} is the average construction cost per m^2 provided by Gardiner and Theobald (2006). The value ACC_{jt}^{GT} is the average of a low and a high estimate of average construction costs in a city centre air conditioned office building. The office markets that are used to calculate the adjustment factor θ_2 are the City of London and London West End; this is because Gardiner and Theobald' survey only provides construction cost data for London but not for the other UK office markets.

The hypothetical *marginal* construction cost MCC_{jt}^{GT} for market j in year t based on Gardiner and Theobald data can be calculated as follows:

$$MCC_{jt}^{GT} = \theta_2 \times ACC_{jt}^{GT} . \qquad \text{(E4)}$$

Appendix F: Regulatory Tax Estimates for 14 British Office Markets over Time

Figures G1-G4 illustrate our estimated regulatory tax rates for our 14 British office markets over time. The four figures combine markets with relative geographical proximity (i.e., London office markets, South East office markets, Midlands and North office markets, and Scottish office markets). Note that the RT scales (y-axis) of the four figures are different, reflecting the regional differences in the magnitude of RT.

Figure F1: Regulatory Tax (Central Estimate)
London Office Markets

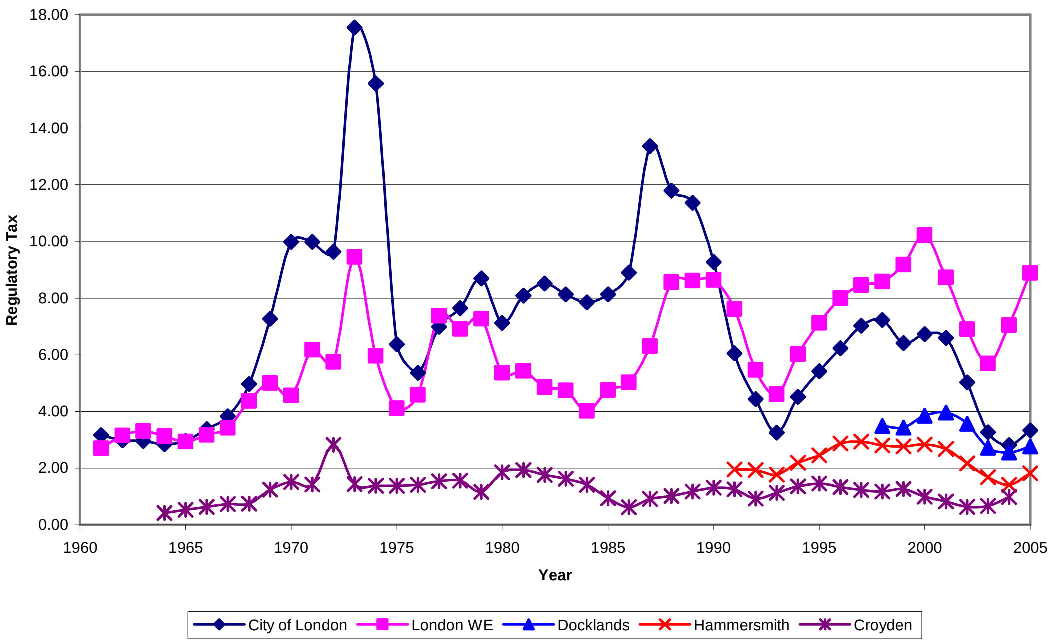


Figure F2: Regulatory Tax (Central Estimate)
South East Office Markets

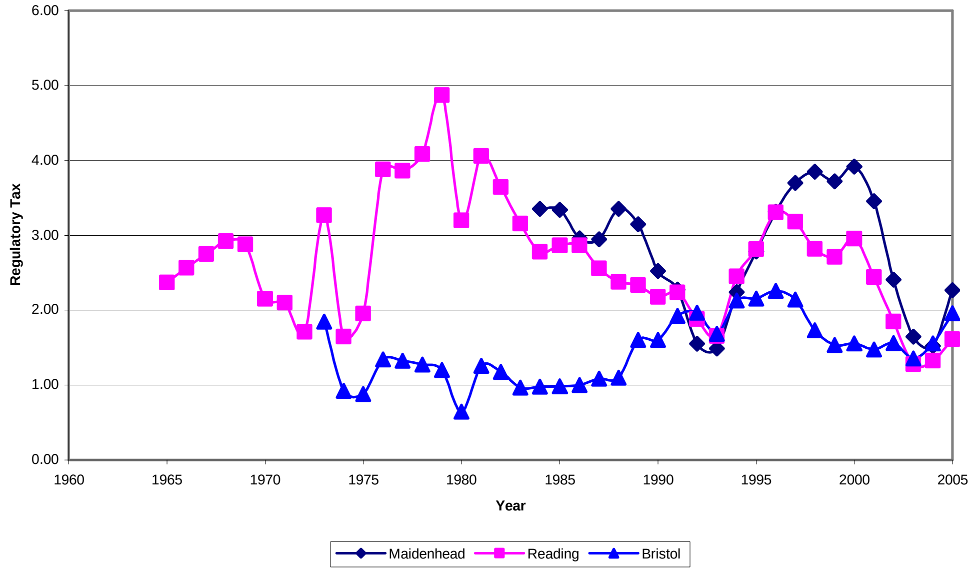
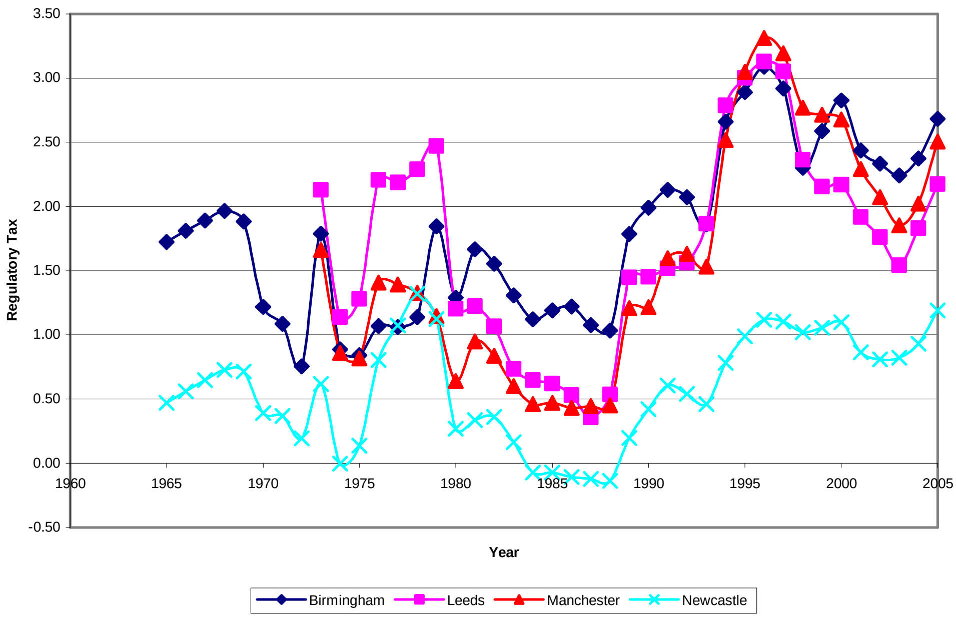
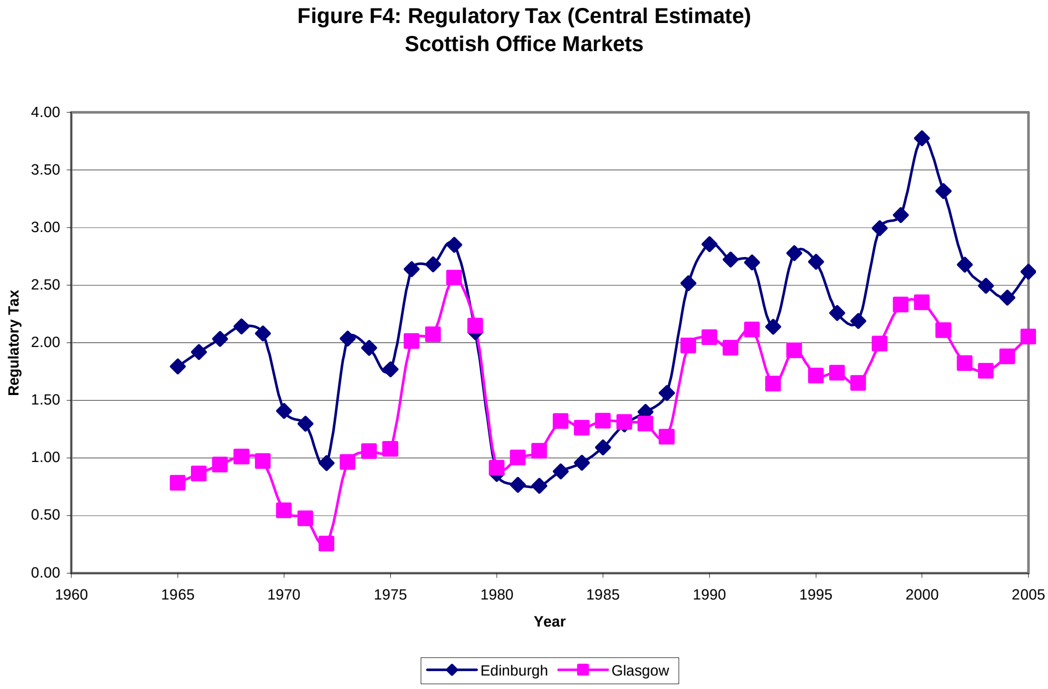


