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SUPERSTORES AND LABOUR DEMAND: EVIDENCE FROM GREAT BRITAIN

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The objective of this paper is to quantify the net effect that the massive opening of edge or out-of-town superstores, which took place in Great Britain in the mid-eighties and early nineties, had on local employment. Our data set consists of the location and the opening dates of Tesco and Sainsbury's stores, in combination with Census of Employment data from 1984 to 1991. Using both a fixed-effects specification and a system-GMM specification which allows to control for endogeneity, we find that in spite of the adverse effects they had on competing smaller stores, superstores had an overall positive net effect on employment.

JEL classification codes: J23, R23
Key words: superstores, labor demand

I. Introduction

Since the early eighties, Great Britain has been characterized by the opening of an increasing number of superstores, located at the edge or out of towns. While in 1982, only 5% of retail sales were made in out-of-town centers, this percentage had grown to 17% in 1994. Moreover, while in 1971 there were

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only 21 superstores and hypermarkets on the edge of towns, by 1992, there were 719 (Vidal, 1994).

Focusing on food retail, there are two main supermarket chains in Great Britain: Sainsbury's and Tesco. By 1991, these accounted for 32.9% of the market (Burke and Shackleton, 1996). Other chains, like Safeway and ASDA, have also been spreading, but their market shares are significantly smaller (between 7 and 8%). In 1992, 72% of Sainsbury's sales were from edge or out-of-town sites; while for Tesco the figure was 87% (*The Guardian Education*, March 14, 1995).

Sainsbury's stores were founded in 1869, with a small dairy in London. By the turn of the century, the company had 48 stores in London and the South East. At that stage, the average sales area of new stores was 1,000 square feet. By 1990, there were 299 Sainsbury's stores, and by 2000, there were 432, with an average sales area of 30,220 square feet. The oldest Sainsbury's stores have now closed and have generally been replaced by modern superstores. Tesco stores are more recent: the first one opened in 1960 in Chichester. In August 2000, there were 669 Tesco stores and the average sales area was 25,749 square feet. Both Tesco and Sainsbury's stores have been growing in size over the years, and while originally, they were only selling food products, many of them nowadays also sell clothes, kitchenware, toys, and have a chemist, a coffee shop and often a petrol station.

The recent spread of these edge or out-of-town stores has been controversial, due to three major issues. The first is that these stores may jeopardize the vitality of the town centers. The second is that they are often built on valuable green-field locations. The third is that they impose costs in terms of increased pollution from the additional car trips that they induce. Another related criticism is that they discriminate against older, poorer and less mobile members of the population, by reducing their choices and increasing their shopping and travel costs.[1] As documented in Lewis (1985), only those living next to the supermarket with the lowest prices, can benefit without having extra costs in transport.

[1] According to Vidal (1994), only 40% of Britain had access to a car in 1994.

One should however not neglect the benefit of the substantial employment that modern superstores create. Most superstores employ between 300 and 700 people. Yet, superstores are characterized by an efficient management technology, so that there is a reason to believe that they achieve a higher sales/employee ratio, compared to other retailers.[2] Unless sales increase, this is likely to cause a reduction in retail employment. Moreover, superstores reduce employment by drawing trade from smaller High-Street shops, which are then bound to shed labor, especially if they are forced to close down.[3] The fact that since 1960, the number of grocery retail outlets in the UK fell from over 140,000 to below 40,000 is strong evidence that this has been happening (Dobson and Waterson, 1999; Cole, 1983). It is therefore crucial to try and quantify the net effects of the opening of superstores on local employment. Are these superstores job creators or destroyers? To answer this question, we will focus on the effects that the opening of Tesco and Sainsbury's stores had both on food retail and total employment.

The rest of the paper is laid out as follows. In Section II we describe our data. We use data on the location and opening/closing dates of Tesco and Sainsbury's stores, in combination with Census of Employment data, for the years 1984, 1987, 1989, and 1991. In Section III we explain the estimation techniques we used, and describe our empirical results. Section IV concludes.

