The Effects of Spatially Targeted Enterprise Initiatives: Evidence from UK LEGI[†]

Elias Einiö[*] and Henry Overman[‡]

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[Preliminary: Please feel free to quote topic, methods etc; but results may change]

Abstract

We investigate the impacts of a significant area-based policy intervention (LEGI) that aimed to increase employment and productivity in 30 disadvantaged areas across England. In order to identify the causal effects of the programme, we use panel data at a fine spatial scale covering years before and after the launch of the program, and exploit several institutional features that determined whether or not an area becomes supported. Using spatial differencing, we find evidence of significant displacement from non-treated to treated areas close to the treatment area boundary. Aside from this displacement, we find little evidence of significant impact on treated areas nor of a net impact of treatment once we take account of this displacement. Spatial differencing combined with a regression discontinuity approach based on eligibility criteria confirm these findings.

Keywords: Employment, policy evaluation, treatment effects

JEL Classification:

[*]Spatial Economics Research Centre (SERC), London School of Economics (LSE). Address: Houghton Street, London WC2A 2AE, UK; Email: e.einio@lse.ac.uk; Tel.: +44-20-7852-3581.

[‡]Spatial Economics Research Centre (SERC), London School of Economics (LSE). Address: Houghton Street, London WC2A 2AE, UK; Email: h.g.overman@lse.ac.uk; Tel.: +44-20-7955-6581.

1 Introduction

Many governments spend large amounts of money trying to boost productivity, employment and incomes in economically disadvantaged neighbourhoods. Despite the prevalence of such policies, their theoretical underpinngs remain unclear and there is surprisingly little evidence on their causal impacts on the performance of local economies.

While programme specific outputs (e.g. number of firms assisted) are increasingly well monitored by governments, most evaluations of spatially-targeted policies do not use credible identification strategies for assessing whether these outputs translate in to improvements in the local economy that would not have happened in the absence of policy. As emphasised by the literature on program treatment effects (Heckman, LaLonde and Smith, 1999; DiNardo and Lee, 2010) solving this problem requires the construction of a valid counterfactual that can then be compared to observed outcomes. One possibility is to use outcomes for 'untreated' areas (i.e. those that are not eligible for the policy). The problem with this strategy is that areas eligible for treatment are usually not randomly chosen. Another strategy is to look for instrumental variables which are correlated with the likelihood that an area is treated, but that do not in themselves affect area outcomes. In spatial settings, such instruments can be hard to come by either because it is difficult to rule out the possibility that they independently affect outcomes or because, if they don't, they only weakly influence the probability of being treated. Increasingly, however, it has been recognised that using details on the institutional setting combined with these strategies can lead to credible identification. It is this approach that we adopt in this paper.

This paper examines the impacts of a significant area-based policy intervention in England. The Local Enterprise Growth Initiative (LEGI), introduced in 2005, aimed to 'release the economic and productivity potential of the most deprived local areas across the country through enterprise and investment'. Between 2006 and 2009, the programme spent around 80 million pounds per year on 20 LEGI areas located across England (with 30 of the most disadvantaged local authorities receiving funding). With resident working age populations of approximately 1.4 million this equated to expenditure of around £60 per capita per year. Although these per capita expenditures are not huge, performance management data claimed that LEGI had assisted or engaged 240,000 individuals during this period (around 17% of the working age population), created 22,700 jobs (a 2% job creation rate from a baseline of around 1 million area jobs in 2006) and 13,700 new business (a 17% creation rate from a baseline of around 78,500 in 2006). Clearly, if these truly represent the causal impacts of the programme, effects of these magnitudes should be ameneable to identification in our empirical analysis.

In order to identify the causal effects of the intervention, we use panel data at a fine spatial scale covering years before and after the launch of the program, and exploit several institutional features that determined whether or not an area becomes supported. Our first strategy exploits discontinuities across space arising because the policies apply to specific areas. Specifically, we compare changes in outcomes in treated areas to changes for neighbouring untreated areas. This strategy consistently identifies the causal effect of the policy if conditional on observable characteristics, the boundaries of treated areas are uncorrelated with any unobserved area characteristics that affect outcomes. The use of neighbouring untreated areas as controls means that we need to exercise care in interpreting any treatment effect because it is possible that this captures displacement from non-treated to treated areas rather than a net positive impact of the policy. To assess this possibility we construct treatment and control 'rings' to comparetreated to nearby untreated neighbours and nearby untreated neighbours to their untreated neighbours that are further from the LEGI boundary. Our results suggest that displacment occurs at the LEGI boundary.

If we are to be confident that these measured displacement effects are truly the causal impact of LEGI treatment then we need to be sure that unobservable area characteristics do not drive selection in to treatment. Our spatial differencing strategy relies on the assumption that LEGI area boundaries, which coincide with LA boundaries, are as good as randomly allocated with respect to unobservable characteristics. We can relax this assumption by drawing on a second institutional characteristics of LEGI. Specifically, our second strategy is based on a discontinuity in the eligiblity rule determining whether an area is eligibile to apply for LEGI funding. According to this rule, a local authority is eligible to apply for funding if it ranks 50th or worse against at least one of six measures of deprivation. This institutional restriction suggests that we might identify the causal impact of the policy by comparing treated and untreated areas just above and below the eligibility threshold. Identification requires that, conditional on observable characterics, the cut-off for eligibility be uncorrelated with any unobserved area characterisics that affects both outcomes and the probability of treatment. Our final strategy combines these two designs. We discuss these strategies in much more detail below.

Our preliminary results suggest that LEGI increased employment, created businesses and reduced worklessness in treated areas. This effect is more pronounced the closer the control group is to the treated area. As discussed above this indicates that increases in employment and business induced by the programme displaced jobs and firms in unsupported areas. Results from triple-spatial differencing support this interpretation.

The paper adds to the small, but growing literature that takes identification issues seriously when evaluating the impact of spatial interventions. To the best of our knowledge, research on the impact of US Enterprise and Empowerment Zones, particularly the papers by Neumark and Kolko (2008) and Busso, Gregory and Kline (2009), has made most progress in trying to address these problems. Earlier contributions include Dabney (1991), Papke (1993), Boarnet and Bogart (1996), Bondonio and Engberg (2000), Peters and Fisher (2002), O'Keefe (2004), and Bondonio and Greenbaum (2007), while Bartik (1991) and Nolan and Wong (2004) provide useful reviews. Recent work on UK Regional Selective Assistance (Criscuolo, Martin, Overman and Van Reenen, 2011), UK Single Regeneration Budget (Gibbons, Overman and Sarvimaki, 2011) and on French Enterprise Zones (Gobillon, Magnac and Selod, 2010; Mayer, Mayneris and Py, 2011) evaluate the causal impact of spatial policy interventions outside of the US.

Our approach combines and extends approaches that have been used in previous papers assessing the impact of spatial policies, as well as the wider policy evaluation literature. The focus on using detailed data to construct control areas follows Neumark and Kolko (2008) and allows us to control for numerous area characteristics in our analysis, and check for differences in pre-program trends just before the introduction of the intervention. We also use the spatial resolution of our data to help consider the issue of displacement. Becker et al (2010, JPub) use a fuzzy regression discontinuity design and regional data to assess the impact of the EU's structural fund project. Relative to that paper, we have firm level and census data which allows us to control for unobserved area trends in outcomes at a much finer spatial scale. [TO DO: Add discussion of Baum-Snow RDD paper]

The rest of the paper is structured as follows. Section 2 provides more details of the LEGI programme. Section 3 describes our data. Section 4 describes our identification strategy, with results reported in section 5. Finally, section 6 concludes.

2 The Institutional Setting

The Local Enterprise Growth Initiative (LEGI) was introduced by the previous government in 2005. As discussed above LEGI aimed "to release the productivity and economic potential of our most deprived local areas and their inhabitants, through enterprise and investment, thereby boosting local incomes and employment opportunities."[1] Total expenditure for the programme was budgeted at around £100 million per year, although actual expenditure appears to have been about 20% lower (DCLG, 2010). Programmes under the scheme were expected to operate with a ten year time horizon, although in 2006 funding was only confirmed for a three year 'comprehensive spending review' period. In the end, the LEGI programme ran for 6 years with the incoming coalition government abolishing the programme from March 2011.

LEGI funding was provided to local authorities who then had considerable flexibility in determining how best to "increase local entrepreneurial activity and support the growth, and reduce the failure rate, of locally owned businesses". As a result, the specific mix of activities differed quite significantly by area. Across the programme as a whole about 30% of expenditure went on supporting existing local businesses, with projects supporting new business start-ups receiving a similar share. Support to residents, e.g., in acquiring skills or a job, accounted for about 20% of expenditure, while about 10% was spent on area improvements or promotion. Management and administration accounted for the remaining 10% of expediture. See DCLG (2010) for more details.

