STUDY OF THE IMPACT OF THE LANCASHIRE-YORKSHIRE (M62) MOTORWAY

E. J. Judge, Leeds University, England

A study of the effect of the Lancashire-Yorkshire (M62) Motorway was initiated in late 1968 at Leeds University under the sponsorship of the Department of the Environment. This paper describes the background of the study and discusses some specific aspects of it. Inasmuch as the motorway is not yet fully open, the paper is an interim report. The main issues addressed are (a) whether there are indirect benefits of road investment that should be incorporated in appraisals, (b) what account should be taken of regional effects, and (c) the nature of and the allowance made for traffic that at present is not included except on an ad hoc basis. "Before" traffic and household surveys were carried out, and interim surveys were taken on newly completed sections. The relationship between transport costs and subregional employment growth has been analyzed. Interim results suggest that the M62 will cause marginal employment growth in Yorkshire and Lancashire. No empirical work has been done on the benefits, but theoretical examination suggests that existing procedures are not inappropriate. New traffic generation on the 27-mile trans-Pennine section is lower than expected. These interim results suggest that transport investment is not among the best regional policy tools for the United Kingdom and also that the current treatment of generated traffic by the Department of the Environment seems appropriate. Much analysis and further data collection still remain that may modify these interim conclusions.

•THE M62 MOTORWAY is a dual, three-lane, limited-access highway that will traverse northern England from near Hull on the east coast to Liverpool on the west coast, a distance of about 130 miles. It provides, via the sections already open, an important link between the economies of West Yorkshire and Lancashire and between the parallel lines of the national motorway network, separated by the Pennine Mountains. This range of hills has in the past constituted a significant barrier to east-west movement, and, although existing trans-Pennine roads are of high quality, they are susceptible to closure during periods of bad winter weather and of inadequate capacity to cope with the increasing volumes of traffic. The M62 Motorway is thus the first all-weather road across the Pennines. Extension of the motorway east to Hull in about 1975 will help to connect the heretofore isolated Humberside region to the national motorway network.

The areas the M62 passes through are the U. K. Standard Planning Regions (SPR) of Yorkshire and Humberside and the North West Region. These areas and other SPRs are shown in Figure 1, which also maps the main road system and cities of Great Britain. The Yorkshire, Humberside, and North West SPRs are shown in greater detail in Figure 2. The two regions are among the older industrial regions of the United Kingdom and have shared to varying degrees in the reduced prosperity, compared to the country as a whole, that has affected these regions since World War I. Table 1 gives a few statistics of these regions along with the corresponding U.K. figures. These statistics point out the net outmigration, higher-than-average unemployment, and lower-than-average activity rates and earnings in the regions. Both regions for the most part are

Publication of this paper sponsored by Committee on Social, Economic and Environmental Factors of Transportation.

Figure 1. Main road system and SPRs of the United Kingdom.

