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Cities are not Isolated States

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Introduction

We know that neighbourhoods within cities do not exist in isolation: that they are part of the interactive whole that constitutes 'a city'. Neighbourhoods cannot be viewed as isolated from the wider metropolitan region either in housing terms or as labour markets. If new jobs are created as part of a local area regeneration effort, people who live outside the community that is the target of the regeneration will take many of these jobs. Moreover, people from outside the neighbourhood who take the jobs create opportunities to be filled elsewhere (either because they have left a job thus creating a vacancy or because they have not taken an alternative job elsewhere in the city). Unemployment rates for people of given employability therefore even out over the city's whole labour market area quite quickly. The speed with which this equalisation of opportunities happens varies with the size of the community concerned relative to the city as a whole and its self-containment in commuting terms. An early and still credible estimate for areas as open to cross commuting as London boroughs was about one year (Gordon and Lamont, 1982).

More recently it has been realised that neighbourhood housing markets interact in rather similar ways within a city. Neighbourhoods within cities have different socio-economic compositions. There are rich neighbourhoods and poor ones and how rich or poor a household or neighbourhood is closely correlated with indicators of labour market success: indeed it directly reflects them. The result is that rich neighbourhoods have concentrations of better educated, more highly qualified, healthier residents with lower probabilities of experiencing unemployment, fewer discriminated against groups and fewer of those groups with low labour market success or inactivity. The residents of poor neighbourhoods have essentially the reverse set of characteristics. But 'residents' are not fixed. Neighbourhoods continuously experience inward and outward movement of households and most of such movements are within a given city. Nor is such movement random. Those moving out of the most deprived areas are biased towards those who have improved their position and employability within the labour market ('get on and get out') while those moving in tend to have even less favourable employability characteristics than those who do not move at all.

The paradox is that even successful attempts to improve the skills of the residents of the most disadvantaged neighbourhoods are likely to lead to an increase (not reduction) in the level of unemployment and poverty in the neighbourhood relative to others. The improved labour market prospects of those whose skills improve leads them to differentially move away to be replaced by more disadvantaged residents (Cheshire *et al*, 2002).

In broad terms much of the research from the U.K. Economic and Social Research Council’s Cities Initiative has re-inforced this conclusion. It has important policy implications. It means that efforts to reduce differences between neighbourhoods – reduce polarisation or social segregation – by simply localised regeneration policies are doomed to failure. It does not mean that they are necessarily a waste of resources. Successfully delivering enhanced labour market prospects to disadvantaged groups by geographically targeted training programmes may be quite an effective way of improving their life chances. But its success is not sensibly measured by looking at the relative incidence of neighbourhood

unemployment after the policy has been implemented. It is likely to have become more unequal and the more effective the policy, the more inequality will have increased because it will have generated more out movement of the previously disadvantaged.

These processes and our increasing understanding of how they operate, focus on relationships between neighbourhoods within particular urban areas. The research reported here was an exploration of the extent to which similar processes of spatial adjustment and labour market interaction exist *between* cities as well as *within* them. It focuses on the interaction between cities within regions of Europe. Although the definition of 'city' that underlay the proposal was intentionally one which generated areas as self-contained as possible in economic terms[1], nevertheless there are regions within Europe which are heavily urbanised and interaction between them is possible - even likely. One of the factors prompting the initial curiosity was the observation in the 1990s that:

"*Dramatic contrasts such as those between the centre and the outlying regions are being overtaken by a more complex pattern .... this diversification of disparities is generating a patchwork in which privileged areas border directly on depressed areas*" (Millan, 1993).

Recent work on the determinants of urban growth in the EU had also shown that, other things equal, a city-region with a faster growth rate grew faster, the closer it was to other, less rapidly growing city-regions. Similarly, a slower growing city-region grew more slowly, the closer it was to faster growing city-regions. Cheshire and Magrini (2000) named this tendency the 'growth shadow effect'. The hypothesis which triggered the initial investigation was that just as commuting patterns adjusted to even out differences in labour market opportunities between neighbourhoods within cities so they might, too, where cities were densely packed. Examples might include the Ruhr region of Germany, much of the Benelux countries, the English London-Birmingham/Bristol Cambridge axis, or central Scotland. It is possibly of direct relevance to understanding some aspects of the interactions between Liverpool and Manchester and of Glasgow and Edinburgh.

The findings are that commuting between cities behaves exactly as would be predicted on the basis of the inter-regional migration literature. It responds both to economic push factors and to pull factors. It does so however with rather more of a lag than findings on the speed of adjustment of intra-urban commuting might lead one to expect. Again complementing the findings in the migration literature, the responsiveness of commuting flows to differential opportunities between cities diminishes with the commuting time between them. We conclude by considering some of the welfare and policy implications of what has been shown to be a process of real economic interaction and systematic adjustment between the economies of the EU's major cities where such cities are a part of larger urbanised regions. The overall approach is rooted in regional science or spatial economics. Our hypotheses are generated on the basis of essentially economic theory and we analysed patterns of interaction between spatial variables using large enough samples to apply statistical methods and tests of significance. In this sense this study usefully complements more detailed case studies based on a variety of different methodologies and data sources.

Background and Basic Hypothesis

The natural starting point is to restate the mechanism by which adjustment occurs between spatially defined labour markets. Empirical work in the late 1970s and early 1980s demonstrated that local labour markets which are integrated into wider urban regions tend to interact with each other primarily through adjustment of commuting patterns (Cheshire, 1979; Evans and Richardson, 1981; Burridge and Gordon, 1981; Gordon and Lamont, 1982; Gordon, 1985; Morrison, 1999). Indeed, this work has shown that the more densely crowded

are sets of local labour markets and the more they are open to cross-commuting, the more important are changes of those flows as a source of adjustment.

