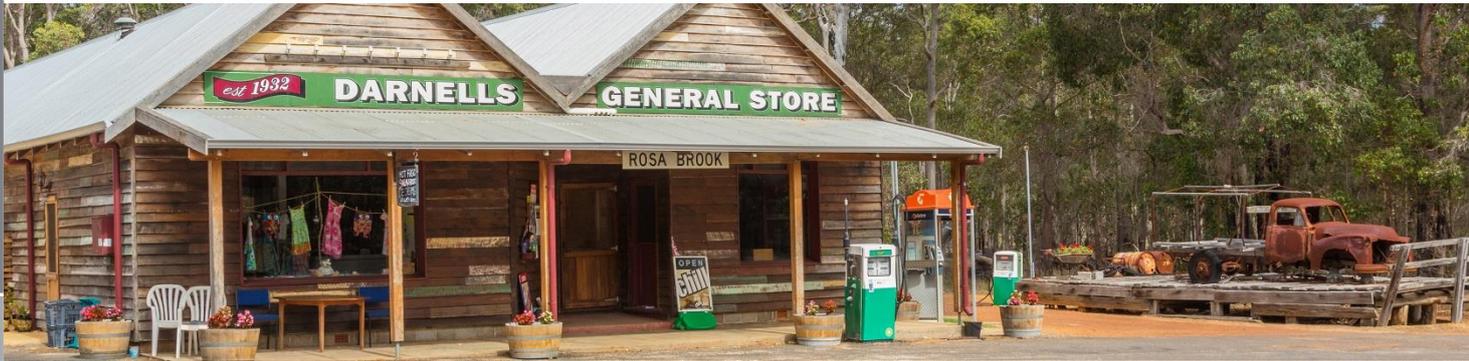




Australian Government

Department of Infrastructure, Regional Development and Cities

Bureau of Infrastructure, Transport and Regional Economics



Economies of scope and regional services

At a glance:

- This paper explores how producing different services together, or the scope of production, affects the spatial distribution of services in Australia's regions.
- Clusters of different types of economic activity, from the remote roadhouse to a city's central business district, are features of economic geography that have been shaped by the scope of production.
- Economies of scope, which are cost savings from producing goods or services together, often exist because inputs can be shared. The cluster of related businesses around an airport provide a good example; they share the infrastructure to transport passengers and freight, provide leisure activities like joy flights and skydiving and house retail, food and beverage operations.
- In areas with low populations, the cost savings from sharing inputs like infrastructure and overheads provide an incentive to produce services together. For example a general store retailing groceries and providing café style meals, can survive by selling a smaller quantity of many goods and services than it would need to sell of a single good or service.
- Economies of scope can also exist for a place, rather than an organisation. A town's main street is a good example, where many businesses benefit from being close to each other and being able to share the town's infrastructure. Because the benefits are localised, there is an incentive to centralise economic activity in that place.
- Increasing the scope of production by providing more types of services from a given location may not result in better access. On the one hand, the cost savings may allow service provision to be more decentralised. However, on the other hand, it may centralise service provision as services will need to be provided from the same location.

Introduction

In this paper we consider how producing goods and services together affect access to services. The extent to which goods and services are produced together is described as the scope of production. Largely this paper focuses on reductions in cost to either the producer or consumer by increasing the scope of production, known as economies of scope. This paper also touches on other benefits from scope, although in less detail.

While economies of scale have historically been credited with driving the centralisation of economic activity, more recent economic thought has focused on economies of scope. Where we see clusters of different types of economic activity, from the remote roadhouse to large service centres like a town's main street or a city's central business district, we see economic geography that has been shaped by scope.

Internal economies of scope describe the cost savings that arise specifically from the *scope* of production, that is, the number and types of different products produced by an organisation (adapted from Panzar & Willig 1981). External economies of scope are similar, however they refer to situations where production takes place across multiple organisations.

Regardless of being internal or external, the spatial consequences are largely, although not wholly, driven by whether or not the effects are local. If the effects are local, that is to say constrained to only a given area, for example a given factory, town, city or country, then they have an inherently centralising force, because to take advantage of the benefits of scope the economic activity must occur in the local area. This is not necessarily the case for an organisation—there may be benefits from producing multiple products in the same organisation, but in different places.

The remainder of the paper is broken into two sections. The first begins by describing how economies of scope arise in the context of an organisation, and is followed by a broader discussion of the scope of place. The second section deals with the effect of realising economies of scope on access to services.