Funding was allocated in two competitive bidding rounds held in February and December 2006. All local authorities eligible for Neighbourhood Renewal Fund (NRF) were eligible to apply for LEGI funding. At the time, the Neighbourhood Renewal Fund was the major funding stream used to try to tackle deprivation in England's poorest neigh-

[1] Unless otherwise indicated, quotes in this section taken from http://www.communities.gov.uk/regeneration/regenerationfunding/legi/ (accessed 23/06/11).

bourhoods. In contrast to LEGI, with its clear economic focus, NRF had much wider objectives with about 20% of expenditure targetted at crime, 20% on education (school and pre-school provision), 13% on employment, 15% on health, 7% on housing and physical environment and 7% on transport (with the remainder spent on miscellaneous other local priorities and administration). See DCLG (2008) for more details.

Eligible local authorities were invited to apply and "two competitive bidding rounds were held in February and December 2006 with funding awarded to 20 areas comprising of 30 local authorities." The fact that our data covers two rounds of funding suggests that one possible identification strategy would be to follow Busso, Gregory and Kline (2009) and exploit the different timing of interventions. That is, we could compare changes up to December 2006 in areas that received funding in the first round to those that only received funding in the second round. In practice, however, the 11 month gap between rounds makes this strategy less attractive. Instead, we treat both rounds symmetrically and assume that impact on areas receiving either round 1 or 2 funding potentially occurs from 2006 onwards. We think this assumption is particularly appropriate for LEGI given the 10 year planning framework and the initial commitment to reasonably generous levels of funding for a 3 year period (even if in practice the scheme was curtailed after 5 years in March 2011). Alternatively, we could follow the alternative strategy of Busso et al (2009) and compare winners to losers. To date, however, the government department in charge of administering the scheme has been unable to provide us with details on unsuccessful applicants.

Instead of using timing or unsuccessful applicants as part of our identification strategy, we focus on two other characteristics of the scheme that can help with identification. The first of these builds on the fact that LEGI funding was granted to specific geographic areas which were demonstrated to be performing badly on some economic criterian (e.g. number of local businesses). Conditional on these observable characteristics, it seems reasonable to assume that the exact placing of boundaries is arbitrary with respect to other unobserved characteristics that might affect area level outcomes. If we further assume that these unobservable characteristics vary continuously over space then we can use areas just outside the LEGI area boundary as control areas for comparison to those areas that get treated because they are inside the boundary. As we describe in more detail below, we follow Duranton, Gobillon and Overman (2011) and implement this idea empirically by using 'spatial differencing' across the LEGI area boundary. The second institutional characteristics that we use to achieve identification builds on the fact that LEGI applicants need to be eligible for the Neighbourhood Renewal Fund (NRF). This restriction means that local authorities were able to apply for LEGI funding if they ranked among the 50 worst local authorities against any of six local authority level Index of Deprivation (ID) indices.[2] Based on the 2004 indices, 80 out of 354 local authorities met this criteria (and hence were eligible for both NRF and LEGI). In addition to these, 7 local authorities that met the criteria against 2000 ID indices but lost their eligibility against 2004 indices were granted transitional funding for NRF and were thus eligible to apply for LEGI. This effectively means that a local authority was eligible to apply for LEGI funding if it ranked among 50 worst local authorities against the 2000 or 2004 ID indices. As discussed in more detail below, we can exploit the discontinuity in the treatment generated by this rule to compare outcomes for small geographical areas that receive treatment because their local authority is 'just' eligible for LEGI to similar small geographical areas that do not receive treatement because their local authority is 'just' *ineligible* for LEGI. Again, conditional on observable characteristics, the key identifying assumption is that the exact choice of cut-off is arbitrary and hence uncorrelated with unobservable characteristics that may influence area outcomes.

3 Data

Our units of observation for the analysis are so-called Lower Layer Super Output Areas, henceforth refered to as super output areas or LSOA. LSOA are small geographical areas used as the basis for the UK census.[3] These super output areas are sufficiently small that

[2]The indices on which eligibility was based on were the following 2004 local authority level summary ID indices based on ID indices at the Super Output Area (SOA) level: 1) *Local Concentration* is the population weighted average of the ranks of a district's most deprived SOAs that contain exactly 10% of the district's population; 2) *Extent* is the proportion of a district's population living in the most deprived SOAs in the country; 3) *Income Scale* is the number of people who are Income deprived. 4) *Employment Scale* is the number of people who are Employment deprived. 5) *Average of SOA Ranks* is the population weighted average of the combined ranks for the SOAs in a district. 6) *Average of SOA Scores* is the population weighted average of the combined scores for the SOAs in a district.

[3]LSOAs have a minimum population of 1,000. The 32,482 LSOAs in England were built from groups of Output Areas (typically 4 to 6) and constrained by the boundaries of the Standard Table wards used for 2001 Census outputs. 2001 Census OAs were built from clusters of adjacent unit postcodes. They were designed to have similar population sizes and be as socially ho-

we can classify them as either treated or untreated on the basis of LEGI boundaries, but large enough that we can construct area level data for three area outcomes of interest - employment, number of businesses and worklessness. These three outcomes correspond closely to the objectives of LEGI. Data on employment and number of business come from the Business Structure Database which provides an annual snapshot of the Inter-Departmental Business Register (IDBR). This dataset contains information on 2.1 million businesses, accounting for approximately 99% of economic activity in the UK and includes each business' name, postcode and total employment. We use the Ordnance Survey Code-Point data set to match business postcodes to LSOA and then construct our measures of employment and number of businesses by aggregating the BSD data by LSOA. Worklessness data measures benefit claimants as a percentage of working age population and is available at LSOA level from the Neighbourhood Statistics database maintained by the ONS.[4] We also have data for a rich set of area characteristics measuring age of residents, economic activity of residents, property values, ethnic composition, population density, acreage and measures of deprivation at LSOA level provided by Neighbourhood Statistics. To control for industry structure, we use information on the number of businesses (local units) categorized in to one of 14 industries and 3 age groups available for Middle Super Output Areas (MSOA) from Neighbourhood Statistics.[5]

Geocoding of super output areas by treatment status is based on shape files provided by the UK Borders database. A super output area is considered as treated if it is located within the boundaries of a local authority receiving LEGI funding. Because super output areas are constructed so as not to cross any local authority boundaries, the geocoding of

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mogenous as possible (based on tenure of household and dwelling type). OAs preferably consisted entirely of urban postcodes or entirely of rural postcodes. They had approximately regular shapes and tended to be constrained by obvious boundaries such as major roads. The minimum OA size is 40 resident households and 100 resident persons but the recommended size was rather larger at 125 households. (http://www.ons.gov.uk/about-statistics/geography/products/geog-products-area/names-codes/soa/index.html and http://www.statistics.gov.uk/geography/census_geog.asp, accessed 27/06/2011)

[4]www.neighbourhood.statistics.gov.uk. Worklessness is measured as the count of Job Seeker Allowance claimants within an LSOA. To get Jobseeker's Allowance a job seeker must be available for, capable of and actively seeking work, aged 18 or over (except in some special cases) but below State Pension age, working less than 16 hours per week on average, and living in Great Britain.

[5]MSOAs were built from groups of LSOAs and constrained by the local authority boundaries of 2003. These areas have a minimum population of 5,000, with an overall mean of 7,200. The industry classification is based on the following 14 industries: Agriculture; Production; Construction; Motor Trades; Wholesale; Retail; Hotels & Catering; Transport; Post & Telecommunications; Finance; Property & Business Services; Education; Health; Public Administration & Other Services. The company age groups are 0-9, 10-19, and more than 19.

treated super output areas is exact. Figure 1 provides an example, showing three LEGI areas to the South of London. The smallest areal units in the figure are the super output areas - our units of observation. Bold lines mark out the boundaries of the Croydon, Barking and Dagenham and Hastings and Rother LEGI areas (two in the north-west corner of the figure, one on the south-west corner). The shaded super output areas comprise the control areas that we use when spatial-differencing as explained below.

The final data issue to be resolved concerns the choice of time period. We treat data from 2005 as capturing pre-treatment area characteristics. The recession causes some difficulties in terms of deciding on the period over which we should look for an impact of the policy. For this preliminary version of the paper we focus on a short time period to 2007. The short time period has the benefit of not incorporating the recession (which may play out unevenly over space) but at the expense of capturing only the immediate effects of treatment. Data is availabile that will allow us to assess changes up to 2010 in future versions of the paper. Descriptive statistics for the data are presented in Tables 1 and 2. The way in which these statistics are presented relates to our empirical strategy and so we postpone discussion of these tables until we have outlined the details of our approach.