This *seamlessness* (Morrison, 1999) is produced not because all workers in any part of a metropolitan area compete for all jobs but mainly by ‘chain interdependence’. Only the highest skilled workers have effective search areas (employment fields) covering the whole metro area. Less skilled workers have smaller search areas and the least skilled the smallest search areas. But while it may be useful for modelling purposes to represent origins of workers as points, that is not how they are in actual metropolitan areas. Residential neighbourhoods occupy space – they are not points – so workers are more or less continuously distributed over urban space. Despite social segregation which results in workers of given skill levels not being randomly distributed across urban space, workers of all skill levels are so widely distributed that it is better to think of search areas for all skills groups as being continuous. Despite each individual unskilled worker’s employment field being relatively local nearly will have substantial overlaps with those of other, similar skill levels.

Similarly demand, even for unskilled workers, is continuous across urban space. This is because, first, employers are relatively widely distributed and, second, the demand for personal services done by unskilled workers – cleaners, window cleaners, odd jobbers and the like – is widely distributed across residential areas. There is substitution by would-be workers both between areas of search/employment and across job categories; and by employers between skill categories of workers and where those workers come from. This results in a form of ‘chain interdependence’ across the whole of the larger metropolitan labour market even though most workers do not search or take jobs far from where they live. This produces an effectively seamless metropolitan labour market for all groups. The essential mechanism which achieves this effect is commuting pattern adjustment. The necessary condition to achieve this outcome, therefore, is a sufficiently high connectivity via commuting patterns

The question now is the extent to which in highly urbanised regions changes in commuting patterns may similarly adjust to changes in the spatial distribution of opportunity between separate city regions. In so far as they do, this provides a consistent explanation for the previous findings on the growth interdependence of neighbouring cities in the EU urban system and the emergence of apparently less prosperous cities in close proximity to successful ones.

The paper is divided into four sections. The next section explores in rather more detail how commuting patterns might be expected to adapt to changes in the pattern of spatial job opportunity between city-regions in densely urbanised wider regions. This is followed by a section summarising the findings of an analysis of the changes in commuting patterns in the EU. The results of this show that changes in commuting flows between cities not only occur over time but that they do respond to changing patterns of economic opportunity. Such changes are also sensitive to the time distance between cities. The final section concludes. Throughout the paper the empirical analysis is undertaken on data relating to Functional Urban Regions (FURs). These are defined on the basis of a core city identified by concentrations of employment and a dependent economic hinterland defined according to commuting patterns observed in 1971. The original FURs were defined in Hall and Hay 1980[2]. It is this definition which supported the assertion above that the cities which were the subject of this research were as self-contained as possible in economic terms. Despite this, because they occupy space and their residents are distributed over that space, opportunities exist for the adjustment of commuting patterns between them in densely urbanised regions. It is to this we now turn.

Adjustment mechanisms between urban labour markets

Changes in flows of commuters between FURs could affect the transmission of economic growth and influence the pattern of spatial disparities in per capita income and mean (un)employment rates. If a more rapid growth of income, or of job opportunities, in a particular urban region had the effect of attracting additional commuters from surrounding areas, there would be three impacts:

1 'Statistical Effect': it would change measured per capita income in each FUR since income and output are measured at workplaces and so would rise in the gaining FUR and fall in the one that was losing economically active commuters. Resident population would remain the same in both regions leading to an (additional) apparent growth of per capita GDP in the faster growing region but to an (additional) apparent fall in the slower growing.

2 'Composition Effect': it would change the average level of labour productivity if the average productivity of the workers induced to change their commuting patterns differed from the average productivity of existing workers. The additional members of the work force attracted to the faster growing FUR would be relatively long distance commuters. Workers who travel longer distances to work tend to have higher human capital and productivity than short distance commuters. As a consequence, the 'composition effect' is likely to be positive for the more rapidly growing FUR and negative for its less rapidly growing neighbour(s).

3 'Dynamic Agglomeration Effects': it could change the average level of labour productivity as a consequence of the absolute increase in human capital in the regional labour force. If there are increasing returns to human capital (Cheshire and Carbonaro, 1996; Magrini, 1998) the increase in high human capital workers in the faster growing FUR(s) may trigger a dynamic mechanism that increases productivity of all workers in the region even further. In addition if over relevant ranges there are increasing economies of urbanisation (agglomeration) then growth could itself lower costs leading to further growth in the faster growing city or cities.

Bearing in mind that conventions of statistical measurement are such that income and output are measured at workplaces but people are enumerated where they live, consider a system of two regions A and B and two types of workers, skilled (high human capital) workers and unskilled (low human capital) workers. In region A, skilled workers represent a higher proportion of the labour force than in B. As a consequence, region A has a higher level of per capita income than B. However, labour markets are assumed to be in equilibrium and unemployment rates and wage levels are assumed to be similar in the two regions for workers of a given skill level. There is therefore no incentive for net changes in cross-commuting or migration to occur. For simplicity's sake, it is also possible to assume that productivity grows at the same rate for all workers in all regions, so that the equilibrium is stable over time.

The first adjustment phase

Suppose now that the system is affected by a spatially asymmetric shock, which generates faster productivity growth in urban region A than in urban region B, and/or determines the creation of new job opportunities in the first region. This underlying process of asymmetric growth could result from a number of different sources, which we will ignore for the present.