Where do economies of scope come from?

This section briefly outlines the basic causes of economies of scope. An understanding of why they arise and when they are likely to be an important consideration is helpful in both understanding the distribution of services and in designing effective service delivery systems. We first deal with production related costs in terms of indivisible inputs and complementarity, which have been the focus of traditional studies of economies of scope. We then move beyond this to consider market and internal transaction costs, risk and consumer information.

The scope of the producer

Indivisible inputs

Like the economies of scale described in the recent BITRE information sheet *Economies of scale and regional services* (BITRE 2019), economies of scope may arise because there is an indivisible input into production. An indivisible input must be bought or consumed in a fixed quantity which is larger than is needed to produce just one unit of a good or service. Some examples are overheads, like accommodation and utilities, a minimum level of staffing, or equipment that needs to be paid for no matter how much is produced. The case of scope is similar to that of scale, except that rather than an input being shared between the production of more of one product, it is shared across the production of two or more products.

An economy of scope created by an indivisible input can be thought of as excess capacity. After producing the optimal amount of one product the indivisible input is not exhausted and has further capacity to either produce more of the first product or be used to produce a second product. Having already produced the optimal amount of the first good or service, and having some of the capacity left over, the excess is used to produce a second product. The receptionist in a small medical centre is a simple example – they can carry out the administration for the multiple services located in the centre, rather than each service having their own receptionist.

The interaction between demand and economies of scope is not strictly centralising. The optimal amount produced by for-profit, not-for-profit, or government organisations depends on demand for the product. Where there is an indivisible input and sufficient demand, an economy of scale will exist: The cost of an indivisible input can be spread across multiple units of production. However, if there is not enough demand for the producer to be able to take advantage of an economy of scale, an economy of scope may exist, if the indivisible input can be shared across producing units of two or more products.

Where they exist together, a producer can choose between exploiting the economies of scale and/or exploiting the economies of scope generated by an indivisible input. However, there can be a trade-off in realising an economy of scope as it may mean taking on some “congestion” costs of two products sharing an input, as well as the loss of any benefits that might be gained by specialising in one product and the loss of returns to scale. This helps to explain why producers do not always exploit economies of scope and why they may instead try to realise returns to scale if there is enough demand for them to specialise.

This has important implications for how services are organised spatially:

- As demand falls (making economies of scale increasingly untenable) economies of scope will tend to be realised (Teece 1980, p231).
- All else being equal, as population decreases (reducing demand) the scope of organisations will tend to increase.

Box 1 provides a short example of how this plays out in remote Australia. A more formal treatment of how increased scope helps organisations with indivisible inputs survive in low demand environments can be found in Appendix A.

Box 1: An outback example of demand and the scope of organisations

A drive into the remote parts of the country confirms the relationship between scope and demand, with the towns dotted along the Outback Highway in South Australia providing a very concrete example. If we begin at Leigh Creek, an already remote township, we find a small regional service centre with an urban population of around 490 people that provides services to up to 1,300 people (for very small hospital services). The services available include a variety of retail; a small grocery store, newsagency and gift shop. Medical services include a very small hospital and doctor's surgery. The town also provides a combined school, police station and postal services through the newsagency. There are accommodation services in the town and recreational services include a swimming pool, tennis and squash courts.

Continuing down the highway a traveller finds the town of Copley, with a population of around 100. There are some retail services; a hotel, a general store, a service station and a caravan park. However, although the number of businesses is far reduced the service offering has not been reduced to the same extent. The hotel provides accommodation, meals, drinks and retails alcohol. The general store provides groceries, hardware, camping equipment and other goods. The service station provides fuel as well as mechanical services, including tyres, batteries, panelbeating, spraypainting, windscreens, metal fabrication and 24-hour towing. The caravan park offers accommodation, as well as a café bakery. The local services available to the residents and passers-by of Copley are certainly fewer than the number available to the more numerous residents of the larger Leigh Creek. However, due to the increased scope of the town's businesses the services available are far greater than the number of service providers.