4 The empirical strategy

In this section, we explain our empirical strategies for identifying the causal effects of LEGI funding on economic outcomes in treated super output areas. The central problem that these strategies need to address arises because we do not know what would have happened to a treated LSOA in the absence of LEGI funding. The simplest approach to this problem assumes that, in the absence of the programme, area outcomes would be determined linearly by the observable characteristics of areas (plus a random component that is independent of treatment). Under this assumption we can identify the causal impacts of LEGI by comparing outcomes for treated LSOA to outcomes for untreated LSOA once we control for these characteristics. To implement this idea empirically, we use a baseline difference-in-difference analysis that compares *changes* in employment, number of businesses and worklessness between treated and untreated LSOA. That is, we estimate the following equation:

$$\Delta y_{ir} = \gamma L_{r(i)} + \beta X_{ir} + \epsilon_{ir} \tag{1}$$

where Δy_{ir} is a log change in the outcome measure of interest over the period 2005-2007 in an LSOA i located within local authority r. $L_{r(i)}$ is a binary indicator equal to one if the LSOA is within a local authority r which was awarded LEGI funding in the year 2006 (Round 1) or 2007 (Round 2), and zero otherwise. X_{ir} are a set of pre-treatment controls which may include industry structure, firm size, age of residents, economic activity of residents, property values, ethnic composition, population density, acreage and measures of deprivation. Time differencing removes LSOA fixed effects that may be correlated with outcomes meaning that the OLS estimate of γ is robust to time invariant unobserved heterogeneity at LSOA level. In other words, equation 1 will provide a consistent estimate of the effect of LEGI funding if, conditional on observed characteristics included in X_{ir}, unobserved LSOA trends in y_{ir} are uncorrelated with LEGI treatment. Clearly, even with a relatively rich set of controls, we might still worry that this condition does not hold. A first strategy for dealing with this is to assume that there are differences in unobserved characteristics across space but that treated areas are similar to neighbouring untreated areas in terms of these unobservable characteristics. This identifies the effect of LEGI by comparing outcomes for treated LSOA to *neighbouring* LSOA that are untreated but otherwise 'similar' once we control for observable characteristics. To implement this idea empirically we use a difference-in-difference estimation that compares changes in outcome between treated areas and *neighbouring* untreated areas. Specifically, we estimate:

$$\Delta y_{ir} = \alpha^{m}_{l(i)} + \gamma L_{r(i)} + \beta X_{ir} + \epsilon_{ir} \tag{2}$$

where, as before, Δy_{ir} is a log change in the outcome measure of interest, $L_{r(i)}$ is a binary indicator for LEGI and X_{ir} are pre-treatment characteristics. Note that, relative to equation 1, this specification 'spatial differences' by including $\alpha^{m}_{l(i)}$ - a set of fixed effects defined as follows: For each LEGI local authority we define a "LEGI neighbourhood" comprising all super output areas within its boundary (a treated area) and within m kilometer of the boundary (a control area); for the remaining super output areas we assign fixed effects by local authority. Identification of the treatment effect now comes from comparisons within LEGI neighbourhoods. Although treatment status is invariant within neighbourhoods that do not include a treated local authority, we include them to improve the precision of the estimated coefficients on pre-treatment controls.

The coefficient on $L_{r(i)}$ estimated from equation (2) needs to be interpreted with caution because, restricting our attention to small geographic areas naturally raises the concern that LEGI funding may have displaced economic activity in untreated super output areas close to the LEGI boundary to treated areas inside LEGI. To consider this possibility we follow Neumark and Kolko (2008) and Gibbons, Overman and Sarvimäki (2011) and divide untreated super output areas within LEGI neighbourhoods in to control rings based on the distance to the LEGI boundary. That is, we augment equation (2) as follows:

$$\Delta y_{ir} = \alpha^m_{l(i)} + \sum_{c\in\{1,\lceil m/g\rceil\}} \xi^c D^c_{ir} + \gamma L_{r(i)} + \beta X_{ir} + u_{ir} \quad (3)$$

where g is the maximum width of each control ring, $\lceil m/g\rceil = min\{z \in \mathbb{Z}\,|z \geq m/g\}$ is the number of control rings, and D^c_{ir} is a binary indicator for control ring c equal to one if a super output area is within a distance $d_c \in ((c-1)\cdot g, min(c\cdot g, m)]$ of the border of the LEGI zone and zero otherwise. For example, for a LEGI neighbourhood with a 5 km control zone ($m = 5$), and 2 km control rings ($g = 2$) we have $\lceil m/g\rceil = 3$. In this case we have three control rings: $d_1 \in (0, 2]$, $d_2 \in (2, 4]$,and $d_3 \in (4, 5]$. Our test of displacement is based on comparing coefficients on control rings. Under the null hypothesis of no displacement $\xi^{c_1} = \xi^{c_k}$ for all $1 < k \leq \lceil m/g\rceil$. In contrast, if $\xi^{c_1} < \xi^{c_k}$ this suggests that the average change in, say, employment was smaller in super output areas closer to a LEGI area compared to the super output areas further away from it. Provided that LEGI funding had a positive effect on employment and that unobserved shocks to employment were similar across these control rings, this would be an indication of displacement to treated areas from the untreated super output areas closest to LEGI. In our most general specifications we also consider the possibility that displacement affects treated output areas differently by further augment equation (3) with binary indicators for treatment rings.

As already discussed, the crucial identifying assumption for consistent estimation of the treatment effect (γ) in equations (2) or (3) is that potential unobserved trends in outcomes (y_{ir}) are independent of LEGI treatment conditional on observable area characteristics. For example, if local authorities that submitted successful bids were more capable of carrying out successful economic policies, economic performance in treated areas may have been better even in the absence of LEGI. In this case, we would overestimate the impact of the treatment.[6] Another concern is that LEGI areas may have been selected based on central government expectations about future economic performance. Depending on the nature of the selection bias, this could lead us to under or overestimate the impact of LEGI if these expectations proved accurate.

In short, it is not immediately clear why spatial differencing should help identify the causal effect of treatment if the boundary of the treatment area is drawn taking in to account unobservable characteristics of areas that might affect outcomes. One possibility is to rely on the fact that the boundaries of LEGI areas coincide with those of the Local Authorities that recieve funding. That is, spatial differencing does help if we can assume that the exact placement of LA boundaries (and hence of treatment areas) is uncorrelated with unobservable characteristics that might affect changes in outcomes.

Fortunately, a second institutional feature of LEGI allows us to relax this assumption. Specifically, in order to assess whether non-random assignment of treatment is driving our results, we use a second strategy which exploits the Index of Multiple Deprivation (IMD) rule that determined eligibility for LEGI funding. According to this rule, a local authority was eligible to apply for funding if it ranked among the 50 worst local authorities against any of local authority level ID indices in 2000 or 2004.[7] Formally, this rule can be written as:

$$E_{r(i)} = I\left(R_{r(i)} \leq 50\right) \tag{4}$$

where $R_{r(i)}$ is Local Authority i's minimum rank across the twelve ID indices (six indices for both years 2000 and 2004) and $E_{r(i)}$ is a binary indicator taking the value of one if this minimum IMD rank is less than or equal to 50. There are two factors that make the receipt of treatment not completely dependent on being eligible for treatment. First, constraints on the overall level of funding for the LEGI programme meant that only 30 local authorities out of 87 eligible areas received LEGI funding. Second, the Rother local authority that was not eligible according to the IMD rule received LEGI funding because

[6] Rodrik (2007) makes this argument in the context of industrial support to firms or industries that have experienced negative shocks.

