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Working Paper 181

October 1984

**A REGIONAL PERSPECTIVE ON THE
HUMBER BRIDGE: EMPIRICAL
AND THEORETICAL ISSUES**

David Simon

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ABSTRACT

SIMON, D. (Sept. 1984) A Regional Perspective on the Humber Bridge: Empirical and Theoretical Issues. Working Paper 181, Institute for Transport Studies, University of Leeds.

In view of sustained controversy over the Humber Bridge's construction and cost, it is necessary to examine the bridge's potential contribution in a wider regional context. This paper begins with a brief sketch of the bridge's history before considering its relationship with motorways and other trunk routes in the region. Route alignments are shown to be controversial. Subsequent sections profile Humberside as a disadvantaged region, suffering protracted decline of its major economic bases; and outline regional development planning efforts since the 1960's. Theoretical arguments on the impact of infrastructural investment on regional development, together with available empirical evidence, are then discussed.

A REGIONAL PERSPECTIVE ON THE HUMBER BRIDGE:
EMPIRICAL AND THEORETICAL ISSUES

BY DAVID SIMON

1. INTRODUCTION

This Working Paper is one in a series presenting preliminary results of an ESRC-sponsored research project, 'The Economic Impact of the Humber Bridge on the Carriage of Goods'. The main focus of empirical investigation has been on commercial firms using the bridge and the extent to which it has benefitted or affected their operations. As will emerge from the findings, to be presented in a subsequent paper, firms regard the distance-based time savings as crucial, provided these can be productively utilized. Although the major theoretical analysis therefore falls within the value of time arena, it is essential for both practical and theoretical reasons to examine the Humber Bridge in its regional context and not only in isolation. In purely commercial cost and revenue terms the bridge may not be strictly viable at present, but oft-heard consequent appellations of "white elephant" ignore its broader ramifications for Humberside and adjacent counties. This paper serves to situate the Humber Bridge in its wider context as a backdrop to the study's empirical sections. It divides into five sections. The first three outline the bridge's history, its relation to the national motorway network, and the Humberside economy respectively, while the fourth sketches the evolution of regional planning proposals. The final section examines theoretical and empirical evidence on the relation between infrastructural investments and regional development, with particular reference to the likely impact of the Humber Bridge.

Until the creation of Humberside County in the 1974 local

government reorganization, the River Humber had formed the boundary between Lincolnshire to the south and East Yorkshire to the north. This, plus the physical barrier of the Humber's broad, muddy estuary, had engendered long-felt and significant socio-cultural and economic divisions. Lincolnshire looked southwards to the Midlands; Yorkshire to Northern England.

A decade after the new county's creation and three years after the Humber Bridge opened - both with the intention of forging greater unity "across the water" - traditional sentiments remain strong. Most managers interviewed during our survey of major bridge-using companies expressed negative views on the notion of Humberside as a single entity. South bankers particularly resented being ruled from Beverley, while interviewees on both banks saw little point in linking two culturally distinct and essentially economically competitive areas at the expense of artificial boundaries with the rest of Lincolnshire and Yorkshire. Doncaster and Sheffield (or even Leeds) are still preferred to Hull as shopping or entertainment locales by most south bankers, despite the greater distance, partially because of objections to paying the Humber Bridge tolls, while few Hull residents venture south. The Hull Daily Mail and Grimsby Evening Telegraph have also made only very minor inroads into the readership on opposite banks. It is, however, on the economic impact of the bridge that this project focuses. Over time improved economic integration may in fact foster greater social interaction.

2. A BRIEF HISTORY OF THE BRIDGE

Discussions and proposals for a Humber crossing have surfaced periodically since at least the mid nineteenth century, with Hull industrial and commercial interests, represented by the local Chamber of Commerce and City Corporation, among its most vigorous advocates (Barlow 1983; Dolphin 1975: 138-141; Evans 1982). They clearly perceived an economic advantage from improved access

to the largely agricultural hinterland of Lincolnshire and its port of Grimsby. Support for such a scheme appears to have been rather localized, but might well have been sufficient to ensure construction of a government-funded bridge before World War II had the depression not intervened. The single span bridge finally built had its origins in a 1955 design by Gilbert Roberts of Freeman Fox and Partners, on the basis of which the Hull Corporation pressed for enabling legislation as subsequently embodied in the 1959 Humber Bridge Act. This legislation provided for establishment of a Humber Bridge Board with powers to build a bridge, issue bonds and collect tolls.

Barlow (1983) and Evans (1982) consider in detail the concerted lobbying for a bridge during the 1960s and the immediate impetus provided by Barbara Castle's oft-quoted pledge as Minister of Transport, made during the 1966 Hull North parliamentary by-election campaign. The ascendancy of regional planning in the 1960s against a background of economic boom, rapid population growth and forecasts of a vastly larger national population by the 1980s, had probably been instrumental in bringing about an official change of heart in favour of the bridge. New growth areas would be required to absorb the anticipated additional population and economic expansion, and Humberside was identified as one such 'natural economic region' if the estuary could be bridged. The Yorkshire and Humberside Economic Planning Council, for example,

"...saw the bridge linking North and South Humberside, and its associated road network connecting the area to the major roads to the west of the region, as essential elements in the region's development." (YAHEPC 1966:56)

Barbara Castle maintains that, contrary to the common view of her promise as pure political opportunism, the bridge fitted in with plans of the Ministry of Economic Affairs for future growth in the region. More specifically it formed part of a strategy change she initiated in the Ministry of Transport, seeking to shift the emphasis of the national road network from north-south

to east-west. Rather contradictorily, she also claims the bridge to have been part of a proposed north-south motorway along the east coast from Tyneside to London (Acton 1981:8). Opinion, both locally and in government, was far from united. South bank businessmen felt that their position relative to Hull would be undermined by a bridge, while at least one technical report suggested separate east-west motorways on each bank and felt a bridge to be unjustifiable (Acton 1981:10; Barlow 1983:5-6; White 1981:55). In the meantime, both the motorways and bridge have been built (see Section 2).

Barlow (1983:8-9) suggests further that feasibility studies by government departments and the HBB after 1966, which found in favour of bridge construction, cannot be regarded as objective or independent since both the Labour government and Bridge Board were by then committed to the project, while the consultants also stood to benefit. It was government acceptance of the Humberside Feasibility Study (Central Unit for Environmental Planning 1969) which led directly to the decision to build (see next section). Against the background of demographic and economic circumstances prevailing at the time, wildly over-optimistic traffic forecasts of 24,000 crossings per day and a first year rate of return greater than 15% at some point in the decade 1976-86 were accepted as the basis for viability.

Since the bridge was deemed to provide essentially local rather than national benefits, the Ministry of Transport did not finance construction directly but advanced a loan covering 75% of the costs, with the balance made up of commercial loans raised at a time when interest rates were at record high levels. Repayment is to be over 60 years with a 13-year grace period, the money being raised from tolls. Construction commenced in 1972 but took nine years instead of the projected four to five, through a combination of abnormal weather, labour problems, technical difficulties with the south pier's foundations, and damage to some of the box unit components for the deck. High inflation and

interest rates also contributed to vastly higher money costs, totalling £92.7m in 1983, as against the projected £20m. In real terms the difference was, however, only £10m. The total capitalized loan debt stood in money terms at £167m in 1983, but £138m in discounted 1979 terms. (Barlow 1983; Tuckwell 1983; White 1981).