This only becomes more evident the further along the road one travels and the smaller the towns one encounters. The next town, Lyndhurst, with a population of around 40, boasts both a roadhouse and a hotel. The roadhouse offers meals, tourist information, a small grocery line and a small range of camping equipment and car parts, as well as both diesel and unleaded fuel. The hotel offers accommodation, meals, drinks, diesel and tyre sales. Although there are only two firms providing services in the town the service offering includes a variety of retail, food and accommodation. The demand, both from residents and passers by being small, the scope of the firms has increased, sharing the fixed costs of buildings, staff and other overheads among multiple products.

Complementarity

Economies of scope also exist where there is some complementarity, or benefit, from producing two (or more) products together, even though they do not share any inputs. In economic jargon, these are situations where the marginal cost of one or more of the products is lower through joint

production than it would be through specialised production (Clark 1988, p18). This is analogous to increasing returns to scale (see Appendix A of the BITRE information sheet *Economies of scale and regional services* (BITRE 2019)).

Banks provide one of the most studied examples of complementarity as they generally provide both deposit and loan services (Clark 1988). These joint services are so ubiquitous that they have made their way into the definition of a bank itself.¹ Complementarity in deposit taking and lending services arise for a number of reasons, the simplest though is that taking deposits provides the capital to be lent. As banks only need to hold a sufficient amount of money to cover withdrawals, and as this amount is less than the total amount deposited, there is the opportunity for the additional capital to be lent out at a profit.

In banks as well as other industries there are also important information complementarities. In the case of banks information is accumulated about the historical financial position of depositors which can be used to make lending decisions. In large organisations, information about the workings of various departments and the products that they produce can be used to allocate resources. The information available to managers in the internal capital market allows it to function more effectively than an external capital market, potentially providing some economies of scope to large diversified firms. In the modern software environment, the economies of scope between providing a service such as a web search or gaming application and collecting information which can be used for other purposes, such as marketing, have become a central part of the revenue model.

Other benefits from scope

There are other benefits from scope that are not fully encompassed by only looking at production costs, and so do not simply fit into the subcategories above. This section briefly outlines the most important factors, namely the costs of market transactions (market costs), consumer transactions costs, reputation and signalling.

Transaction costs

Operating in a market is not free and involves transaction costs, for example the time spent gathering information about products and services and negotiating with suppliers. These costs can be saved by having a direct authority, like a manager inside an organisation, decide how to allocate the resources (Coase 1937). Managers themselves come with a cost, as does information gathering and decision making in an organisation. In every organisation there is a trade-off between the cost of organising resources using the market and organising resources in the organisation. The market and internal transition costs of organisations play an important role in defining their scope and provide the most salient explanation for the existence of organisations in the first place.

¹ See for example the definitions provided by the Oxford Dictionary: <http://www.oxforddictionaries.com/definition/english/bank> and the Macquarie Dictionary: https://www.macquariedictionary.com.au/features/word/search/?word=bank&search_word_type=Dictionary

The tension between these countervailing forces defines the size of an organisation in terms of 'vertical integration'. This describes the extent to which an organisation conducts an integrated production process. If market transaction costs are low, many organisations can each complete a few parts of the integrated production process and provide the partially completed product to the next organisation in the production chain. If market transaction costs are high, there is an incentive for a single organisation to carry out the entire integrated process. This is especially important in situations where there needs to be a high level of co-ordination between stages in the process. While this clearly describes many complex manufacturing processes, it equally describes complex service processes, like complex medical procedures in a hospital which require different teams to provide diagnosis, treatment and post treatment care. Hospitals are perhaps the supreme example of vertical integration, being a mix of an enormous number of separate but highly related services that require very close co-ordination.

Another classic benefit from increasing the scope of services offered is that it may reduce a consumer's transactions costs. The traditional department store, supermarket and one-stop-shop, which can attract customers through the convenience of only having to shop in one location all provide good examples of this effect. The reduced transaction costs drives up demand for all the products of a one-stop-shop and may give it a competitive advantage over specialist service providers.

Risk

Risk can also produce an economy of scope. To see this, we need to take a broader view of costs than we have used so far. Rather than limiting the concept of costs to financial costs, we need to consider costs to the utility or wellbeing of an individual. When an individual is risk-averse, uncertainty reduces their wellbeing compared with certainty. A simple illustration is that a person who is risk-averse prefers \$1 in the hand more than participating in a coin toss where heads would earn \$2 and tails would earn nothing. Even though these have the same expected value (50% chance multiplied by \$2 equals \$1), the uncertainty of the coin toss reduces the value of the expected earnings.