[7] For details of this rule and definitions of the indices it was based on, see section 2.

it was a part of a joint bid with Hastings. Note, however, that the minimum IMD rank of Rother is 158 and thus it is dropped out of the sample in preferred specifications using a sample based on a narrow band around the minimum IMD threshold (we provide more details below). As a result of both these factors the discontinuity at the threshold of the IMD rule is fuzzy. To allow for this, we implement a fuzzy regression discontinuity (FRD) design by regressing Δy_{ir} on the treatment status $L_{r(i)}$ and apolynomial of $R_{r(i)}$ and using the eligibility status as an instrument for the treatment status (see e.g., Hahn, Todd and Van der Klaauw 2001; Van der Klaauw 2002). That is, we estimate a Two-Stage Least Squares (2SLS) procedure based on the following equations:

$$\begin{aligned} L_{ir} &= \rho E_{r(i)} + \tilde{\tau}^P R_{r(i)}^P + \tilde{v}_{ir} \\ \Delta y_{ir} &= \gamma L_{r(i)} + \tau^P R_{r(i)}^P + v_{ir} \end{aligned} \tag{5}$$

where $\tau^P R_{r(i)}^P = \sum_{p=1}^{P} \tau_p R_{r(i)}^p$ is a Pth order polynomial of the minimum IMD rank. This approach identifies the impact of LEGI at the minimum IMD threshold. If we assume that treatment effects vary across output areas this approach recovers the local average treatment effect (LATE) at the threshold. In other words, this is the impact of LEGI among those treated output areas just below the threshold that were drawn into LEGI because of higher LEGI funding on their side of the threshold. As discussed above, there was only one treated local authority above the IMD threshold (with a minimum rank of 151). As a result, our preferred specifications based on narrow bands around the IMD threshold will have no treated output areas on the ineligible side of the threshold and thus estimates of the treatment effect based on these specifications recover the average treatment effect on the treated (ATT) at the threshold. Because the assumption required to interpret our estimates as average treatment effects (ATE), i.e. that treatment effects are homogeneous across minimum IMD rank, is rather strong, using the fuzzy regression discontinuity design to reduce concerns about the endogeneity of LEGI treatment (internal validity) comes at the cost of increased concerns about the general applicability of the identified effect (external validity).[8] This is why we see the FRD analysis as a complementary approach for our difference-indifference estimations, which enables us to

[8]See Imbens and Angrist (1994) and Angrist and Pischke (2009) for further discussion.

assess the robustness of our results against the argument that the placement of LEGI boundaries is somehow not random with respect to unobserved characteristics that affect changes in outcomes.

The key identifying assumption underlying the FRD approach is that local authorities did not manipulate their minimum IMD ranking in order to receive the LEGI funding. This is highly unlikely for several reasons. First, we can rule out direct manipulation through false reporting because the IMD ranks are constructed by central government on the basis of national statistics. Second, the timing rules out indirect manipulation of underlying socio-economic characteristics in response to the announcement of the rule for LEGI funding because local authorities only knew about the IMD rule after 2004 with the IMD rule calculated on the basis of 2000 and 2004 data. It is possible, however, that local authorities just above the threshold may have anticipated that future funding depends on future IMD rankings. We believe that this is unlikely to affect our results LEGI funding would not provide large enough incentives for local authorities to manipulate the ranking. Furthermore, even if if it did occur, it should not affect our results because the minimum IMD rank is based on six indices which each in turn are based on complicated formulas so that the outcome of any such manipulation on own IMD score would have been uncertain. In addition, even in the unlikely event that a local authority could control own scores on which the rankings are based on, its final ranking also depends on the performance of other local authorities which further increases the inability to precisely manipulate ones own ranking.. In short, it is very unlikely that LAs manipulated own IMD scores to affect LEGI funding and inconceivable that they could affect their rankings.

Before turning to results, a map helps clarify our spatial differencing strategy. Figure 1 shows 1km-wide control rings around Croydon and Barking & Dagenham LEGI area in London. The smallest areal units in the figure are the lower level super output areas - our units of observation. As discussed above, a LEGI neighbourhood comprises of a LEGI area and a control area around it. The shaded super output areas are those within an 8km control zone and are defined on the basis of the distance of the super output area centroid to the *nearest* LEGI super output area centroid. In contrast to defining the distance on the basis of the LEGI boundary, this has the advantage of ensuring that the average distance between a location in a treated LSOA at the LEGI boundary and an untreated LSOA at the, say, 1km control ring is approximately 1km. Estimation based on equation (1) compares average performance of LEGI super output areas to that of all untreated super output areas, while an approach based on the fixed effects specification of equation (2) compares average performance of treated and untreated output areas *within* LEGI neighbourhoods. Different shading identifies super output areas within different 1km control rings (again based on distance of the LSOA centroid to the centroid of the nearest LEGI LSOA). Our test of displacement based on equation (3) compares average performance of the nearest control rings to that of the control rings further away from the LEGI area within a given LEGI neighbourhood. As should be clear, the non-uniform size of both LEGI areas and individual super output areas introduces some unevenness in terms of the exact shape of the control 'rings'.

5 Results

Table 1 displays descriptive statistics for outcomes and key area characteristics for the full sample (all LSOAs), LEGI areas (LSOAs that are in a LEGI Local Authority), control areas (all LSOA not in a LEGI Local Authority), and 8km Neighbourhoods (covering all treated LSOAs as well as all LSOA not in a LEGI Local Authority that are within 8km of a LEGI boundary). Comparing the first block of statistics to the second we see that, compared to the average LSOA, treated super output areas start with lower employment, higher worklessness and fewer businesses. This is hardly surprising as LEGI is specifically targetted at disadvantaged neighbourhoods. When we turn to changes in our key outcome variables, we see that LEGI areas do better in terms of changes to employment and number of businesses but worse in terms of worklessness. All of these differences are amplified when we compare LEGI areas to the control (untreated LEGI areas), which is unsurprising as, in contrast to the whole sampe, the control sample excludes treated areas. Narrowing our focus to LEGI neighbourhoods (as we do when we include LEGI neighbourhood fixed effects, we see that in terms of initial characteristics LEGI LSOA are more similar to their neighbours than to the average LSOA (compare block 2 to block 4 and block 1, respectively). This provides some initial support to our assumption that nearby LSOA may provided better controls than LSOA that are further away. [TO DO: This paragraph needs more work]

Table 2 displays descriptive statistics for outcomes and key area characteristics for LEGI areas (identical to the second block of results in 1), and control areas within 2km, 5km and 8km LEGI Neighbourhoods (covering all LSOA not in a LEGI Local Authority that are within 2km, 5km and 8km of a LEGI boundary). We use these rings when implementing the spatial differencing specifications corresponding to equation (3) [TO DO: further discussion]

Tables 3-5 display the results from specifications corresponding to equations (1) to (3). Each table reports results for pooled specifications (equation 1) in the first two columns and for specifications including LEGI neighburhood fixed effects (equations 2 and 3) in columns 3 to 7. Each table contains three panels reporting results using three different LEGI neighbourhoods (all super output areas within 2km, 5km and 8km of the LEGI boundary, respectively). The first pooled specification (column 1) excludes area characteristics while the second pooled specification (column 2) includes them. The third column reports the results from the specification comparing treated super output areas to untreated super output areas within the same LEGI neighbourhood, i.e. the coefficient on $L_{r(i)}$ in equation 2. Columns 4-7 report the results from a specification corresponding to equation 3 where we address concerns that any positive effect of LEGI may be at the expense of displacement of economic activity from control rings near the LEGI border. These specifications add binary indicators for 1km control rings based on the distance of untreated LSOA from the LEGI boundary. For the 2km LEGI neighbourhoods this gives two control rings (at 1km and 2km). We report results first with the 1km ring omitted (column 4) and then with the 2km ring omitted (column 5). We think that the availability of multiple comparison groups helps highlight the role of displacement in driving results. In panel 2, for 5km LEGI neighbourhoods, this gives 5 control rings (at 1km, 2km, 3km, 4km and 5km). For brevity, we report estimates for the four closest control rings and, once again, present results omitting each ring in turn in columns 4-7.[9] Finally, in panel 3, we report results for 8km LEGI neighbourhoods for the closest four (out of 8) control rings omitting each ring in turn as before.

The first panel of table 3 displays the results for employment based on 2km LEGI neighbourhoods (i.e. areas comprising of a LEGI area and super output areas within

[9] A full set of estimates is available from the authors upon request.