The bridge finally opened to traffic in June 1981, and although daily traffic flows reached 20,000 during the initial novelty period, these soon fell to around 4,000. A gradual rising trend has since become evident with 7-9,000 daily vehicle crossings counted by October 1983 - still only one third of the original forecasts. The tolls were set at a high level, ranging from 50p for motor cycles and £1 for cars to £7.50 for large HGVs, in accordance with the Humber Bridge Toll Study's recommendations for revenue maximisation (Halcrow Fox and Associates 1977). They have proved to be one of the bridge's most controversial aspects since its opening; their impact on traffic levels and on the bridge's relative costs and benefits will be discussed in a later paper. Now, however, we consider the relationship between the bridge and other routes in the vicinity.

3. THE HUMBER BRIDGE AND ASSOCIATED REGIONAL ROAD NETWORK

Humberside's chief communications with the rest of Britain had historically been by rail, and with Europe by sea. Given the contracting railway network, technical change and the progressive shift to road transport, construction of a new road network to and in the area was receiving priority attention by the 1960s. The Minister of Transport announced plans for initial motorway links in January 1967, to comprise

- i) the M62 extension eastwards from the A1 to Gilberdyke
- ii) the M18 Doncaster Spur extension, to link the M18/A1(M) junction via Doncaster and Thorpe, with the M62 at East Cowick

- iii) an improved trunk road from this motorway at Thorne to Scunthorpe, including a replacement for the antiquated Keadby Bridge across the River Trent
- iv) a Brigg bypass.

These route alignments were not, however, seen as inimical to the proposed Humber Bridge:

"...this decision in no way prejudices the prospect of constructing a Humber bridge as an integral part of any large-scale development of Humberside. The Government will make decisions that when they consider the results for the current planning studies...the bridge will be given a place in the road programme so as to fit in with this development in the 1970s if need be..."

(Minister of Transport to Parliament 25/1/67, cited in CUEP 1969:30).

Implicit in such thinking is an apparent assumption that the bridge would have both local and wider spread benefits. Yet the actual financing arrangements arrived at - as mentioned above - are based on the bridge being essentially a local asset. We test this empirically in our study.

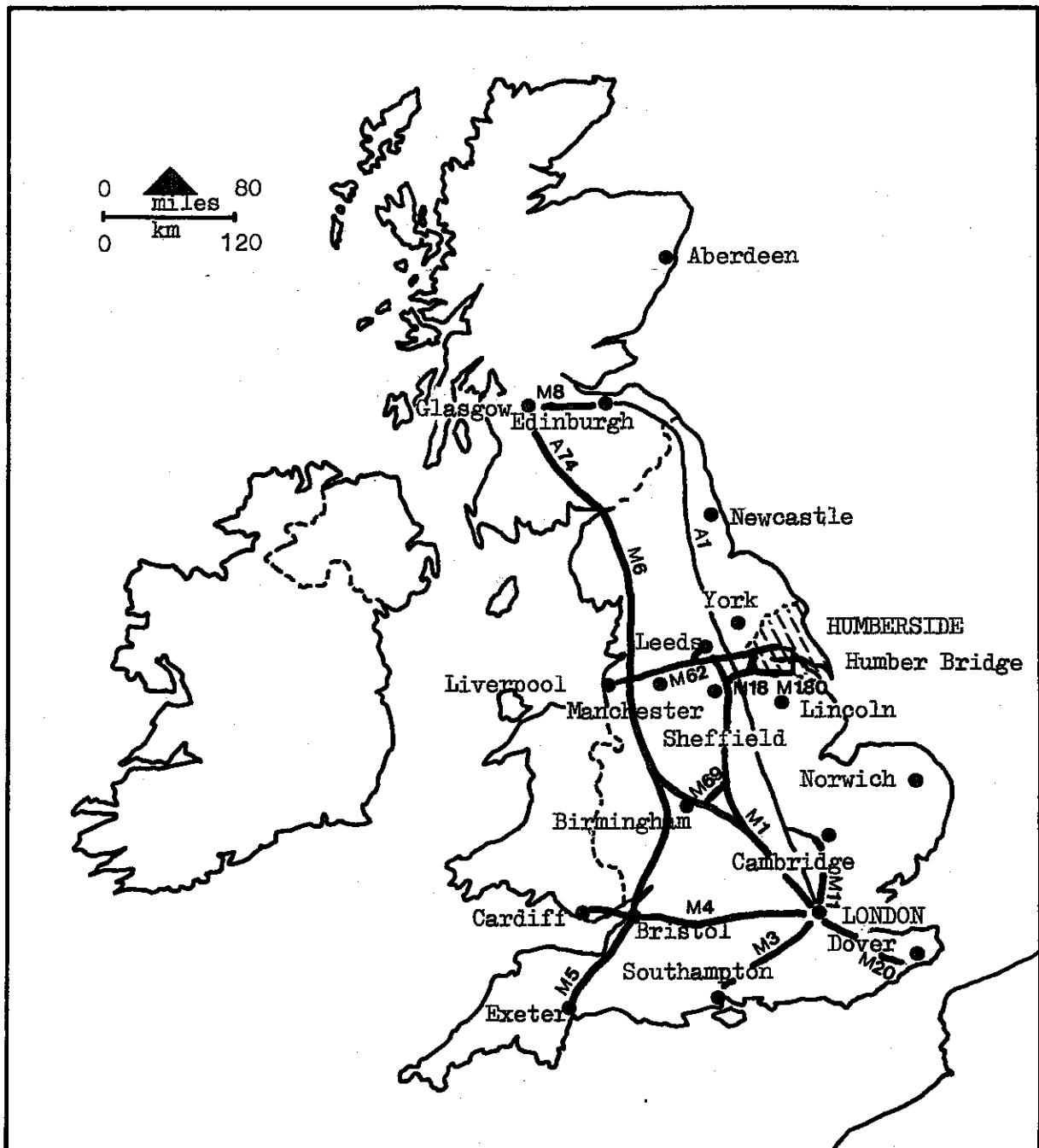
The Humberside Feasibility Study considered an estuarial crossing essential to overcoming the divisive effects of the Humber and continued development of low order sub-regional economies and transport systems on either bank (CUEP 1969:29-32). Clear and early commitment to bridge construction would be needed to avoid misdirection of private sector investment (given existing networks) impeding subsequent regional economic integration. Under existing conditions, however, completion of the bridge during the 1970s was not seen as fully justifiable unless linked to Humberside's designation as a growth area. In that case it would be needed before large-scale expansion, both in traffic terms and as an added attraction to firms considering relocation/establishment in the area, providing access to a wider spectrum

of commercial and service facilities, a larger market and labour pool.*

This rationale sees the bridge fulfilling a local role, with interregional access provided by the motorway system as outlined above. Given that the feasibility study was accepted by government as the basis for bridge construction, the influence of this perspective in the final funding package appears self-evident, particularly (and paradoxically) since the CUEP proposals for major population growth and a Maritime Industrial Development Area were abandoned by the government in 1973 and 1971 respectively. The Humber Bridge is thus marginal to the present motorway system (Figure 1). Within the region, this system comprises the completed M62/A63 into Hull, M18, and M180/A180 into Grimsby. The Humber Bridge thus forms only a local link - the eastern side of a rectangular "motorway box" centred on the estuary. On the basis of relevant distance, cost and time comparisons between alternative cross-bridge and circum-estuarial routes, Dolphin (1975:118-136) predicted that the bridge would have a mainly local significance for Humberside, enlarging the local market and reducing intraregional distances. The motorways would cater adequately for inter-regional flows and would thus have far greater impact on the regional economy.