(Figure 1 about here)

For the moment, no adjustment mechanisms between the labour markets exist. This implies that adjustment takes place essentially through intra-regional changes. Suppose each FUR is composed of a core city and a set of sub-centres as in Figure 1. Given the absolute concentration of activities in the core, the creation of new job opportunities determined by the upsurge in economic activity in FUR A is likely to be relatively concentrated in its core.

Job search is assumed to be a costly activity where the cost is a positive function of the physical size of the search area. At this stage, it is likely that the differences existing between the two FURs in terms of wages and/or job opportunities are not sufficient to offset the higher search costs faced by workers residing in FUR B. As a consequence, the underlying process of growth is expected to give rise to a process of intra-regional adjustment, whereby some workers previously employed in one of the sub-centres are now able to improve their position if they find a job in the region's core. At the same time, it will also be easier for previously inactive or unemployed workers residing in the faster growing FUR A to find employment. In this FUR, therefore, there will also be falling unemployment and rising activity rates.

A representative situation is summarised in Table 1. Wage rate differentials are likely to develop due to the difference in labour productivity growth. At the same time, the creation of new jobs in FUR A reduces unemployment rates for both skilled and unskilled workers.

It is also possible that this would produce a shortage of labour supply and, as a consequence, wage differentials could rise even further. Because of the combined effect of all these forces, FUR differentials in skill-specific wages and average per capita income will appear and would be expected to widen.

(Table 1 about here)

A Second Adjustment Phase

The combination of the process of economic growth favouring FUR A and the process of intra-regional adjustment described above implies that job opportunities and skill-specific wages in sub-centres A1, A2, and A3 are likely to improve. This fact, coupled with the widening of inter-regional differentials in terms of job opportunities and wages, will trigger a mechanism of adjustment between the FURs. Workers resident in B1, B2 and B10, who were previously commuting to the core of FUR B or to one of its sub-centres, might now find a job in one of the close-by sub-centres of FUR A (Figure 2).

Although this implies inter-regional commuting, actual commuting distances may not increase, so that the incentive for a costly adjustment such as migration does not necessarily arise. Cross-commuting flows are likely to represent the dominant labour market adjustment mechanism since they are much cheaper than migration (which involves both a change of job location and of residence).

(Figure 2 about here)

Unemployment levels, which are measured at place of residence, are expected to decrease in FUR B since some workers residing in it find a job in FUR A. FUR unemployment rates are still not in equilibrium, however. Those for both skill groups in FUR A are still generally lower than in FUR B. As noted before, it is assumed that skilled workers search for, and travel to, work over longer distances and so manifest a greater propensity to respond to changes in spatial opportunities. Consequently, unemployment rate disparities are likely to be smaller for skilled workers than for unskilled ones.

Whether skill-specific FUR wage differentials disappear, persist or widen depends essentially on the strength and the nature of any ‘agglomeration effect’. The possible outcome ranges between two extremes. Let us examine the upper limit case first. This would be where positive ‘agglomeration effects’ related to the mass of skilled labour exist, and are dynamic in nature. In this case, the net in-flow of skilled workers will accelerate the process of productivity growth and so generate a further increase in wage disparities for skilled workers.

The evolution of the wage differential for unskilled workers depends on the overall effect on the demand for unskilled labour of the concentration of skilled workers, and on the elasticity of supply of unskilled workers in both FURs. For instance, if the concentration of skilled workers in FUR A stimulates demand for unskilled labour (i.e. production is characterised by a relatively high degree of complementarity between skilled and unskilled labour) and the supply of unskilled workers is relatively small and inelastic (implying among other things that FUR B unskilled workers are relatively immobile), existing regional wage disparities for unskilled workers would be likely to widen.

In this situation, the main effects induced by this additional adjustment mechanism are described in Table 2A.

(Table 2A about here)

Although inter-regional unemployment rate disparities might have decreased with respect to the outcome of the previous adjustment phase, wage disparities might have further increased both for skilled and unskilled workers.

As for differentials in average per capita income, it is quite clear that the particular mechanism of adjustment fosters existing disparities even further. Indeed, the ‘statistical effect’, the ‘composition effect’, and any ‘dynamic agglomeration effects’ are all positive for FUR A and negative for FUR B, increasing the gap in measured average per capita income. Moreover, the hypothesised evolution of inter-regional wage and unemployment rate differentials is likely to enhance this tendency even further.

The lower limit case for the outcome of the second adjustment phase would be where the accumulation of high skill, high human capital workers has no agglomeration effects on labour productivity and, instead, commuting flows interact with 'conventional' diminishing returns to scale effects. In this case, cross-commuting by skilled workers tends to reduce productivity differentials, so that inter-regional wage differentials for skilled workers also tend to fade away as adjustment proceeds.

As with the previous case, the evolution of unskilled labour productivity depends also on the degree of complementarity between the two types of workers and on the characteristics of the supply of unskilled workers. A high degree of complementarity between skilled and unskilled labour coupled with a low degree of elasticity of unskilled labour supply implies that FUR differentials in wage rates for unskilled workers are likely to persist for some time before being absorbed. In contrast, the combination of a low degree of complementarity between skilled and unskilled labour (leading to a smaller increase in the demand for unskilled labour) coupled with a large and elastic supply of unskilled labour would imply that the demand increase for unskilled labour in FUR A could be met and inter-regional wage disparities for unskilled labour would be likely to be rapidly eliminated.

