safety, cost and dependability which either induce an expansion of existing productive patterns or create the possibility of entirely new activity. Each of this service features has a somewhat different impact upon mobility and economic development.\(^1\)

The speed factor permits more intensive use of existing transport facilities which leads to capital saving in two respects. 1) Less needs to be invested in transport to provide the same amount of service. 2) Industrial and commercial firms may require to retain smaller inventories so that the greater amount of the capital may be released and variety of real investment is possible.\(^2\)

The element of safety has both a cost and psychological dimensions. Improvement in safety tends to stimulate use and reduce the hazards of movements. This brings about the greater utilization of the facility per time period and reduced cost in the form of damage loss and insurance.

The cost factor refers to the reduced inputs required to move any given quantity of goods. These released inputs become available for other purposes permitting greater

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2. Ibid.
output from the same economic resources. The ultimate significance to the economy depends upon its opportunity cost. The incidence of the pecuniary benefits is a function of relative competitiveness in product and transport market. Further the allocative mechanism of benefits also depends upon the time element. The short run allocative pattern may be different from that of long run. The disposition of primary gains will condition subsequent secondary effects and may range all the way from increased leisure through increased consumption to greater investment in productive facilities.

The dependability factor allows producers to schedule operations more efficiently and further greater investment may be stimulated in agro and dairy industries. In general, improved transport in any of the four service dimensions reduces the total resources required to produce and distribute a given volume of output per unit of time. The use of released resources depends on many factors like elasticity of demand for transportation in the dynamic context of development process with a given level of employment.  

ii) Deceleration effect of accessibility:

The creation of additional transport capacity may

absorb some portion of scarce resources that should be used on economic grounds elsewhere. In terms of opportunity cost these investments may be less productive than some alternative thereby reducing the growth rate. Essentially, this case involves misdirected investment. This misdirection may be the result of the following factors.

1) Errors in cost benefit estimates: It cannot be ignored that use of cost-benefit analysis as a criterion for allocation of investment encounters certain difficulties. The cost-benefit analysis, as an investment criterion, especially for investment in transport sector is said to be error-prone. This can be attributed to the lumpiness, specificity, longevity and externalities often associated with transportation capital creating greater hazards in calculating and specifying future benefits and costs.¹ The estimates of benefits faces greater uncertainty as they are mainly estimated on the demand projections. The demand projections are having greater likelihood of over estimations or under estimations owing to following factors.

   a) Demand for transportation is derived. It is generally function of the level of income, population and pattern of spatial dispersion of economic activities. The projection of

¹ Hirschman Albert - Strategy of Economic Development.
demand for transportation in future depends upon the projections of these variables.

b) Temporal and locational specificity of demand for transportation. Demand for transportation refers to particular point of time and also it is between two nodes.

c) Presence of intermodal competition also makes projections more difficult and uncertain. For instance for the second five year plan period, in our country it has been observed that, about 35 per cent over estimation of freight demand by railway has been revealed. Further, it appears that the demand for the specific categories of freight especially coal, materials for steel plants which failed to rise as expected rather than general freight. Thus, it is specificity that results in excessive investment in transport sector.

The capital invested in transport sector has high proportion of sunk capital which deprives the adaptability and reversibility.

1. From econometric point of view, inspite of high explanatory power of estimated multiple regression equation, its predictive power may be weak owing to multicollinearity between various determinants. Presence of multicollinearity makes it difficult and sometimes impossible to separate individual effect of different determinants influencing demand for transportation.


3. Ibid.
This misdirected excessive investment may lead to rise in price level as it tends to increase employment and wage rate thereby increasing cost of labour intensive products significantly. Moreover, increase in money income generates demand resulting in demand-pull inflation, as if the supply of wage goods is not sufficiently elastic. Excessive investment exclusively in transport sector would fail to exert an impact on production to the desirable extent. Any excessive non-priority, less productive investment in underdeveloped country causes inflation as such investment in transport sector cannot be an exception.