Comparison of actual road distances measured after 1981 (Table 1) substantiate Dolphin's prediction. The greatest mileage savings are achieved between centres located around the estuary or in cases where both towns lie east of the bridge. From Hull to

*Footnote: Timing was recognized as a clear problem, with initial spare capacity should a large bridge be built early. However, on the basis of traffic forecasts, saturation of a single bridge was likely by 1991, when a second crossing would be necessary.

FIGURE 1HUMBERSIDE: NATIONAL CONTEXT

Source: after "Humberside Facts and Figures 1984.
Beverley: Humberside County Council"

Table 1

Comparative Distances Around the Humber Estuary and
Over the Humber Bridge (miles)

	<u>Estuary*</u>	<u>Bridge</u>	<u>Difference</u>
A) From Hull to			
Scunthorpe	52.5	27.4	-25.1
Immingham	71.5	25.8	-45.7
Grimsby	78.7	32.8	-45.9
Lincoln	84.9	48.4	-36.5
Grantham	96.2	72.9	-23.3
Boston	118.1	83.7	-34.4
Peterborough	130.4	98.9	-31.5
Kings Lynn	144.5	110.1	-34.4
Norwich	187.9	153.5	-34.4
B) From Scunthorpe to			
Beverley	48.8	31.9	-16.9
Bridlington	68.6	59.2	- 9.4
Driffield	55.1	46.4	- 8.7
York	45.8	57.6	+11.8
Middlesborough	102.9	107.2	+ 4.3
C) From Grimsby to			
Beverley	75.6	36.6	-39.0
Bridlington	95.4	63.9	-31.5
Driffield	83.7	51.1	-32.6
York	72.6	62.3	-10.3
Middlesborough	129.2	111.9	-17.3

* routes suitable for HGVs.

Source: AA data provided by Humber Bridge Board.

London or other centres south-west of the bridge, the difference is minimal, especially when seen as a proportion of total trip mileage. Conversely the savings from Grimsby to Middlesborough (or even York) are small. From Scunthorpe it is actually further to York and Middlesborough over the bridge. The same would apply from Grimsby or Scunthorpe to the north-west of the country.

These considerations raise an interesting and important issue. Since the bridge has long been envisaged as being an integral component of regional development and the latter regarded as crucially dependent on improved road connections with the rest of England, why was no motorway routed over the Humber Bridge? The bridge was certainly on the drawing board when the crucial route alignment decisions were made in the mid-1960s, and it could have fulfilled a similar national role to the Severn Bridge, assisting regional development. This would have greatly boosted traffic flows, thereby enhancing its viability, enabling lower tolls to be charged, and perhaps most importantly of all, meant construction at state rather than local expense. If the Bridge had been intended to form part of a proposed Teesside-London motorway as suggested by Barbara Castle (see above), but now presumably scrapped because of financial constraints and reduced population growth, the existing funding arrangements would not have been applied. Alternatively, the M62 might have been routed south of the estuary to pass over the Humber Bridge, thereby avoiding costly construction of the Ouse Bridge as a second river crossing in the area, and also duplication of the parallel M62 and M180 on opposite banks. Another option would have been to shift the M18 Doncaster Spur extension further east to cross the Humber Bridge, joining the A63 (M62 extension) at Hessle.

It appears that one of these routeings had originally been proposed, but the reasons for the subsequent about-turn are unclear. Given the high costs and reasonably close completion dates of these arteries as revealed in Table 2, such an

Table 2 The "Motorway Box" in Humberside²

<u>Section</u>	<u>Opening date</u>	<u>Assumed price base*</u>	<u>Money cost</u>	<u>Inflation index</u>	<u>1983 cost</u>	<u>Land</u>	<u>Admin/ Consultancy</u>	<u>Total Cost</u>
M18 Thorne	30/9/75	1974	£2.5m	0.31	£8m	£0.9m	£1.6m	£10.5m
M62 County boundary to Goole	30/9/75							
M62 Howden-Caves	19/2/76	1974	£29.5m	0.31	£95m	£0.9m	£19.0m	£119.8m
M62 Goole-Howden (incl. Ouse Bridge)	24/5/76							
M180 Brigg bypass	6/77							
M180 Thorne-Sandtoft	6/78	1978	£52.0m	0.57	£91m	£4.0m	£18.2m	£113.2m
M180 Scunthorpe bypass (to Brigg bypass)	12/78							
M180 Trent Bridge (all lanes)	31/10/79							
Humber Bridge	24/6/81		£97.2m		£166m			£166m
A63 Caves Bypass (dualling)	late 75/ beg. 76							
A180 Brigg-Immingham	29/3/83							
A180 Immingham-Grimsby	15/12/83							

Notes

- ² Prices corrected to 1983 levels
- * Taken as mid-point of expenditure
- Includes M181 into Scunthorpe (W)

alternative would seemingly have generated significant capital savings. However, geological instability in the area between Scunthorpe and the estuary, due to the presence of abandoned and now waterlogged iron ore mines, undoubtedly influenced the decision. Work on the Humber Bridge commenced in 1972, the same year as on the relevant sections of the M62. They were also due for completion at roughly the same time, but the bridge was delayed until 1981 due to the factors mentioned earlier. This inevitably raised its cost substantially - the more the pity that no trunk road utilizes it.

A reliable source closely involved with developments at the time, maintains that the idea of separate north and south bank motorways originated with the Leeds DRE, who proposed that the M62 should form a scissors with the A1, its axis passing south or east of Goole. The M62-A1 junction was also shifted southwards in the hope of stimulating economic revival in Pontefract and its environs. These alignments were then suggested in modified form by the Scott-Wilson report in 1965, and approved by the Ministry of Transport despite cheaper alternatives, along the lines suggested above, put forward by a senior local official. These would have routed at least one trunk road over the Humber Bridge and obviated the need for the Ouse Bridge. Little more can be said at this stage on the basis of the available information, save that the existing Humber Bridge financing system appears anomalous, and is certainly controversial. We shall return to this subject in a later paper when the bridge as a whole is evaluated.

4. THE BRIDGE'S HINTERLAND: A PROFILE OF HUMBERSIDE

The creation of Humberside County with effect from April 1974, as already mentioned, was intended to facilitate development efforts in the area once construction of the Humber Bridge had commenced. Until this date North Humberside had formed the East Riding of Yorkshire, and South Humberside part of North Lincolnshire.