If the income from a particular good or service is highly variable then a risk-averse owner or manager has an incentive to diversify if that will generate a more certain income.² This rests on the incomes from each product being unrelated and not being subject to the same variations. In this way, on average, reductions in income from one product will be offset by increasing income from the other product. Under these circumstances a complementarity exists when both products are

²Economic theory suggests that if there is capital mobility then shareholders will not have an incentive to look for risk neutrality in a firm – they can achieve their desired risk profile by investing in multiple firms. Diversification is a strategy likely to be pursued by the owner operated firm, or a firm controlled by non-owner managers who want to reduce the risk to their employment (Amihud and Lev 1981).

produced together as this reduces the costs of uncertainty associated with producing each product in isolation.

When we think of diversification as a means of smoothing income the most obvious example are multi-product farms. Farming income is inherently volatile, both from the supply side in terms of rain and temperature, and on the demand side where fluctuations in market-wide yields can cause large fluctuations in price. Studies have shown that among other significant factors the more risk-averse a farmer and the less closely related the income stream of two crops, the more likely a farmer is to diversify into that crop (Ghadim et. al 2005). Diversification for risk reduction does not stop at multiple crops and often involves finding sources of off-farm income or moving into other industries. The classic example are wineries that, along with wine production, generate income by providing services to tourists, like food and beverages, winery tours and accommodation. Again, diversification into service and tourism markets is related to the risk aversity of the farmer, with more risk-averse farmers being more likely to diversify into other markets (Northcote & Alonso 2011).

Consumer information

Like organisations, there may be benefits to consumers in applying information gained using one service from a producer to the other services of that producer. In part this lies behind the value of an organisation's reputation. A good consumer experience of one product may lead consumers to have a preference for other products from the same producer. This means that for the producer, there can be a signalling benefit in providing a service that is known to be difficult to produce and thus shows the skill or quality of the producer. This has been a key explanation of why some private hospitals in the United States invest in the capability to perform difficult operations such as open heart surgery, even though these operations are loss making. By producing such products the producer can signal exceptional skill and quality and gain consumer trust in simpler, more profitable services (Robinson 1988).

The scope of place

To this point the discussion has concentrated on local economies of scope internal to an organisation. However, in some sense internal economies of scope are a special case in the broader category of local economies of scope. When we look at how economic activities are geographically organised, it is unusual to see a single product being produced on its own in an isolated location. There are examples, such as remote mines or oil platforms or even factories, however they are the exception. The scope of most places where non-household production takes place is generally fairly broad.

This breadth of activity in a single place is shaped by the same forces which drive diversity in the scope of an organisation. Indivisible inputs, complementarities, risk and transaction costs affect the scope of place through the same mechanisms that affect the scope of organisations. The key difference is that in the scope of place the effects are by definition local – the effects are always confined to a certain area. As the effects of the scope of a place are by definition local, there is always a centralising tendency, because to gain the benefits activity needs to be carried out locally, at that place.

Transaction costs are perhaps the most important factor in the scope of a place. Consumers benefit by being able to carry out multiple transactions in a single location. Organisations benefit by being near customers and suppliers, whether those suppliers are goods or specialist business services such as accounting or legal services (Goldstein and Gronberg 1984, 96). Proximity may also reduce co-ordination costs between related business. These are especially important if an overall production process is essentially a long chain of smaller processes where intermediary outputs need to be moved from one process to the next to create the final output.

Indivisible inputs are also very important in the scope of place, with basic infrastructure providing a very good example. Every business located along the main street of a town takes advantage of the fact that there is a street that provides access to their business. The cost of each business building their own access road would be enormous, but by sharing the existing infrastructure each only pays a small portion of the total cost through various local taxes such as land tax and rates.

These examples show that although we often focus on the scope of an organisation when evaluating the benefits of scope, the intuition is equally applicable to wider groupings of economic activity. Perhaps even more so than at the level of the organisation, economies of scope at the level of place are an important centralising force on economic activity (Goldstein and Gronberg 1984). Thus where we see most economic activity concentrated in centres like central business districts and town centres, which provide a mix of services to each other and the surrounding population, external economies of scope provide a compelling explanation.

Internal or external

The fact that we are able to distinguish between the two raises the question of why some economies of scope are internal and some are external. In this regard it is no coincidence that infrastructure is a commonly cited public good. There are two factors that define public, private and quasi-public goods; excludability and rivalry, which are described in more detail in Appendix A of the BITRE staff paper *What is a service and who provides them?* (Thomson et al. 2019). In brief, excludability is the ability to prevent others from benefiting from a good or service, while rivalry is the characteristic that use by one person or organisation reduces or removes use by another.