2km of the LEGI boundary). The treatment effect for the specification excluding area characteristics and area fixed effect (column 1) is insignificant, but when area characteristics are included (column 2) the estimate becomes significant at the 10% level. It is worth noting that the estimates for these two specifications are equal across panels because fixed effects for LEGI neighbourhoods are not included, although standard errors may vary due to clustering by different LEGI neighbourhoods.When we include area fixed effects (column 3), the estimate is 0.0388 and, again, significant at the 10% level. This point estimate suggests that LEGI funding resulted on average in 1.9 percentage points higher annual growth rate of employment over the two year period 2005-2007. Columns 4-7 display results for the specification including binary indicators for 1km control rings. For each specification the reference group is the control ring for which an estimate is not displayed. For example, in column 4 the reference control ring is the 1km control ring and the coefficient in the row labeled "LEGI" displays an estimate for how much larger on average the two-year growth rate was in the treated super output areas compared with super output areas in the 1km control ring. This estimate is 0.0871 and significant at the 1% level, while the coefficient on the LEGI dummy in column 5 (representing the difference between treated super output areas and super output areas in the 2km control ring) is three times smaller and insignificant. In other words, the two-year growth rate for LSOA in the 1km control ring was 6.07 percentage points *lower* than that of LSOA in the 2km control ring. These findings suggest that LEGI funding may have resulted in a considerable displacement of employment from untreated to treated areas, and that the displacement is stronger the closer an untreated area is to the border of a LEGI area. The results based on 5km and 8km LEGI neighbourhoods display a similar pattern. In both of these specifications, note that the estimate in column 3 comparing treated output areas to *all* untreated output areas within the LEGI neighbourhood is smaller than the corresponding coefficient for 2km LEGI neighbourhoods. Again, this is consistent with significant displacement to treated LSOA from untreated LSOA close to the LEGI boundary. This displacement pushes down the estimated coefficient as we widen the LEGI neighbourhood, because the estimate for 2km neighbourhoods includes only output areas nearest the LEGI border and is thus more affected by displacement than the corresponding estimates for broader LEGI neighbourhoods where the control group also includes untreated super output areas further away from the LEGI border.

Results for the impact of LEGI on worklessness are reported in Table 4. In this table, with the exception of the pooled results with no controls reported in column 1, none of the coefficients on the LEGI dummy are significant although the standard errors are in general of a similar magnitude as for employment. It is worth noting, however, that when we control for area characteristics (column 2) and area fixed effects (column 3), the point estimates of the treatment effect are all negative. This is in line with the positive effects of LEGI on employment (Table 3) as higher growth rate of employment should lower the growth rate of unemployment. That said, overall, these results indicate that LEGI had no detectable impact on worklessness when we compare outcomes for treated LSOA to neighbouring LSOA (controlling for observable characteristics). This finding is easy to reconcile with our findings of positive impacts on employment, once we recognise that local labour markets almost certainly cross most LEGI boundaries so that workers who take the additional jobs may easily be from neighbouring untreated areas. Finally, Table 5 displays the results for business formation measured as a log-change in the number of businesses. The point estimate of the treatment effect is positive for all specifications in columns (1)-(3), while it is significant at the 10% level only for the pooled specification including area charateristics (column 2).Taken at face value, the positive point estimate would suggest that the additional employment we identified in table 3 is being created in existing rather than new firms. Caution is needed in interpreting the results for worklessness and number of businesses, because our estimates using Fuzzy Regression Discontinuity design do detect positive impacts, suggesting that spatial differencing may not eliminate all unobserved heterogeneity correlated with LEGI treatment. It is worth noting, however, that the OLS estimates based on spatial-differencing and IV estimates based on the eligibility rule may be different even if both are consistent, because the OLS procedure recovers an estimate for the average treatment effect (ATE) while the IV procedure recovers an estimate for the local average treatment effect (LATE). Indeed, the negative point estimate for worklessness and positive point estimates for number of businesses are in line with the significant coefficient estimates we get for these two outcomes when using FRD. It is to these results that we now turn.

Results from the Fuzzy Regression Discontinuity design (equation 5) are reported in tables 6-8. Again, there are three panels, reporting results using three different LEGI neighbourhoods (all super output areas within 2km, 5km and 8km of the LEGI boundary, respectively). Within each panel, the first row reports the coefficient on the LEGI dummy in the second stage (i.e. the coefficients from the regression involving changes in the outcome of interest regressed on the LEGI dummy, a higher order polynomial of the IMD rank plus controls). The second row reports the first-stage coeffient on the NRF intrument, a dummy that indicates whether or not the LSOA is in a Local Authority eligible for NRF (i.e. the coefficients from the regression of the LEGI dummy on NRF eligibility status, a higher order polynomial of the IMD rank plus controls). Columns 1 and 2 in each panel display IV estimates for specifications excluding LEGI neighbourhood fixed effects. Columns 3 and 4 display results for specifications with these LEGI dummies included so that identification comes from variation in LEGI status induced by the NRF instrument within LEGI neighbourhoods. This addresses the potential concern that unobserved neighbourhood level effects may be correlated with the proportion of NRF-eligible LSOA across neighbourhoods. As discussed above, we still include LSOA that are located outside any LEGI neighbourhood to help with the precision of the estimated coefficients on the control variables. Results reported in columns 1 and 3 are based on estimations using a sample that includes all LSOA. We also examine the robustness of our estimates by narrowing the sample around the eligibility threshold (as recommended, for example, by Lee and Lemieux 2009). To do this, we re-run the estimations using a sample that excludes 8293 super output areas located in local authority areas with a mimimum IMD rank higher than 175. Results based on this restricted sample are displayed in columns 2 and 4 of each panel.

Table 6 reports the FRD results for employment. Notice that the coefficient estimates reported in the first column are equal across the different panels because the specification includes no area fixed effects. Standard errors may differ across panels, however, because we cluster errors at the LEGI neighbourhood level (even when we do not include LEGI fixed effects).For this specification we find no significant effect of LEGI on employment although the first-stage coefficient on the NRF instrument is large and highly significant. The fact that the first stage coefficient on the NRF instrument is highly significant holds across most specifications pointing to the strength of our instrument. The second column displays results for the pooled restricted sample specification where the sample excludes LSOA located in local authorities ranked above 175 against all six indices of deprivation. The exclusion of super output areas located within the least deprived local authority areas increases the treatment effect estimate, although the precision of the estimation is again low. The standard errors are such that we should not draw strong conclusions on the basis of the differences in the coefficient estimates, but the fact that they do differ underlies our decision to replicate results for this sample when we move to the specification including LEGI neighbourhood fixed effects.

As discussed above, even though we condition on a rich set of observable area characteristics and the minimum IMD rank determining the NRF status, NRF status may be correlated with spatially heterogenous trends in employment (thus making it invalid as an instrument). To address this problem, we estimate specifications combining the FRD and spatial-differencing approaches by including LEGI neighbourhood fixed effects into our IV model. Columns (3) and (4) display the results for the full and the restricted samples, respectively. For all LEGI neighbourhoods (2km, 5km, and 8km) and for both samples the first-stage coefficient on the NRF instrument is more than twice as large as the correspoding IV estimate when we exclude LEGI neighbourhood fixed effects. This is because estimation is based on variation in NRF status within LEGI neighbourhoods, and within these neighbourhoods the fraction of super output areas eligible for NRF is larger than in the full sample. Comparing across the panels, we see that the precision of the estimation improves as the LEGI neighbourhood is expanded because more untreated super output areas (that act as controls for treated LEGI LSOA) are included in estimation. This is reflected in the decreasing standard error for the first-stage coefficient on the NRF instrument as the LEGI neighbourhood is expanded. With a 2km LEGI neighbourhood the fact that we are trying to identify the effect from a small number of LSOA causes the estimates to be insignificant (although the point estimate is positive). For the 5km LEGI neighbourhoods results are significant at the 10% level, at least when we restrict the sample by excluding LSOAs located in local authorities ranked above 175 against all six indices of deprivation (column 4). For 8km neighbourhoods the coefficient estimates on LEGI treatment are significant at the 10% level for both samples, with the restricted sample giving a positive significant coefficient at the 5% level. To give some idea of magnitudes, the coefficient of 0.0726 for the 8km LEGI neighbourhood estimated on the restricted sample suggests that the average annual growth rate among LEGI super output areas was about 3.6 percentage points higher than for control areas.

As discussed in the methodology section, the FRD approach identifies the LATE. If we assume that the effects of LEGI are heterogenous across areas then this estimate gives us the effect of LEGI on treated LSOA compared to nearby untreated non-NRF super output areas which would have received LEGI funding if the minimum of six IMD ranks in their local authority area was 50 or less. This estimate is clearly of significant policy interest, because it tells us what would have happened if the IMD criterion for NRF funding had been relaxed to make more Local Authorities eligible. If we are willing to assume that the effects of LEGI are similar across super output areas, then the LATE is equal to the average treatment effect (ATE) and tells us what would have happened under a number of different changes to the policy framework. Specifically, it gives the effect if (i) more LEGI areas were funded under the existing scheme, (ii) NRF funding criterion had been relaxed or, indeed, (iii) a Local Authority had been randomly allocated LEGI treatment.