Most pre-1974 county-level data are thus not directly comparable; the Yorkshire and Humberside Economic Planning Region boundaries also changed in 1974 (House 1982:63). This was the spatial unit, designated in April 1965, to which much of the regional planning strategy effort had been directed, although the EPC lacked effective powers and fulfilled a purely advisory role (Carter et al 1978). Since the demise of the EPCs in 1979, Humberside County Council has inherited the role of structure plan authority in the absence of any formal regional planning body, and deals direct with central government.

Yorkshire and Humberside may, like the North West, be classed as a less favoured region. It comprises three distinct zones, each with its own problems (House 1982). Three quarters of the regional population live in the western Pennine zone, characterized by the declining urban-industrial complex in the West Yorkshire conurbation and surrounding engineering or wool-based towns. The central zone has been seriously affected by the progressive rundown of the Yorkshire coal mines since the 1950s, notwithstanding the Selby field coming on stream recently. Humberside, the eastern zone, has suffered in the past through relative isolation from the hub of England and a narrow industrial base, despite Hull's role in import-export and harbour-based industry (CUEP 1969; House 1982). The region's problems are thus longstanding, but the last four years have witnessed a rapid acceleration of the recession, as amply illustrated by regional redundancy rates per 1000 manufacturing employees. Whereas the 1977-79 figure for Yorkshire and Humberside was 17.5 (cf 16.9 nationally), it had risen to 74.9 for 1980-82 (cf 58.8 nationally). Only the North, North West, Scotland and Wales fared worse. From June 1978 to September 1981, Yorkshire and Humberside lost 139,000 manufacturing jobs, nearly 12% of the national figure of 1,193,000 (Regional Studies Association 1983:55-56).

Britain's accession to the EEC and completion of the M62, M18,

M180 motorway links and the Humber Bridge (see Figure 1) have certainly had a positive influence on Humberside's accessibility, but the recession and deindustrialization have bitten deeply. Traditionally important sources of employment - fishing in Hull and Grimsby, and steelworking in Scunthorpe - have declined sharply over the last decade or so. In some respects, not least physically, Hull has not yet entirely recovered from its World War II damage. Notwithstanding expansion of the petrochemical industry based on the Killingholme refineries, Humberside's economic base remains insufficiently diversified to absorb the surplus labour power. Immingham docks have increased in importance, not only as an oil terminal for Killingholme and bulk port for grain and steel, but also as a general harbour at Hull's expense, because of labour militancy at the latter.* This point was frequently cited by respondents in our sample survey as the reason for cargo switching and their consequent greater or reduced use of the Humber Bridge, depending on which bank of the Humber the firms are located. Interestingly, this contradicts Dolphin's prediction (1975:179) that opening of the bridge would not facilitate significant loss of custom from Hull, as the two ports were mainly complementary in terms of ship types and the nature of cargoes handled. Outside the three major centres of Hull, Scunthorpe and Grimsby-Cleethorpes agriculture remains important, as it does on the high quality land to both the north and south of the county boundaries.

Over the last twenty years, Humberside's employment structure has changed in similar proportions to that of the country as a whole, with numbers in primary industries halving, construction remaining constant, and the most pronounced shift being from manufacturing into service industries, which now account for

* Consequently, by 1982 Immingham ranked as the UK's fifth most important harbour in terms of value of goods handled, whereas Hull had fallen to seventh position from third in the late 1960's (CUEP 1969; Gill 1984).

nearly 60% of total employment. Sectorally, Humberside has greater concentration than the national average in agriculture and mining; construction; utilities and transport; distributive trades; and especially food, drink and tobacco; and coal, chemicals and metals (Table 3). In these last two, employment was more than double the national average in 1978, the most recent year for which data are available (Gill, 1984).

Between 1970 and 1978 female employment rose 19% (cf 11% nationally) while that of males declined 4% (cf 3% nationally). Until 1977, however, the local decline had been slower than the national trend.

Although the Humberside economy has followed national trends closely, albeit with greater fluctuations, it is important to emphasize again that at least until the Humber Bridge's opening in 1981 there was in fact no unified 'Humberside economy' as such. Rather, each bank's economic structure and orientation differed significantly from the other. Detailed analysis of their respective fortunes over the period 1951-1971, shows that the decline in North Humberside after 1966 eclipsed earlier growth there, the poor performance generating a widespread loss of confidence. South Humberside, by contrast, fared far better, with both male and female employment growth rates above the national average until the end of this period (Dolphin 1975:9-34).

Since 1971, unemployment among both sexes in the county has remained consistently 1-2% above the national level. Apart from temporary drops in 1973-4 and 1979, total unemployment has risen progressively over the decade from under 5% in 1971 to over 15% in 1982 (Gill 1984:42-43). In May 1984, Humberside unemployment had fallen marginally to 15.5% of the estimated population of 856,000 compared to 14.0% in Yorkshire and Humberside as a whole, and 12.9% nationally. Well over 40% of unemployment is accounted for by the under-25 group; while total male unemployment stands

Table 3 Comparative Employment Structures 1978

	Humber side	Yorkshire & Humber side	Great Britain
	%	%	%
Agriculture and Mining	4.1	5.8	3.2
Food, Drink and Tobacco	6.9	4.3	3.1
Coal, Chemicals and Metals	11.1	6.3	4.2
Engineering	3.7	6.4	8.2
Shipbuilding, Vehicles, etc.	4.2	2.3	4.1
Textiles, Leather and Clothing	2.3	7.2	3.9
Bricks, Timber, Paper, etc.	3.5	4.5	4.7
Construction	6.8	5.6	5.5
Utilities and Transport	9.6	7.2	8.1
Distributive Trades	13.5	11.6	12.2
Commercial and Professional Services, etc.	27.1	28.6	32.0
Public Administration and Defence	5.2	5.6	7.0
Total Employees	327,520	1,987,380	22,253,200

Source: 1978 Annual Census of Employment

at 18.1% (HCC 1984). Geographically, overall unemployment within the county is highest in Goole employment office area (18.3%) and Bridlington (17.7%), with Hull (15.7%), Scunthorpe (15.2%) and Grimsby (15.1%) around the average, and only Driffield significantly lower (10.1%). These employment office areas are shown in Figure 2.