The experience from Turkey substantiates the same. Turkey provides an example of a nationwide effort to improve transport quickly without relating the effort to a comprehensive development plan. The programme was largely military in character, and the emphasis was on building a system of modern roads. During the ten year period 1948-57, half of all the investment by the central government was in transport and communication, with 23 percent in agriculture, 13 percent in public works other than transport, and 7 percent in industry, mining and power. As a result of this concentration of effort, rapid strides were made in the improvement of ports, airports, roads, and railways. In five years the mileage of all-weather roads in Turkey nearly doubled. But the road programme in general proved less efficacious in promoting higher living
standards is indicated by aggregate data for Turkish economy. For while gross national production increased substantially from 1950 to 1956, the country encountered severe financial difficulties. Only large credits and grants made available through the United States Aid Program plus extensive shipments of spare parts, raw materials and operating supplies helped to offset foreign exchange deficits and to restrain inflationary pressures. The evidence indicates that the transport program had been too ambitious in relation to other aspects of the development effort.¹

Lack of the sequential planning and investment in complementary sectors may be one reason for abortive investment in transport sector. Let us take an hypothetical illustration. Suppose there is an agricultural underdeveloped region which lacks efficient road system and irrigation facilities. Let us assume that there is no idle land. Thus the region suffers from lack of accessibility and uncertainty of rains and consequently the agro-productivity is very low. The development of irrigation facilities and road system would provide the stimulus for regional development. Suppose that road development in the region is initiated and completed with no efforts for development of irrigation facilities. The road

¹ Owen Wilfred - Strategy for Mobility, op. cit. pp. 41-43.
accessibility by new roads would fail to increase more yield owing to lack of assured and timely water-supply without which fertilizers and other agro-inputs could not be used. Total agricultural production in the region would remain same, indicating no stimulating effect by road development. In contrast to it, suppose development of irrigation facilities in the region is initiated and completed and immediately after it road development is completed. The road development could provide the needed accessibility for carrying agro-inputs to the farm side and outlet for additional production. Thus, this kind of sequential and complementary intersectoral planning is likely to make investment in transport sector significantly productive.

The competitive behaviour is highly essential for efficacy of stimulating effect of accessibility on production. There would be enhanced production only when benefits of transport improvements are percolated to the producer. This happens only when there is effective competition in transport industry as well as in the markets.

The stimulating impacts of accessibility on production would be corroborated by generated traffic that can be attributed to improvement in transport facilities. One important ex ante and ex post study in Iran has shown that the elasticity of demand for road transport was in fact zero. Although there was considerable improvement in roads and
although the cost per ton-mile fell and transport costs also fell, there was no observable expansion of development traffic. The explanation apparently lay in the noncompetitive structure of marketing and distribution. The middlemen were not forced by competition to increase the prices which they offered for farm produce, and so there was no expansion in the amount of produce offered on the market. The main consequences of the road improvements were to increase the profits of the middlemen. ¹

The reduction in cost of transportation due to improvement in transport facilities may be ineffective if the demand generated for traffic tends to increase demand for truck transportation enabling truck owners to raise the freight rates. It is not improbable in our country as in the short run the number of trucks in the country cannot be increased to the desirable extent. Thus, especially in the short-run the transport development may fail to generate the stimulating impact on development.

The improved accessibility effects on the price vary according to produce surplus or deficit in the region. There would be a tendency of increasing prices in the local markets.

of surplus produce as improved accessibility creates outlet thereby increasing demand from distant places. Increased imports from distant markets tend to reduce the prices of goods short in supply in local markets. This particular change in price structure would have ultimate effects on different incumbents in that particular region. It can be imagined that the increased accessibility has increased the exports of foodgrains, therefore, the price level of foodgrains in the region goes up. It will tend to affect the entire wage structure causing increase in the cost of production. This increase in wage rates will be restrained only if there is significant fall in prices of imported commodities from distant markets in the region. The ultimate effects depend upon the relative change in prices of exported and imported commodities and its share in the regional economy. This shows how the ultimate stimulating impact of accessibility encounters multi-dimensional complexities of the economic realities.

