

clusters of shops may appear creating a pyramid of land values with its peak at the intersection. The size of such nucleations shows considerable variation, for in the largest urban areas, like London, these suburban centers may well include department stores, variety chain stores, specialist shops, public utility offices, and so on. The smaller suburban centers cater for a more limited residential area and there will be found the usual collection of convenience-type outlets-grocer, greengrocer, dispensing chemist, butcher, fishmonger, sub-post office, hardware store, newsagent-cum-tobacconist-cum-confectioner. At the lowest size level, in the older residential areas, is the corner shop acting as a general store for immediate streets.

Industry in suburban areas is primarily concerned with the production of goods for distribution beyond the immediate confines of the town and does not want access to a single market, nor does the customer collect from the factory. Such industry needs good general transport facilities and is attracted to sites along routes connecting that city with other urban areas so aiding product distribution and material assembly. The bulkier the product and/or materials the greater is the likelihood of a railroad, river or canal site, with the less bulky being produced at sites associated with road transport. The present tendency is for industry, especially the larger plants, to locate in suburban areas because their demands for land are becoming more extravagant due to the development of new production techniques (continuous flow systems with automatic controls) which require single-storey factories and to the provision of extra facilities such as car parking and sports grounds. Other industry which finds peripheral sites attractive are those deemed incompatible with other urban uses and must today accept relatively isolated sites, as is the case with obnoxious industry such as copper smelting.

The suburban area is also the one built-up area of the city where open space is most common. The open spaces, i.e., not built over, take the form of golf courses, race courses, parks, allotments, sports grounds, cemeteries, etc. Such uses can

compete for land towards the edge of the built-up area and are relatively accessible for the persons who use the facilities.

(iv). Rural-Urban Fringe

The influence of the city on land use does not, of course, end its political boundary but extends, to a greater or lesser degree depending on the size of the city, over the surrounding countryside. Most large cities have an area from which commuters are drawn to work in the central business district, the journey to work perhaps taking upwards of an hour. This is the rural-urban fringe where the single-family homes of those workers mix with agricultural use of the land. These persons are in the higher income groups and have chosen to live in rural surroundings because space is relatively unlimited and encroachment by lower-income groups is kept at bay by the access barrier.

Around the larger cities the commercial farming of the rural-urban fringe is oriented towards the city market, and as there may be competition from residential use for the land, which raises the latter's value, then land must be farmed intensively if it is to remain in agricultural use. Market gardening, pig farming, and dairying are, therefore, common.

From this examination of the general pattern of urban land use it can be seen that urban areas provide opportunities for specialization in the type of activity performed. The economic efficiency associated with this elaborate functional specialization of activities dictates that there must also be specialization in the location of those activities. Thus residences are separated from workplaces, and the workplaces are themselves functionally differentiated. Where land use is highly specialized there will be well-defined movements of persons and goods between one area and another in the urban area. There will be a functional relationship between the specialized land uses in an urban area and the amount and type of traffic generated.

CHAPTER TWENTY TWO

LOCATION THEORY AND URBAN LAND USE DECISIONS

22.1 URBAN LOCATION THEORY

In analyzing urban land use patterns emphasis has been placed on those factors which explain an actual pattern of land use. It was recognized that the principle of highest and best use had to operate within a limiting framework and even in those circumstances it was highly likely that certain site-uses would not reflect the application of the principle. What was the highest and best use of any urban site depended upon the relationship of that site with all other sites. These relationships were examined in terms of accessibility and complementarity. Urban land users place different valuations on accessibility and complementarity and through the process of competitive bidding each site would, in the long run, be used by that business use which maximized its profit or that residential user who maximized his total utility in that position. Thus the principles determining the internal pattern of urban land use were established within a practical framework.

22.2 NATURE OF LOCATION THEORY

Location theory goes a stage further for it argues that the explanation of an actual location or pattern of land use must be distinguished from the explanation of a rational location or pattern of land use. In fact the two need not coincide. Location theory, given any criterion seeks an answer to the question of what is the most rational location or pattern of land use. Not only should society seek an explanation of what is present or has happened but it should also seek to improve upon existing situations. Concern would be to find that pattern of location decisions which gave the maximum amount of real goods and services from the resources available. Should actual land use patterns match the theoretical pattern then persons in that community would not be able to gain any greater satisfaction

by re-arranging their economic activities. On the other hand should the actual pattern differ from the theoretical the community would benefit in the long run by undertaking certain adjustment indicated by the location theorist.