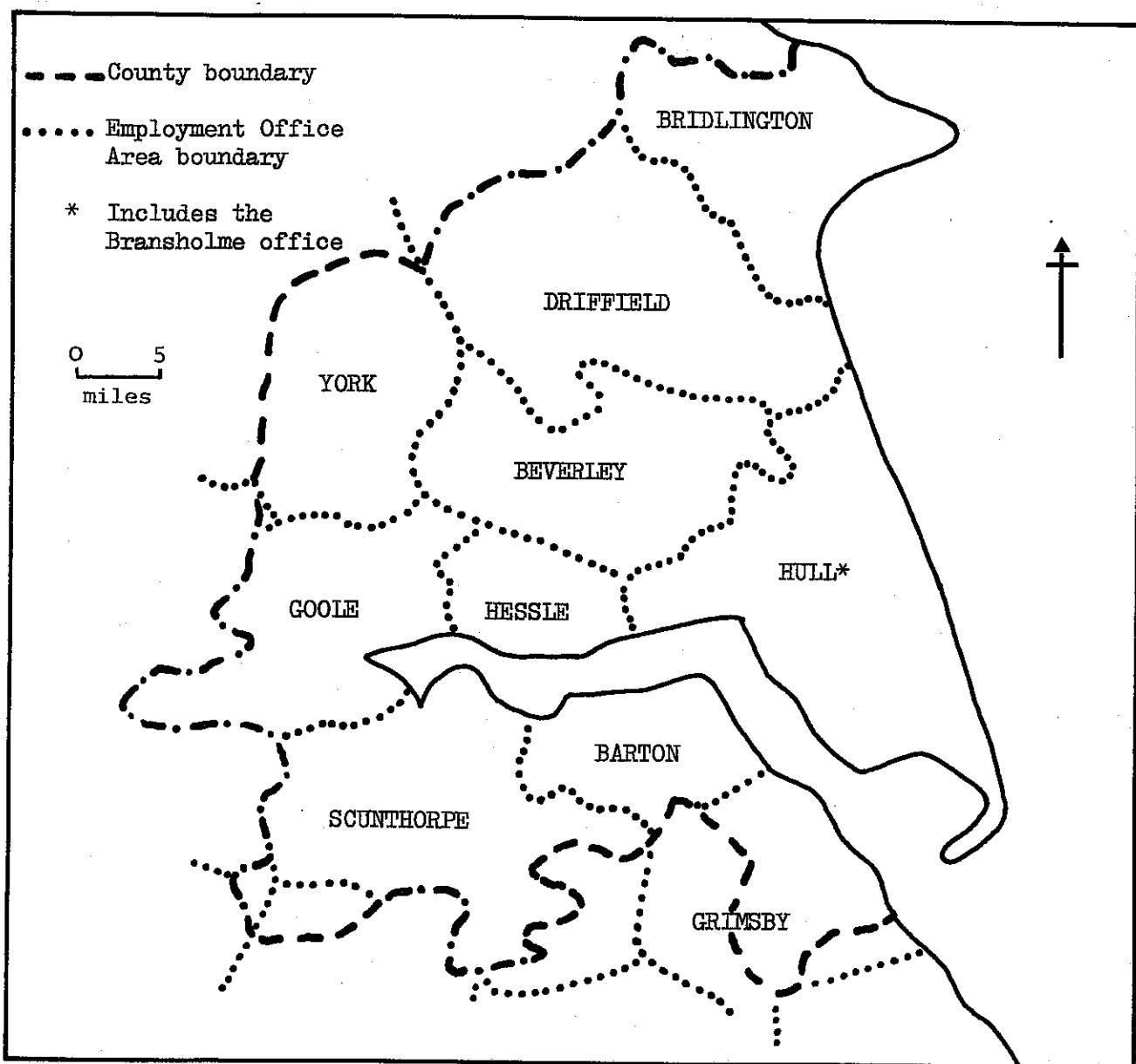
This brief sketch suffices to portray a vastly different picture from that envisaged during the heady late 1960s and exemplified by the Humberside feasibility study (CUEP 1969). Although the study did not foresee major development taking place until the 1980s, a decision in principle was required by 1972. This was to be a prime overspill area absorbing up to 750,000 of the 15m increase in population expected countrywide by the year 2000. Although the region's two main disadvantages as seen by the report, namely poor road connections with the rest of the country, and outdated housing, have been largely rectified, its position relative to other regions has changed little. National population growth has virtually ceased, industrial decline accelerated beyond all expectation, and unemployment reached record levels. Interestingly, the study anticipated a 1981 'indigenous' population (i.e. without in-migration) of 857,000 which is remarkably close to Humberside's mid-1982 estimate of 855,800, based on 1980 census results. However, the high unemployment rate implies that new in-migration is not a viable proposition under present conditions.

5. REGIONAL PLANNING PROPOSALS

The Humberside feasibility study formed one of a series of regional planning reports from the mid 1960s until abolition of the Economic Planning Councils in 1979, seeking to produce a development strategy for Yorkshire and Humberside. Notwithstanding some dissent within the research teams, the general thrust was to promote regional coherence and

FIGURE 2

EMPLOYMENT OFFICE AREAS



Source: after Humberside County Council (1984): Humberside Employment Monitor.

collaboration while solving the vastly different sub-regional problems mentioned above, locally (House 1982:64-66). However a strong regional framework, both analytically and practically, in terms of the EPC's weak powers, was lacking.

The 1969 Hunt Committee majority report recommended a selective growth centre strategy. Subsequent documents developed a 3-tier system of such centres, based on the regional growth points of Leeds and Doncaster. Goole, designated a 'secondary growth point' (the lowest tier) was the only one within the present Humberside county boundaries, although rapid growth was anticipated in Hull, Grimsby and Scunthorpe. The Yorkshire and Humberside Regional Strategy stressed the need for environmental conservation and strengthening of the economic base in Humberside. By the mid 1970s, the county's position had improved somewhat, despite the growing recession, because of progress with the motorway network, modernization of BSC at Scunthorpe, and Britain's accession to the EEC. The fishing industry continued to decline, however, and BSC shed progressively more labour. Development priorities, it was felt, should focus on reducing regional outmigration, improving incomes and housing quality (House 1982:65-66).

Little information is available on how, if at all, the counties in the former EPC region have attempted to co-ordinate policy since 1979. It is likely that each has adopted an inward-looking approach, seeking primarily to stem the tide of recession locally. Despite the "demise of regional policy", most of Humberside still qualifies as an assisted area. The employment office areas of Hull, Hessle, Beverley, Barton, Scunthorpe and Grimsby are classified as Development Areas, while Bridlington and Goole are Intermediate Areas (see Fig. 2). Thus only Driffield and York are excluded from Regional Development Grants, Regional and National Selective Assistance to new industries in terms of the 1982 Industrial Development Act. Nevertheless a wide range of other financial aid is available in the Scunthorpe