II. The Data

Two data sources are used. First, we have complete lists of Sainsbury's and Tesco stores, updated to 1996.[4] These lists include the names of the stores, their

[2] Dobson et al. (1998) found that retail sales (in real terms) per outlet increased by 53% and retail sales per employee by 23% during the period 1980 to 1994, which was characterized by the superstore expansion.

[3] Those smaller High-Street shops are essentially firms such as Somerfield, Kwik Save and Co-op. Small "mom and pop's" corner shops are also likely to be affected.

[4] These lists were obtained directly from the stores' management. The management of

locations (including the postcodes), and their opening dates. For Sainsbury's stores, we also have closing dates where relevant, because many of the old and smaller stores have at some point been closed and replaced by a bigger store generally in the same town, but not in the town center.[5] For Tesco stores, we have information about the store type. Tesco stores can be superstores, compact stores, Express stores, Metro stores or other stores. The former three types are bigger stores, located at the edge or out of towns. Express stores generally have a petrol station. Metro stores are much smaller, and located in town centers. We deliberately exclude the latter stores from our analysis.[6] Other stores are older stores, which have been at some point extended.

The second data set we use is the Census of Employment for the years 1984, 1987, 1989, and 1991.[7] "The Census provides a detailed picture of the number of employee jobs according to the industrial activity and location of individual workplaces" (Taylor and Lewis, 1993). Census data are available for geographical areas, down to electoral ward level (subject to confidentiality safeguard). Employees (excluding the self-employed) are classified by Standard Industrial Classification (SIC) activity headings (4-digit codes). The 1984, 1987, 1989, and 1991 Census data sample all larger employers (with 25 or more employees), but only some smaller employers. Small units are selected at the

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ASDA and Safeway stores was not willing to provide lists of their stores complete with both address and opening dates. This is why our analysis is limited to Tesco and Sainsbury's stores.

[5] Savacenter hypermarkets are excluded from our analysis, which focuses on food retailing.

[6] There were only eleven Metro stores in our sample. Their exclusion is therefore not likely to significantly affect our results.

[7] The Census of Employment is not conducted every year, but at irregular intervals. We use the Censuses of the years 1984, 1987, 1989, and 1991 because these were the years of the superstore expansion. The expansion continued after 1991, but the structure of the Census changed. In particular, the geographical units were totally revised, and the Standard Industrial Classification was changed making the pre- and post-1991 employment figures not comparable.

higher SIC-division-within-county level.[8] We use data for employment in the food retail sector and total employment.

We conduct our analysis at two different levels of regional aggregation, to check whether the effects that we find in the smaller regions are due to relocation from neighboring regions. The smaller regions are 852 amalgamated job center areas (JCAs), while the larger ones are 310 job center best-fit derived 1984 travel-to-work areas (TTWAs). These are both fixed areas, which can be used for comparison over time. The JCAs are aggregations of postcodes, while the TTWAs are aggregations of JCAs. The latter are closely related to the standard 322 travel-to-work areas. The boundaries of the travel-to-work areas are determined so that each area meets the following three criteria: a minimum working population of 3,500; 75% of those living in the TTWA also work there; 75% of those working in the TTWA also live there (Department of Employment, 1984). To meet the second and third criteria, travel-to-work areas often cover extensive areas with large population. For instance, the whole region of London is only divided into two travel-to-work areas (London and Heathrow).

We merged the two above described data sets, matching the superstores to both JCAs and TTWAs using postal codes. This allowed us to obtain two new datasets: one for the JCAs and the other for the TTWAs. Each of these data sets contains figures for employment in the food retail sector, total employment, and number of Tesco and Sainsbury's stores, for the years 1984, 1987, 1989, and 1991.

