WIDER ECONOMIC IMPACTS IN REMOTE AREAS

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1 INTRODUCTION

In Scotland 11% of the population live in remote areas as defined by the Scottish Government (Scottish Government, 2008a Table 1). That is 11% of the population live in an area or a settlement that is more than 30 minutes from a population centre of 10,000 people or more. Remote areas also constitute at least half of Scotland’s land mass and include more than ninety inhabited islands (see Figure 1). Scotland’s remote areas, along with northern Norway, Sweden and Finland, are amongst the most sparsely populated in Europe.

In an economic context the distinguishing aspect of a remote area is a lack of alternatives and choices. Travel choices are limited in mode, departure time and route. In the wider economy choices of employment, opportunities to fill vacancies and choices of supplier when purchasing goods and services are also limited. This combined with long distances of travel, the reliance of communities on what is often a single link, and the vulnerability of these links to inclement weather and subsidence, places a burden on businesses and residents in rural communities. This is explicitly reflected in government economic and transport policies which recognise both the role of transport links in sustaining remote and fragile communities (e.g. Scottish Executive, 2006 p.19) and the need to achieve a better regional balance in wealth (e.g. Scottish Government, 2007 pp.36-39).

Transport schemes in remote areas are therefore expected to have impacts in markets other than transport (e.g. the labour market, product market, land market, etc.). Often these impacts – job creation, wealth creation – are the policy rationales for the intervention in the first place. These economic impacts are, however, only
Figure 1: Scottish Government 6-Fold Urban Rural Classification

Scottish Government
6-Fold Urban Rural Classification

- Large urban areas (with a population of over 125,000)
- Other urban areas (with a population of 10,000 to 125,000)
- Accessible* small towns (with a population of 3,000 to 10,000)
- Remote small towns (with a population of 3,000 to 10,000)
- Accessible* rural
- Remote rural

* Accessible is defined as those areas that are within a 30 minute drive time from the centre of a town with a population of 10,000 or more

Source: Scottish Government (2008a, p.11)
additional to changes in transport user benefits in a cost benefit analysis if a market failure occurs. Thus an additional welfare impact only occurs if:

- An impact is felt in markets other than transport (e.g. employment expands or output expands); and
- Price does not equal marginal social cost in the market where the impact occurs. Thus if employment expands and there is a failure in the labour market an additional welfare impact occurs.

If markets are perfect the economic value of all the wider economic impacts (e.g. increased employment) is captured in the change in transport user benefits. Thus the value of increased output is captured through the change in consumer surplus of business and freight traffic, whilst the value of increased employment is captured through the change in consumer surplus of commuter traffic.

To date wider economic impacts in remote areas have been largely ignored in the literature. This paper asserts that this is a mistake and wider economic impacts are likely to be as important to transport improvements in remote areas as they are in urban or accessible rural areas. In the literature a lot of consideration has been given to agglomeration externalities as the principal channel by which wider economic impacts will be felt. This interest has led to a focus on urbanisation economies and productivity gains in large cities. This is of little relevance to remote areas with their sparse populations and primary sector industries. In contrast localisation economies associated with industrial clusters be important in a remote area. Transport projects can therefore generate localisation externalities in remote areas and these should be taken into account where relevant. Next in importance the literature suggests are the wider economic impacts associated with imperfect competition in the goods and services market (Venables and Gasiorek, 1999; DfT, 2005). This impact is arguably more important in remote areas, as remote markets are isolated and competition less intense. Labour economic literature would also suggest that two other market failures may be important in remote areas. These failures lead to involuntary unemployment (Elhorst and Oosterhaven, 2008) and thin labour markets (Findeis and Jenson, 1998; Vera-Toscano, Phimister and Weersnik, 2004; Pilegaard and Fosgerau, 2008).

This paper is organised as follows. Following this introductory section the second section addresses the concepts and evidence associated with each labour market failure. The third section considers how the existing evidence base can be used in an appraisal, whilst the fourth section presents two case studies illustrating the importance of wider economic impacts in remote areas. The conclusions are presented in the fifth and final section of the paper.

2 CONCEPTS AND EVIDENCE

2.1 Agglomeration

Agglomeration economies have been the main focus of attention in the literature on the wider economic impact of transport interventions (van Exel et al., 2002; Laird, Nellthorp and Mackie, 2005; DfT, 2005; Eddington, 2006; Venables, 2007; Graham, 2007a; 2007b; 2009). They arise as a consequence of the positive consumption
externalities that occur when economic agents in transport using sectors of the economy are brought closer together by a transport improvement. By bringing these agents closer together labour productivity is raised above and beyond what would be expected from the transport efficiency saving alone. Where agglomeration economies exist and where as a consequence of the transport intervention employment increases, Venables (2007) shows that two measures additional to transport user benefits are needed to capture the full welfare impact of the intervention. The first of the two additional measures relates to the productivity increase that occurs to existing and new workers. The second arises as a consequence of the distorting effects of taxation – this tax wedge effect is discussed in section 2.3 below. There exists a substantial literature on the variation in worker productivity with agglomeration size (see Rosenthal and Strange 2004 for a review), though much of this data is international rather than British in nature. Rice, Venables and Patacchini (2006) and Graham (2007a; 2007b; 2009) present recent UK evidence on such relationships.