Turning to worklessness, results for the same specifications and LEGI neighbourhoods are reported in Table 7. When we do not include LEGI neighbourhood fixed effects, results suggest no impact of LEGI on worklessness (Table 7, Columns 1 and 2) in either sample. Once we introduce LEGI fixed effects (columns 3 and 4) looking across the panels, we see that, as with employment, we cannot obtain precise estimates using 2km LEGI neighbourhoods. For 5km and 8km LEGI neighbourhoods the results for worklessness are slightly weaker than those for employment in terms of statistical signficance. In our preferred specification (i.e. column 4, included fixed effects on the restricted sample) we found significant effects on employment for both the 5km and 8km LEGI neighbourhood definitions, with the latter coefficient significant at the 5% level. For worklessness, results are only significant for the 8km LEGI neighbourhood definition and then only at the 10% level. That said, point estimates are similar across both 5km and 8km neighbourhoods highlighting the fact that this is mostly an issue of the precision of estimates rather than the magnitudes of the estimated effects on worklessness. These point estimates are similar in magnitude to the corresponding results for employment. This is what we should expect, as increases in unemployment are expected to show up in reduced worklessness provided that incoming residents or commuters from other areas are not occupying all new jobs.

Finally, when we consider the number of business, in Table 8 we find some weak evidence of positive impacts on business formation even when we exclude LEGI neighbourhood dummies, providing that we restrict the sample by excluding LSOAs located in local authorities ranked above 175 against all six indices of deprivation (column 2). As for both employment and worklessness estimates of the treatment effect for IV specifications with LEGI neighbourhood fixed effects defined on 2km LEGI neighbourhoods are insignificant (Table 8, Columns 3 and 4). For 5km and 8km LEGI neighbourhoods we find highly statisically significant effects (with the significance somewhat stronger than for employment and considerably stronger than for worklessness). Again, as for worklessness, the estimated effects are of very similar magnitude to the corresponding estimates for employment. The similar magnitude of the impact of the programme on employment and business formation suggests that a substantial fraction of employment resulting from LEGI funding resulted from new businesses starting up in the LEGI area.

[TO DO: Results combining rings and FRD to look at the issue of displacement]

[TO DO: Robustness tests for FRD approach experimenting with different order of IMD rank polynomials and different bands around the threshold]

[TO DO: Descriptive and diagnostic figures for the FRD design.]

6 Conclusions

We assess the causal impact of a significant area based initiative that aimed to raise productivity and employment in England's most deprived neighbourhoods. To identify causal impacts of the scheme we use detailed spatial data combined with strategies based on two institutional features of the scheme. Specifically, we use the fact that treatement areas are spatially bounded to compare treated areas to nearby untreated areas and the fact that only certain local authorities are eligible for funding to compare treated areas to similar areas that are untreated due to the ineligibility of the local authority of which they are a part. Our preliminary results suggest that the scheme may have positively effected both employment and number of businesses as well as reducing worklessness. However, we also find evidence that these impacts come at the expense of nearby areas. In future versions of the paper we intend to improve the analysis along a number of dimensions, in addition to calculating whether the overall scheme has positive impacts net of displacement.

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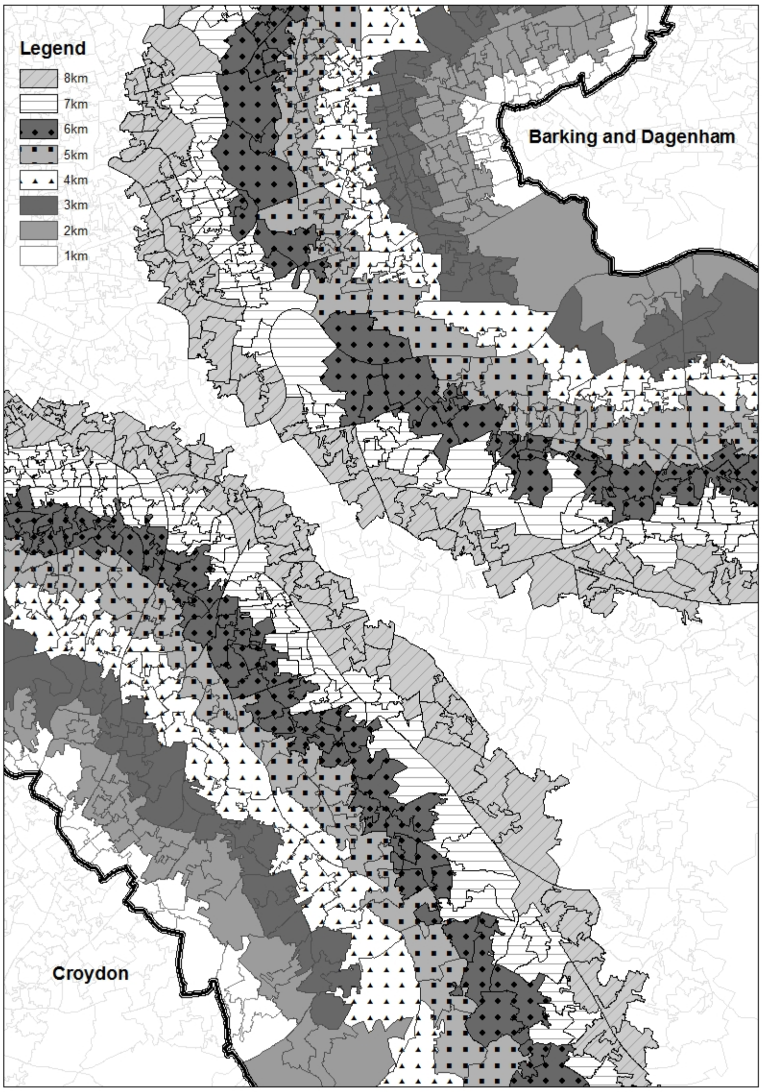

Figure 1: 1km-wide control rings (Croydon and Barking & Dagenham)

Table 3: The Impact of LEGI on Employment. Log changes 2005-2007.

	Pooled		FE				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			2 km LEGI Neighbourhoods				
LEGI	0.0172	0.0305*	0.0388*	0.0871***	0.0264		
	(0.0171)	(0.0181)	(0.0233)	(0.0202)	(0.0248)		
1km control ring					-0.0607***		
					(0.0203)		
2km control ring				0.0607***			
				(0.0203)			
Observations	32,473	32,473	32,473	32,473	32,473		
LEGI Neighbourhoods			354	354	354		
			5 km LEGI Neighbourhoods				
LEGI	0.0172	0.0305*	0.0251	0.0901***	0.0290	-0.00669	0.0252
	(0.0172)	(0.0180)	(0.0211)	(0.0263)	(0.0264)	(0.0263)	(0.0258)
1km control ring					-0.0612***	-0.0968***	-0.0649***
					(0.0207)	(0.0321)	(0.0172)
2km control ring				0.0612***		-0.0357	-0.00376
				(0.0207)		(0.0233)	(0.0226)
3km control ring				0.0968***	0.0357		0.0319
				(0.0321)	(0.0233)		(0.0307)
4km control ring				0.0649***	0.00376	-0.0319	
				(0.0172)	(0.0226)	(0.0307)	
Observations	32,473	32,473	32,473	32,473	32,473	32,473	32,473
LEGI Neighbourhoods			353	353	353	353	353
			8 km LEGI Neighbourhoods				
LEGI	0.0172	0.0305	0.0270	0.0912***	0.0327	-0.00141	0.0312
	(0.0175)	(0.0187)	(0.0218)	(0.0252)	(0.0260)	(0.0282)	(0.0262)
1km control ring					-0.0585***	-0.0926***	-0.0601***
					(0.0209)	(0.0317)	(0.0160)
2km control ring				0.0585***		-0.0342	-0.00156
				(0.0209)		(0.0228)	(0.0219)
3km control ring				0.0926***	0.0342		0.0326
				(0.0317)	(0.0228)		(0.0308)
4km control ring				0.0601***	0.00156	-0.0326	
				(0.0160)	(0.0219)	(0.0308)	
Observations	32,473	32,473	32,473	32,473	32,473	32,473	32,473
LEGI Neighbourhoods			348	348	348	348	348

Notes: Specification in column (1) includes only LEGI dummy variable as a right-hand-side variable. Specifications in columns (2)-(7) include a full set regional controls. Specifications in columns (3)-(7) include LEGI neighbourhood fixed effects. For control ring specifications indicators for all control rings are included but coefficients are shown only for the four closest rings. 90, 95 and 99 % confidence levels are denoted by "*", "**", and "***", respectively.