The data are described in Table 1. Part A of the Table has descriptive statistics for the JCAs, while Parts B and C relate to the TTWAs. We consider TTWAs with and without London, because the latter area can be considered as atypical, in the sense that it has a very high number of superstores, compared to the other travel-to-work areas. Part B of Table 1 shows in fact that the maximum number of Tesco and Sainsbury's stores per TTWA is 36 and 73

[8] The data obtained from the sample are grossed up to give estimates for total employment. See Taylor and Lewis (1993) for more details on the Census of Employment.

respectively, while excluding London it becomes 11 and 19 respectively (Part C of the Table). Similarly, we can see that the average number of Tesco stores per TTWA is 0.89, while the average number of Sainsbury's stores is 0.93. Excluding London, these figures become 0.80 and 0.71 respectively. This happens because the London travel-to-work area is obtained by the aggregation of a greater number of job center areas (52 of them), compared to the other TTWAs. Also notice that the London travel-to-work area represents on average about 11% of the employment in the food retail sector, and about 16% of the total employment.

Table 1. Variables Description

Part A: JCAs

Variable	Mean	St. Deviation	Min.	Max.
emp	25,058.63	34,203.86	421	415,439
empf	745.94	799.75	1	7,118
ntesco	0.326	0.584	0	3
nsainsb	0.338	0.714	0	6

Part B: TTWAs

Variable	Mean	St. Deviation	Min.	Max.
emp	68,870.83	192,049.8	992	3,131,633
empf	2,050.09	4,412.87	19	71,523
ntesco	0.895	2.166	0	36
nsainsb	0.930	4.236	0	73

Table 1. (Continued) Variables Description

Part C: TTWAs Excluding London

Variable	Mean	St. Deviation	Min.	Max.
emp	59,212.17	89,604.32	992	677,135
empf	1,843.22	2,496.21	19	19,934
ntesco	0.800	1.350	0	11
nsainsb	0.709	1.669	0	19

Note: *emp* represents total employment; *empf* is employment in the food retail sector; *ntesco* represents the number of Tesco stores, and *nsainsb* is the number of Sainsbury's stores. There are 852 JCAs and 310 TTWAs. Source: The mean, standard deviation, min and max of *emp* and *empf* were calculated from the Census of Employment data, pooling the years 1984, 1987, 1989, and 1991. The corresponding statistics for *ntesco* and *nsainsb* were calculated on the basis of the list (complete of location) of all Tesco and Sainsbury's stores over the same period.

III. Estimation Technique and Results

As we mentioned in the introduction, superstores create employment, on the one hand, but they are likely to cause a reduction in employment by drawing trade away from smaller shops which are then forced to shed labor. It is therefore important to try and quantify the net effect of store presence on employment in the food retail sector.

Denote employment in the food retail sector by *empf*; the number of Tesco stores by *ntesco*; and the number of Sainsbury's stores by *nsainsb*. We start by estimating an equation of the form:

$$empf_{it} = \beta_0 + \beta_1 ntesco_{it} + \beta_2 nsainsb_{it} + \alpha_i + \nu_t + \eta_{it} \quad (1)$$

where t = 1984, 1987, 1989, 1991; and i represents the region (JCA or TTWA).

This specification aims at investigating the net effects of an increase in the number of Tesco or Sainsbury's stores on employment in the food retail sector.[9] The error term in this equation is made up of three components: α_i, v_t, and η_{it}. α_i is a time-invariant region-specific effect, included to account for unobserved regional heterogeneity. This type of heterogeneity is related to those factors that are specific to the region, and likely to affect its food retail employment, but are not included within the regressors used in the estimated equation, either because they are not available in the data set, or because they are unobservable.[10] Failure to account for unobserved heterogeneity generates an omitted variable bias. The inclusion of α_i in Equation (1) is designed to prevent this particular type of bias in estimating β_1 and β_2. v_t represents a time-specific effect, which accounts for possible business cycle effects. Food retail employment may in fact fluctuate with the economy over time, and including v_t mitigates therefore another omitted variable bias. η_{it} is the idiosyncratic component of the error term, which we assume to be uncorrelated with the number of stores.