STAG, along with NATA, utilises Graham’s research on the relationship between productivity and population mass in deriving estimates of changes in productivity as a consequence of improved accessibility. Graham’s research, and Rice, Venables and Patacchini’s research, mainly relates to urbanisation economies – that is where the agglomeration economies are driven by pure economic mass (e.g. city size) rather than specific linkages between firms within a city. By definition urbanisation economies are those which are external to the firm and the industry but internal to the city (or region). Clearly such economies are of little relevance to sparsely populated remote areas, as it is difficult for a transport scheme to increase the effective economic mass of a remote small town much beyond what it is prior to the intervention – unless that is on the fringe of the ‘accessible’ area (Scottish Government definitions).

Localisation economies are a different form of agglomeration economy and in contrast to urbanisation economies may be of importance to the appraisal of certain transport projects in remote areas. Localisation economies are those that are external to the firm but internal to the industry. They are therefore driven by proximity of firms to firms within the same sector or related sectors and to the size of the industry specific workforce. Of the industries Graham (2004 Table 1) identifies as exhibiting strong tendencies towards localisation (or clustering) several of them are prevalent in the remote parts of Scotland. These include textile manufacturing, oil and gas extraction, fishing, fish processing and food and drink processing. In terms of the spatial distribution of these industrial clusters of the top 30 local authorities exhibiting industry localisation 6 of them are in remote regions of Scotland (Graham, 2004 Table 4). These regions include the Shetland Islands (oil) and the Scottish Borders (textiles). Fishing is the main clustered industry in Eilean Siar (Western Isles) and Argyll and Bute. The other two areas that exhibit industrial clustering are the Orkney Islands and Dumfries and Galloway. Some of the clustering arises as a result of comparative advantage (e.g. inshore prawn and lobster fishing). No localisation economies would be expected for such clusters. Other observed clusters (e.g. the capital intensive deep sea fishing and the oil and gas sectors) could well be subject to localisation economies due to for example linkages in the supply chain and the sharing of knowledge between businesses.
Whilst an international literature on localisation economies exists this mainly focuses on the manufacturing sector (see Rosenthal and Strange, 2004). Graham (2009) presents new evidence on localisation economies in the UK, and importantly he does not confine his analysis to the manufacturing sector. Amongst the industries in which Graham finds statistically significant localisation economies are the food and drink sector (which includes fish processing) and the paper and pulp sector - both of which are important employers in the remote areas of Scotland. He reports an elasticity of productivity to industry employment of 0.074 and 0.059 respectively for these industries. With respect to other industries in remote areas exhibiting localisation (fishing, oil extraction and service activities and textiles) he does not find any statistically significant localisation economies. For the primary sector industries this may have arisen as these industries are treated as a single sector. Graham also finds that localisation economies tend to attenuate quite rapidly with distance. Almost all localisation externalities are found within 10km of a firm.

How localisation economies will impact on the appraisal of a transport project in a remote area is uncertain, as to date the data on elasticities of productivity to localisation have not been used in this context. It is expected that localisation economies will have a positive impact on the economic benefit of a transport intervention where they exist, but will probably be more muted than the effect of urbanisation economies. This is for several reasons: the elasticities of productivity to localisation are much smaller than the corresponding elasticities of productivity to urbanisation (Graham, 2009); the effect of localisation economies dissipates quite rapidly with distance (a quite limiting factor in an area where populations are dispersed); and the proportion of the population that work in the clustered industries is small. For example, only 6% of the population work in the fishing sector in the Western Isles and 5% in the Shetland Islands, whilst only 3% of the population work in the mining and quarrying sector (includes oil extraction) in the Shetland Islands (GROS, 2008 Table UV77). This view is supported by Bråthen (2001) who found no evidence of external economies affecting the growth of four firms located near to recently constructed fixed link crossings in Norway.

In the main therefore localisation economies are probably not going to be of significant relevance to an ‘average’ transport scheme in a remote area. Clearly, there will be exceptions to this, such as where a transport intervention specifically targets a known cluster. To understand the full relevance of localisation economies in these exceptional cases, further work is needed to expand the evidence base on the elasticities of productivity and to disaggregate it further (e.g. identify elasticities of productivity for known clusters in remote areas).