It is not proposed here to undertake a lengthy exposition of location theory for salient points relating theory to urban land use decisions can be made without resort to detailed analysis. Location theory starts from an assumptive base of fixed locations of market and sources of factors of production and a given transport system, and proceeds to build up the ideal or best location pattern in those circumstances. Some criterion necessary to judge what is the best pattern and here there has not always been agreement. Early theories of location tended to define their criterion in terms of either costs or revenue. Those theories which explain a chosen site or land use pattern either by showing that it gives the lowest total cost for material assembly, production, and product distribution or by showing that it serves the largest market so giving greatest total revenue, are in themselves inadequate, although pointing to two important points of location analysis. That site which, for a certain business user, gives minimum costs per unit may serve a limited market area, but another with higher per unit costs has access to a larger market which more than offsets the higher costs and so yields a greater profit. On the other hand the site providing a business user with the greatest revenue may do so only at prohibitive costs in the case of the more distant consumers or the assembly of factors of production and once again profit would be lower than in an alternative location. Thus a more realistic criterion, now generally accepted by location theorists, is that of profit-maximization. This same criterion was used for business uses allocating urban sites amongst competing users.

Within the assumptive framework location theorists examined the interaction of those factors which have a bearing on an individual business user's profits. What was true for one business user would be true for all users. Location theory has been especially concerned with the quantitative factors (i.e., costs, revenues, outputs, inputs) which influence the pattern of manufacturing industry. Agricultural activity has also attracted specialist study but service activity and consumption activity have been less frequently subjected to detailed analysis. But

service and consumption activities use a large part, even the majority of land in an urban area. With given markets sources of factors of production, and transport system as well as production methods, the latter determining the extent to which one factor can be substituted for another, focus was placed upon transport costs for assembly of materials and distribution of products and from this profit-maximizing locations were established. Resultant patterns differ according to whether labor is concentrated or dispersed, whether economies of concentration are important or otherwise, and so on.

Location theory was primarily concerned with the areal or regional pattern of distribution of productive activity, to the extent that it would suggest that area A is the best area for a particular activity, but not to say that site Z in area A was the best site. This can be interpreted as meaning that those national productive activities would derive advantages from being located within a certain area but that within that area there may be many sites which offer the sought-after advantages. On the other hand analysis of urban land uses indicates that position within an urban area can be extremely important for activities dependent upon that area alone for consumers. For example, a matter of a hundred yards can make a great difference to the earning capacity of a shop in the central business district.

22.3 LOCATION ANALYSIS

No activity's location is actually determined by a single location factor. Every location decision represents an amalgam of interacting forces and is only made after an assessment of the relative advantages or disadvantages of alternative locations for the activity in question. The amount and growth of economic activity in any region (or urban area) depends upon its access at competitive costs to factor inputs and its access at competitive costs to markets for the products. An individual business activity will find that its products costs and sales revenues vary from one site to another depending upon access to factors and markets. Sometimes one or the other is dominant, sometimes neither.

The location pull of markets as against factor sources depends upon the ratio of transport costs on factor inputs as compared with those on output distribution. In

general this ratio will result in orientation to the market or to factor inputs. Transport costs on factor inputs compared with final goods depend on a number of factors. First of all, the physical qualities of the inputs or goods influence the cost of moving them. The bulkier or heavier the raw material or commodity the more expensive it is likely to be to transport. For manufacturing industry whether a firm locates near markets or material sources may well depend on what happens during the production process: materials may lose weight or bulk in processing, as with the reduction of metallic ores, or the final product is in some other way easier to move than materials. In such cases manufacturing industry is likely to find that the material source is the profit-maximizing location. Alternatively, market locations are more profitable where finished goods are more expensive to move than materials. Secondly, the structure of transport charges may sway the advantage one way or another, for pricing of journeys can differentiate between commodities, journey lengths and amounts involved. If, for example, raw materials are charged at a lower rate per mile, weight, or value than finished goods this would favor a market location because materials can be assembled more cheaply than products distributed.

Locations intermediate between markets and factor sources are also possible. Compared with market or factor source locations it would appear that intermediary places face a handicap, for with graduated freight rates short hauls are relatively more expensive than long hauls which could make prohibitive the combined hauls necessitated by intermediate sites. However there are several situations making for profitable location at intermediate places. Firstly, where there is a break of bulk point a change of transport is inevitable, e.g., if imported raw material comes by cargo ship it requires a land journey to get it to the producer's factory, unless the latter is established at the dockside. Secondly, where transport costs are a negligible proportion of a firm's total costs then other factors may influence its location at an intermediate site. Thirdly, on occasions peculiarities in the transport rate structure make intermediate sites possible locations as when "in transit" privileges are granted to manufacturing industry so that a single rate is quoted for an item which starts its journey as a raw material and ends it as a semi-

finished or completed good. Fourthly, with widely scattered markets plus multiple factor input and a dominant factor it is highly likely that an intermediate place will be the most profitable location for the activity in question. These four cases, together with market and factor locations, are important in that they provide economic reasons for the location and development of many urban areas, but they do not throw as much light on the chosen sites of activities within these urban areas.