A potential problem with Equation (1) is that store openings might be endogenous. Superstore managers might in fact decide to locate their new stores in those regions where they forecast population growth and therefore employment growth to be higher. In such circumstance, it would be total employment (which includes employment in food retail) causing an increase in

[9] Note that we chose employment in the food retailing sector rather than total retail employment as our left-hand side variable because in the period 1984-91, superstores were essentially selling food products. Although some of them were starting to sell toys, clothes, books etc., this phenomenon was not strong enough to induce the closure or the shedding of labor by smaller high street stores other than food retailers.

[10] For instance, regions of different size could have different amounts of employment in the food retail sector, even in the absence of Tesco and Sainsbury's stores. Similarly, although our analysis only focuses on Tesco and Sainsbury's stores, there were also other superstores like ASDA and Safeway in the regions considered. The α_i component of the error term in Equation (1) would thus also pick up the presence of these other stores in region *i*.

the number of stores, rather than the other way around. To see whether this is the case, we estimate the following equation:

$$emp_{it} = \gamma_0 + \gamma_1 ntesco_{it} + \gamma_2 nsainsb_{it} + \alpha_i + \nu_t + \eta_{it} \quad (2)$$

which is identical to Equation (1) except that total employment (emp_{it}) rather than employment in the food retail sector is on the left hand side. Disproportionately large γ_1 and γ_2 coefficients can be seen as an indication of the presence of the above described endogeneity bias.

The estimation results for Equations (1) and (2) are reported in Table 2.A. and Table 2.B. All our specifications include time dummies to control for the ν_t component of the error term, and are estimated using a fixed-effects estimator, both for the JCAs and for the TTWAs.[11] For the former areas, the opening of an extra Tesco store is associated with an increase in employment in the food retail sector of about 209 people, while the opening of a new Sainsbury's stores is associated with an increase of 123 people (Table 2.A., column 1).

For the TTWAs, Tesco stores seem to be associated with an increase in employment of 407. However the opening of Sainsbury's stores does not seem to significantly affect food retail employment (Table 2.B., column 1). Yet, if we run the same regression of $empf_{it}$ on $ntesco_{it}$ and $nsainsb_{it}$ excluding the London travel-to-work area (column 2), we obtain positive and significant effects of both $ntesco_{it}$ and $nsainsb_{it}$ on food retail employment (the figures are 298 and 261 respectively). If anything, the coefficients on $ntesco_{it}$ and $nsainsb_{it}$ for the TTWAs are larger than the corresponding coefficients for the JCAs, suggesting

[11] Since we have observations on the employment levels in all the JCAs and TTWAs in Great Britain, we can say that our data do not represent draws from a larger population. This justifies our use of a fixed-effects model (Kennedy, 1998). As stated in Baltagi (1995), estimation with panel data allows to control for unobserved heterogeneity, to alleviate aggregation bias, to improve efficiency by using data with more variability and less collinearity, and to examine adjustment dynamics. The estimation was performed using version 6.0 of the STATA statistical package.

Table 2.A. JCAs. Fixed-Effects Estimates of the Effects of $ntesco_{it}$ and $nsainsb_{it}$ on $empf_{it}$ and emp_{it}

	Dependent Variable:			
	$empf_{it}$	emp_{it}	$empf_{it}$	emp_{it}
$ntesco_{it}$	208.83	1,278.43	---	---
	(11.15)	(5.12)		
$nsainsb_{it}$	122.58	930.59	---	---
	(6.45)	(3.67)		
$ntesco_{i(t+1)}$	---	---	36.53	804.04
			(1.48)	(2.79)
$nsainsb_{i(t+1)}$	---	---	59.24	1,022.07
			(2.53)	(3.73)
R^2	0.42	0.25	0.34	0.24
n	852	852	852	852
T	4	4	3	3

Note: t-statistics are in parenthesis. Time dummies were included in all the specifications.

that employment is not displaced from area to area.[12] Comparing columns 1 and 2 of Table 2.B., we see that the very small and insignificant coefficient on $nsainsb_{it}$ in column 1 was driven by the London travel-to-work area. This TTWA can be seen as an outlier, being characterized by a very high number of stores compared to other travel-to-work areas.