2.2 Imperfect competition

If a market failure occurs in the product and services market then a transport induced expansion of output will give rise to an additional welfare impact stemming from this market. This is because in the presence of a market failure output is not at its socially optimum level. Two sources of market failure can be identified; that associated with taxation on final products (i.e. indirect taxation) and that arising through the market power of firms. Since transport appraisal practice in the UK already takes account of the additional welfare impacts associated with indirect taxation (Sugden, 2002 pp.8-10; 2005) indirect taxation is not considered further. With respect to the second source of market failure firms may hold market power as
they engage in product differentiation or become large relative to their market. The latter is particularly true in geographically isolated areas as exemplified by very remote areas, where as a consequence of geography firms can act as local monopolists.

Venables and Gasiorek (1999 Table 2) using synthetic data estimate that in a two region one sector economy with imperfect competition the additional welfare impact from an expansion in output is between 30 and 40% of the change in consumer surplus derived by business and freight users. This result relates to a partial equilibrium analysis, in that changes induced in other sectors of the economy (the general equilibrium effects) are of no net social value – that is price equals marginal social cost in all other sectors of the economy. Davies (1999) and Newbery (1998) who undertook reviews of the Venables and Gasiorek research consider the 30-40% figure to be an upper limit.

For the UK as a whole the Department for Transport estimate that on average the additional impact of an expansion in output is 10% of the change in consumer surplus derived by business and freight users. This is based on a UK wide price-cost margin of 0.2 and an elasticity of demand for goods and services of 0.5 (DfT, 2005 p.49). These data are sourced from a range of studies on price-average cost and price-marginal cost margins for the UK plus an estimate of the elasticity of demand for goods and services\(^1\).\(^2\).

Market isolation in rural areas mean that firms can hold more market power in these areas than they do in urban areas. Prices are certainly higher in rural areas of Scotland. In 2003 petrol prices were on average 9.7% higher than in urban areas whilst food was 11.0% higher (Sneddon Economics, 2003 p.1). Not all of this price difference can be attributed to differences in market power as the cost of transporting goods to the locality and differences in economies of scale in production (if goods are produced on-site) and economies in retailing account for some of the difference. Identifying the component of the price differential attributable to market power and the component attributable to differences in operating costs is difficult.

There is a notable lack of evidence on price-cost margins in general and those specific to remote areas of the UK particularly. As far as it can be ascertained no work in this area has been undertaken since SACTRA (1999). The evidence base is therefore restricted to that reported in SACTRA (1999) and DfT (2005). The most disaggregate data, at a geographic scale, therefore separates Scotland and Wales from the English regions (e.g. Harris, 1999) but does not disaggregate further. This is too coarse, as in a Scottish context there needs to be a distinction between North West Scotland and the islands and the rest of Scotland. The lack of research of on price cost margins at an appropriate level of geographic disaggregation has arisen in part because of the difficulty in obtaining good quality data on prices and marginal or average cost (long or short run).

As a consequence our best understanding of the market conditions in remote areas is probably the Office of Fair Trading (OFT) studies into the supply of petrol (OFT, 1998; 2000). The OFT has the power to examine companies’ financial transactions to identify if excessive margins are made, a power that other researchers do not have. In their view the petrol industry is competitive across the UK as a whole because of the proximity of consumers to many different suppliers. This competitive
argument breaks down in remote areas where they concluded that a lack of competition in some localities gave rise to higher prices (OFT, 1998 p.73). By implication this implies higher price-marginal cost margins in some remote areas compared to elsewhere.

A more detailed OFT study examining petrol and diesel pricing in the Highlands and Islands identified a wide variation in prices across the region (OFT, 2000). Typically prices rise as one moves north west from Inverness and the Inner Moray Firth area. The OFT found no evidence of a failure of competition in the Inner Moray Firth area. Margins increase the more remote a mainland petrol station is (see Table 1). The OFT also found that the increase in margins is principally associated with increases in retail margins, as for example wholesale margins are 0.1p less in the Western Isles than elsewhere (once transport costs have been accounted for). These remote petrol stations with the high margins can have a captive market, but also tend to have higher operating costs per unit of output. The OFT found that the five petrol stations with the highest prices sold less than 180,000 litres of fuel a year (i.e. < 10% of the average in the Inner Moray Firth area). Of the islands investigated (Western Isles, Orkney Islands and Shetland Islands) the OFT had serious concerns about excessive pricing in only the Western Isles. For the Orkney Islands and the Shetland Islands they found that, whilst prices were similar to the Western Isles, average volume throughputs were smaller.

A mixed picture therefore presents itself. Competition in the supply of petrol appears to work effectively in rural accessible areas (like the Inner Moray Firth) as it does in other parts of the UK, but can breakdown in some of the most remote locations (the Western Isles). A lack of intense competition in very remote parts, whilst not constituting a problem from the perspective of the OFT, can lead to higher price cost margins. Compared to the UK petrol industry as a whole, price-cost margins in the Highlands and Islands are 64% larger (= 8.7/5.3 see Table 1). Clearly margins in the more accessible Inner Moray Firth area are lower than this (comparable to UK wide levels), whilst margins in the remotest parts are larger than this. Some of this difference is associated with differences in scale in operation, but the other reason for the difference is a lack of local competition.