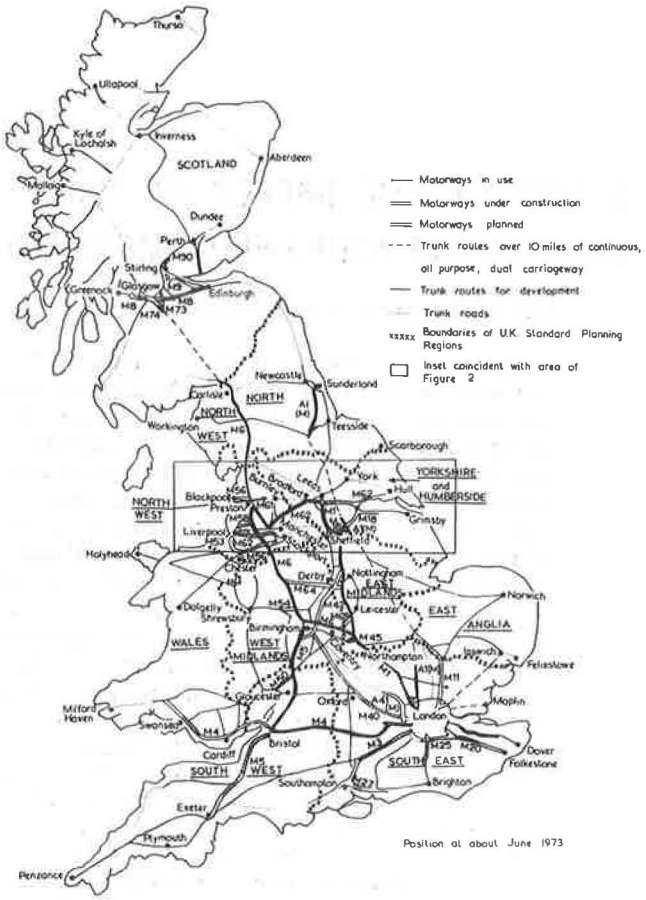
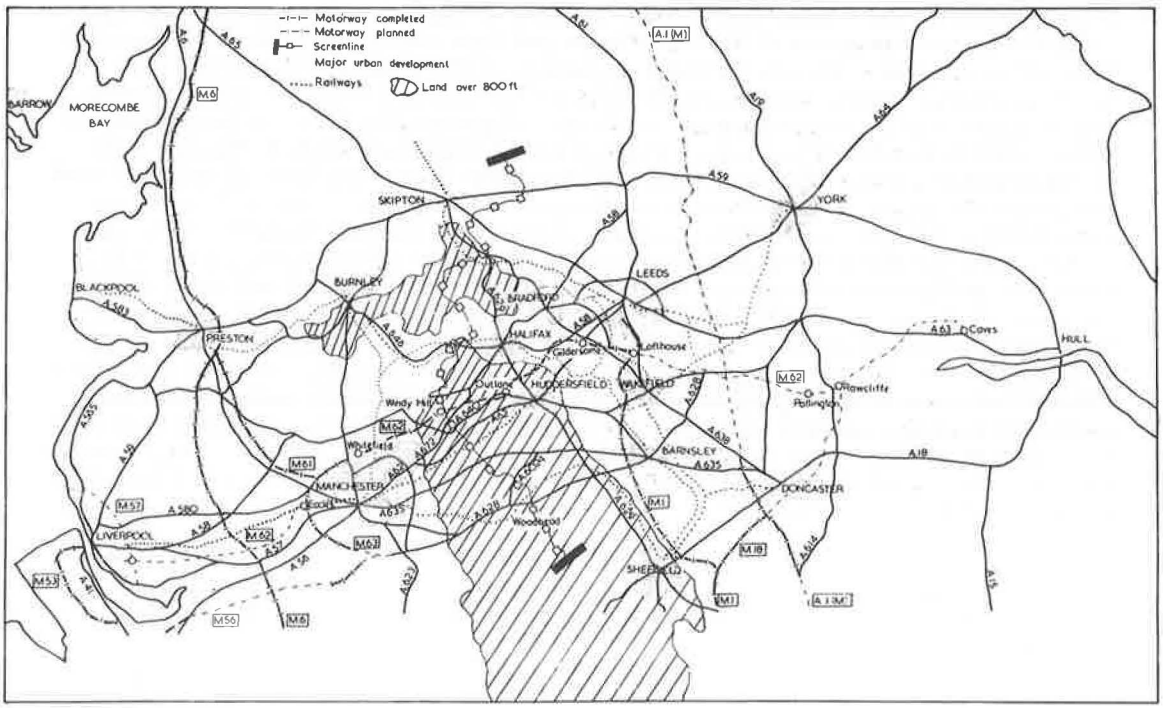


Figure 2. Road network in vicinity of M62 Motorway.



categorized as intermediate areas under which they are eligible for preferential treatment within the framework of current government regional policy. This is, however, less favorable than the treatment accorded to the worst affected regions—development areas.

The decision to build the Lancashire-Yorkshire Motorway was not, however, based on regional development grounds but on the need for network improvement. The need for such a new east-west link has long been recognized and was first proposed before World War II. In 1961 the Minister of Transport invited the county councils of Lancashire and Yorkshire to carry out route feasibility studies to determine the alignment of the motorway. These studies were completed in 1963, and the alignment chosen is shown in Figure 2. (The populations of the main urban centers along the route are given in Table 2.) Construction started in 1966 and has been a topic of considerable interest in itself (1). The first sections opened in 1970; phasing of completed and planned sections of the motorway is given in Table 3.

The effect of the motorway on travel times will be substantial, and, as an illustration of the magnitude of the change, some comparisons for private vehicles are given in Table 4. Although the travel times are derived by multiplying average speeds by the specified mileages, they are, nevertheless, reasonably comparable to observed travel times. As can be seen, the time savings are very significant—up to 40 percent for the longer journeys.