[12] This conclusion still holds if we compare the coefficients in front of $ntesco_{it}$ and $nsainsb_{it}$ in the JCA and TTWA regressions expressed in terms of elasticities. The results in column 1 of Part A of Table 2.A. suggest in fact that an increase in the number of Tesco (Sainsbury's) stores by 10% leads to an increase in employment in the food retailing sector by 0.91% (0.56%). Similarly, the results in column 2 of Table 2.B. suggest that an increase in the number of Tesco (Sainsbury's) stores by 10% leads to an increase in employment in the food retailing sector by 1.29% (1.0%).

Table 2. B. TTWAs. Fixed-Effects Estimates of the Effects of $ntesco_{it}$ and $nsainsb_{it}$ on $empf_{it}$ and emp_{it}

	Dependent Variable:					
	$empf_{it}$	$empf_{it}$ (excluding London)	emp_{it}	emp_{it} (excluding London)	$empf_{it}$ (excluding London)	emp_{it} (excluding London)
$ntesco_{it}$	407.06	298.14	-2,780.43	1,666.59	---	---
	(14.36)	(9.17)	(-6.32)	(5.25)		
$nsainsb_{it}$	3.319	261.06	8,505.31	1,011.72	---	---
	(0.096)	(6.75)	(15.84)	(2.68)		
$ntesco_{i(t+1)}$	---	---	---	---	-8.62	1,512.98
					(-0.21)	(3.38)
$nsainsb_{i(t+1)}$	---	---	---	---	212.40	2,375.46
					(4.44)	(4.46)
R^2	0.81	0.66	0.85	0.58	0.51	0.60
n	310	309	310	309	309	309
T	4	4	4	4	3	3

Note: t-statistics are in parenthesis. Time dummies were included in all the specifications.

If instead of considering employment in the food retail sector, we consider total employment (Equation 2), the opening of a new Tesco store seems to imply, for the JCAs, an increase in employment of 1,278 people, compared to 931 for a new Sainsbury's store (Table 2.A., column 2). For the travel-to-work areas, we can see figures of 1,667 and 1,012 respectively (Table 2.B., column 4). The latter figures are obtained excluding the London TTWA.[13] The figures

[13] When London was included in the regression, we obtained a negative coefficient on $ntesco_{it}$ (column 3 of Table 2.B.).

in the regression of total employment seem to be very high, even considering for indirect employment effects (i.e. construction, warehousing operations, food processing...). As explained above, this might be evidence of an endogeneity bias.

As an additional test for the existence of this endogeneity bias, in Equations (1) and (2), we check whether the leads on *ntesco* and *nsainsb* are significant determinants of $empf_{it}$ (emp_{it}), by estimating an equation of the type:

$$empf_{it}\ (emp_{it}) = \delta_0 + \delta_1\ ntesco_{i(t+1)} + \delta_2\ nsainsb_{i(t+1)} + \alpha_i + \nu_t + \eta_{it} \qquad (3)$$

Positive coefficients on the leads would indicate an inverse causation between employment and the number of stores, invalidating therefore the identifying assumption in Equations (1) and (2).

The estimates of Equation (3) are reported in the last two columns of Tables 2.A. and 2.B. We can see that in the regressions for total employment, the leads are always significant and positive, indicating that it is likely that superstore managers decide to open supermarkets in those areas where they predict a higher employment growth.[14] In the regressions for employment in the food retail sector, although the coefficients on $ntesco_{i(t+1)}$ are generally not precisely determined, the coefficients on $nsainsb_{i(t+1)}$ are always statistically significant. These results confirm the hypothesis that the variables $ntesco_{it}$ and $nsainsb_{it}$ in Equation (1) are likely to be endogenous.