**Table 1: Regional comparisons of petrol prices, margins and volumes**

<table>
<thead>
<tr>
<th>Area</th>
<th>Average pump price for unleaded petrol (ppl)*</th>
<th>Average combined gross retail/wholesale margin (ppl)</th>
<th>Average annual site volume (petrol and diesel) litres</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>62.9</td>
<td>5.3</td>
<td>2,800,00</td>
</tr>
<tr>
<td>Highlands and Islands</td>
<td>66.2</td>
<td>8.7</td>
<td>950,00</td>
</tr>
<tr>
<td>Inner Moray Firth</td>
<td>64.2</td>
<td>&lt;8.7</td>
<td>2,170,000</td>
</tr>
<tr>
<td>Remote Highlands</td>
<td>67.0</td>
<td>&gt;8.7</td>
<td>710,000</td>
</tr>
<tr>
<td>Western Isles</td>
<td>71.7</td>
<td>14.1</td>
<td>760,000</td>
</tr>
<tr>
<td>Isle of Lewis/Harris (Western Isles)</td>
<td>71.5</td>
<td></td>
<td>1,250,000</td>
</tr>
</tbody>
</table>

*Between May 1999 and March 2000
Source: OFT (2000, Table 8)
2.3 Labour supply effects

Changes in the supply of labour can have wider economic impacts additional to transport user benefits if a market failure exists in the labour market and employment levels change. Three forms of labour market failure are relevant. These are those resulting from the presence of:

- An income tax which leads to tax wedge effects;
- ‘Sticky’ wages which lead to the presence of involuntary unemployment; and
- Job search costs which lead to thin labour markets.

**Tax wedge effects**

The presence of an income tax means that if a transport intervention induces a change in GDP through either changes in the number of people choosing to work, changes in the number of hours worked, or the relocation of jobs to higher-productive areas an additional welfare benefit occurs. This is equivalent to the change in tax revenue; and is known as a tax wedge effect. DfT (2005; 2008) discusses these effects and recommends some procedures for accounting for them. No advice regarding the calculation of these effects is given in STAG, though further guidance is planned.

As the treatment of tax wedge effects does not vary between remote areas and other areas no further discussion of them is given in this paper.

**Involuntary unemployment effects**

Involuntary unemployment arises as workers are willing to work at the existing wage rate, but remain out of work. The causes of such unemployment are varied. They include both legislative (e.g. minimum wages), skill mis-matches and mobility costs. High transport costs are one form of mobility cost, but others include access to childcare and difficulties in moving house – particularly when living in social housing. When involuntary unemployment exists a welfare benefit additional to transport user benefits occurs if employment levels change.

Elhorst and Oosterhaven (2008) show in their appraisal of four variants of a MAGLEV line in the Netherlands that involuntary unemployment effects in peripheral regions can have a substantial impact on scheme benefits. Depending on the route of the MAGLEV line under consideration, they found that wider economic impacts may change benefits as measured in a conventional transport cost benefit analysis by between -1% and +38% and can also dominate agglomeration benefits. This example on the face of it suggests that there could be substantial additional economic impacts for transport projects in peripheral regions. The results are, however, case dependent. In this instance they arise as a consequence of a labour market failure relevant to the Netherlands – that of national minimum wages by industry. This is extremely important. In the Netherlands there is a legal mechanism, the setting of national wages by industry, which means an excess supply of labour will prevail in peripheral regions when the market clearing wage is below the minimum industry wage.
In contrast there is no legal mechanism in the UK that keeps the wage in general above the market clearing wage (aside from the national minimum wage). This combined with the fact that those losing jobs in rural areas are thought to have a higher propensity to migrate away from the area completely rather than remain in an area and search for a job (Monk and Hodge, 1995) mean that in the UK this market failure has little relevance to remote areas despite the evidence from the Netherlands. Evidence for this position includes the fact that of the eight local authorities that might be considered remote in Scotland only one (Eilean Siar) has an unemployment rate in excess of the Scottish average. Furthermore, three of the lowest five regional unemployment rates are associated with remote areas. Falling population levels as evidence of out-migration are also certainly evident for all the Scottish island groups³ and the north and north-west coasts of Scotland (Sutherland, Caithness and Lochaber) (HIE, 2003b Table 2). This would suggest that in peripheral areas of Scotland there is no significant discrepancy between the wage and the market clearing wage.

Whilst out-migration by the labour force from remote areas might rightly be a cause of policy concern it does not constitute a market failure. The market failures that give rise to involuntary unemployment effects are not therefore generally applicable to remote areas of Scotland.