Table 1: Descriptive statistics

	All			LEGI			Controls			8 km Neighbourhood / all		
	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs
Employment, log change 2005-2007	0.042	0.327	32473	0.057	0.359	3791	0.04	0.322	28682	0.042	0.368	9066
Worklessness, log change 2005-2007	-0.02	0.284	31954	0.006	0.24	3773	-0.024	0.289	28181	-0.018	0.252	9024
Number of businesses, log change 2005-2007	0.0371	0.1719	32473	0.047	0.192	3791	0.036	0.169	28682	0.042	0.19	9066
Employment, 2005	664	2257	32473	589	2131	3791	673	2273	28682	578	1747	9066
Worklessness, 2005	23	21	32477	30	23	3791	22	20	28686	29	22	9066
Number of businesse, 2005	62	183	32473	46	139	3791	64	188	28682	47	101	9066
LEGI treatment (1 if treated)	0.117	0.321	32477	1	0	3791	0	0	28686	0.418	0.493	9066
Neighbourhood Renewal Funds (1 if eligible)	0.391	0.488	32477	0.985	0.123	3791	0.313	0.464	28686	0.718	0.45	9066
Working-aged population, LSOA	1094	168	32477	1081	146	3791	1096	171	28686	1086	143	9066
Population density / working-aged	2822	2802	32477	2977	2276	3791	2801	2864	28686	3321	2824	9066
White, british (%)	0.871	0.176	32477	0.892	0.159	3791	0.868	0.177	28686	0.86	0.19	9066
White, other (%)	0.027	0.038	32477	0.014	0.015	3791	0.028	0.039	28686	0.021	0.027	9066
Black (%)	0.023	0.057	32477	0.017	0.044	3791	0.024	0.059	28686	0.035	0.078	9066
Asian (%)	0.045	0.106	32477	0.05	0.121	3791	0.044	0.103	28686	0.051	0.113	9066
House owners (%)	0.711	0.208	32477	0.688	0.222	3791	0.714	0.206	28686	0.679	0.23	9066
Businesses employing 0-4 persons (%) MSOA	69	11	32477	64	11	3791	69	11	28686	66	12	9066
Businesses employing 5-9 persons (%) MSOA	14.3	5.1	32477	15.8	5.2	3791	14.1	5	28686	15.1	5.4	9066
Businesses employing 10-19 persons (%) MSOA	7.8	3.8	32477	9	4.3	3791	7.6	3.7	28686	8.4	4.2	9066
Businesses employing at least 20 persons (%) MSOA	9.2	5.3	32477	10.9	5.4	3791	9	5.3	28686	10.4	5.5	9066
Agriculture, fraction of local units	0.038	0.077	32477	0.018	0.041	3791	0.041	0.08	28686	0.019	0.045	9066
Production, fraction of local units	0.079	0.052	32477	0.085	0.057	3791	0.079	0.052	28686	0.082	0.056	9066
Finance, fraction of local units	0.009	0.018	32477	0.01	0.028	3791	0.009	0.017	28686	0.009	0.021	9066
Rank of Index of Multiple Deprivation Score Rank LSOA	16244	9376	32477	11049	8345	3791	16930	9289	28686	12281	8735	9066
Minimum of the six LA level IMD ranks	106	93	32477	21	25	3791	118	92	28686	45	57	9066

Table 2: Descriptive statistics by distance from the LEGI boundary

	LEGI, all			Controls								
				8km Neighbourhood			5km Neighbourhood			2km Neighbourhood		
	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs
Employment, log change 2005-2007	0.057	0.359	3791	0.031	0.374	5275	0.029	0.381	2875	0.019	0.407	698
Worklessness, log change 2005-2007	0.006	0.24	3773	-0.036	0.259	5251	-0.033	0.26	2866	-0.047	0.251	698
Number of businesses, log change 2005-2007	0.047	0.192	3791	0.039	0.189	5275	0.039	0.203	2875	0.04	0.229	698
Employment, 2005	589	2131	3791	570	1408	5275	525	1132	2875	485	1023	698
Worklessness, 2005	30	23	3791	28	21	5275	28	20	2875	30	21	698
Number of businesse, 2005	46	139	3791	48	61	5275	44	53	2875	39	41	698
LEGI treatment (1 if treated)	1	0	3791	0	0	5275	0	0	2875	0	0	698
Neighbourhood Renewal Funds (1 if eligible)	0.985	0.123	3791	0.527	0.499	5275	0.536	0.499	2875	0.509	0.5	698
Working-aged population, LSOA	1081	146	3791	1090	140	5275	1090	143	2875	1089	122	698
Population density / working-aged	2977	2276	3791	3569	3136	5275	3474	2847	2875	3579	2807	698
White, british (%)	0.892	0.159	3791	0.838	0.206	5275	0.841	0.211	2875	0.818	0.244	698
White, other (%)	0.014	0.015	3791	0.026	0.032	5275	0.022	0.025	2875	0.02	0.021	698
Black (%)	0.017	0.044	3791	0.048	0.093	5275	0.044	0.081	2875	0.05	0.081	698
Asian (%)	0.05	0.121	3791	0.051	0.107	5275	0.059	0.124	2875	0.075	0.155	698
House owners (%)	0.688	0.222	3791	0.673	0.235	5275	0.687	0.22	2875	0.707	0.217	698
Businesses employing 0-4 persons (%) MSOA	64	11	3791	67	12	5275	67	12	2875	67	13	698
Businesses employing 5-9 persons (%) MSOA	15.8	5.2	3791	14.6	5.4	5275	14.6	5.6	2875	14.7	6.1	698
Businesses employing 10-19 persons (%) MSOA	9	4.3	3791	8	4.1	5275	7.9	4.2	2875	7.9	4.6	698
Businesses employing at least 20 persons (%) MSOA	10.9	5.4	3791	10	5.6	5275	10	5.7	2875	10.2	5.7	698
Agriculture, fraction of local units	0.018	0.041	3791	0.019	0.048	5275	0.018	0.045	2875	0.014	0.038	698
Production, fraction of local units	0.085	0.057	3791	0.08	0.055	5275	0.08	0.057	2875	0.076	0.058	698
Finance, fraction of local units	0.01	0.028	3791	0.008	0.015	5275	0.007	0.013	2875	0.007	0.014	698
Rank of Index of Multiple Deprivation Score Rank LSOA	11049	8345	3791	13167	8902	5275	12908	8751	2875	13098	8719	698
Minimum of the six LA level IMD ranks	21	25	3791	62	66	5275	61	66	2875	65	71	698

Table 4: The Impact of LEGI on Worklessness. Log changes 2005-2007.

	Pooled		FE				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			2 km LEGI Neighbourhoods				
LEGI	0.0301*	-0.0130	-0.00474	0.00248	-0.00659		
	(0.0167)	(0.0157)	(0.0208)	(0.0282)	(0.0209)		
1km control ring					-0.00907		
					(0.0213)		
2km control ring				0.00907			
				(0.0213)			
Observations	31,954	31,954	31,954	31,954	31,954		
LEGI Neighbourhoods			354	354	354		
			5 km LEGI Neighbourhoods				
LEGI	0.0301**	-0.0130	-0.00720	0.00211	-0.00252	-0.00734	-0.00526
	(0.0149)	(0.0152)	(0.0183)	(0.0259)	(0.0220)	(0.0195)	(0.0206)
1km control ring					-0.00464	-0.00946	-0.00737
					(0.0199)	(0.0195)	(0.0179)
2km control ring				0.00464		-0.00482	-0.00273
				(0.0199)		(0.0155)	(0.0151)
3km control ring				0.00946	0.00482		0.00209
				(0.0195)	(0.0155)		(0.0143)
4km control ring				0.00737	0.00273	-0.00209	
				(0.0179)	(0.0151)	(0.0143)	
Observations	31,954	31,954	31,954	31,954	31,954	31,954	31,954
LEGI Neighbourhoods			353	353	353	353	353
			8 km LEGI Neighbourhoods				
LEGI	0.0301**	-0.0130	-0.00571	0.00894	0.00281	-0.00418	-0.00361
	(0.0132)	(0.0151)	(0.0163)	(0.0247)	(0.0209)	(0.0190)	(0.0207)
1km control ring					-0.00613	-0.0131	-0.0126
					(0.0201)	(0.0198)	(0.0187)
2km control ring				0.00613		-0.00699	-0.00642
				(0.0201)		(0.0152)	(0.0148)
3km control ring				0.0131	0.00699		0.000571
				(0.0198)	(0.0152)		(0.0142)
4km control ring				0.0126	0.00642	-0.000571	
				(0.0187)	(0.0148)	(0.0142)	
Observations	31,954	31,954	31,954	31,954	31,954	31,954	31,954
LEGI Neighbourhoods			348	348	348	348	348

Notes: Specification in column (1) includes only LEGI dummy variable as a right-hand-side variable. Specifications in columns (2)-(7) include a full set regional controls. Specifications in columns (3)-(7) include LEGI neighbourhood fixed effects. For control ring specifications indicators for all control rings are included but coefficients are shown only for the four closest rings. 90, 95 and 99 % confidence levels are denoted by "*", "**", and "***", respectively.