In order to control for this endogeneity, we estimate Equation (1) using a system-Generalized Method of Moments (GMM) approach.[15] This technique combines in a system the relevant regression expressed in first-differences

[14] Within the same fixed-effects framework, the number of both Tesco and Sainsbury's stores responded positively to lagged employment growth. This confirms the idea that store managers use lagged employment growth to predict future employment growth, and thus to locate stores optimally.

[15] See Arellano and Bond (1991) on the application of the GMM approach to panel data. The program DPD by Arellano and Bond (1998) has been used in estimation.

and in levels. First-differencing allows to control for unobserved regional heterogeneity, and the associated omitted variable bias.[16] To correct for the endogeneity bias, the $ntesco_{it}$ and $nsainsb_{it}$ variables are instrumented using their own lags as instruments. As an additional instrument, we also use lagged values of total employment (emp_{it}). This can be justified by the fact that, as discussed above, store managers might decide to open a new supermarket in those regions were total employment is high. Values of the relevant variables lagged at least twice, and first-differences of the same variables lagged at least once can be used as instruments respectively in the equation in differences and in the equation in levels. Estimating the two equations in a system reduces the potential bias and imprecision associated with a simple first-difference GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998).[17]

In order to evaluate whether our model is correctly specified, we use two criteria: the J test and the test for second order serial correlation of the residuals in the differenced equation (*m2*). If the model is correctly specified, the variables in the instrument set should be uncorrelated with the error term in Equation (1). The J test is the Sargan/Hansen test for overidentifying restrictions, which, under the null of instrument validity, is asymptotically distributed as a chi-square with degrees of freedom equal to the number of instruments less the number of parameters. The *m2* test is asymptotically distributed as a standard normal under the null of no second-order serial correlation of the differenced residuals, and provides a further check on the

[16] By first-differencing Equation (1), one gets in fact rid of the α_i component of the error term.

[17] In particular, Blundell and Bond (1998) show that the simple first-differenced GMM estimator suffers from bias and imprecision when the instruments available for the first-differenced equations are weak, i.e. when the lagged levels of the series are only weakly correlated with subsequent first-differences. They show that this bias and imprecision can be dramatically reduced when the additional moment conditions relative to the equation in levels are considered.

specification of the model and on the legitimacy of variables dated *t-2* as instruments in the differenced equation.[18]

The results of the GMM estimates of Equation (1) are reported in Table 3.A. and 3.B. Table 3.A. refers to the estimates relative to the JCAs.[19] From column 1, we can see that both the coefficients in front of the $ntesco_{it}$ and $nsainsb_{it}$ variables are positive and precisely determined. Their magnitudes suggest that the opening of an extra Tesco (Sainsbury's) store is associated with a rise in the number of people employed in the food retail sector of 561 (653). These numbers are significantly larger than those reported in column 1 of Table 2.A., suggesting that the latter coefficients suffered indeed from an endogeneity bias. The coefficients in front of $ntesco_{it}$ and $nsainsb_{it}$ are however likely to suffer from a further bias due to the fact that in our estimating equation, we do not allow for persistence in employment.

In column 2, we therefore present the results of a dynamic specification of the following type:

$$empf_{it} = \varepsilon_0 + \varepsilon_1 ntesco_{it} + \varepsilon_2 nsainsb_{it} + \varepsilon_3 empf_{i(t-1)} + \alpha_i + \nu_t + \eta_{it} \qquad (4)$$

The coefficient in front of $empf_{i(t-1)}$ is precisely determined and equal to 0.49, suggesting a moderate degree of persistence. The coefficients ε_1 and ε_2 are still positive and precisely determined. They are now respectively equal to 261 and 396.[20] A t-test suggested that the difference between these two coefficients is not statistically different from 0 (p-value: 0.41).