**Thin Labour Market Effects**

The fact that job search costs can exist means that thin labour markets can also exist – i.e. labour markets where job opportunities are limited can exist. Thin labour markets are particularly relevant in remote areas as sparse populations give rise to a limited choice between employers for workers (Findeis and Jenson, 1998; Vera-Toscano, Phimister and Weersnik, 2004). The limiting case of a thin labour market is the monopsony case where only one employer exists for labour. This illustrative case is worth examining as whilst it is not a realistic depiction of a modern labour market the consequence of the market failure (a wedge between the marginal product of labour and the wage) is relevant to thin labour markets.

A monopsony employer faces an upward sloping labour supply curve. If it cannot discriminate then to recruit additional workers it needs to raise the wage paid to all workers. This implies that the marginal cost (MC) of labour supply to the firm lies above the average cost of labour supply (AC). This is illustrated in Figure 2. To maximise profits the firm will therefore employ L₀ workers and pay them W₀. This is because when employment is at L₀ profits for the firm are maximised with the marginal cost of labour equal to its marginal revenue product (MRP_labour). Employment levels (L₀) are therefore below those of full employment. That is the labour market is inefficient. In equilibrium a wedge therefore exists between the marginal revenue product of labour and the wage received by workers. A reduction in commuting costs shifts the labour supply curve downwards from AC₀ to AC₁. A shift in the marginal cost curve experienced by the firm also occurs and a new equilibrium occurs at employment level L₁ and wage W₁. The surpluses felt in the labour market from the commuting cost reduction are therefore given by Areas B and C. Area B double counts commuter user benefits, whilst Area C, the welfare benefit of expanding employment, is additional to transport user benefits.

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As already mentioned the limiting monopsony case of a single employer is not in itself of direct relevance to modern economies or rural economies. For example, only 73.8% of workers in the Highlands and Islands work in a firm with less than 100 workers (HIE, 2003). The modern monopsony literature in which (a lot of) competing firms have some market power over workers, is however of relevance to modern economies (Bhaskar, Manning and To, 2003; Manning, 2003a). In this literature it is argued that a large number of independent and competing firms are able to exert market power over workers due to: the presence of imperfect information on the part of workers and firms; the heterogeneous preferences of workers; and workers’ mobility costs. Job search models (see Rogerson, Shimer and Wright, 2005 for a survey) encapsulate some aspects of this source of market power. In these models unemployed workers have difficulties in finding information on job vacancies, and even if there are many jobs within the workers’ neighbourhood only a small percentage of them become vacant at any one time. From the perspective of the employee labour markets are therefore thin, even if there are many firms.

The wedge between the wage and the marginal product of labour is critical to the estimation of the wider economic impact of a transport project in a thin labour market (i.e. Area C in Figure 2). The wedge itself depends on the elasticity of the labour supply curve faced by the firm (noting under perfect competition it should be perfectly elastic), however, a good estimate of this elasticity still eludes labour economics. On average what estimates that are available suggest that wages will on average be about 17% below the marginal product of labour (Manning, 2003a Chapter 4). With reference to Figure 2 this implies that the average difference between $W'_0$ and $W_0$ represents 17% of $W'_0$. This implies that if employment generation effects are significant (i.e. the difference between $L_0$ and $L_1$ is important) the size of Area C may well be substantial. This hypothesis is confirmed by Pilegaard and Fosgerau (2008) who implement a Pissarides (1990) type job search
model into a spatial computable general equilibrium (SCGE) model populated with Danish economic data. The model is then used to evaluate a transport quality improvement that increases labour supply at a national level. They report significant additional benefits of around 30% of commuter user benefits arising from the labour market (for an economy with no labour tax) as a consequence of search imperfections.

Laird (2008 Chapter 8) uses commuting and income data from the Scottish Household Survey to investigate whether a labour market failure in remote Scottish labour markets occurs as a result of job search costs. If job search costs exist then theories on job search predict that workers will only receive partial compensation for commuting costs (Manning, 2003b; van Ommeren and Rietveld, 2005; Rouwendal and van Ommeren, 2007). Laird finds that workers in remote labour markets are not compensated for their commute. Implying a market failure exists. We believe this occurs as mobility costs are high in remote areas with low workplace densities and long commuting distances. Job search costs for workers and firms are also high in remote areas, as workers do not have ready access to job centres, vacancies are often not advertised, and successful job search is often attributed to contacts and networks (Monk and Hodge, 1995; Lindsay, Greig and McQuaid, 2005). Laird (2008) also finds that women and men with low skilled jobs do not on average receive compensation for their commute. It is therefore considered a market failure in these labour market segments occurs as a result of restricted geographic job search areas, arising either due to familial constraints or a lack of mobility in housing (Madden, 1981; 1985; Zax, 1991; Ihlanfeldt, 1992; McQuaid, Greig and Adams, 2001).