The stimulating effects on accessibility may be proved abortive if the inputs that are required for additional production are short in supply. For instance, accessibility tends to increase acreage under crops and the greater use of fertilizers and other inputs. As accessibility increases price level of some produce and provides advantages in the form of saving in time and other service dimensions. But if the supply
of the fertilizers, is inelastic, the consequences would be the increase in prices of fertilizers and thereby increasing the profits of fertilizer manufacturers and commercial agents. This indirectly absorbs the net effect of improved accessibility, especially in the short run.

While anticipating accessibility effect on production, the price of the produce is assumed constant. But there is every possibility that more production in economy owing to improved accessibility tends to increase the supply to such an extent that the prices would be lowered. This phenomenon of lowering price would deprive the advantage of anticipated profit to the producer because the final consumers may gain the accessibility advantage. Thus, the final stimulating impact cannot be highly effective in the short run. Further, the ultimate incidence of accessibility effects depend upon so many interactions between different sectors and so the net result is highly uncertain, the magnitude of it is also not easily gauged and the final pattern influenced by accessibility effect would be revealed only in the long run.

It does not mean that the transport facilities have no place in the developmental programme, but it makes us only cautious about the possibility of excessive over-investment in the transport sector, importance of cluster of change in other complementary sectors, complexities of the interactions of the economic realities, and significance of time lags in the process
Retrogression effect of accessibility.

An increase in transport capacity may actually lead to a decline in per capita income in the region. It may be termed as retrogression effect of accessibility. There are two variants of the retrogression effect of accessibility.

The first is simple protectionist argument which suggests that initial industrialization in any area requires the protection of high transport cost as a shield against low cost competition from other regions. ¹

The second one is the thesis that in an underdeveloped economy the backwash effects tend to swamp the spread effects. Hence it would be relevant to explain briefly the backwash effect and spread effects. ²

Backwash effects:

Backwash effects refer to the unfavourable effects of expansion of one locality on other locality leading to contraction in other localities widening the gap between rich region and poor region. More specifically the movements of labour, capital,

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goods and services do not by themselves counteract the natural tendency to regional inequality. By themselves, migration, capital movements and trade are rather the media through which the cumulative process evolves upwards in the lucky regions and downwards in the unlucky ones. In general, if they have positive results for the former, their effects on the latter are negative.¹

The Spread Effects:

Against the backwash effects there are, however, also certain centrifugal "spread effects" of expansionary momentum from the centres of economic expansion to other regions. It is natural that the whole region around a nodal centre of expansion should gain from the increasing outlets of agricultural products and be stimulated to technical advance all along the line.²

This detrimental impact of back-wash effects on one segment of the economy due to improved transport is not counterbalanced by equivalent expansion.

² Ibid p.43.
elsewhere and as a consequence, the inter-regional disparity may be increased.¹ There are some instances, no doubt rare, indicating probable and short-run unfavourable impact of transport improvements on a particular region. For instance the case of Appalachia in U.S.A. can be quoted. It is argued that owing to highway improvement in the said region, wood and timber transportation has in recent years switched from rail to road at a much faster rate there than in the result of the country. This change has led to wood being shipped out of the region for processing. Thus, in some cases, it is likely that improvement in major highway appears to be altering transportation costs and the terms of trade in a way which is detrimental to the region.² In the light of these observations the study of the impact of accessibility on a region like Marathwada, would yield interesting results highly relevant to our analysis.

**Critique of views of the relationship of transportation to growth**

In each of above cases there is a larger element of contingency. The declaration effect as well as retrogression effect may be valid on the -

theoretical plane but subject to certain assumptions pertaining to highly imaginary situations. The possibility of excessive wastage in real terms is meagre as the transportation is a more grubby kind of necessity unless it is lavishly overdone. Let us confine our analysis to the possibility of excessive investment in road and road transportation that may cause deceleration effect.