Location at the source of factor input or at the market are most evident where there is a single geographical source of the factor and similarly in the case of the market. However, markets rarely assume such point form character, especially where it is the market associated with consumer demand. In such cases one can only speak of market orientation in relative terms for it involves the determination of that transport centre which is best for carrying through a given set of market contacts. Like reasoning can be applied to the supply sources of factors. Where an industry has a wide factor supply area but an essentially point form market then the pull of the market is strengthened and vice versa. Intermediate sites assume importance where an industry faces both wide factor supply and market demand areas. Those industries which have the greatest chance of having pointform market and/or supply sources are those primarily oriented to semi finished inputs and/or outputs.

Location of economic activity is further influenced by the economies derived from large-scale operation and from proximity to complementary firms and facilities. Internal economies of scale affect the individual firm and their influence varies between industries. Where internal economies are of extreme importance for a producer the national market could be served from a single location and the excellence of other sites for that industry would avail nothing once a producer has pre-empted the market. External economy benefits accruing to producers in a single industry grouped in a limited geographical area will have a similar effect in concentrating production in certain areas. The same is true of the general economies of urban concentration. The current agglomeration pattern, which is

essentially the end result of past growth and a reflection of these various economies, naturally exerts considerable influence on new firms or firms seeking a new location because these agglomeration economies are immobile and not equally available to all firms irrespective of their location. As the scale of business increases so it often becomes possible for the territorial subdivision of functions, formerly united in the same plant, to take place. It must be emphasized that this option of moving part of its functions is usually open only to large firms and to so subdivide productive activity must increase management costs. Therefore there must be some benefit to the firm, such as lower site costs or greater volume of business, which offsets the higher management costs.

For the most part location theory has been centered on productive activity and implicitly assumed that population could respond to economic opportunities. However, for some persons location interests them only in so far as it affects their consumption possibilities. Most persons, besides being units who consume goods and services, also contribute labor to production. The person or household is thus responsible for distributing the labor outputs owned and assembling desired consumption inputs. In nearly all cases the costs of marketing these labor services over any considerable distance will be greater than the costs of assembling consumption inputs. The distribution of population must, therefore, correspond to the regional distribution of economic opportunity and so the factors which explain the general location of productive activity also explain the general distribution of consumptive activity. The exceptions are of course, those persons who do not contribute to productive activity, largely retired persons and persons who are of private means, and these persons require maximum accessibility to the consumption inputs they demand. For the rest, available economic opportunities may determine the regional distribution of population but the force of consumption considerations is particularly strong over shorter distances, such as in an urban area. This can be illustrated by the choice of residential locations in suburban areas where persons enjoy increased amenity but at the penalty of greater transfer costs in marketing their labor.

Again location theory has emphasized the costs of production and distribution which have to be borne by the producers. In many cases the goods are consumed at the consumer's place of residence and the producer does not always bear the whole cost of getting a good or service to the place of final consumption. The range of possibilities is immense. The producer may bear the whole cost as when the field agent of an insurance company calls at the consumer's home to arrange a policy and subsequently calls to collect the premium installments at regular intervals. Another case is where a consumer buying furniture incurs transport costs in visiting a shop to make his choice. The price of furniture in the shop would be fixed regardless of the consumer's location. If the consumer was responsible for moving the furniture to his home or the retailer made a charge to cover the full cost of delivery then the revenue per sale of an item would be the same for the retailer for all sales to consumers, irrespective of consumer's location. On the other hand where a retailer delivers free of charge or makes a charge less than the full delivery cost then his revenue per sale will vary according to the location of the consumer. These considerations are probably most important in the case of consumer goods and firms, mainly retailers, requiring access to a regional market the people in a certain urban area rather than to a national market. It is such activities which are chiefly associated with the highest values in an urban area. For example, a site occupied by a shop serving a given urban area will have a higher value per site acre than a site used by a factory producing for a national market because general accessibility within the urban area is more critical for the shop.

Of course the factors influencing location decisions are subject to change over time and thus the optimum locations of given activities can also change. For example, the increasing land-per-worker ratio at industrial sites, which is associated with new production techniques, has increased the relative importance of site costs for manufacturing industry and coupled with the difficulty of obtaining land for expansion near the centre of cities has persuaded many industrialists that, sites on the urban periphery are best. Similarly as the bonds of transportation are relaxed the next most important factors will tend to dominate the location decisions of

firms and individuals. As might be expected it is expanding industries which respond most quickly to change in location forces.