These two factors also partly define whether economies of scope will be realised internally in an organisation or externally by many organisations working together or sharing inputs.

- If the benefits of scope are rivalrous and excludable then organisations will have an incentive and a means to undertake joint production and realise the benefits of scope *internally*.
- At the other extreme, if the local benefits are non-rivalrous and non-excludable then there is no reason for organisations to undertake joint production internally – instead many specialist organisations can each produce one product and still take advantage of the *external* economy of scope.³

The other major factors determining whether an economy of scope will be internal or external are market and internal transaction costs. Even in the case of an economy of scope being purely private it is not necessarily the case that it will be realised internally rather than externally. This will depend on the ability and cost to organisations of negotiating access to the economy of scope (Teece 1980, p240). Such arrangements are very common in service provision, for example professional services in a small business centre sharing overheads, reception and administration costs or a general practice, pathology, radiography, dentist and a pharmacy forming a medical centre. So long as organisations can come to a mutually beneficial arrangement the economies of scope will be realised.

Whether a given economy of scope will be realised internally or externally depends on excludability, rivalry and transaction costs, which allow and incentivise keeping the benefits internal. In fact, some economies of scope are realised in different configurations of organisations depending on the specific circumstances of the organisations involved.

³ Being a public good, the shared input or complimentary process still might not take place or may be under provided.

The spatial effect of changes in scope

We have seen that local economies of scope have a centralising tendency in that by definition, organisations need to be located locally to take advantage of the economy of scope. On the other hand, we have seen that realising economies of scope helps an organisation reduce costs in low demand environments. To the government or not-for-profit service provider these two competing forces are especially important to the spatial configuration of service provision.

For these providers there is a complex tension between the two forces that is not necessarily obvious. On the one hand, realising an economy of scope may reduce the cost of providing the service, allowing the provider to decentralise service provision by opening new locations from which to provide the service (service points). On the other, joint production requires that the two services be provided from the same location. This may mean that when one service is more decentralised than the other, joint production leads to the more decentralised service being centralised.

The intuition behind these two forces can be explained in economic terms as an income effect (the effect of reduced costs on the budget) and a substitution effect (the change in the choices of a decision maker caused by the change in the relative price). The relevant relative change in price is the change in the cost of building or maintaining an additional access point when it is produced by itself, compared with when it is produced through joint production.

Economies of scope allow producers to exist in low demand environments where they would not be able to survive as specialist producers. However, moving from being a specialist producer to joint production in order to benefit from economies of scope does not necessarily increase the number of service points or access to both products. While it reduces the overall cost, if one service is more decentralised than the other then joint production may cause it to become more centralised. Whether or not this is the case depends on the extent of the cost reduction on the one hand (income effect) and the relative cost of service points for the two services on the other (substitution effect). This means that realising economies of scope may increase or decrease access to the jointly produced services.

Conclusion

Economies of scope often arise from indivisible inputs. Where there is not enough demand for a single service to be able to take advantage of economies of scale, increasing the scope of production can provide an alternative, as the fixed, indivisible production costs are shared between products. There are often 'congestion costs' and the loss of any benefits from specialisation that make this a second best strategy. However, it does allow for the provision of services in locations with low populations that mean there is low demand for a given service. This allows producers to decentralise production.

The indivisible inputs may not be specific to a given producer and may be able to be shared across producers. Infrastructure and other public goods are prime examples of large, indivisible inputs which are shared by many producers. If the effects are local, in that organisations need to be near the shared input to use it, economies of scope have a centralising effect as organisations need to be located close to the input. How the input is shared and whether it is one organisation that internalises the production process, like a hospital, or a group of firms, like a medical centre, depends on the transaction costs within an organisation, between organisations and the size of the benefits from scope.

Increasing the scope of production by producing multiple services instead of one service can be either centralising or decentralising depending on the costs of each service. On the one hand, there are cost savings from sharing inputs, like overheads, which can be decentralising. On the other, the two services need to be produced in the same location, and this may cause centralisation if some services are more widely distributed than others when produced alone. It is important to be aware of these complexities, as while initiatives to take advantage of the benefits of scope, like 'one-stop-shops' or 'regional service hubs' may bring cost savings to producers, they may not result in more decentralised service provision, and may even result in centralisation. Far from benefiting the people who access services, this can in some cases make services harder to access.