We can have roads of different specifications according to anticipated demand reflected in traffic intensity. Further road construction can be carried out in stages over a period of time after ascertaining the changes in the level of point density of vehicular traffic. Thus, these possibilities tend to minimise the magnitude of misdirected investment in the provision of road tracts.

Another pertinent point, especially with regard to India's labour surplus economy, is that road construction is mainly a labour intensive activity. It is estimated that direct expenditure on the labour component absorbs 70 percent of investment on state highway construction.¹

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Thus, it implies very low opportunity cost of investment in road construction in a labour surplus economy like India. Further the raw material required for gravel road is also obtained from indigenous sources having very low scarcity value.

Investment in commercial vehicles, is not lumpy and further, the magnitude of investment is mainly governed by the level of demand as trucking industry is mainly in private sector and is organised as a commercial enterprise. The excessive investment in vehicles in public sector can be also minimized by deliberate scientific procedures like capital budgeting. Further, it is to be noted that the transportation is influenced by significant variables outside of the transport field. It has two dimensions, namely, spatial and temporal. This is the problem of how far economic activities are dispersed spatially. The temporal demand function depends upon the concerned seasonality of production functions and variations in demand pattern over the period of time. The problem of peak demand in metropolitan cities is to be attributed to the factor outside the transport sector like
schedule of working hours of factories, administrative offices and educational institutions. In short, excessive investment in transport sector is, in many cases thrust upon it owing to deficiencies in general planning of the economy but however, it is manifested in transport industry. This demonstrates the overdue need for integrated approach to the transport and spatial planning for development process as a whole with a view to minimize the total need of transportation. The analogy between isolation of the region caused by lack of transport facilities and protective shield to the infant industries is far-stretched and also fallacious. Infant industry protective policy confines the selective promising industries, whereas isolation and other consequences of poor accessibility are all pervasive.

The short run and temporary protection is argued on the basis of initial lower competitiveness of the industries in the underdeveloped nations attributable to the lack of external economies. The lack of external economies may be the result of paucity of basic transport facilities like roads and railways. Thus the lack of transport facilities may be one reason for need of infant
industry protection. As transport sector has pervasive forward linkages, improvement in transport facilities tends to reduce the cost level in sectors and industries and thereby competitiveness of industries is strengthened. It demonstrates that improvement in accessibility and protection policy tend to generate not countering but collaborating forces, promoting the development of the region. Mention of the sugar industry can be pertinent as development of this industry is crucial for the development of Marathwada region. The tariffs for sugar at national level provides shield for sugar industry in India as well as in Marathwada. The improving road accessibility is expected to increase sugar-cane yield per acre and also reduce the wastage of sugar content attributable to delay in regard to farm to factory transhipment owing to the deficiency in road facilities. The improvement in road accessibility would reduce not only the cost of transportation promoting the agro-industry development, but also extend the market area for the agro industrial products. Nobody would deny that the real
purpose of infant industry policy is to provide time for improving efficiency in the short run, but the inaccessibility due to lack of transport facilities will prolong the need for protection.

Nobody can ignore that improvements in transport facility not only influence a particular firm but different regions in the economy. The final impact will depend upon the inter-regional interdependence which can be ascertained by forward and backward linkages of the regional composition of economic activities in general. Its impact strikes macro variables like national income, employment and price level. Its ramifications are not readily visible. The difference between international trade and interregional trade has been ignored. Basically the factor mobility between two regions in the same country would be relatively high as compared to the same between two nations owing to socio-economic and political factors. The adaptation process ensuing transport improvement would be inclined to raise entire regional economy at higher level of equilibrium with some distributional effects. This is analogous to adaptation process generated by
technological revolution. The process may not be easy and joyful, even it may be partly painful but it is a price for economic development of the region.

This argument presumes that industrialization in the region does not require inputs from other regions and there is no market for output outside the region. There would be a rare region corroborating such a hypothetical case. The process of industrialization, on the contrary generates more intra as well as inter-regional linkages for which the provision of efficient and adequate transport facilities is a pre-requisite.