Figure F3: Regulatory Tax (Central Estimate)
Midlands and North Office Markets





Appendix G: Data Sources and Methodology Used to Calculate Unemployment Rate Time-Series

We use unemployment data from three major sources; Eurostat, Labour Gazette and Nomis. We describe the precise data sources and the methodology used to compute comparable unemployment rate time-series over time below.

(1) Data Sources

(a) Eurostat

Eurostat United Kingdom regional data for Southeast, Southwest, North/Northeast, Northwest, West Midlands, Yorkshire and Humberside, and Scotland between 1973-1996 collected from "Regional Statistics" 1973, 1975, 1977, 1979; continued by "Yearbook of Regional Statistics" 1983, 1984, 1985; continued by "Regions: Statistical Yearbook" 1986-1997. All three published by the office for official publications of the European communities, Luxembourg. 1999-2004 collected from the Eurostat homepage; http://epp.eurostat.ec.europa.eu.

(b) Labour Gazette

Unemployment rates for the regions of Southeast, Southwest, North/Northeast, Northwest, West Midlands, Yorkshire and Humberside, Scotland, and local authority areas of Birmingham, Leeds, Bristol, Manchester, Reading, Greater London, Edinburgh, Glasgow, Newcastle upon Tyne, Tyneside, North Tyneside, South Tyneside, Slough and Berkshire between 1960-2005 collected from "Labour Gazette" 1960-1967; continued by "Employment and Productivity Gazette" 1968-1970; continued by "Department of Employment Gazette" 1971-1978; continued by

“Employment Gazette” 1979-1995; continued by “Labour Market Trends” 1996-2005. All five published by the Office for National Statistics.

All data was collected monthly and the arithmetic average was taken to produce annual estimates. Where data was missing due to government employee action, etc, missing months were estimated by linearising the difference between the nearest existing values.

Greater London

Data on Greater London unemployment rates does not begin until March 1960, however unemployment counts are published for January and February. Because the Labour Gazette uses the same normalizing count for each month of the same year, this statistic was estimated given the counts and rates of unemployment between March and December by dividing unemployment counts by unemployment rates. The resulting statistic was averaged over the 10 months, and unemployment counts for January and February were divided by it to produce rates.

Newcastle upon Tyne

Data for Newcastle upon Tyne was collected from the Tyneside area between January 1962 and May 1978, then from North and South Tyneside from June 1978 to July 1984, and finally from Newcastle upon Tyne from August 1984 to December 2005.

In order to try and reconcile these differing areas, claimant counts for North and South Tyneside were divided by unemployment rates to estimate the normalizing statistic used for each area like January and February 1960 for Greater London. These statistics were then summed to produce a pseudo-North and South Tyneside normalizing statistic, and then the sum of claimant counts for both North and South were divided by the pseudo-North and South normalizing statistic to reconstruct a rate of unemployment for both North and South Tyneside.

At the May/June 1978 and July/August 1984 structural breaks the data was reconciled by assuming that the ratio between the data on each side of the structural break remained constant backwards in time, and these ratios was used to back-calculate all data sets from Newcastle upon Tyne from August 1984. For example;

$$\frac{Newcastle\ upon\ Tyne_{August\_1984}}{North\ \&\ South\ Tyneside_{July\_1984}} = \frac{Hypothetical\ Newcastle\ Upon\ Tyne_{i\_(Pre\_August\_1984)}}{North\ and\ South\ Tyneside_{i\_(Pre\_August\_1984)}} \quad \text{(G1)}$$

and,

$$\frac{Hypothetical\text{-}Newcastle\text{-}Upon\text{-}Tyne_{July\_1978}}{Tyneside_{June\_1978}} = \frac{Hypothetical\ Newcastle\ upon\ Tyne_{i\_(Pre\_July\_1978)}}{Tyneside_{i\_(Pre\_July\_1978}} \quad \text{(G2)}$$

Maidenhead

Data for Maidenhead comes from local area unemployment from Slough between January 1981 and August 1984, and then Berkshire between September 1984 to December 2005.