Summarizing this far it can be stated that location theory will account for the type and amount of productive activity to be found in a given area and, therefore, also the type and amount of consumption activity which will respond to the economic opportunities in that area. But as has been pointed out the markets served by productive activity vary from the national to the local, and because many activities dealing with final consumption goods have local markets and rely upon the potential purchaser coming to the place of sale. The competitive bidding for sites within an urban area gives a location pattern of land use which reflects a user's ability to benefit from general accessibility to the city as a whole. It is these local market activities most dependent upon general accessibility which create the areas of highest land values in a city, with the possible exception of complementarity between office users. Also the stronger influence of consumption factors in a limited area has been noted. These relationships can best be illustrated by considering in detail the factors which influence the location within an urban area of a number of major uses. The location of shops will show the importance they attach to access consumers within a given urban area. Office location will likewise need access to consumers, but access to factor inputs, especially inter-office contacts become important. Industry will occupy relatively less value sites, even where serving a national market, whilst the choice of residential location depends upon the consumption considerations. Finally mention will be made of certain uses, mainly public uses which are less closely controlled by these location forces.

22.4 SHOPS

Retail productivity is highly dependent upon location, even within a short distance one site need not be good as another, for this determines the volume of sales and often the selling price of goods. The number of sites which can, therefore, be profitably occupied in an urban area by shops is strictly limited. A shop has to be located in a position where it is able to attract sufficient suitable customers. The consumer wishes to minimize the disutilities involved in making a purchase and

much will depend upon the type of good, the immediacy of the need, the frequency of purchases, the degree of selection desired, and whether the price of the good represents a fraction of or a multiple of the consumer's weekly income. Within any given urban area the number, size and location of shops will depend upon the density of population, the extent to which purchasers come from out of town, the purchasing power of the population and its spending habits.

As noted in the previous chapter consumer goods can be subdivided into convenience, shopping and specialty goods, although it is not always easy to make the clear-cut distinction between them. Convenience goods are purchased at fairly regular short intervals, represent a small part of people's weekly incomes, and where selection is relatively unimportant. With such goods customers tend to purchase from the shop nearest to their home. This is the case with groceries, fruit and vegetables, sweets, and washing powders. Shopping and specialty goods are bought at irregular and infrequent intervals, represent in many cases a multiple of the purchaser's weekly income, and the purchase can be delayed in order to select from as wide a range of models as possible. With these goods would be buyers are more prepared to travel and take time over the purchase by comparing goods not only within a shop but between shops.

Shops selling convenience goods must be located close to the homes of customers and must seek out those positions within residential areas which offer the greatest accessibility to the local population. Such positions are likely to be along any major roads through the area, on corners where roads converge, or near the railway station if one exists. At the lowest level, in the older residential areas, is the corner shop which is very much a general store selling a wide range of commodities to which people can pop out when necessary. According to the density of population and the ease with which persons can get to shops by car, public transport or foot, complementary shops cluster in the positions of greatest local accessibility. In the less densely populated residential areas there may be a limited number of convenience shops in the cluster - usually a grocer, butcher, greengrocer, newspaper/confectioner and as the density increases so others join the cluster, a

baker, dispensing chemist, fishmonger, cleaners, hardware store, etc. For these shops local and near to purchasers' homes are the most profitable ones because consumers will not go out of their way to make convenience purchases and usually carry the good home themselves. In order to gain the use of the sites conferring the greatest local accessibility shops have to compete with the surrounding residential use. Where there is competition between different retailers for these sites the price may be competed up well above those of surrounding sites.

In the case of shopping and specialty goods the shop needs to be in a position where it can tap a larger population because purchases by any one consumer are made at less frequent and more distant intervals than with convenience goods. Such shops are most likely to be found where transport routes converge, and in an urban area the shopping centre will be in the position of greatest accessibility which is adjacent to the focus of the intra-city transport system. However, in the larger urban areas where there are several shopping centers, the main one occupying the position of greatest accessibility may share that position with other land uses. It is not simply access to the largest number of consumers that is important but also to the amount of purchasing power. Thus the location of the higher class residential areas may influence the choice site of shops selling this type of good.

Again shops selling specialty and shopping goods cluster together to reap the advantages of complementarity. These shops are the focus of shopping expeditions and persons may want to visit more than one shop selling an item in order to compare goods or they are shopping for more than one type of good. Similar shops cluster together as this will promote sales by attracting customers and facilitating comparison between shops. Even where the shops are selling like goods, such as shoes or women's clothing, they are often more complementary than competitive, for different shops may concentrate on different grades of commodity or serve different classes of customers. Competition between the various shops will determine the actual allocation of sites within the position of greatest general accessibility. As most shopping expeditions are undertaken by women it is shops

catering for these customers which can make the most profitable use of the best sites. Basically these shops are department stores, variety chain stores, and specialist shops for women's clothing.