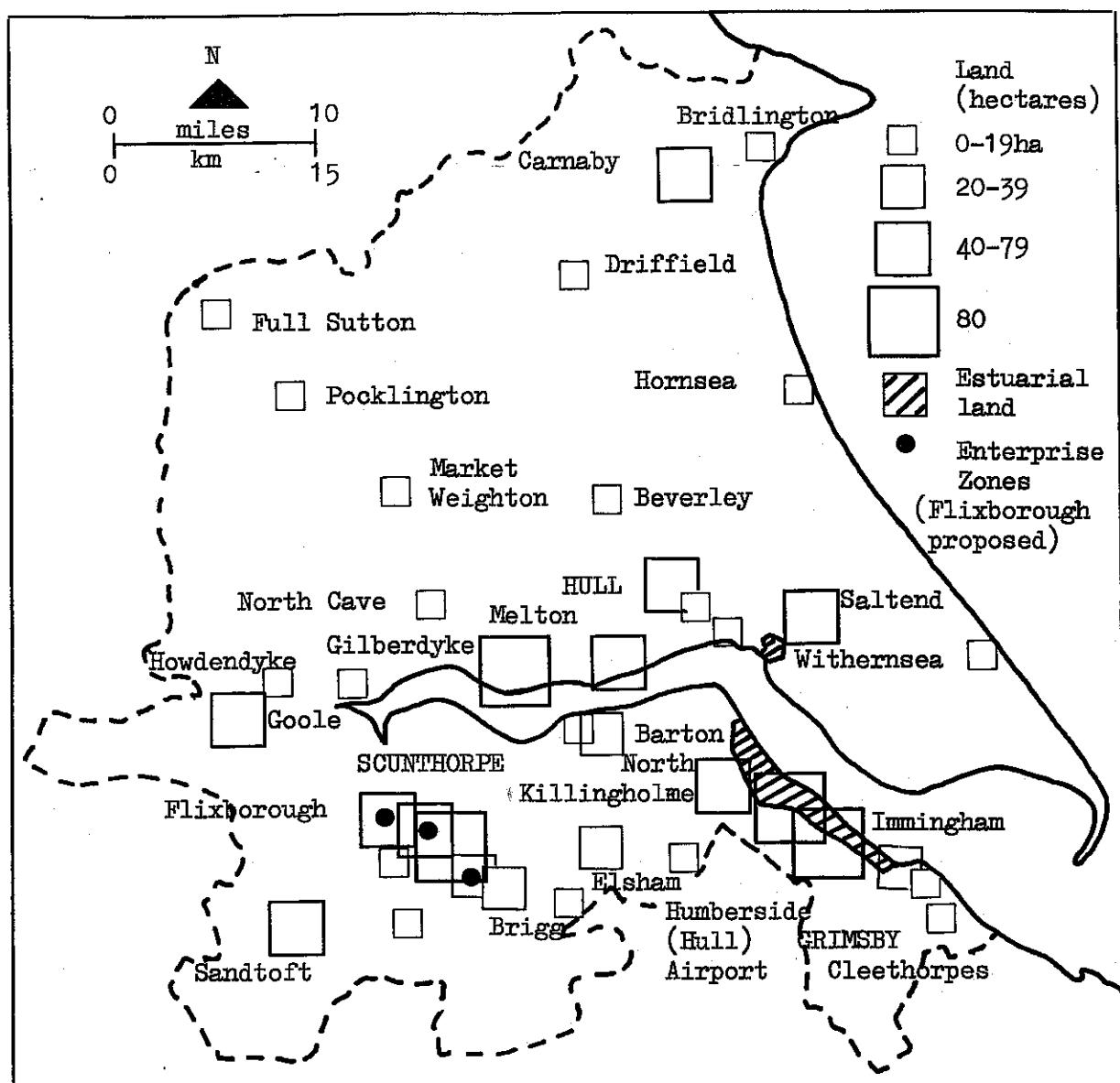
and Flixborough Enterprise Zones, or countywide under various EEC, governmental or local authority schemes for small businesses, site expansion, new technology, research and development and environmental improvement (Gill 1984:33-35). There is much industrial land available throughout the county, with existing allocations totalling 3,025 ha (7472 acres), while roughly 400,000 m² of factory and warehouse floorspace are in use or vacant (Gill 1984:25-29). The largest concentrations are inevitably located in and around the major centres (Figure 3), illustrating graphically the chief nodes generating commercial traffic likely to cross the Humber Bridge.

6. THE IMPACT OF INFRASTRUCTURAL INVESTMENT ON REGIONAL DEVELOPMENT

(a) Theoretical Overview

Although road and related infrastructural investments are often justified in terms of providing benefits for commerce and industry, considerable attention has been focused on secondary or indirect benefits in the last decade, especially over the efficacy of such investment as a regional policy tool. Detailed analysis of the large literature on this subject is beyond the present study's scope, since it concentrates on direct (primary) benefits to Humber Bridge users. A brief overview is nevertheless warranted in view of the bridge's envisaged role in promoting development in Humberside by uniting the two banks and their respective economies, as emphasized earlier in this chapter. Secondly, any economic growth generated by the bridge will comprise two components: expansion by existing firms, and attraction of new firms to Humberside. The extent of the former will depend, apart from newly created scale economies or market potential, on the ability of firms to utilize time savings through use of the bridge. Thirdly, indirect benefits, of which regional growth is potentially one of the most important, will perforce be considered in a later chapter appraising the bridge.

FIGURE 3



INDUSTRIAL DEVELOPMENT (Land Allocation)

Source: after "Humberside Facts and Figures 1984."
Beverley: Humberside County Council

investment as a whole.

Essentially we are concerned here with two interrelated issues. Firstly, to what extent the Humber Bridge is generating employment/development benefits in excess of the measured transport benefit, and secondly, what the geographical distribution of that benefit is. In terms of neo-classical economic theory, the ratio of incremental output (benefits) to transport benefit is proportional to the elasticity of factor supplies, the degree of both input and product substitutability, the extent of scale economies and factor mobility, and inversely related to the initial level of regional productive specialization.

Two levels of regional benefit have been distinguished, intra-regional, and inter-regional. Short run intraregional effects are essentially the reduced costs and improved efficiency for local transport within existing industries. Some additional benefits may accrue in the longer term from efficiency adjustments such as labour market extension and commercial/industrial relocation to key nodes on the new transport link. Once again, the magnitude of these benefits depends on the importance of transport costs relative to total production costs and the elasticities of product demand and factor supply (Gwilliam 1970).

Similar factors at the interregional scale determine the extent to which a road investment alters the comparative advantage of the region (or regions linked by the new road) relative to others. The impact may vary between industries, with expansion in those realizing lower production costs than elsewhere, and contraction in those at a cost disadvantage. At the limit, new industries will be established and non-competitive industries cease operation altogether, thus changing the regions' respective economic structures. At least eight determinants of the outcome can be identified:

- i) the nature of the regions linked (are they both/all of similar or different development levels?)
- ii) the relative importance of the new infrastructure to the regions concerned (is it of marginal or strategic value?)
- iii) the range of goods in the cost advantaged and disadvantaged categories in each region
- iv) the relative price elasticities of demand for goods in these categories in the respective regions
- v) the importance of transport costs for goods and inputs in the two categories
- vi) availability and supply elasticities of relevant inputs, particularly suitably skilled or trainable labour
- vii) potential for realizing economies of scale
- viii) market size for each category of goods in the respective regions (ECMT 1975; Gwilliam 1970; Parkinson 1981).

Measurement of such secondary effects is, of course, problematic both because transport is an intermediate good and because the adjustments referred to involve time lags, thereby presenting difficulties in distinguishing the road investment's impact from other factors affecting the level, location and composition of economic activity. Delimitation of an appropriate geographical scale for analysis is also problematic (ECMT 1975) though administrative areas of one or other hierarchical level are invariably adopted because of data availability. When transnational corporations are involved, an international scale may be required. These issues have also underlain much of the debate over refinements to infrastructural investment appraisal (e.g. Mohring and Harwitz 1962; Harrison 1963; Mohring and Williamson 1969; Dodgson 1973; Leitch 1977; Thomas 1977). Overall, however, there is consensus in the literature that direct transport benefits far exceed all indirect effects in importance. Modelling interregional freight flows, or land use and transportation have thus far been of little assistance in assessing the indirect impact of such investments since they are

beset by statistical and methodological problems (Botham 1981; ECMT 1975; Gwilliam 1979).