The presence of higher search and mobility costs in remote areas is therefore expected to lead to a larger degree of inefficiency in remote labour markets. The result is that an increase in employment in remote labour markets will have an economic impact greater than that captured though commuter user benefits.

3 USING THE RESEARCH EVIDENCE BASE

3.1 Agglomeration

The best source of UK evidence on elasticities of productivity to effective density (both urbanisation and localisation economies) is Graham (2007a, 2007b, 2009). This data has been discussed elsewhere (e.g. DfT, 2005; 2008) and is not therefore considered further here.

3.2 Imperfect competition

There is limited evidence on price marginal cost margins as a whole let alone at a detailed geographic level. Any application of the evidence that does exist is therefore subject to a reasonable degree of uncertainty. Theory points towards higher price marginal cost margins in remote areas where competition is less intense, compared to areas where competition is more intense. Evidence from the petrol supply sector supports this position, where margins across the Highlands and Islands are 64% higher than across the UK. The higher on average margins in the region disguise wide variations in local margins: from margins that are comparable to the rest of the UK in the urban and accessible rural area of the Inner Moray Firth to high margins in the very remote parts of the region.
Taking the petrol supply sector as a barometer for price-cost margins in other sectors leads us to consider that the added value of additional output in the very remote areas of Scotland is larger than in the less remote parts of Scotland. That is the wider economic impact due to imperfect competition is larger in very remote parts of Scotland than in other parts ceteris paribus.

The evidence suggests there is a valid argument that the uplift to business and freight user benefits, used to capture the added value of increased output, should be higher in very remote areas than in urban areas. For transport schemes in the Central Belt where competition is intense an uplift of 10% is used in STAG. For very remote rural areas an uplift of double this, i.e. 20%, is not unreasonable, though it is based on limited evidence from only one industrial sector. The rationale for doubling the uplift in very remote areas compared to urban and accessible areas is that on average petrol and diesel margins in the Highlands and Islands are 64% higher than the UK average. This average disguises large variations between the accessible area surrounding Inverness, where margins are comparable to national averages, and the very remote parts of the region where margins can be almost 3 times larger than the UK average. An uplift of 20% means that in an appraisal increased economic output has twice the added value in very remote areas compared to other areas ceteris paribus. It should be noted that where a scheme impacts on businesses in very remote areas and other areas (e.g. an upgrade to the A9 Perth to Inverness) only the user benefits of business and freight traffic originating/destinating in the very remote area should have the 20% uplift applied to them.

### 3.3 Thin labour market effects

From the perspective of measuring thin labour market effects the key issue is the size of the wedge between the marginal product of labour and the wage. It is this that determines the additional welfare benefit associated with the creation (or loss) of employment. As discussed earlier there is a lack of evidence on the size of this wedge, though Manning argues that on balance the evidence indicates it to be 17% below the marginal product of labour on average. That is on average the marginal product of labour is 20% higher than the wage. For highly mobile labour market segments we would expect this wedge to be a lot smaller than 20%, whilst for the segments of the labour force that experience high mobility costs the wedge will be larger.

The limited evidence that is available indicates that high skilled male workers in accessible rural and urban areas experience low mobility and job search costs, whilst women, those with low skills and those in remote and very remote areas experience high search costs and high mobility costs. We suggest this evidence can be used in an appraisal by taking the added value of employment creation (displacement) over the change in transport user benefits to be:

- Zero if the job created (or displaced) is held by a male worker in a high or medium skilled occupation (manager, professional or technical occupation);
- Equal to 20% of the wage if the job created or displaced is held by a worker in a remote area, a women or someone in a low skill occupation.
To calculate the net welfare impact of displaced employment it is therefore necessary to calculate both the welfare benefits of job creation and the welfare costs of the jobs that are displaced.

4 CASE STUDY – BERNERAY CAUSEWAY AND SOUND OF HARRIS FERRY

The Berneray causeway opened in April 1999 at a capital cost of £6.6 million. It is just less than 1km in length and is free to use (i.e. there is no toll). As illustrated in Figure 3 the causeway replaced the Berneray ferry (between Berneray and North Uist) and shortened the Sound of Harris ferry crossing between Harris and North Uist. The shorter crossing for the Sound of Harris ferry was expected to lead to an increase in service frequency in the summer (to two hourly). Halcrow Fox (1996) undertook the ex-ante appraisal of the project.

The Do Something delivers the following benefits compared to the Do Minimum:

BERNERAY TRAFFIC
- a time saving of 12 minutes and the elimination of queuing time;
- a fare saving of 48p per passenger and £1.92 per car (for residents) and 75p per passenger and £2.60 per car (non-resident);
- no net vehicle operating cost saving;
- A reduction in average headway over the year from 89 minutes to an effective headway of zero with the construction of the causeway; and
- An extension of the effective operating day from an average of 12 hours to 24 hours.