The number of specialist shops found in any shopping centre is also a function of the extent of the market. Generally speaking, the larger the population and, therefore, the shopping centre the more specialist shops there will be. In the larger shopping centre, a specialized shop site concentrate on one or two commodities which would be sold along with other commodities in a smaller shopping centre. Some shops selling convenience goods will also be found in a main shopping centre for they are complementary to shops selling shopping and specialty goods in the sense that a shopping trip can combine the purchase of both types of goods. Other complementary activities such as restaurants, snack bars, branch banks, ticket agencies and entertainment facilities are also found there. Again, these activities require the support of a relatively large population and enter for persons wishing to combine their shopping trip with a visit to the theatre or cinema, or with eating out.

It is most often the case that shopping centers containing the shopping and specialty retail trade are found near the centre of an urban area because the convergence of transport routes designed to get persons from the outer to the inner part of the city makes this the position of greatest accessibility to the whole urban population. However, there may come a time when an urban area has reached such a size that the suburban population on a particular side of the city is large enough to warrant a suburban shopping centre which includes shops selling shopping and specialty goods.

Shops must, therefore, be located with respect to their market area and sources of supply of saleable goods are a negligible influence. Potential customers are scattered throughout an urban area and shops must be highly accessible to them because the customer must come to the shop and will incur transport costs. etc in doing so and perhaps, also, costs in getting the goods home. Access to the market is critical in the case of shopping and specialty goods, therefore, such shops demand

sites commanding the greatest access to the urban population. In most cities, these sites will have the highest land values because shops must compete them away from other uses such as offices. Land values within this shopping area will not be uniform for some positions will be better than others: on a comparable area basis, sites occupied by department stores are more valuable than those used by women's clothing stores and the latter are more valuable than those of furniture store and so on. Shops selling convenience goods can be supported by a smaller population and again they must be located with respect to consumers, but land values will be relatively low because competition is only with residential uses.

22.5 OFFICES

Offices can cover a multitude of activities. Most manufacturing firms need some office space in order to deal with the hiring and payment of labor, the purchase of materials and stocks, the distribution of products, and decisions regarding how much to produce. The larger the firm the greater the likelihood that certain of these office activities associated with manufacturing will be separated from the place of production and probably located, instead, in the position of greatest accessibility. This is especially true of the executive, decision, taxing offices of manufacturing firms, and although it has often been the case that routine office activity is kept under the same roof as the executive, the reasons for central location of the routine work are less critical. The advantages from locating in the area of greatest accessibility are discussed below. For those offices of manufacturing firms which cannot be geographically separated from the factory, because the firm is too small, etc., then the location will be determined by those factors influencing the location of the productive unit.

Those offices which can be separated from their manufacturing unit(s) and offices which need contact with a large population or with other offices all gravitate towards the position of greatest accessibility is, firstly, the existence or development of complementary activities.

The executive manufacturer's office finds lawyers, advertising agencies and other offices to which reference need be made during the working day. Similar contacts

are facilitated between other offices, i.e., the market for one office's service is made up of other offices in the area, and represents a near point form market. The advantage of this close positioning is a saving in time because the exchange of information between offices usually involves personal contact. The importance of this cannot be over-emphasized because much of the goodwill of a firm is based upon this personal contact. Secondly, offices require access to a supply of labor whose educational standard is above the median for the total population. The greatest supply of such labor will be tapped by locating at the position of greatest accessibility in an urban area. Competition between offices for this labor and the need to compensate employees for travelling costs may push up the price of such labor to such offices but these increased costs are more than offset by the higher earning capacity from being in that area. Thirdly, the advantage of a prestige address in the position of greatest accessibility. Increased prestige shows itself in increased sales and thus is a further reason making the position of greatest accessibility the most profitable location for these offices.

Office firms have greater latitude than shops in choosing a location because their earning capacity is seldom affected by the matter of a hundred yards or so, whilst, in most cases office activity can be carried out efficiently on floors other than the ground floor. The earning capacity of offices is dependent on being within the area of greatest accessibility rather than on a particular position in that area. Offices will be able to pay higher prices or rents for accommodation in that area and will compete sites away from alternative uses with the exception of certain sites and ground floors occupied by the retail trade. The explanation is twofold. First of all activities which use space intensively are able to pay higher prices per square foot of floor space than uses which make a less intensive use of space. Office activity requires a relatively small space compared with residential, manufacturing and storage activity. Therefore, office users will be able to compete a site away from other users with equal earning capacity. Secondly, where the earning capacity of an office is dependent upon being in a given area, office users, like shops, are willing to pay the high prices to put their offices where they want them.

As explained earlier, in most urban areas, the high land values corresponding to the area of greatest accessibility and complementarity is shared by offices and shops. In many cases the highest valued are those where ground floors are occupied by retail traders and the upper floors are office accommodation. As it is possible to produce more suitable accommodation for offices, than shops, on a site by building upwards those sites which are used wholly or partly for offices will be amongst the most intensively used in an urban area.