Holland's critique of liberal capitalist regional policies and indicative regional planning (1976a:46-54; 1976b:212-233) argues that infrastructural improvement in lagging areas can have only a very limited developmental impact. Such economic overhead capital is generally of lesser importance to managerial location decision-making than the quality and range of social overhead capital.

"By definition the areas which need to attract management most will be those least attractive to them."

(Holland 1976a:48).

Furthermore, regional policy within any one country is undermined by the ability of transnational corporations, which control an increasing share of global manufacturing, to select locations between countries. The service sector has also been neglected by most regional policy formulations.

b) Empirical Evidence

The available evidence from empirical studies of infrastructural investments in Europe and North America suggests that hoped-for development has seldom materialized to any significant extent whatever the nature of the regions linked (Botham 1981, 1983; Dodgson 1974; ECMT 1975; Gwilliam 1979; Judge 1983; Leitch 1977; Parkinson 1981; Peaker 1976). Notwithstanding the inevitable problems of mistaking association for cause and effect, of estimating the counterfactual or 'without' situation, and of collecting data for suitable scales and time periods, these findings support A J Brown's dissent from the Hunt Committee's report, which reflected conventional wisdom at the time,

emphasizing the importance of transport improvements for greater development of the intermediate areas (Hart 1983; Hunt 1969; Gwilliam 1979; Thornton, undated).

Several more specific conclusions can be drawn from these studies:

- (i) While infrastructural investments are usually necessary, especially in remote/underdeveloped regions, they are certainly insufficient alone to generate development. Transport costs seldom represent more than 4-10% of total production costs, and the savings made are only a fraction of these. Many other significant economic, amenity and intangible factors have a bearing on the outcome; conversely industrial relocation to rural areas has been known in Sweden and elsewhere even without improved infrastructure.
- (ii) Economic potential is a precondition for development; otherwise the new links will be ineffectual.
- (iii) Other policy measures must complement infrastructural investment as part of a comprehensive regional development policy. These could include relocation/establishment incentives, technical assistance and other familiar policy instruments likely to assist small and medium sized firms in particular.

Simply put, a new highway linking regions A and B improves the accessibility of firms in both to each other's markets. The final outcome is indeterminate, depending on the factors set out above such as the regions' respective development level, market size, product and factor elasticities, or exploitable economies of scale. One of the regions might actually be worse off. Even a whole new road network may not have a substantial impact: evaluating the British motorway programme between 1957 and 1972,

Botham (1981) estimated a total interregional job redistribution of 20,000-60,000, depending on the definition of accessibility used. Most importantly, the redistribution was towards the central regions; in the absence of the motorway programme and assuming a consequent rise in interregional transport costs over time through congestion, 28,000 to 162,000 (and eventually, with local multiplier effects, perhaps 206,000) jobs would have been redistributed to peripheral regions. Furthermore factors such as petrol and drivers' wage changes appeared at least as important as the infrastructural investments.

Two decades ago, British interregional freight cost variations were not considered great (Chisholm and O'Sullivan 1973; Edwards 1975). Edwards' analysis found the range to be a relatively modest 23% in 1963, bearing in mind that transport costs comprised only 3.5% of net output. Although dependent on the measure used the UK divided into two broad zones, one of comparatively high cost, comprising the peripheral regions including Yorkshire/Humberside, and a comparatively low cost group of the more central regions. These data, however, refer to the pre-oil crisis, pre-motorway and pre-juggernaut era, so that inter-regional differences may well have shrunk somewhat in the interim. Such a trend would emphasize the importance of other region-specific characteristics in determining the geographic distribution of infrastructural effects. Nevertheless, it seems likely that Humberside is still a relatively high cost transport region.

Clearly the extent to which commercial traffic is able to exploit distance- and time-related cost savings in practice is a function of individual firms' operating characteristics and the importance of the particular route to them. This therefore is one of the main themes running through the interviews with a sample of firms as analyzed in a later chapter. The overall impact of infrastructural improvements on development depends, *inter alia*, on the proportion of total costs accounted for by transport/

distribution costs. This may be expected to vary by sector, region and time period.

Edwards established these parameters using 1963 Census of Production results and the 1965 Board of Trade survey. In wholesale trades, transport expenditures in 1965 accounted for 21.6% of gross margins (a proxy for net output) on average. There was wide variation, however, between trades, ranging from 64.3% (coal merchants) to 4.4% (merchant converters) and he suggests a four-category ranking: >30%, 20-30%, 10-20%, and <10% of gross margins (Edwards, 1969). Most transport expenditure was on own account, except for textiles and yarns, and general exports.

By contrast, transport costs averaged 3.5% of the value of sales, or just under 7% of net output, in industry in 1963. The range was from 40% in stone/slate quarrying to 1.08% in watch and clock production (Edwards, 1970). These figures reflect the level of transport costs relative to value added in each industry. Calculation of unit transport costs (for own account fleets only) again revealed wide variation but with four groups, namely timber and furniture, engineering and electrical goods, vehicles, and clothing and footwear, experiencing high costs per ton as well as per ton-mile. The last three of these groups had low overall transport costs relative to net output, however, thus showing how high value added can moderate high unit costs. Chemicals and allied, metal manufacture, building materials, and mining and quarrying had low costs per ton and ton-mile, but high overall transport costs because of low value added. The proportion of own account as opposed to purchased transport also varied widely. Only public utilities and construction ranked >70% on own account, while food, drink and tobacco, shipbuilding, vehicles, timber and furniture used their own vehicles for over 50% of transport. In general these sectors produce either final consumer goods or fragile, high value commodities; the importance of own account transport increases through successive stages of the production process (Edwards, 1970).

c) Estuarial Bridge Crossings

A few impact studies have been undertaken on bridges, and as estuarial crossings like the Humber Bridge, they merit separate consideration. Macgregor (1966) surveyed firms in Fife eighteen months after the Forth Road Bridge, spanning the Firth of Forth between North and South Queensferry, west of Edinburgh, was opened in 1964. Unfortunately the results are presented only in a crude qualitative form, although examples are given. It proved difficult to isolate the bridge's impact from that of other simultaneous development initiatives in Central Scotland, but only a minority of firms claimed to have been scarcely affected. Most of these used Glasgow or Lanarkshire as main transport routes to/from branches or associates in Lancashire or the West Midlands. Other firms had begun to use the bridge in a small way, representing the start of closer industrial linkage between Fife and Edinburgh, while a variety of manufacturers, food producers, hauliers, wholesalers and retailers had altered their operations significantly. Overall the bridge had rapidly been integrated into the Fife and east-central Scottish networks to the benefit of business on both banks. Its main advantages were cost and time reduction (hence greater fleet flexibility) and improved accessibility to/from Edinburgh, its airport and the national road system. There were thus both local and national impacts. However, the poor road system north and east of the new motorway in Fife provided a potential impediment to growth.