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[18] If the undifferenced error terms are *iid*, then the differenced residuals should display first-order, but not second-order serial correlation. In this case, variables lagged twice or more are acceptable instruments in the differenced equation.

[19] Note that due to the first-differencing process, we lose one cross-section of observations compared to Tables 2.A. and 2.B.

[20] Due to the presence of the lagged dependent variable, one further cross-section is lost in this specification. Given that only two cross-sections are available in estimation in this case, a test of second order autocorrelation of the residuals could not be provided.

Table 3.A. JCAs. GMM Estimates of the Effects of $ntesco_{it}$ and $nsainsb_{it}$ on $empf_{it}$

	Dependent Variable:	
	$empf_{it}$	$empf_{it}$
$ntesco_{it}$	560.83	261.13
	(4.62)	(2.92)
$nsainsb_{it}$	652.72	395.72
	(5.50)	(3.79)
$empf_{i(t-1)}$	---	0.49
		(7.45)
J	8.67	6.96
(p-value)	(0.19)	(0.43)
m2	-1.75	---
n	852	852
T	3	2

Note: All specifications were estimated using a system-GMM estimator. t-statistics are in parenthesis. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Time dummies were included in all equations. Instruments in column 1: $ntesco_{i(t-3)}$, $nsainsb_{i(t-3)}$, $emp_{i(t-3)}$ in the first-differenced equation; $\Delta ntesco_{i(t-1)}$, $\Delta nsainsb_{i(t-1)}$, $\Delta emp_{i(t-2)}$ in the levels equation. In column 2, $empf_{i(t-3)}$ was used as an additional instrument in the differenced equation, and $\Delta empf_{i(t-1)}$ was used in the levels equation. The time dummies were always included in the instrument set. The *J* statistic is a test of the overidentifying restrictions, distributed as chi-square under the null of instrument validity. *m2* is a test for second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation.

In order to formally justify the specification in column 2, we have performed a test of the dynamic model versus the static one. This test involves the construction of the χ^2 statistic suggested by Newey and West (1987). If a model is incorrectly specified, the *J* test for that model will tend to be relatively large. The difference in the *J* statistics between the static and the dynamic

model, holding the weighting matrix fixed can be seen as a test of whether the improvement of specification which takes place when lagged employment is added is statistically significant.[21] The difference between the two *J* statistics is distributed as a χ^2 with one degree of freedom.[22] The Newey-West statistic is in our case equal to 71.87, which is obviously statistically significant. This shows that there is a clear improvement in the specification of our employment equation when lagged employment is added. Finally, in all regressions in this Table, the Sargan and *m2* tests do not indicate problems with the instrument selection, or the general specification of the model.

Table 3.B. presents the results of the GMM estimation of Equations (1) and (4) performed for the TTWAs. Columns 1 and 2 refer to the static model, whereas columns 3 and 4 refer to the dynamic model. As in Table 2.B., we present the results including the London TTWA, as well as those excluding it. The results presented in column 1 suggest that in the former case, the opening of a Tesco store is associated with a rise in food retail employment of 1,561 people, whereas the corresponding figure for a Sainsbury's store is 152. It is hard to believe that Tesco and Sainsbury's stores have such different effects on employment: this result is likely to be driven once again by the London TTWA, which can be considered as an outlier. Once the London TTWA is removed, the estimated coefficients on $ntesco_{it}$ and $nsainsb_{it}$ become respectively 1,130 and 773 (column 2). Although more similar to one another, they still appear to be very high. This might be due to the fact that we are estimating a static model, whereas employment is in fact dynamic. Allowing

[21] The instruments that we choose provide a set of moment restrictions. The GMM estimator minimizes a quadratic form, in the corresponding sample moments, using a weighting matrix given by a consistent estimate of the variance-covariance matrix of the moment restrictions themselves. See Arellano and Bond (1998) for more details.