(Table 2B about here)

As for per capita income disparities, it is clear from Table 2B that the major source of disparities is now represented by the ‘statistical effect’. Indeed, a comparison with Table 1

shows that productivity effects, either due to the underlying growth phenomenon or to the adjustment mechanism, have faded away. As just pointed out, this, coupled with a gradual convergence of skill-specific wage rates across FURs tends to eliminate one of the sources of per capita income disparities previously identified. On the other hand the ‘statistical effect’ brought about by the change in commuting patterns is even more important than at stage 1, and its effect is enhanced by residual differences in measured unemployment rates. As a consequence, the actual level of per capita income differentials between the two regions depends on the relative magnitude of these two opposing tendencies.

It is also worth emphasising that the general situations summarised in Tables 2A and 2B are not necessarily mutually exclusive over time. Indeed, even if a situation characterised by positive dynamic agglomeration effects actually occurred, it is quite possible that congestion problems in FUR A and the abundance of idle immobile resources in FUR B will at some point become significant enough to limit the unfettered growth of FUR A and slow down, if not halt, the tendency towards ‘catastrophic’ decline in FUR B.

A Third Adjustment Phase

The natural evolution of the previous state is the attainment of a new steady-state situation, in which no further adjustment is necessary. This representative case is described in Table 3; it is clear that all the forces stimulating adjustment have faded away, although small differentials in wages and unemployment rates may still persist in the presence of positive costs of adjustment via changes in commuting patterns.

(Table 3 about here)

However, even if differences in productivity, wages and unemployment levels had completely disappeared, this does not imply that per capita income disparities have also disappeared. On the contrary, the presence of a ‘statistical effect’ implies that ‘observed’ disparities in average per capita income levels between the regions have increased with respect to even the second phase of adjustment. Part of this increase in disparities might be due to the presence of ‘true’ disparities originating from the structural differences between the FURs, but part owes its existence to the fact that output and income are measured at workplaces rather than at residences. They are, moreover, essentially induced by the particular mechanism dominating the adjustment to spatial changes in job opportunity.

It is worth noting, however, that these disparities could be in reality non-trivial. For instance, the growth rate of per capita GDP of the urban region of Bremen (defined so as to be largely self-contained with respect to commuting) was only 72% of that of the much smaller administratively defined NUTS region of Bremen between 1981 and 1991. Similarly, the level of per capita GDP of the urban region of Bruxelles in 1980 was only 50% of the level for the corresponding NUTS 2 region.

The size of these disparities depends on the composition of the cross-regional commuting flows induced by the adjustment mechanism. Clearly, the larger the share of skilled labour within these commuting flows, the larger the induced increase in ‘observed’ disparities since the larger will the effect be on the recipient FUR’s total income.

In addition, the size of the ‘statistical effect’ also depends on the definition of 'region' being adopted. Indeed, the use of a functionally defined set of regions, the boundaries of which are defined on commuting patterns, such as FURs used for the analysis presented here (see Hall and Hay, 1980; Cheshire and Hay, 1989), should substantially reduce - even eliminate - the effect if boundaries were regularly redefined. Let us suppose that as a consequence of the adjustment in commuting patterns, the majority of the workers residing in some localities of FUR B now commute to employment centres in FUR A rather than to

employment centres in B. Then if fixed (or administrative) definitions of regional boundaries are used, it is clear that the output of these workers will be counted in region A whilst they will still be enumerated as residents of region B. This is precisely the ‘statistical effect’ described above. In contrast if FUR boundaries were re-drawn on the basis of commuting patterns a change in commuting patterns would require an adjustment in their delimitation along the lines indicated in Figure 3. The spatial sphere of influence of FUR A would now be enlarged to include localities that were previously contained in FUR B.

(Figure 3 about here)

A change in regional boundaries such as this would therefore reduce the ‘statistical’ component of the ‘observed’ per capita income disparities between the two regions. It would not eliminate it if the induced changes in commuting patterns only increased the flow of commuters into FUR A from the nearest zones of FUR B but did not produce a situation in which a majority of the active population in those zones now worked in region A. Redefining boundaries on the basis of (changes in) commuting patterns, however, would certainly be beneficial to the analysis of regional disparities in per capita incomes. As a result, observed disparities would be closer to ‘true’ disparities arising from structural factors rather than to disparities originating from the way in which data are measured. The size of these disparities depends on the composition of the cross-regional commuting flows originated by the adjustment mechanism. Clearly, the larger the share of skilled labour within these commuting flows, the larger the induced increase in ‘observed’ disparities since the larger will the effect be on the recipient region’s total income.

Opting for a functional definition of regions does not, even in principle, eliminate the ‘statistical effect’ therefore but simply reduces its importance. Since the definitions of FURs used in the analysis in this paper are 'frozen' at 1971 patterns of commuting, even this qualification does not apply.

Changes in commuting flows over time

This section presents the results of a new analysis of actual commuting flows between FURs and changes in them over the decade of the 1980s. It took advantage of parallel work on urban growth and development in the EU, the most recent results of which are summarised in Cheshire and Magrini (2002). This not only confirmed the statistical significance of the 'growth shadow' effect but also suggested that the most relevant measure of distance between FURs was in terms of time; and that the effect disappeared if FURs were more than about 100 minutes travel time apart.