AIMS AND THEORETICAL BACKGROUND

The study of the effects of the M62 Motorway was described as an "impact study." In some ways this is a misnomer because the primary purpose of the study was not to build up a generalized view of the effects of the facility per se or to attempt to predict its effects so that these forecasts could be used by government agencies in their general planning activities. This is very often the case with what are conventionally termed impact studies, of which there have been numerous American examples (2) and some British ones (3).

Although such aspects were not excluded from the M62 study its objectives were related more specifically to a number of problem areas in the procedures used by the Department of the Environment (DOE) for evaluating interurban road investments. The economic evaluation of road investments in the United Kingdom is of fairly recent origin and began with the retrospective evaluation of the M1 Motorway from London to Birmingham (4). Following the experience gained here, procedures were outlined for the economic evaluation of road investments (5) and later updated and improved (6). At the same time DOE laid down general procedures specifying the format in which all road schemes submitted to it were to be evaluated (7); subsequently these procedures were computerized (8, 9). Hence, a large proportion of all interurban road schemes in the United Kingdom are evaluated in a fairly sophisticated and uniform way. Larger schemes are evaluated on a case-by-case basis using modeling approaches specific to each scheme, though there are similarities of philosophy and technique with the standardized procedures. The most important similarity is that all appraisals are direct user cost-benefit appraisals, and there is no explicit procedure for incorporating indirect effects on the economy into the appraisal. Such effects are sometimes quoted to justify more road construction in absolute terms or preference for road construction in some places rather than others.

In the past, recognition that road improvements benefit other than existing users was allowed in the treatment of generated traffic. The Transport and Road Research Laboratory (TRRL) suggested (6) that "to obtain an estimate of the total traffic (i.e., including generated traffic) the predicted traffic should be multiplied by $(C_1/C_2)^n$ where C_2 and C_1 refer respectively to the total costs of the journey with and without the improvement," and n is an impedance exponent from an unconstrained gravity model. Such a procedure has been criticized (10), and, in fact, DOE has not adopted this formulation as a general rule. At the present time the standard procedure (8, 9) incorporates no allowance for generated traffic, though in the past up to 30 percent had been allowed where specific justification was offered. For example, "Generated traffic on large

Table 1. Statistical data for 1971.

Item	United Kingdom	North West Planning Region	Yorkshire and Humberside Planning Region
1. Population (thousands)	55,515	6,743	4,799
2. Migration per 1,000 population	-0.6	-1.7	-1.5
3. Total persons employed (thousands)	23,987	2,923	2,039
4. Total persons unemployed (thousands)	724	102	70
5. Unemployment as percentage of total labor force	3.5	3.9	3.9
6. Economic activity rate[a], percent	72.0	73.3	71.6
7. Wage rate[b], £	29.8	28.2	29.8

[a]Percentage of population in age group 15 to 64 economically active.
[b]Average weekly earnings in April 1971 of males aged 21 and over.

Table 2. 1971 population for main urban centers.

Region	City	Population
Lancashire	Barrow	64,032
	Blackpool	151,860
	Burnley	76,513
	Liverpool	610,113
	Manchester	543,650
	Preston	98,088
Yorkshire	Barnsley	75,395
	Bradford	294,177
	Doncaster	82,668
	Halifax	91,272
	Huddersfield	131,190
	Hull	285,970
	Leeds	496,009
	Sheffield	520,327
	York	104,782
	Wakefield	59,590

Table 3. Construction schedule for M62 Motorway.

Section	Approximate Length (miles)	Opening Date
1. M57 junction (near Liverpool) to Tarbock	3	Autumn 1975
2. Tarbock to Risley	13	Spring 1974
3. Risley to Eccles	7	Summer 1974
4. Eccles to Whitefield	6	October 1970
5. Whitefield to county boundary	13	August 1971
6. County boundary to Outlane	8	December 1970
7. Outlane to Ainley Top	1	December 1972
8. Ainley Top to Chain Bar	7	July 1973
9. Chain Bar to Gildersome	4	October 1972
10. Gildersome to Lofthouse	6	December 1970
11. Lofthouse to Pollington	20	Summer 1974
12. Pollington to Rawcliffe	6	Spring 1975
13. Rawcliffe to Caves (near Hull)	13	Summer 1975

Note: Opening dates are not necessarily synonymous with completion of construction, and opening dates for uncompleted sections are tentative.

Table 4. Estimated journey times by private car with and without M62 Motorway.