Two studies exist of the Tay Road Bridge which links Dundee with northern Fife across the Firth of Tay, and opened in August 1966. Writing immediately after this, Jones and Pocock (1966) presented no survey results, but speculated on the bridge's likely impact. They considered it to have primarily local spin-offs in terms of

enhanced urban growth and redevelopment potential, and (sub-) regional benefits for commuters and shoppers, since Dundee's southern service hinterland had previously been restricted by the estuary. Commerce in Dundee was thus expected to gain modestly, mainly from residents southeast of the bridge. Little national through traffic was likely to be diverted over the bridge because of its relative isolation from the M90 Forth Bridge to Perth route. The effects on industry were not discussed but, in view of the above considerations, would probably be insignificant. Gillhespy's (1968) study is a conventional 1960s cost-benefit analysis, of little direct relevance here since regional benefits were not meaningfully considered.

The Severn Bridge, linking South Wales with the South West and South East via the M4, and with the West Midlands and North West via the M5 and M6, was opened in September 1966, and has been the subject of detailed impact study from 1966-1969 (Cleary and Thomas 1973). Given its national importance on the motorway system, very heavy traffic flows have resulted, with a significant proportion of generated journeys. There was clearly also much scope for industrial expansion and relocation. No large manufacturing firm (i.e. 100 staff) with plants on both sides of the bridge closed one as a result, and only 3% opened a new plant across the estuary. There was a moderate increase in purchasing of supplies across the river by Welsh building materials firms and South West firms in "other metal goods" and "mining and quarrying" SIC orders. The major benefit to existing firms appeared to have been better vehicle utilization, while small firms felt increased competition as a disadvantage, and large firms in Swindon and North Wiltshire complained of congestion. Overall the effects were consistent with previous regional specializations and creation of a single enlarged market. Thus trading areas grew and overlapped, giving more competition, while service frequency and reliability improved. Some switching of supply procurement to the two proximal regions occurred at the expense of third regions, but little change in

market orientation emerged.

"While more firms trade across the estuary and more of those doing so have increased their trade, this has not altered the basic position that, for the great majority, trade with the region across the Severn remains less important than trade with either the region in which they are sited or with other parts of the country, especially the South East. National markets remain the principal interest of those firms that are not catering to a local market." (Cleary and Thomas 1973:62).

Distribution, by contrast, underwent rapid and extensive changes in both delivery methods and, for 28% of firms, distribution zones. The scale of this impact varied according to the distribution system used (local, sub-regional, regional, super-regional or national). Given the concentration of distributors in the regional centres of Bristol and Cardiff, increased competition resulted.

Overall the Severn Bridge was felt to be a "massive benefit to the nation", while the changes it induced seemed likely to exceed anticipations, although occurring over several years. Private vehicle traffic would adapt and grow most quickly, followed by commercial users and most slowly by major manufacturing enterprises.

d) Impact of the Humber Bridge: hypotheses and value of comparable studies

What, then, may we hypothesize about the Humber Bridge's regional impact? As Dolphin (1975: 141-145) correctly points out, however, none of the other three bridges just considered is directly comparable with it, and the results of the studies cited can at best therefore serve as general indicators by the drawing of inferences. Neither the Forth nor Tay Bridge studies provided

the type of detailed survey results needed for thorough comparison; moreover, Macgregor failed to investigate the Forth Bridge's impact on Edinburgh and the south bank empirically. Secondly, the Forth, Tay and Severn estuaries all had rail bridges and/or tunnels (and the Forth also the Kincardine road bridge further up the estuary) in addition to ferry services before construction of the respective road bridges. Some goods traffic had thus historically been crossing these estuaries, although the now defunct ferries carried almost exclusively passengers and cars, as did the former Humber Ferry which ran between Hull docks and New Holland pier. None of the studies cited details the extent of pre-bridge contact, however. Thirdly, the peri-estuarine industrial structures and their respective national importance differ in each case.

Fourthly, the Tay Bridge represented a single improvement to the area's road network, whereas the Forth, Severn and Humber bridges were constructed simultaneously with related motorways and the implementation of other development policies. The task of isolating their respective individual impacts is well-nigh impossible from the available information. Furthermore and, fifthly, whereas the Forth and Severn Bridges form part of the motorway networks and are thus of national importance, the Humber Bridge is marginal to, and in commercial viability terms undermined by, the adjacent motorways. Major differences in their impact can thus be anticipated, with the Severn and perhaps also the Forth Bridge able to exert a more significant influence on industrial and commercial location than the Humber. This difference will be heightened by the sixth and final problem of comparison, namely that the three earlier bridges opened during the economic boom of the mid 1960s, whereas the Humber Bridge finally opened in the depth of recession in 1981. As indicated earlier in this paper, Yorkshire and Humberside has suffered more than most regions from industrial decline, with little imminent improvement likely.

Perhaps the greatest similarity is that between Dundee and Hull, both of which have historically suffered curtailment of their service hinterlands and hence central place functions relative to population size by the Tay and Humber estuaries, a problem the respective bridges may be expected to obviate somewhat (Dolphin 1975:143). Dolphin considered that the Humber Bridge's actual construction would have only a small temporary direct multiplier effect on the Humberside economy, that any other benefits would be primarily local, and that the most likely commercial beneficiaries would be extractive and local market-based industries or services able to utilize economies of scale or exploit an enlarged market/service area.

Some empirical evidence on these hypotheses will emerge from surveys undertaken for this study, although the principal concern remains time-related commercial transport impacts of the Humber Bridge. There will inevitably be problems in isolating the bridge's impact from that of associated road improvements or other factors. Very little information exists on the relative regional cost advantages or disadvantages, supply or demand elasticities, and other criteria suggested in subsection 6a above as being determinants of the regional impact an infrastructural improvement such as the Humber Bridge may have. There does indeed appear to be some scope for economies of scale and market expansion, but if the state of regionally important industries and severity of the current recession are borne in mind, such structural adjustments may be small or occur over a far longer time period than has so far elapsed since the bridge's opening. Much of the evidence will therefore rest on information provided by firms in the region during interviews with management.

7. CONCLUSION

In this paper we have sought to elucidate the regional geographical and economic context on Humberside within which the

Humber Bridge was constructed, and in terms of which its success will partly be measured. Theoretical parameters for evaluating its regional impact were also set out. The county was shown to have suffered serious setbacks by virtue of its past isolation from the English heartland and insufficiently diversified economy. Unemployment is above the national average, while industrial land, deep water wharfage and financial incentives are available to potential entrepreneurs. The motorway system built over the last 15 years has overcome the problem of isolation but this is a necessary rather than sufficient precondition for renewed economic growth. Transport costs represent only a small proportion of total production costs. Although the Humber Bridge formed part of the road improvement programme, its funding arrangements, available research on other highways and bridges, insights from economic theory, and also the state of the Humberside economy, suggest that its impact will probably be primarily local rather than national in the short to medium term. This contention is investigated by means of roadside surveys on the bridge and in-depth interviews with management of major bridge using firms, as will be set out in a later paper.

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