The data

The aim was to collect data for two dates – 1981 and 1991 - and for all the countries in which the growth shadow effect had been shown to be significant. The choice of dates was determined by the availability of data. This needed to be a matrix of commuting flows only available from national Censuses of Population. Since the FURs are built from the smallest spatial units in each country for which the relevant data are available commuting data had to be obtained for these small units. In fact the analysis had to be confined to the FURs of just three of the six countries where the growth shadow effect appeared to exist: France, Italy[3] and the UK. There has been no census in Germany since 1987. The only alternative source of German commuting data (for all the *Kreise* – there have been one off studies in a number of *Länder*) derived from the social security records[4]. These relate only to private sector workers and suffer from the problem that the place of record is frequently the location of the

headquarters of the employing company rather than the actual place of employment. This produces significant distortions in recorded commuting flows and as a result it proved impossible to construct a time series for German FURs on a consistent basis. It proved impossible to find a Dutch source of commuting data relating to units small enough to re-constitute to FURs. The only available potential source was a sample survey undertaken on behalf of the Dutch Ministry of Transport but this is not published. Belgium data have been collected but have not yet been integrated into the pooled database. Since there are only four Belgian FURs this means that only 6 data points are missing which could be incorporated so the results are not likely to change in any significant way when the Belgian data are included.

In order to generate true commuting data for FURs it is necessary to obtain a matrix of flows between all the component spatial units on the basis of which the FUR boundaries are defined. Since the boundaries of such small spatial units are subject to change over time the original boundaries have to be re-approximated on units for each Census for countries where such changes occur. For example in the UK the units on which the boundaries of the FURs used in this data set were originally analysed related to the pre-1974 local government units: the old urban and rural districts and boroughs. The original boundaries had to be re-estimated therefore on the basis of 1981 and 1991 Census Wards (there were small changes in the boundaries of these between 1981 and 1991). In addition because in France (where Commune boundaries have been comparatively stable) the Census years were 1982 and 1990 the changes in commuting flows over time for all countries have been converted into annualised rates and re-estimated to correspond to 1981 to 1991.

The analysis

The dependent variable to be 'explained' is the change in gross commuting - or the best approximation thereof in the case of France - between each pair of FURs over the ten-year period 1981-91. The data for all countries has been pooled yielding a total 114 observations.[5]

The model tested reflects the arguments set out in the introductory sections of the paper. There is an expectation that commuting adjustment would react with a lag to changes in economic conditions but there is no *a priori* way of identifying what the appropriate lag should be. Table 4 shows the result of experimentation with alternative periods over which the growth differentials were also measured (see Cheshire and Magrini, 2002). It was found that the identical period to that which works best in the growth model performs best when changes in commuting flows are the dependent variable. That is the result reported as model (3).

In addition to the pull factor of faster growth in GDP per capita in one FUR compared to others it is necessary to reflect changing opportunities in the FUR(s) of origin. This is done by including the change in the unemployment rate in the FUR of origin. The result reported in Table 4 uses the change in unemployment[6] in the FUR of origin over the period 1987 to 1992.

As well as these two measures of changes in economic opportunities in FURs of destination and origin it is necessary to take account of the distance between the FURs and of their size. It will be seen that the results are as expected. The sensitivity of commuting flow adjustments to any given change in economic opportunities falls with distance but increases with the absolute size of the labour market opportunities in the FUR of destination. Alternative models were estimated in which distance was measured in kilometres rather than estimated travel times but these performed worse. This is further evidence that commuting flows are sensitive not just to distance but to transport connectivity.

The models reported in Table 4 show the results of including three other economic variables although none of these is 'significant' in statistical terms. The additional variables are: the difference in the density of population between the two FURs, the population of the

FUR of origin and the log of the commuting flow between the two FURs at the start of the period. The rationale for including the size of the FUR of origin is straightforward: not only might the size of the labour market affect the attractiveness of a destination FUR but so might the size of the FUR of origin. This however appears not to be the case.

The difference in population density between the two FURs was included on the grounds that other things being equal this would be reflected in differences in housing costs. Thus, other things equal, lower density cities might provide cheaper locations than higher density cities (adjusting for size and income). The result would be, therefore, that any difference in economic opportunities between the FURs would be (partially) offset by differences in housing costs. Such arguments underlie the approach of the 'quality of life literature' (Blomquist et al, 1988; Gyourko and Tracey, 1991) and the argument proposed by Glaeser *et al*, 1995 that the best measure of the growth of a city's welfare is the growth of its population. The density of population is a very crude proxy, however, and appears from the results reported in Table 4 to be not significant. Whether this is because of the noise in the data or because such effects are too small to have any impact on residential location and so commuting flows is not clear.

If the variables measuring the labour market size and the time distance between the pairs of FURs are omitted the size of the commuting flow at the start of the period tends to be significant and positive. It is correlated both with the measures of size and the time distance. However when these underlying variables are included its significance disappears.

The final variables are the dummies for individual countries. These estimate differences in roles of change in commuting between different countries. Since the dependent variable is the log of the change in in-commuting over the decade these tell us about the differential rates of autonomous change in each country. Inter FUR commuting flows in all three countries showed large positive trends. The order of magnitude of the increase in commuting was similar in all three countries but somewhat smaller in Britain than in France or Italy.