Table 5: The Impact of LEGI on Number of Businesses. Log changes 2005-2007.

	Pooled		FE				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			2 km LEGI Neighbourhoods				
LEGI	0.0111	0.0167*	0.0143	0.0110	0.0151		
	(0.00896)	(0.00907)	(0.00885)	(0.0157)	(0.0110)		
1km control ring					0.00404		
					(0.0206)		
2km control ring				-0.00404			
				(0.0206)			
Observations	32,473	32,473	32,473	32,473	32,473		
LEGI Neighbourhoods			354	354	354		
			5 km LEGI Neighbourhoods				
LEGI	0.0111	0.0167*	0.0144	0.0175	0.0177	0.0132	0.0101
	(0.00924)	(0.00949)	(0.0144)	(0.0177)	(0.0143)	(0.0155)	(0.0157)
1km control ring					0.000217	-0.00425	-0.00738
					(0.0199)	(0.0166)	(0.0154)
2km control ring				-0.000217		-0.00446	-0.00760
				(0.0199)		(0.00997)	(0.00913)
3km control ring				0.00425	0.00446		-0.00313
				(0.0166)	(0.00997)		(0.00804)
4km control ring				0.00738	0.00760	0.00313	
				(0.0154)	(0.00913)	(0.00804)	
Observations	32,473	32,473	32,473	32,473	32,473	32,473	32,473
LEGI Neighbourhoods			353	353	353	353	353
			8 km LEGI Neighbourhoods				
LEGI	0.0111	0.0167*	0.0124	0.0113	0.0145	0.0109	0.00803
	(0.00928)	(0.00972)	(0.0127)	(0.0178)	(0.0148)	(0.0164)	(0.0162)
1km control ring					0.00316	-0.000439	-0.00329
					(0.0204)	(0.0169)	(0.0162)
2km control ring				-0.00316		-0.00360	-0.00646
				(0.0204)		(0.00978)	(0.00911)
3km control ring				0.000439	0.00360		-0.00285
				(0.0169)	(0.00978)		(0.00800)
4km control ring				0.00329	0.00646	0.00285	
				(0.0162)	(0.00911)	(0.00800)	
Observations	32,473	32,473	32,473	32,473	32,473	32,473	32,473
LEGI Neighbourhoods			348	348	348	348	348

Notes: Specification in column (1) includes only LEGI dummy variable as a right-hand-side variable. Specifications in columns (2)-(7) include a full set regional controls. Specifications in columns (3)-(7) include LEGI neighbourhood fixed effects. For control ring specifications indicators for all control rings are included but coefficients are shown only for the four closest rings. 90, 95 and 99 % confidence levels are denoted by "*", "**", and "***", respectively.

Table 6: The Impact of LEGI on Employment. Log changes 2005-2007. IV estimates.

	Pooled		FE	
Minimum IMD rank	>0	0-175	>0	0-175
	(1)	(2)	(3)	(4)
			2 km LEGI neighbourhood	
LEGI	0.0196	0.0363	0.151	0.161
	(0.056)	(0.052)	(0.11)	(0.17)
1 km control ring				
1st stage regressions				
NRF	0.293***	0.331**	0.762**	0.729
	(0.10)	(0.14)	(0.36)	(0.52)
NRF / neighbouring LEGI				
#(Observations)	32473	24180	32472	24179
#(LEGI neighbourhoods)			353	220
			5 km LEGI neighbourhood	
LEGI	0.0196	0.0363	0.0516	0.0630*
	(0.053)	(0.050)	(0.035)	(0.034)
1 km control ring				
1st stage regressions				
NRF	0.293***	0.331**	0.863***	0.994***
	(0.097)	(0.14)	(0.24)	(0.38)
NRF / neighbouring LEGI				
#(Observations)	32473	24180	32472	24179
#(LEGI neighbourhoods)			352	219
			8 km LEGI neighbourhood	
LEGI	0.0196	0.0363	0.0648*	0.0726**
	(0.055)	(0.052)	(0.037)	(0.036)
1 km control ring				
1st stage regressions				
NRF	0.293***	0.331**	0.781***	0.966***
	(0.093)	(0.14)	(0.20)	(0.31)
NRF / neighbouring LEGI				
#(Observations)	32473	24180	32470	24177
#(LEGI neighbourhoods)			345	213

Notes: All specifications include a full set regional controls. FE specifications include LEGI neighbourhood fixed effects. 90, 95 and 99 % confidence levels are denoted by "*", "**", and "***", respectively.

Table 7: The Impact of LEGI on Worklessness. Log changes 2005-2007. IV estimates

	Pooled		FE	
Minimum IMD rank	>0	0-175	>0	0-175
	(1)	(2)	(3)	(4)
			2 km LEGI Neighbourhoods	
LEGI	-0.0114	-0.00160	-0.0402	-0.0426
	(0.0993)	(0.0911)	(0.0448)	(0.0576)
1 km control ring				
1st stage regressions				
NRF	0.295***	0.333**	0.760**	0.726
	(0.100)	(0.137)	(0.357)	(0.516)
NRF / neighbouring LEGI				
#(Observations)	31959	24018	31958	24017
#(LEGI neighbourhoods)			353	math
			5 km LEGI Neighbourhoods	
LEGI	-0.0114	-0.00160	-0.0779	-0.0757
	(0.0943)	(0.0871)	(0.0565)	(0.0535)
1 km control ring				
1st stage regressions				
NRF	0.295***	0.333**	0.862***	0.991***
	(0.0969)	(0.137)	(0.239)	(0.378)
NRF / neighbouring LEGI				
#(Observations)	31959	24018	31958	24017
#(LEGI neighbourhoods)			352	219
			8 km LEGI Neighbourhoods	
LEGI	-0.0114	-0.00160	-0.0780*	-0.0611*
	(0.0941)	(0.0860)	(0.0469)	(0.0365)
1 km control ring				
1st stage regressions				
NRF	0.295***	0.333**	0.779***	0.964***
	(0.0937)	(0.136)	(0.200)	(0.315)
NRF / neighbouring LEGI				
#(Observations)	31959	24018	31956	24015
#(LEGI neighbourhoods)			345	213

Notes: All specifications include a full set regional controls. FE specifications include LEGI neighbourhood fixed effects. 90, 95 and 99 % confidence levels are denoted by "*", "**", and "***", respectively.

Table 8: The Impact of LEGI on Number of Businesses. Log changes 2005-2007. IV estimates.

	Pooled		FE	
Minimum IMD rank	>0	0-175	>0	0-175
	(1)	(2)	(3)	(4)
			2 km LEGI Neighbourhoods	
LEGI	0.0325	0.0559*	0.0143	0.0224
	(0.029)	(0.033)	(0.029)	(0.033)
1 km control ring				
1st stage regressions				
NRF	0.293***	0.331**	0.762**	0.729
	(0.10)	(0.14)	(0.36)	(0.52)
NRF / neighbouring LEGI				
#(Observations)	32473	24180	32472	24179
#(LEGI neighbourhoods)			353	220
			5 km LEGI Neighbourhoods	
LEGI	0.0325	0.0559*	0.0497**	0.0621***
	(0.029)	(0.033)	(0.023)	(0.022)
1 km control ring				
1st stage regressions				
NRF	0.293***	0.331**	0.863***	0.994***
	(0.097)	(0.14)	(0.24)	(0.38)
NRF / neighbouring LEGI				
#(Observations)	32473	24180	32472	24179
#(LEGI neighbourhoods)			352	219
			8 km LEGI Neighbourhoods	
LEGI	0.0325	0.0559*	0.0450***	0.0575***
	(0.028)	(0.032)	(0.016)	(0.019)
1 km control ring				
1st stage regressions				
NRF	0.293***	0.331**	0.781***	0.966***
	(0.093)	(0.14)	(0.20)	(0.31)
NRF / neighbouring LEGI				
#(Observations)	32473	24180	32470	24177
#(LEGI neighbourhoods)			345	213

Notes: All specifications include a full set regional controls. FE specifications include LEGI neighbourhood fixed effects. 90, 95 and 99 % confidence levels are denoted by "*", "**", and "***", respectively.