In the largest urban areas the position of greatest accessibility may show a tendency to develop functional sub cores with the main office concentration splitting off from the main shopping centre. This enables greater specialization to take place between shops and between offices in their respective areas so enhancing the advantages derived from complementarity. Offices become a “dead heart” of an urban area in the evenings and at week-ends. With increasing city size, more offices want locations in the greatest accessibility area, but the latter is severely limited on the horizontal plane and building costs ultimately limit vertical expansion. So the price of office accommodation rises, to an extent where certain offices must reconsider their location. Those offices which obtain the least advantage from being in the area will move out, others cut their demand for central office space by living off those activities which gain little from being in the centre, usually routine work dealing with accounts, general administration, records and technical departments.

Certain other offices are found outside the central area. They may be part of a firm which has located itself in a relatively accessible position to tap the local labor supply. More often they are offices which follow the population for they need face-to-face contact with clients, the latter being resident in a particular area. This is true for field offices of insurance companies, building societies or branch banks and in each case there is a minimum population necessary to support such an office. There will also be estate agents, solicitors, accountants and such like who serve local population needs. These offices are located so as to be accessible to the residential population of a given area and they find that the position(s) giving local

accessibility are near a suburban railway station or the local shops. In some cases these offices can occupy the building above the shop.

The proportion of land devoted wholly or partly to office use will differ greatly between urban areas of similar size. Urban areas serving as national, regional, or local capitals will tend to have a higher proportion of office space than other urban areas of the same size. Moreover, their administrative function may serve to attract the offices of firms which have a need to contact those government offices during the course of a working day. Alternatively, urban areas which specialize on the production of a few goods or services will tend to have less office space than other urban areas of comparable sizes.

The location of offices within an urban area is, as in the case of shops, especially influenced by market considerations. This gives rise to two main patterns of office location, depending on whether the market comprises other offices or urban residents. In the former case the market turns out to be relatively point form because of the complementarity advantages, reaped from close positioning of offices needing to exchange information, etc., by means of personal contact between employees. These offices cluster in the position of greatest accessibility because the whole urban area must be tapped to provide sufficient suitable labour, and because certain offices may serve a wider market than the particular urban area as their size increases.

The remaining offices need face-to-face contact with the resident population and they will locate in a position giving ease of local access, which, depending on the size of city will be the city centre or suburban shopping centers.

22.6 MANUFACTURING INDUSTRY

We have seen that industry gravitates in the long run to the site where profits are maximized and that such a location decision is the outcome of many factors, such as accessibility to raw materials, components, sources of power, markets and labor, which may be pulling in different directions. Manufacturing industry is very often dependent upon markets which are to be found outside the particular urban

area in which it is located: this will be especially true where the market is geographically scattered rather than point form. For example, a firm producing electrical consumer goods would find that the South-east of England was an important market area and a location in that region could well be the firm's profit-maximizing one. But with a scattered market in the region there will be several urban areas from which the potential sales could be equally tapped i.e., the total revenue possibilities would be the same for any of these locations. Thus, where total revenue is the same for any location the question of profit maximization depends upon the site with minimum production costs. This is very much the problem which faces manufacturing industry when deciding upon a site in a particular urban area. Where an industry or firm makes a significant proportion of its sales outside the town it is unlikely that one site will have any advantage over other sites when it comes to the number of sales which can be made at a given price, i.e., for a given firm total revenue will be the same for any site in that urban area. But costs may differ between sites because of access problems to local labor, or because transshipment was necessary between different forms of transport. Assuming total revenue is the same for any site a firm will maximize its profits by locating at that site where costs are minimized for the output envisaged. This will be determined by a comparison of the relative costs at alternative sites.

To a greater or lesser extent, depending upon the industry, the profit maximizing location of any firm will be influenced by the various methods of transport and the orientation of routes, both outside and within an area, which exist in an urban area at the time of the location decision. In the case of a firm using heavy raw materials, such as crude oil, iron ore or grain, which are weight-losing during the production process, the plant will be located alongside the route where the transport of that raw material is cheapest, probably at a point where trans-shipment would be unavoidable. Canals, other navigable water, and railways usually provide the cheapest means of moving such materials. Therefore, heavy industrial plants may be established near to railway lines, rivers, canals or docks. The sites served by heavy freight transport in any urban area are limited in number, but, unless the saving in material assembly costs are offset by other additional costs at such sites,

heavy industry will not have to look further for its profit maximizing site. Where the railway line or navigable Water passes through an urban area it is unlikely that heavy industry will be found near the city centre (for there are more profitable alternative use of the land) unless the site was developed when the urban area was smaller and has now been enveloped in the subsequent growth. It is more usual to find these industrial plants away from the main part of the city and this is enhanced by factors such as noise, odors, waste disposal and fire hazards. Where an industry needs access to raw material from outside the urban area or to markets beyond the urban area then access will be required to transport facilities connecting that area with other urban areas and industry will compete sites adjacent to those routes away from other uses, especially in the less central parts. Lighter industry will depend more on motor transport and prefer sites along radial roads out of the city or on outer ring roads.