Conclusions

These results are consistent with previous findings that there is a systematic interaction between the rates of growth of European FURs and that the strength of this interaction diminishes with time distance between them. The variable capturing this effect - the sum of differential growth – was designed to reflect the expected interaction of urban economies when they are spatially clustered. It was expected that not only would the faster growing FUR(s) attract commuters in from surrounding regions boosting their measured GDP relative to the size of their resident populations but also such differential commuting would attract more highly skilled and productive workers. In addition there might be a dynamic agglomeration effect of such differential growth performance.[7]

The expectation that induced changes in commuting flows were the mechanism giving rise to the observed interaction in the growth performance of neighbouring FURs in the EU is consistent with the results reported in section 4. Changes in commuting flows between FURs behave remarkably like migration. They respond to changes in the spatial pattern of opportunities, both to 'push' and to 'pull' factors, and commuting responses induced by a given change in differential opportunities also decline with (time) distance. These interactions between urban growth rates seem both to represent and to reflect a fundamental mechanism of spatial economic adjustment. They reflect the way that commuting acts as a spatial adjustment mechanism. Moreover they represent more than just an accident of statistical measurement, because the sum of growth differences variable continues to be highly significant even if the dependent variable is the rate of change of output per employee (rather than per resident).[8] The most plausible explanation for this would seem to be that such

changes in commuting flows produce composition effects in the skill mix of the labour forces of the neighbouring FURs, adverse in the case of the slower growing FUR and beneficial in the case of the faster growing FUR. Some form of dynamic agglomeration economies may accompany such composition effects. On this basis it is worth giving at least some preliminary consideration to what the policy implications of these results might be.

As was noted in the introduction, one of the stylised facts of European urban and regional development has been the fact that some of the worst performing cities/regions in Europe are located in close proximity to some of the most dynamic and prosperous ones - the 'patchwork of disparities' phenomenon. This has both excited considerable comment and influenced the development of policy. The findings reported in this paper suggest two things. The first is that the 'patchwork of disparities' phenomenon is neither isolated nor does it arise by chance. Assuming – as the evidence now strongly suggests - it is produced by changes in commuting patterns induced by changing patterns of spatial opportunity generated by the growth process itself, then it is a systematic feature of the European spatial economy. The evidence also shows that the emergence of this ‘patchwork of disparities’ is not just the result of a quirk of statistical measurement (although that may contribute to the phenomenon as observed).

Even so the policy implications are not as clear-cut as one might expect at first glance. There is a paradox. The divergence of mean differentials in per capita incomes between city-regions is not necessarily inconsistent with the convergence (or stability) of marginal differentials for specific groups, with common characteristics, as is illustrated in Table 2B. If correct this would have non-trivial consequences for urban and regional research but - perhaps equally important - important welfare and policy consequences also. If the divergence of growth rates and mean per capita and per employee GDP reflects only the composition effect then it is consistent with returns for skill (and other characteristics for individuals with the same characteristics affecting employability) being equal or at least in equilibrium allowing for commuting costs. The same would be true for unemployment rates. These conclusions would only relate to the 'patchwork of disparities' phenomenon i.e. where the disparities exist between FURs which are located in wider densely urbanised regions.

The situation in terms of its implications for welfare and policy becomes more complicated if dynamic agglomeration economies are involved in the process of interactive FUR growth. In that case, as Table 2A suggests, there might be persistent differentials in the wage and unemployment rates of equivalent individuals between neighbouring urban regions. Thus disparities emerge and grow and will not disappear unless or until some diseconomies of agglomeration intervene. On the other hand there is an efficiency gain from the process of differential growth. Because growth is more concentrated in one among a cluster of interacting urban regions, the income of the cluster as a whole (and by implication the country and the EU as a whole) will be increased since it is possible to exploit economies of agglomeration which would not otherwise exist. Intervention to remove the initial disparities would result in the non-exploitation of potential agglomeration economies. The case for intervention would be strengthened if some other mechanism – perhaps of social exclusion and consequent welfare losses – were involved. But even then it would appear to a classic problem of trading off gains in equity against losses of efficiency.

The second point which emerges is that in densely urbanised regions differences in the mean values of indicators such as unemployment rates or income per capita bear a significant parallel to such differences as measured over the neighbourhoods of a large metropolitan area. In order to obtain a measure of such indicators of welfare capable of a reasonable interpretation one should relate them to individuals of constant characteristics.

The above discussion is not meant to be conclusive. It is intended rather to raise some not so obvious complexities for policy makers to address given the findings about the importance and source of interaction between the economies of neighbouring FURs

and the way in which commuting flows adjust to, and produce adjustments to economic differences between neighbouring cities. Some questions can be addressed directly. For example it is possible to see whether the unemployment rates of skill-specific groups tend to converge relative to aggregate unemployment rates across interacting city-regions.[9] It is also possible to investigate the extent to which the degree of convergence varies with skill level. The results reported here therefore answer one significant question but suggest others. One particular implication is that they provide a new piece of information hinting at the existence of that elusive phenomenon – urban agglomeration economies.

End Notes

[1]Empirical analysis is undertaken on data relating to Functional Urban Regions (FURs). These are defined on the basis of a core city identified by concentrations of employment and a dependent economic hinterland defined according to commuting patterns observed in 1971. The original FURs were defined in Hall and Hay 1980[2].

[2]Commuting data were not available in all countries and other data – such as retail catchment areas in Italy – were resorted to in some countries to delimit the FURs.

[3]One interesting by-product of the work was the discovery that the official analysis of commuting flows in Italy from the 1981 Census was incorrect because of a programming error. This only emerged when changes in flows between 1981 and 1991 were calculated and in many cases nonsense emerged. After a significant delay ISTAT traced the problem and re-estimated all small area commuting flows for the 1982 Italian Census.

[4]Which were kindly made available by Professor F-J. Bade of the University of Dortmund.

[5]A dummy is included for each country effectively as an alternative estimate of the constant. This dummy is highly significant as can be seen from the results reported in Table 4. There are distinct different national patterns to commuting.

[6]Estimated from the Labour Force Survey so giving comparable results over countries.