Origin-Destination Pair	Distance on Existing Roads (miles)	Journey Time on Existing Roads (minutes)	Journey Time With M62 Motorway (minutes)			Percentage Reduction in Travel Time
			Distance on M62	Distance on Other Roads	Total Journey Time	
Leeds-Manchester	40	80	32	9	50	38
Leeds-Liverpool	73	146	58	13	84	42
Halifax-Manchester	24	48	21	10	41	14
Halifax-Liverpool	57	114	47	14	75	34
Hull-Manchester	93	186	78	16	110	40
Hull-Liverpool	123	246	104	20	144	41

Note: Approximate and measured distances to nearest mile. Times derived by computing an average speed of 30 mph for ordinary roads and 60 mph for motorways. Data include no allowance for improved running times on existing roads after reassignment of traffic to M62 nor for improvements to access roads to the motorway.

schemes has often amounted to between 5 percent and 25 percent over and above the normal forecast traffic level" (11). Hence, DOE takes a cautious stance on this point, and one of its interests in sponsoring this study of the effects of the M62 Motorway was to see whether more light could be thrown on the nature and magnitude of generated traffic.

The more general question of indirect effects of transport investment on the structure of the economy still remains. This has three aspects:

1. It is often argued that transport investment has an effect on the structure of an economy that is not reflected fully in the direct user benefit, so that, even if traffic patterns and benefits are correctly predicted, the total benefit to the economy is underestimated.
2. Related to 1 above, but not dependent on it, is the argument that road investment can alter the relative economic positions of different regions and can therefore be used as a tool of regional policy.
3. Existing structural changes in the economy generated by the transport investment may themselves generate further traffic, which then invalidates the forecasts used in the normal appraisal procedures (which may or may not include allowances for generated traffic based on straightforward price effects). This point, of course, relates back to the initially stated interest in evaluating the conventions used to estimate generated traffic.

Each of these points may be discussed in a little more detail. The general line of argument on externalities and secondary benefits in road investment is discussed extensively elsewhere (12, 13), and only the elements need be presented here. Regarding the external effects, it would appear that the possibilities for technological externalities are somewhat limited, though there is a range of intangible technological external diseconomies of an "environmental" nature that may be significant. The argument on pecuniary externalities, mainly relating to the effect of transport investment on land values, has been shown to be mainly a double-counting problem, though there are possibly relevant distributional issues involved.

Secondary benefits, discussed by Bos and Koyck (14), Tinbergen (15), and Friedlaender (16), in which an initial investment sets off a chain of effects throughout the economy leading to an increase in national income, have, however, seemed to carry more weight. Bos and Koyck and Tinbergen, using arithmetical examples, show that, in an imaginary economy with various assumed supply and demand functions for the products considered, the change in national income due to a transport investment would be greater than the conventional measure of benefits to existing and generated road traffic, as measured by the area under the demand curve for transport between old and new transport costs. Although this may be so, it does not follow, for various reasons, that the magnitude of the welfare change that results from the transport change can be deduced correctly from the change in national income. Once this is recognized, we are thrown back from the general to the partial equilibrium level in order to measure welfare changes via consumers' surplus. Because it has been shown by arithmetic examples that the demand for freight transport is derived in a perfectly competitive world, we can measure the net level of benefits of a road investment to the community as a whole by accurately measuring the benefits to both existing and generated freight and passenger road users. This brings the argument back to the question of how we forecast generated traffic.

Even if one does not subscribe to the secondary benefits argument at the whole economy level, it is possible to hypothesize that a reduction in transport costs at a regional level effects an improvement in the growth rates of the regions most directly affected by the highway investment to the disadvantage of the regions less directly affected. The idea that a region's accessibility affects its growth rate has had some popularity (17) and has been voiced in official policy statements advocating road construction as an aid to regional development (18, 19, 20). Analysis at the SPR level by Brown (22) does not support this proposition; an attempt to discover such an effect at a more disaggregated level is described later.

Given the low significance ascribed to generated traffic with current procedures, the question of whether road improvements cause structural changes that then cause new

traffic generation has perhaps less practical importance. However, even when more importance was attached to generated traffic in appraisals it was not totally explicit where this new traffic came from. The former TRRL procedure (6) would suggest that a price effect produced these new trips, inasmuch as there was no allowance for loss of benefit on other links or modes. Equally well, the former DOE procedure of allowing up to 30 percent new traffic generation made no such allowances but, at the same time, was not explicit on whether a structural effect might be operating along with the price effect, though one would presume only a price effect. At a practical level one might ask whether the observed new traffic generation is due to redistribution of the existing trip levels or merely reassignment of traffic across a wider area than that covered by the pre-appraisal survey. This would be equivalent to saying that the price-structural effects were negligible. Of course any intermediate combination of the two propositions is possible.