Appendix A: Indivisible inputs, scope and low demand

This appendix more formally sets out how increasing the scope of a service with large indivisible inputs allows them to survive in areas with low demand. Take two services which for simplicity have an identical cost structure and demand and share an Indivisible input. As they are identical we'll only consider the first service in detail. The average cost of the first service is the total cost divided by the quantity produced. The total cost is made up of a fixed cost (the Indivisible input), plus a variable cost multiplied by the quantity produced.

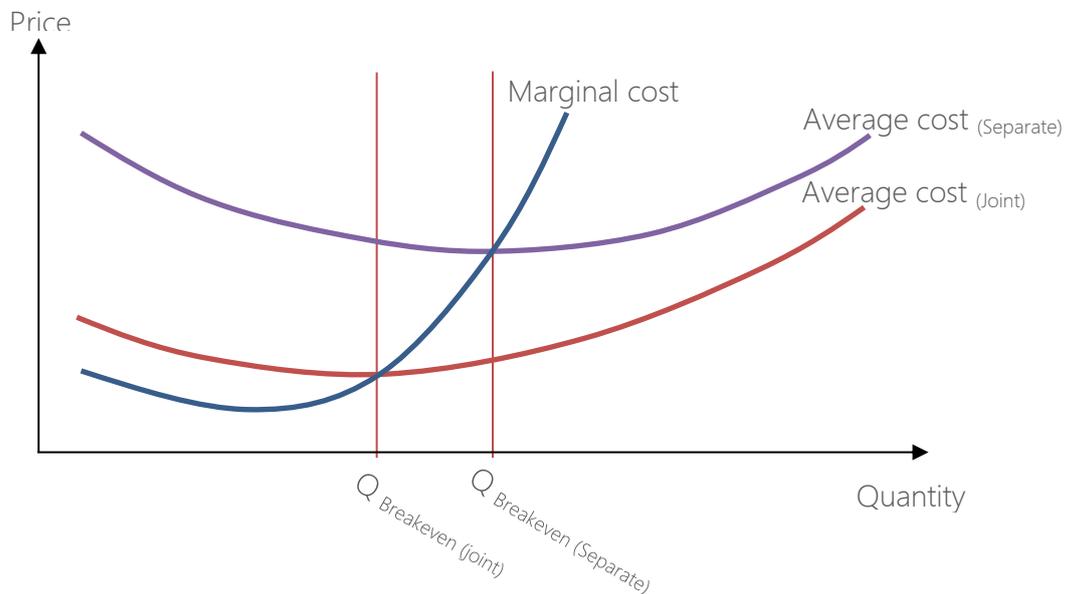
This can be expressed generically as:

$$\begin{aligned} \text{Average Cost}_{(\text{Separate})} &= \frac{\text{Fixed Cost} + \text{Variable Cost} * \text{quantity}}{\text{quantity}} \\ &= \frac{\text{Fixed Cost}}{\text{quantity}} + \text{Variable cost} \end{aligned}$$

To break even the firm needs to sell at a price that at least covers the average cost of production. For separate production the minimum breakeven quantity is shown in Figure 1 below by

$Q_{\text{Breakeven (Separate)}}$.

Figure 1: Economies of Scope and Service Provider Viability



Source: BITRE analysis

The average cost of joint production needs to take into account production of the other service. Because we have assumed they are identical but share the indivisible input the cost of joint production is:

$$\begin{aligned}\text{Average Cost}_{(\text{Joint})} &= \frac{\text{Fixed Cost} + \text{Variable Cost} * 2 * \text{quantity}}{2 * \text{quantity}} \\ &= \frac{\text{Fixed Cost}}{2 * \text{quantity}} + \text{Variable cost}\end{aligned}$$

The intuition is very simple: The fixed cost of production is being divided between producing both goods. As a result, the average cost is less under joint production than under separate production. In turn, this means that the break even quantity of the firm under joint production, shown in Figure 1 by $Q_{\text{Breakeven (Joint)}}$, is lower than under separate production.

The joint producer can survive by selling a smaller quantity of both services than the quantity it would need to sell of a single service. In a market with low demand, such as a small town, the joint producer can survive where two specialist producers would go out of business.

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