[7]The variable was designed to minimise the possibility of estimation bias arising from endogeneity by measuring the sum of differential growth only over the first part of the period. Such an implicit lag is also economically plausible since commuting patterns are likely to react to changes in the spatial distribution of opportunities only with some delay. In Cheshire and Magrini, 2002, additional models are estimated which measure the growth interaction variable in terms of employment instead of income growth further reducing the possibility of endogeniety problems. The main results are replicated.

[8]See Cheshire and Magrini, 1998: that it continues to be observed when the dependent variable is the rate of growth of output per worker rather than GDP per capita rule out the possibility that it arises just from the accident of measuring output or GDP where people work while population is measured at place of residence, of course, because both output and employment are measured at workplace.

[9]Lack of data precludes this for wages/incomes.

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Table 1 Outcome of First Phase

FURs	Under-lying Growth Pheno-menon	Statistical Effect	Composition Effect	Agglomer-ation Effect	Wage Rates		Unemployment Rates	
					Skilled	Unskill	Skilled	Unskill
A	>B	n.a.	n.a.	n.a.	>B	>B	<B	<B
B	>A	n.a.	n.a.	n.a.	<A	<A	>A	>A

Table 2A Outcome of Second Phase: with Dynamic Agglomeration Economies

FURs	Underlying Growth Phenomenon	Statistical Effect	Composition Effect	Agglomeration Effect	Wage Rates		Unemployment Rates	
					Skilled	Unskill	Skilled	Unskill
A	=B	Positive	Positive	Positive	>B	>B	<B	<B
B	=A	Negative	Negative	Negative	<A	<A	>A	>A

Table 2B Outcome of Second Phase:
without Dynamic Agglomeration Economies

FURs	Underlying Growth Phenomenon	Statistical Effect	Composition Effect	Agglomeration Effect	Wage Rates		Unemployment Rates	
					Skilled	Unskill	Skilled	Unskill
A	=B	Positive	n.a.	n.a.	(>B)	(>B)	(<B)	(<B)
B	=A	Negative	n.a.	n.a.	(<A)	(<A)	(>A)	(>A)

Table 3 Outcome of Third Phase: a new steady state

FURs	Under-lying Growth Pheno-menon	Statistical Effect	Composition Effect	Agglomer-ation Effect	Wage Rates		Unemployment Rates	
					Skilled	Unskill	Skilled	Unskill
A	=B	Positive	n.a.	n.a.	=B	=B	=B	=B
B	=A	Negative	n.a.	n.a.	=A	=A	=A	=A

Table 4: Pooled regressions with country fixed effects: Dependent variable - Log of adjusted change in in-commuting, 1981-1991

Independent Variables	**Model (1)**	**Model (2)**	**Model (3)**	**Model (4)**	**Model (5)**	**Model (6)**
Difference between the two FURs in their population densities in 1981	-0.00001 (-0.09)	-0.00005 (-0.55)	0.00001 (0.11)	-1.49e-06 (-0.013)	-1.99e-06 (-0.017)	5.55e-06 (0.049)
Growth differential; calculated as the difference between two FURs in their average annual growth rates over the period 1981-1991	0.9903 (1.20)	-	-	-	-	-
Growth differential; calculated as the difference between two FURs in their average annual growth rates over the period 1978-1982	-	4.116 (1.4)	-	-	-	-
Growth differential; calculated as the difference between two FURs in their average annual growth rates over the period 1978-1986	-	-	9.89** (2.11)	9.825** (2.03)	9.765 (1.45)	9.144 (1.403)
Change in growth differential for each pair of FURs: difference between average annual growth rates of 1978-1982 and average annual growth rates of 1987-1992	-	-	-	-	-0.04 (-0.013)	-0.505 (-0.165)
Distance (minutes)	-0.0091*** (-3.40)	-0.0087*** (-3.30)	-0.009*** (-3.47)	- 0.00354*** (-4.14)	-0.0035*** (-4.08)	-0.009*** (-3.44)
Employment in FUR of destination in 1981	4.14e-07*** (5.20)	4.15e-07*** (5.23)	4.04e-07*** (5.13)	3.63e-07*** (5.18)	3.63e-07*** (5.12)	4.05e-07*** (5.10)
Change in unemployment rate in the FUR of origin between 1987 and 1992	0.1212*** (3.17)	0.123*** (3.22)	0.127*** (3.39)	0.147*** (3.97)	0.1477*** (3.95)	0.127*** (3.37)
Population of FUR of origin (1981)	-9.03e-09 (-0.26)	-5.13e-09 (-0.14)	-2.05e-11 (-0.001)	-3.18e-08 (-1.03)	-3.18e-08 (-1.027)	-9.61e-11 (-0.003)
Log of in-commuters (1981)	-0.0133 (-0.30)	-0.0093 (-0.22)	-0.011 (-0.261)	-	-	-0.0108 (-0.255)
Dummy for France	7.471*** (16.22)	7.39*** (16.4)	7.423*** (16.66)	6.95*** (44.17)	6.956*** (43.9)	7.420*** (16.56)
Dummy for Italy	7.387*** (22.39)	7.339*** (22.81)	7.398*** (23.11)	7.072*** (39.5)	7.071*** (0.180)	7.40*** (22.9)
Dummy for Britain	6.891*** (24.20)	6.90*** (24.27)	6.89*** (24.64)	6.57*** (49.66)	6.57*** (49.08)	6.90*** (24.5)
R-square	0.994	0.994	0.994	0.994	0.994	0.99