SOUND OF HARRIS FERRY TRAFFIC
- a time saving of 16 minutes and no change in queuing time;
- no fare saving;
- an increase in vehicle operating costs associated with increased causeway length and access roads on North Uist (0.9km);
- a reduction in headway from an average of 3hrs 45mins to 2 hrs in May, to June, July and August. 62% of the ferry’s annual demand occurs in these four months; and
- a reduction in headway from an average of 3hrs 13mins to 2 hrs in April and September. 18% of the ferry’s annual demand occurs in these two months.
4.1 Agglomeration

The populations on Berneray are too small and too dispersed for urbanisation economies to have an effect. Localisation economies may, however, be relevant. Graham (2004) identifies the Western Isles as an area in which the fishing sector is clustered. The proportion of the working population employed in the fishing sector on Berneray and North Uist is 21% and 10% respectively (GROS, 2008), though the absolute numbers are small – 8 people on Berneray and 38 people on North Uist. This comprises of about 7% of those working in the fishing sector in the Western Isles. The main fishing industry in the Western Isles is based in the Isles of Lewis and Harris, which between them have about 50% of those employed in the fishing sector in the Western Isles. The main deep water harbour in the island group is also located on Lewis. As the Berneray causeway does not impact on transport costs of businesses in Lewis (the location of the main cluster), and the fishing sector in Berneray and North Uist is small, the Berneray causeway is not expected to enlarge the existing cluster. This view is supported by the evidence gathered by Halcrow Fox who did not identify any employment impacts of the Berneray causeway for businesses in the agriculture or fishing sectors (Halcrow Fox, 1996 Table 3.1). Furthermore there is no evidence to date that the fishing sector experiences positive elasticities of productivity to economic mass (e.g. Graham, 2009). The Berneray
causeway is not therefore expected to generate any wider economic impacts due to localisation or urbanisation externalities.

4.2 Imperfect competition

A wider economic impact arising from imperfect competition in the product market can only occur if there is an expansion in output. There is only indirect evidence that such an expansion in output occurred as a consequence of the Berneray causeway. Halcrow Fox found evidence that businesses on and off Berneray expected turnover to increase, whilst a real cost of living reduction was also anticipated by Halcrow Fox. If households experience a cost of living reduction then the surplus can be used to purchase other goods that were not previously available (i.e. expand output). The SQW (2004) ex-post study confirms that such a cost of living reduction did occur, as it finds that households through reduced transport costs and lower prices were £407 better off per year (in 2003).

A wider economic impact of £15,000 (1996 resource prices and 2000 values) attributed to imperfect competition is estimated for the first full operating year (2000). This is 20% of the sum of time savings accruing to businesses. This is based on an assumption that 56% of time savings is attributable to business benefits (SACTRA, 1999 paragraph 3.55).

4.3 Thin labour markets

If the wage does not equal the marginal product of labour then changes in employment lead to wider economic impacts in the labour market. Once again wider economic impacts will only be felt if employment levels change. Halcrow Fox estimate that construction of the Berneray causeway leads to a net increase of 38.5 full-time equivalent (FTE) jobs. If we then assume:

- Employment does not increase at the national level as a consequence of implementing the project. That is all the jobs created by the project are re-distributed from other parts of the UK;
- The additional jobs in Berneray and North Uist are re-distributed from accessible rural and urban areas;
- 22% of the 38.5 full time equivalent jobs created by the causeway will be held by men in medium to high skilled occupations, and 78% will be held by men in low skilled occupations or by women. These proportions derive from the Scottish Household Survey dataset (2000-2004); and
- The wage of all jobs created (and destroyed) by the transport intervention is £263 (1996 prices and 2000 values). This is based on a median gross weekly wage in the Western Isles for all full time employees of £445 in July 2008 (Scottish Government, 2008b).

This gives an estimate of the wider economic impact due to efficiency gains in thin labour markets in the first full operating year of £23,000 (1996 prices and 2000 values). The calculation behind this is summarised in Table 2.
Table 2: Welfare benefits of employment creation in the Western Isles (£1996 prices and 2000 values)

<table>
<thead>
<tr>
<th>Location</th>
<th>Occupation</th>
<th>FTE jobs</th>
<th>Wage per week</th>
<th>Total change in regional incomes per annum</th>
<th>Additional welfare benefit as proportion of wage</th>
<th>Welfare benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs created in Western Isles</td>
<td>All occupations</td>
<td>+38.5</td>
<td>£263</td>
<td>£527,000</td>
<td>20%</td>
<td>£105,000</td>
</tr>
<tr>
<td>Jobs displaced from Accessible rural and urban areas</td>
<td>Male high and medium skilled</td>
<td>-8.5</td>
<td>£263</td>
<td>-£116,000</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Low skilled and female high and medium skilled</td>
<td>-30.0</td>
<td>£263</td>
<td>-£411,000</td>
<td>20%</td>
<td>-£82,000</td>
</tr>
</tbody>
</table>

£23,000

4.4 Summary

The revised economic impact of the Berneray causeway and re-cast of the Sound of Harris ferry is summarised in Table 3. As can be seen from this table, the inclusion wider economic impacts increases the overall benefit of the project by 19% (from £200,000 in 2000 to £238,000).