The net effect of current procedures is to make interurban appraisals more consistent with urban transportation study procedures where a fixed trip matrix is assumed and there is no interaction between transport networks and the total level of trip generation. This is not to say that no such interaction exists, but until now there has been no satisfactory method for establishing the nature of the effect and the way in which it can be incorporated into forecasting procedures. Hence, research into this question is proceeding on a number of fronts, one of which is the present study.

The general area of interest in the study has been discussed at some length. Whereas it was not realistic to expect results on all the questions raised, work is in progress on a number of them. Topics singled out for study have been, first, the effect of the M62 on subregional employment growth; second, its effect on crude traffic generation; and, last, its effect on total traffic generation. Clearly, because the motorway will not be fully open for up to 2 years, much of the work is of necessity focused at a cross-sectional level. However, some time series work is being done and is described at length in the next section.

EMPIRICAL WORK

M62 Motorway and Subregional Employment Growth

Dodgson (23) has conducted a cross-sectional analysis of the impact of the motorway on employment growth; this analysis is used to provide a forecast of the impact. The analysis consists of three parts:

1. Development of measures of industrial transport costs for each of 30 zones at varying distances from the motorway;
2. Development of a relationship between employment growth in these zones and the transport costs from each zone; and
3. Use of this relationship to predict what employment increase will result from the transport cost reduction brought about by the motorway.

The development of a transport cost measure consists basically of an accessibility calculation in which the expected cost of transporting a given quantity of freight from (or to) each origin (or destination) is computed. The effect of the M62 is readily calculated and indicates that the likely fall in transport costs is not great, varying from less than 4 percent in Huddersfield near the center of the motorway to less than 1 percent in Preston and Blackpool, some distance from the motorway. In addition, the disparity in transport costs between areas is not very great; all but three are within about 15 percent of the lowest (Manchester). Edwards (24) has calculated that transport costs represent about 9 percent of the value of net manufacturing output; therefore, a cost reduction of less than 4 percent of 9 percent for Huddersfield is not a large effect. Clearly some haulers will benefit more than others, especially, for instance, if most of their traffic is, say, Huddersfield-Manchester, but the average effect must as indicated be smaller.

The second stage of relating regional growth to transport costs involved a regression analysis to include the effect of other variables on areal employment growth, namely, the interaction of demand for and supply of labor, variations in industrial structure, and

the effect of congestion in large urban areas. The analysis indicates a relationship between employment growth and these variables, which is consistent with theoretical expectations in terms of parameter signs, but the relationship as a whole is weak. (The corrected multiple correlation coefficient is 0.26.) All the parameters are, however, significant at the 97.5 percent level. However, most of the influence of access cost in the model is due to a smaller number of areas on the periphery of the industrial North of England (around the Barrow peninsula), which had the highest transport costs. This effect is reflected in the statement by Brown (22): "as between the existing major industrial concentrations of Great Britain, differences in the average extent to which an establishment in them is accessible to the industry and population of the country as a whole are not very important in promoting or hindering growth, other things being equal. Small and remote areas may be at a disadvantage but so far as the major ones are concerned, the extra growth at the centre of the United Kingdom economy as compared with its periphery is to be explained largely by differences of structure."

The third stage of using the derived relationship to predict the employment-generating effect of the M62 is based tentatively on the weak relationship and the poor-quality data, but the actual predictions may, as Dodgson (23) states, "suggest the most probable maximum orders of magnitude of employment change on the basis of present knowledge." The predicted total employment change is 2,900 per annum in an area with a total employed population of 3,400,000. This is not a large effect and constitutes what is due solely to the M62 and may in fact be counter-balanced by the effects of motorway construction in other areas. (Also, it needs to be emphasized again that this is a predicted effect and has not been observed.)

Whereas Dodgson is cautious about the results derived from his model and points out that his conclusions are not directly testable, they are nevertheless consistent with other work for the United Kingdom (21, 22) and do help to temper somewhat the enthusiastic claims that have been made about the likely effects of the motorway. Indeed, when the large size of the regional economies concerned and the fact that the M62 is a very marginal addition to the existing capital stock are considered, such a conclusion is hardly surprising. Thus, in a developed economy, the effect of transport investment on regional growth may be limited as compared with other regional policy measures. In an underdeveloped economy with inadequate transport facilities, transport investment may clear away bottlenecks with apparently quite dramatic effects, but even here, as Wilson et al. suggest (25), "There are, in fact, few magical properties in transport investment that warrant the excessive attention frequently paid to them." Nevertheless, further research would be useful to amplify and support these initial tentative conclusions.