For some manufactured goods labor is by far the most important factor input in the process, and the firms concerned are attracted to urban areas where there is an abundant supply of suitable labor. The firms involved require either unskilled labor, e.g. clothing, or labor of a very high educational standard, e.g. electronics. Here the main factor input is available from within the urban area. Firms depending on relatively low-paid unskilled labor cannot move away from the older, near central area so long as the supply of cheap housing is predominantly located there. On the other hand the high quality labor is amongst the first to enjoy suburban living conditions and this has influenced industries dependent upon that labor to seek sites in suburban areas.

Industries which most naturally gravitate to urban areas will be those which produce final consumer goods and whose market is mainly confined to the urban area itself, e.g., bread-baking. The larger the population the more numerous these industries become and in the largest cities will include tailoring, processed and manufactured foods, even electrical goods. Often the labor content of these products is high so the firms in question have the double advantage of a labor supply and a potential market near at hand when locating in an urban area. With a

well-developed intra-city transport system these firms could establish themselves almost anywhere in the area, and are truly "foot-loose". Those firms which have low ratios of area per establishment and per worker as compared with other manufacturers, clothing trades, printing, etc., can compete for sites near the edge of the position of greatest accessibility. Firms producing on a larger scale and using modern production techniques requiring horizontal factory layouts and a large floor area per worker, as with electrical consumer goods, etc., tend to locate in the outer part of the urban area where land is cheaper but also where good road connections are available.

When an industry first establishes itself in an urban area it will tend to locate in its profit-maximizing position, taking as unalterable such factors as existing transport routes and facilities, workers' residences and the location of other firms. Once established the existence of an industry in that position will have an influence on these other factors and will, in time, add to the advantages of the original position. Similar or complementary firms may move to adjacent sites, transport routes may be re-oriented or additional facilities provided, and the labor supply may also find advantages from living nearer. In time these acquired advantages may far outweigh the original ones. For this reason, mistakes or ignorance as to what was the profit maximizing position will be rendered less important over time. Thus in the absence of any drastic changes in raw materials or production methods used or in market location existing producers will consider their present location the best, as indeed they will be due to the acquired advantages.

These acquired advantages point, in one sense, to the importance of complementarity as a factor influencing industrial location within an urban area. Complementarity usually helps explain why industry clusters together within an urban area. As an industry develops in a particular location firms serving that industry may locate their plants near to the main firms in that industry. This is so for firms producing components to be incorporated into the final product or providing some specialized service such as repair facilities or transport services. In both cases the main industry represents a pointform market for the products of

these other firms and this is an important force drawing the auxiliary firms towards the main industry. The existence of these complementary activities will serve as an attraction to new firms in the main industry and so bring a further concentration of industry in that location.

With a very large urban population, there may develop clusters of small single plant firms each specializing on producing one or two articles or parts of an article for a particular industry. This is likely to occur where there is a fluctuating demand for a differentiated product, e.g., high-style dressmaking, toys and games, job printing and publishing. These small plant firms have many advantages over the concentration of production of such goods in larger units. They are more adaptable to changing tastes and seasonal demands since they use relatively little capital equipment and rely heavily on outside suppliers. Each firm will find its demand more stable since it will be producing only a very small proportion of the total. Face-to-face contact often plays a critical role in bringing about the pronounced clustering tendency amongst complementary small firms, e.g., dressmakers need to finger fabrics. As noted earlier these firms have only a small ratio of land per plant and per worker and can thus compete for near central sites, especially as the "value added" during the productive process is high compared with many industries. Moreover, such locations give these firms access to the necessary supply of diversified labor and there is a considerable amount, of rentable space available in this part of the city which is attractive to these small firms with little capital.

The proportion of land devoted to industrial purposes shows a wide variation between different urban areas. Urban areas which specialize on the production of heavy goods, like ships or steel, will devote a relatively large proportion of land to industrial use, whereas areas specializing on services, such as a resort town or university, will have a much smaller proportion of industrial land. However in all urban areas, there will be some demand for land for industrial purposes, if only to satisfy local demand, e.g. baking and laundering.

22.7 RESIDENTIAL ACCOMMODATION

If roads and open spaces are excluded, the highest proportion of land in an urban area is used for residential purposes. The stock of residential accommodation varies from multi-store flats near the city centre, through back-to-back terrace houses and then semi-detached, to detached houses often standing in spacious grounds. This stock of residential accommodation reflects decisions taken at some time in the past because building costs rule out the choice of new construction for a substantial part of the population. The heterogeneity of this accommodation reflects these past decisions, as well as differences in income, capital accumulation, family structure and job access of the present population, and the competition from other land uses.