[22] More in general, the degrees of freedom of the χ^2 statistic are given by the number of omitted parameters in the parsimonious model. Since the two models that we are comparing differ only by the presence of lagged employment, we consider a χ^2 statistic with only one degree of freedom.

Table 3.B. TTWAs. GMM Estimates of the Effects of $ntesco_{it}$ and $nsainsb_{it}$ on $empf_{it}$

	Dependent Variable:			
	$empf_{it}$	$empf_{it}$ (excluding London)	$empf_{it}$	$empf_{it}$ (excluding London)
$ntesco_{it}$	1,561.17	1,130.07	555.51	324.62
	(30.93)	(6.61)	(3.53)	(2.13)
$nsainsb_{it}$	151.63	772.64	36.57	263.64
	(5.13)	(3.85)	(0.59)	(1.79)
$empf_{i(t-1)}$	---	---	0.73	0.71
			(8.71)	(9.62)
J	15.24	18.94	8.91	7.30
(p-value)	(0.17)	(0.06)	(0.26)	(0.40)
m2	-1.10	0.49	---	---
N	310	309	310	309
T	3	3	2	2

Note: All specifications were estimated using a system-GMM estimator. t-statistics are in parenthesis. Standard errors and test statistics are asymptotically robust to heteroskedasticity. Time dummies were included in all equations. Instruments in columns 1 and 2: $ntesco_{i(t-3),}$ $nsainsb_{i(t-2),}$ $nsainsb_{i(t-3)}$, $emp_{i(t-2)}$, $emp_{i(t-3)}$ in the first-differenced equation; $\Delta ntesco_{i(t-1)}$, $\Delta nsainsb_{i(t-1),}$ $\Delta emp_{i(t-1)}$ in the levels equation. In columns 3 and 4, $empf_{i(t-3)}$ was used as an additional instrument in the differenced equation, and $\Delta empf_{i(t-1)}$ was used in the levels equation. The time dummies were always included in the instrument set. The *J* statistic is a test of the overidentifying restrictions, distributed as chi-square under the null of instrument validity. *m2* is a test for second-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation.

for a dynamic specification (column 4), the corresponding coefficients become 325 and 264, and remain precisely determined, while their difference is once again statistically insignificant (p-value = 0.83). A Newey-West (1987) test similar to the one described above indicated once again that the dynamic model is to be preferred to the static one. Finally, once more, in all regressions in this Table, the Sargan and *m2* tests do not indicate problems with the instrument selection, or the general specification of the model.

IV. Conclusions

Using both a fixed-effects and a system-GMM specification which allows to control for endogeneity, we have shown that the opening of Tesco and Sainsbury's stores generally has positive net effects on employment. This means that the job creation that these stores imply is sufficient to offset the job destruction, due to the reduction in the sales at competing stores, or in some cases to the closing of the latter. It is worth noting that the latter effects might be somehow understated since the Census of Employment does not deal with the self-employed, which make up a significant part of those "mom and pop's" stores that might be affected by the opening of superstores. Given the structure of the British society however, it is possible to explain that the net effects of local employment is significantly positive by the fact that competitors are not necessarily strongly affected by superstores. Most competitors being located in town, village or suburb centers, many people who do not own a car will in fact continue to use those rather than the superstores, which are often difficult to reach by public transportation. Moreover, people tend to go to superstores only once a week and do the top up shopping in the local corner shop. Therefore, while superstores might somehow imply a reduction in the sales of competitor stores, these effects might not be strong enough to affect the competitors' employment levels. These considerations can explain the increase in employment of 12% that characterized the UK grocery retailing sector between 1983 and 1994, and which took place in the face of a general downward trend in the national levels of employment (London Economics, 1995).

Finally, it is worth noting that although the main outcome of this analysis is that the opening of superstores is beneficial to employment, it would be worth exploring the issue of the effects of these openings on wages. In fact, many of the supermarket employees being unskilled, the effects of the opening of the stores on wages might be negative. This issue is on the agenda for future research.

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