M62 Motorway and Generated Traffic

Previous discussion has indicated that more information is required on the magnitude and nature of generated traffic so that it may be more satisfactorily taken account of in appraisals. However, from a practical point of view, planners have not been in a position to check their forecasts against results because of the long intervals between appraisal and construction, a problem compounded by the intervention of numerous other unforecast developments. This difficulty can be reduced to some extent by reducing the time interval involved, i.e., by providing a data base on travel patterns shortly before the new facility is operational and then comparing forecasts derived from this data base with new data collected shortly after the facility opens. The commissioning of a new link like the Lancashire-Yorkshire Motorway was such an opportunity to attempt to clarify some of these problems.

The term "generated traffic" may be used to describe the extra road traffic that is observed in a corridor after a network improvement (over and above secular growth). Alternatively, and more precisely, the term may describe those new trips observed in a corridor once account is taken of trip redistribution, modal-split changes, and secular changes. The task is to investigate the nature and magnitude, initially of the first type of "generated traffic" and then of the second type.

A good start has been made on monitoring the effect of the M62 Motorway with these objectives in mind. Surveys were carried out on traffic movements and household trip generation before the M62 Motorway was open, and monitoring surveys have been carried out in the intervening period. It will be some time before a complete data bank is assembled on the effects of the M62 Motorway on traffic patterns in northern England. Apart from the data collection effort mounted by the study team, various public bodies are, or will be, generously supplying relevant data collected in the course of their own work, including traffic and household surveys carried out after the opening of some main sections of the motorway in 1973. Hence, much work remains before full results can be reported. Nevertheless, a brief summary can be given of the initial effects of the motorway, pending a complete analysis carried out with the aid of a transport planning computer program, which has been commissioned.

Because of the very large area involved, data on traffic flows have only been collected on one screen line (Fig. 2). This was a line running along the Pennines for about 40 miles from Skipton in the north to Woodhead in the south. It would have been valuable to monitor effects within the Yorkshire and Lancashire urban areas, but this would have involved an enormous data collection effort. The "before" traffic survey in spring 1970 involved interview surveys for four 16-hour days (Thursday to Sunday) on each of the 11 roads. In addition, interurban bus passengers across the screen line were surveyed and almost all the 11,000 passengers were interviewed. At the same time, British Rail carried out one of its periodical passenger surveys on routes across the Pennines and the results of this, covering interviews of about 20,000 passengers, were made available. Further data have subsequently been collected on the effects of the M62 over the sections opened to traffic up to spring 1972. In addition, monitoring counts and full traffic surveys for 1973 have been carried out, and a further survey is planned for 1974; however, no results for the 1973 surveys are yet available. The results up to 1972, which are presented in more detail elsewhere (26), may be summarized briefly.

The situation in 1970 before a few short sections of the motorway opened is given in Table 5. This table indicates the relative importance of the various trans-Pennine roads for east-west movement. About three-quarters of the flow passes on the A65, A629, A646, A58, A62, and A628, whereas some roads stand out as particularly important commercial vehicle routes (A628, A62, A646, A629).

Intermodal comparisons are available for passenger flows; almost all freight moves by road across the Pennines except for certain bulk movements, like coal, that constitute a small percentage of the total. The aggregate results for the screen line indicate that 91.2 percent of the 346,261 passengers crossing the line during the survey went by private car. However, this share is an overestimate of the true share, inasmuch as public transport modes were surveyed differently from road traffic. On some origin-destination pairs, the road share is as low as 70 percent, and, hence, there is clearly room for some significant diversionary effects.

When the 1970 survey was carried out no part of the M62 was open. In the period up to spring 1972, for which data are available, a number of sections were opened:

Date	Section
December 1970	Lofthouse-Gildersome
	Outlane-Windy Hill
August 1971	Whitefield-Windy Hill

Follow-up surveys that monitored secular trends and the initial effects of the sections then commissioned were carried out in spring 1971 and spring 1972. The monitoring surveys were generally carried out by automatic traffic counts, although some manual counts were also taken in 1972. The results of the automatic counts for 1970, 1971, and 1972 are summarized in Table 6, giving figures for the weekdays Thursday and Friday and for the full survey period of Thursday to Sunday.