The data between these two regions is reconciled at the structural breaks in the same manner as Newcastle upon Tyne, producing a hypothetical Berkshire between January 1981 and August 1984.

(c) Nomis Official Labour Market Statistics

All 33 London local area unemployment rates including London West End, City of London, London Docklands, Hammersmith & Fulham, and Croydon local authority area unemployment rates between 1996-2005 were collected from www.nomisweb.co.uk.

(2) Methodology Used to Compute Hypothetical Eurostat Unemployment Rates for Local Areas back to 1960

(a) Regions

Prior to 1973, as well as 1974, 1976, 1978, 1980-1982, and 1989 we have no data on Eurostat regional unemployment. In order to estimate this data the ratios between all Eurostat and Labour Gazette regions are calculated for the existing Eurostat years. For the years in which the Eurostat data does not exist, the annual Eurostat/Labour Gazette ratios on both sides of the missing years are linearised and then multiplied by the Labour Gazette region for the missing year(s) to estimate the missing Eurostat values. For example in the case of a one year gap;

$$\frac{Hypothetical\ Eurostat_{i1}}{Gazette_{i1}} = \frac{Eurostat_{it-1}}{Gazette_{it-1}} + \left[\left(\frac{Eurostat_{t+1}}{Gazette_{t+1}} - \frac{Eurostat_{t-1}}{Gazette_{t-1}}\right)/2\right] \qquad \text{(G3)}$$

For region i and time t.

For years prior to 1973, the 1973 Eurostat/Labour Gazette ratio is used to estimate hypothetical annual Eurostat values from Labour Gazette unemployment rates for each year.

(b) Local Areas

Hypothetical Eurostat local area (not including Intra-London areas, see below) and Greater London unemployment rates between 1960 and 2005 were estimated by assuming that the ratio between Eurostat regional and Labour Gazette regional unemployment for each year was identical to the ratio between the hypothesized Eurostat and Labour Gazette local area rates, as shown below.

$$\frac{Eurostat_{it}}{Gazette_{it}} = \frac{Hypothetical\ Eurostat_{at}}{Gazette_{at}} \qquad \text{(G4)}$$

For local area a and the corresponding region i at time t. Where the corresponding region represents the region inclusive of the local area in question (ex. Scotland for Glasgow, Southeast for Reading, etc).

(c) Intra-London areas

Neither Eurostat nor the Labour Gazette produce local area unemployment rates for the City of London, London West End, London Docklands, Hammersmith & Fulham, or Croydon (intra-London) and so hypothetical Eurostat unemployment rates for all intra-London areas were estimated using corresponding rates from Nomis as follows.

First a hypothetical Eurostat London unemployment rate was calculated for the years 1996-2005 using Eurostat and Gazette Southeast regional and Greater London data as shown below.

$$Hypothetical\ Eurostat\ London_t = \frac{Eurostat\ SE_t}{Gazette\ SE_t} \times Gazette\ London_t \qquad \text{(G5)}$$

Then, a hypothetical Nomis Greater London was constructed using estimates of working age population (see below) as follows.

$$Hypothetical\ Nomis\ London_{at} = \sum_{a=1}^{n} \left[\frac{population_{at}}{\sum_{a=1}^{n} population_{at}} \times Nomis_{at} \right] \qquad \text{(G6)}$$

Then, taking these two hypothetical rates a hypothetical Eurostat rate for all intra-London areas was estimated as follows.

$$Hypothetical\_Eurostat_{at} = Nomis_{at} \times \frac{Hypothetical\_Eurostat\_London_t}{Hypothetical\_Nomis\_London_t} \qquad \text{(G7)}$$

Intra-London unemployment rates prior to 1996 were back-calculated assuming the 1996 ratio between the local area and Greater London unemployment rates remained constant until 1960 as follows.

$$Hypothetical\ Eurostat_{at} = Hypothetical\ Eurostat\ London_t \times \frac{Hypothetical\ Eurostat_{a1996}}{Hypothetical\ Eurostat\ London_{1996}} \qquad \text{(G8)}$$