If residence is to compete land away from other uses, then sites could have to be developed to higher densities in or near the position of greatest accessibility than elsewhere, because sites in that area provide optimum locations for higher order uses such as offices and retailing. There is another reason why residential densities increase as the city centre is approached. If an equal number of persons demand to reside within a distance of one mile from the centre, as demand to live between one and two miles, then, because the area within one mile of the centre is less than the area between one and two miles of the centre, demand in the inner area will be more concentrated and the demand for individual sites greater. Therefore, in the absence of density controls and the like, residential densities increase as the position of the greatest accessibility is approached.

Usually, there is a relationship between a person's income, his place of residence and his place of work; although the correlation is not fixed, for individuals differ in the proportion of their incomes they choose to spend on accommodation. An individual seeking to maximize utility, must weigh his desire for access to his place of work against various possible combinations of community costs and accommodation prices and his other desires for urban contacts and amenities.

Income will determine how far a household's residence preference can be indulged. With different preferences consumers in the same income group may

demand different types of accommodation. For example, those with a strong preference for residential site amenities will tend to substitute such amenities for other advantages and therefore find that additional commuting costs are incurred. On the other hand, those desiring contacts furnished by near central locations have the advantage of lower transport costs but frequently have to sacrifice certain site amenities. Where persons of unlike incomes live at distances where they incur the same commuting costs then the person with the highest income will occupy the best accommodation, and so on. Although job access is still the most important factor in influencing residential location it might be argued that, with increasing leisure time and mobility of families then, eventually recreational facilities may become a major determinant of residential location.

Where persons in the lower income groups have to pay the full price for their accommodation and transport they will be forced to live near to their places of work. Therefore areas of low-income residences correspond to those areas which permit workers to travel to work inexpensively, e.g., adjacent to industry demanding large amounts of relatively cheap labor so that workers can walk or cycle, or near city centers in areas with ready access to public transport. Besides living nearer to their work, lower income groups also live at higher densities than other groups. Being able to pay only low prices or rents for accommodation and having to live near to their place of work to keep down commuting cost, it is only by making intensive use of the land, that sites can be competed away from other uses in the locality. The residential areas now occupied by low income groups may have been originally developed for them, in which case they are tenement buildings and back-to-back terrace houses or they may be houses vacated by higher income groups which have deteriorated and now subject to more intensive use. In many British towns lower income residential areas are found in locations which may differ from those suggested because they are council houses and provide subsidized accommodation. However, council estates are rarely found on the side of the urban area catering for higher income groups because land values are higher and access to work more expensive.

Higher income groups have a wider choice in residential location; for they are able to choose from amongst the existing stock of houses, as well as having the ability to pay for the newer most desirable residential facilities. Therefore, the separation of workplace and residence is likely to be greater. The higher a person's income and then it will be greatest for those persons who work in the city centers. By using more rapid and flexible means of transport, high income workers can travel considerably longer distances to work with the same time expenditure as lower income groups. In many cases travelling time is longer than for other groups but this is a price willingly paid to gain access to the amenities of living at or beyond the edge of urban area. Usually, prices of high income, housing fall with increasing distance from the city centre. As an alternative, some high-income workers choose to commute only short distances and pay higher prices for near central accommodation. In the latter case, high prices are necessary to compete land from other uses, including low-income housing, and to secure accommodation of the required quality. Whether a high-income worker chooses one or the other of these residential locations will depend upon the presence of children in his family. Single persons, childless married couples and the elderly ones whose children have left home frequently prefer the near central locations, whilst married couples with children find that the suburban locations suit their needs best, and allow them neighbours with children of similar ages.

There is nothing intrinsic in the land which creates an upper-class residential area although high-income groups would be able to compete area with attractive physical qualities. Once established a high-class residential area is able to prevent the invasion of other uses. This is true of the areas of luxury apartments and town houses which retain their exclusiveness in spite of being near to the position of greatest accessibility.

Between the districts which cater for the lowest and highest income groups will be found residential accommodation for the middle-income groups. The latter are likely to occupy detached and semi-detached houses and bungalows developed to higher densities than for the higher-income groups as the highest-income groups

will be located on the opposite side of the position of greatest accessibility to the concentration of the manufacturing industry and the latter attracts low-income residences, the middle class residences occupy the remaining sectors.

Although the main distinctions between types of residential use can be explained in terms of income, job access, and family structure further divisions may occur. For example, immigrant populations tend to seek out their fellow immigrants and cluster in the same area.

The individual urban use discussed conform to the analysis of locational decisions whereby business users seek to maximise profits and residential users to maximise utility and within an urban area profits and utility depend upon accessibility and complementarity. However, in the case of public use of land, where political factors enter into the decision, the location of such uses, e.g. local authority offices, public utility works, could be independent of accessibility considerations, although this is not always the case.

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