The table indicates the marked effect that the M62 has had on traffic patterns across the screen line. Between 1970 and 1972 the roads on either side of the M62 lost substantial amounts of traffic. It is, however, instructive to group the results for the

Table 5. Trans-Pennine traffic flows during spring 1970.

Road	Two-Way Traffic Flow			Buses and Coaches
	Private	Commercial	Total	
A59	9,088	3,050	12,138	132
A65	14,299	3,885	18,184	303
A629	45,839	12,842	58,681	1,322
A646	21,020	7,614	28,634	738
A58	12,195	4,990	17,185	262
A672	8,282	2,119	10,401	201
A640	10,739	3,366	14,105	90
A62	14,966	11,960	26,926	416
A635	7,487	1,628	9,115	71
A6024	3,582	352	3,934	19
A628	9,769	8,198	17,967	304
Total	157,266	60,004	217,270	3,838
Total east			108,109	
Total west			109,161	

Table 6. Summary of automatic traffic counts on trans-Pennine screen line.

Road	Thursday and Friday			Thursday to Sunday		
	1970	1971	1972	1970	1971	1972
A59	7,196[a]	7,060[a]	9,400[a]	13,953[a]	13,991[a]	17,407
A65	8,861[a]	13,489	10,247	19,718[a]	26,405	21,755
A629	30,861	30,931	31,493	68,231	59,550	64,390
A646	17,228	16,378[a]	13,064	35,162	30,608[a]	26,902
A58	10,805[a]	9,155	4,094	21,123	15,965	8,074
A672	5,544	4,469[a]	3,946[a]	11,925	8,198	7,239
A672/M62	—	—	3,435[a]	—	—	6,871
M62	—	13,560	54,301	—	24,679	85,170
A640	8,947	2,851	1,480[a]	15,928	6,315	3,427[a]
A62	19,450	19,653	10,443	34,959	33,981	18,758
A635	4,200	5,209	3,230[a]	9,186	10,696[a]	6,636[a]
A6024	2,181	2,102	1,478	3,953	4,062	2,850
A628	15,651	14,118[a]	12,157	25,229	24,383[a]	21,244
Total	130,924	138,975	158,768	259,367	258,833	290,723

[a]Total partly derived by estimation (usually due to counter deficiency).

Table 7. Analysis of screen-line traffic growth.

Corridor	Thursday and Friday			Thursday to Sunday		
	1970 Flow	1972 Flow	1972 Index of Growth (1970 = 100)	1970 Flow	1972 Flow	1972 Index of Growth (1970 = 100)
1. Northern	46,918	51,140	109.0	101,902	103,552	101.6
2. Motorway	61,974	90,763	116.5	119,097	156,441	131.4
3. Southern	22,032	16,865	76.5	38,368	30,730	80.1
4. 2 + 3	84,006	107,628	128.1	157,465	187,171	118.9
5. All (1 + 2 + 3)	130,924	158,768	121.3	259,367	290,723	112.1

Table 8. Secular growth across screen line.

Days	Corridor	1971 Flow	Ratio 1971/1970	Predicted 1972 Flow	Generation or Degeneration	Percentage Generation
Thursday and Friday	1. Northern	51,480	109.7	56,474	-5,334	-9.4
	2. Motorway	66,066	106.6	70,426	+20,337	+28.9
	3. Southern	21,429	97.3	20,850	-3,985	-19.1
	4. 2 + 3	87,495	104.2	91,170	+16,458	+18.1
	5. All (1 + 2 + 3)	138,975	106.1	147,453	+11,315	+7.7
Thursday to Sunday	1. Northern	108,697	106.7	115,980	-12,428	-10.7
	2. Motorway	119,746	100.5	120,345	+36,096	+30.0
	3. Southern	39,141	102.0	39,924	-9,194	-23.0
	4. 2 + 3	158,887	100.9	160,317	+26,854	+16.8
	5. All (1 + 2 + 3)	267,584	103.2	276,147	+14,576	+5.3

whole screen line into a number of corridors. The roads seem to fall naturally into the following groups:

1. Northern corridor—A59, A65, A629;
2. M62 corridor—A646, A58, A672, M62, A640, A62; and
3. Southern corridor—A635, A6024, A628.