t values in parenthesis **=significant at 5% ***=significant at 1%

Figure 1

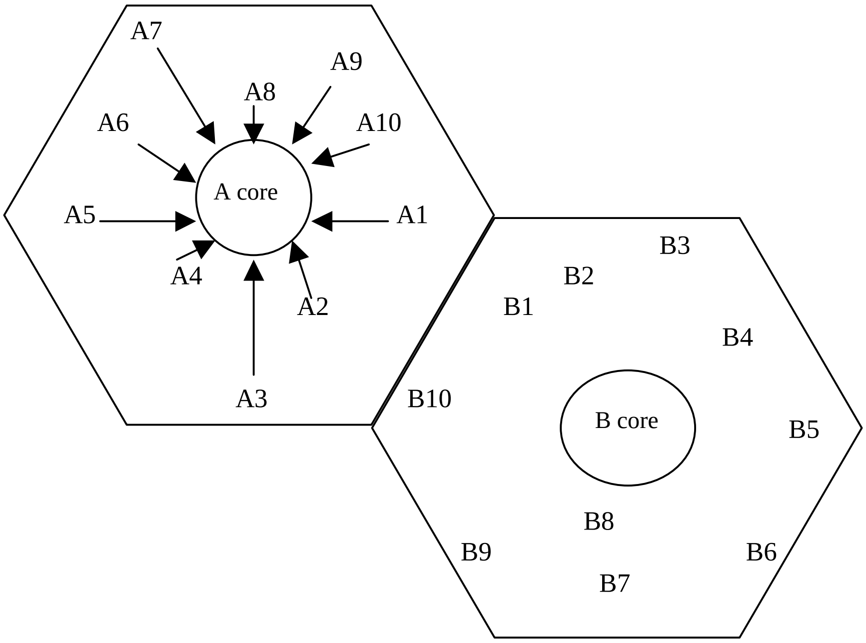
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Figure 2

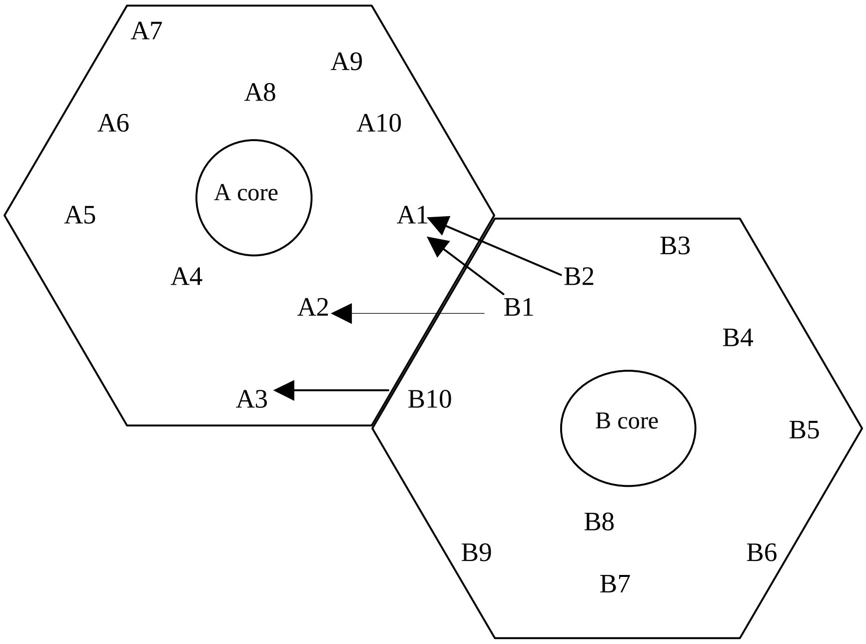
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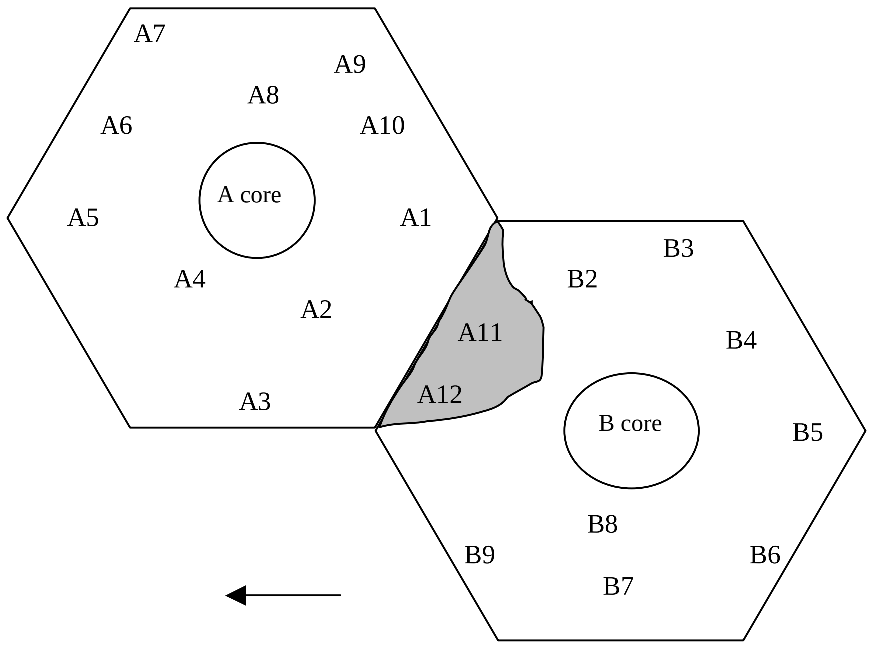
Figure 3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