Table 3 Benefits of the Berneray causeway and Sound of Harris ferry service enhancement in first full operating year (2000)

<table>
<thead>
<tr>
<th>Economic impact (£)</th>
<th>Existing approach</th>
<th>Extended scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Benefits</td>
<td>200,000</td>
<td>200,000</td>
</tr>
<tr>
<td>Agglomeration effects</td>
<td>N/A</td>
<td>0</td>
</tr>
<tr>
<td>Imperfect competition</td>
<td>N/A</td>
<td>15,000</td>
</tr>
<tr>
<td>Labour supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thin labour markets</td>
<td>N/A</td>
<td>23,000</td>
</tr>
<tr>
<td>Single year benefits</td>
<td>200,000</td>
<td>238,000</td>
</tr>
</tbody>
</table>

Note: 1996 resource prices and 2000 values

5 CONCLUSION

There is limited evidence on the added value of wider economic impacts to transport user benefits in a transport cost benefit analysis. This is in direct contrast to say travel time savings, where there is an extensive evidence base collected over many years. Clearly the wider economic impact evidence base becomes smaller as one tries to disaggregate evidence between remote and accessible or urban areas. Theory and what evidence is available point towards a larger degree of imperfect competition in very remote areas than in the urban or accessible areas (Scottish Government definitions) and to the existence of thin labour markets in remote areas. From a practical perspective the case study presented demonstrates that market
failures in remote areas can lead to significant economic benefits additional to transport user benefits. The assertion that wider economic impacts are only relevant to large urban areas is therefore refuted.

Given this and on the basis that the wider economic impact analysis in transport appraisal guidance is currently only a sensitivity test to the main cost benefit analysis the following recommendations seem defensible:

• Imperfect competition: a higher mark-up to business user benefits than the 10% should be used for very remote areas. A mark-up of 20% has been suggested, albeit this is based on evidence from only one industrial sector; and

• Thin labour markets: the creation of employment in remote areas has an additional welfare impact to that captured through commuter user benefits. The limited evidence that is available suggests that his impact is equivalent to 20% of the gross wage. When incorporating these benefits into an appraisal it is also necessary to take into account the welfare costs of displaced jobs.

The inclusion of thin labour market effects in an appraisal makes it necessary to estimate employment impacts as part of an appraisal. It is also necessary to estimate the number of jobs that are displaced from other regions, the skill set of those jobs and the regions from which the jobs will be displaced. This increases the modelling burden placed on the analyst and would imply that thin labour market effects will only be calculated when significant employment impacts are anticipated.

The limited evidence base on wider economic impacts means that almost any new research has value. The nature of the subject means that the research will be complex and that for some issues there is a risk the results may be inconclusive. Three research areas, from a remote area perspective, stand out as being worth pursuing. Firstly, there is a need to disaggregate the existing elasticities of productivity to economic mass to distinguish between the industry clusters evident in remote areas. Secondly, there is a need to build up the evidence base on the level of imperfect competition. Ex-post studies on areas which experience a large change in access costs could be informative (e.g. the impact of the ferry Road Equivalent Tariffs pilot to the Western Isles) as could recent advances in economic research which has attempted to back out price-marginal cost mark-ups from regional input-output tables. Finally, job search costs are a cause of the market failure in remote labour markets. The development of specific job-search models for these areas would add to the literature. If the models could be embedded into either a partial or general equilibrium model that included the transport sector this would have added value for transport appraisal.
NOTES

1. An assessment of imperfect competition should be based on price-marginal cost margins as the market failure occurs when prices do not equal marginal costs. Price-cost margins and price marginal cost margins are only equivalent when industries exhibit constant returns to scale.

2. It should be noted that this calculation rests on the assumption that the monopolist does not price differentiate. If a monopolist is able to discriminate between consumers they will expand output towards the socially optimum level and convert some of the surplus under the demand curve to producer surplus. In this scenario there will be a lower, and at the limit zero, additional welfare impact in the product market. With a price differentiating monopolist average price-cost margins will not be a good indicator of market power. To date this issue has not been explored in the literature, and we will not return to it, but we note that such an argument undermines the general case for wider economic benefits in the product market.

3. The population of the Western Isles (Eilean Siar) dropped by 10% between 1991 and 2001.
REFERENCES


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