The results for this breakdown are given in Table 7, which shows that traffic growth in the immediate motorway corridor has been quite dramatic, namely an increase of over 30 percent between 1970 and 1972 for the whole survey period and an increase of over 45 percent on weekdays. Such results would appear at first to support the expectation of 30 percent for generated traffic. The roads covered by the original appraisal (as far as the trans-Pennine section is concerned) consisted of the motorway and southern corridors, and here the increases are not so substantial, the full survey period showing an increase of 18.9 percent and the weekday period an increase of 28.1 percent between 1970 and 1972. However, the corresponding figures for the screen line as a whole are 12.1 and 21.3. This would suggest that the overall impact of the M62 Motorway so far has been significant in abstracting traffic from along the length of the screen line, but not very significant in generating new traffic once secular growth is allowed for. The impact seems to be greater proportionately for weekdays than for the full survey period, perhaps suggesting that commercial vehicle and work or business trips may have been more affected than nonwork trips, 76 percent of which occur on Saturday and Sunday.

By making allowance for secular growth, we can arrive at a crude estimate of completely new traffic generation. In Table 8 an attempt is made to use the traffic growth rates estimated between 1970 and 1971 (with some necessary adjustments) to predict 1972 flows without the M62 and, hence, to obtain a crude estimate of new generation. The results should, of course, be treated with reserve, since it would be preferable to estimate the secular growth rate in the area over a longer period. Nevertheless, the results are interesting as a preliminary indication. The estimate of generation is greatly affected by whether the northern corridor is included, though the results are broadly consistent between the weekday period and the full survey period. Thus, if the northern corridor is included, new generation is 5.3 and 7.7 percent, whereas, if it is excluded, new generation is 16.8 and 18.1 percent. Given the nature of the traffic in the northern corridor, it is reasonable to assume that there has been significant reassignment because of the M62 (this should emerge in more detailed traffic assignment work in progress), whereas exclusion of the northern corridor leaves secular growth in the other corridors at less than 1 percent. Although the 50-point census results for 1971 and 1972 are not yet available, the last results published in 1970 (27) indicate a growth rate of 7 percent per annum for nonurban roads over the previous decade. Although this high rate of growth eased off at the end of the decade, present conditions would suggest that a current growth rate of 3 to 4 percent is not unreasonable and is, moreover, consistent with the results for the screen line as a whole. Hence, the upper generation estimate is likely to be optimistic for both the reasons suggested, and a figure of around the lower estimate is preferable.

The above analysis is, of course, tentative and preliminary. The M62 has still to open completely while the effect of sections opened since spring 1972 is not included in the figures quoted. Data are being collated to monitor the changes between 1972 and 1973, and further data collection is scheduled from 1974 onward. Thus the results given may be subject to modification, both in light of further data collection and in the light of more refined and disaggregated analysis using the computer models mentioned. Nevertheless, the results gained so far provide the first consistent and complete picture of what is happening on the trans-Pennine screen line with the opening of the major link. The results indicate a moderate increase in traffic due to the M62, but on the other hand a substantial effect on the routing of existing traffic. Also they suggest that the present cautious treatment of generated traffic by the DOE is not inappropriate. Finally, the wide spatial extent of the observed effect strongly indicates the need to take a large survey area when the future impact of a proposed new link is assessed.

CONCLUSIONS

The area of interest in looking at the impact of the M62 Motorway has been discussed and some of the empirical work in progress has been reported. The amount of work still to be done is substantial and hence we are still to some extent in the early stages. Nevertheless, it is felt that some useful work has been completed.

The main priorities for future work are to carry through the cross-sectional investigation of the effect of accessibility on trip generation, and to analyze the nature of the changes in traffic patterns between 1970 and 1973, the latter year being the first for which a full "after" origin-destination study is available. In the meantime, the annual monitoring counts in the interim period 1970-1973 and thereafter provide and will provide a useful indication of year-to-year changes.

ACKNOWLEDGMENTS

Thanks are due to several persons and organizations who have worked on the study or contributed in various ways. Gwilliam, the Project Director, has provided continuous advice and encouragement over the years (parts of this report are based on an earlier joint paper, 26). I am indebted to my colleagues on the study team, namely Davies (1968-69), Bamford (1969-72), and Copley (1970-73), who have contributed significantly to the work carried out. The invaluable contribution of Dodgson (now of Liverpool University) is, of course, clear from the paper. The Department of the Environment sponsored and funded the work described (it does not, however, necessarily agree with any of the opinions expressed). In addition, many local authorities, public transport operators, and agencies of the DOE and other government departments have helped generously, and continue to help, with the provision of advice, data, and services.

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