The protection policy is deliberate and selective. The poor accessibility is natural, inevitable consequence of inertial policy of public authorities. It is a result of lethargy about transport development on the part of the State. The consequences would be scarcely conducive and promotional for development. The contention that retrogression effect is hardly relevant to Marathawada which is predominantly an agricultural region, it may prove untenable on empirical analysis with reference to particular sectors, though the lower
productivity in agricultural sector in Marathwada is mainly attributable to the paucity of roads and other transport facilities. It prompts us to analyse the accessibility effects on different segments of economy of Marathwada region.

One would fail to understand how without efficient road system or transport facilities, economic development of backward region can be fostered. The Myrdalian concepts of backwash effects have been developed to elucidate the possibility of circular causitive cumulative process of widening the gap between a rich region and a poor region through automatic mechanism in free market economy motivated by a level of profit. It would be highly misleading to regard backwash effects as inevitable with the opening up of a region, as an efficient road network is a pre-requisite for planned regional development. A careful study of backwash effects and spread effects would support this contention. This is evidenced by conclusions drawn by Myrdal who has conceived the concepts of backwash and spread effects.

First one is that in poorer countries disparities

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of income between one region and another are much wider in the poorer countries than in the richer ones.

The second conclusion is that while the regional inequalities have been diminishing in the richer countries of Western Europe, the tendency has been the opposite in the poorer ones.

A large part of the explanation for these two broad correlations may be found in the important fact that the higher the level of economic development that a country has already attained, the stronger the spread effects will usually be. For a high average level of development is accompanied by improved transportation and communications, higher levels of education, and a more dynamic communion of ideas and values all of which tends to strengthen the forces for the centrifugal spread of economic expansion or to remove the obstacles for its operation.1

If left to themselves, those regions which had not been touched by the expansionary momentum could not afford to keep up a good road system and all their other public utilities would be inferior thus increasing their competitive disadvantages.2

2. ibid pp. 41-42.
From the earliest times national states, when they came into being, almost always relied partly upon popular appeal and therefore almost always exerted a certain amount of countervailing power against the tendency to regional inequality. Every national state took some responsibility for common services, and for building roads and raising the level of technology in the backward regions.¹

Migration to developing and rich regions is not the result of only centrifugal forces in rich regions but also centrifugal in stagnating poor region. The very low productivity in agriculture and declining industries in poor region may be one cause of migration. Can we imagine higher level of productivity in agricultural and industrial sector without efficient and adequate road system? Thus, it would not be difficult to comprehend how improved and adequate accessibility tends to promote spread effects and counterbalance backwash effects.

The anticipated unfavourable age composition in poor regions having high fertility attributable to poverty in the region can be corrected only by effective family planning programme for which efficient road

system is indispensable, though the backwash effects are analysed to explain the natural tendency of widening the gap between poor and rich regions in unplanned free economy, but these effects could be minimised in economy like India, through purposeful regional planning based on objective of balanced regional development. The possibility of transmission of backwash effects through improved accessibility does not, however, mean that the present state of poor accessibility should continue but this possibility encourages in a more positive and forward-looking programming of the problem of regional development, wherein accessibility figures as one of the important ingredients.
Siphon-off propensity, accessibility and spatial price pattern:

There is a natural tendency of out-flow of goods from surplus market to deficit market, as price is low in surplus market and high in deficit market. This tendency of outflow of goods may be described as "Siphon-off propensity" of the goods. The accessibility tends to actuate this siphon-off propensity; further, a Siphon-off phenomenon is facilitated; and accentuated by improved, adequate and efficient transport system. Two consequences of the said phenomenon follow: firstly, it narrows down the inter-nodal or inter regional price-disparity and secondly it lessens the gravity of deficit and surplus of corresponding goods in a region.

With reference to given market, as a result of improved accessibility, the surplus goods flow out and deficit goods flow in. This dynamic aspect can be conveyed by coinig the terms, viz. export-ease-surplus goods and import-ease-deficit goods in regard to surplus and deficit goods respectively. The improved accessibility tends to raise the price of export-ease-surplus goods and to reduce the price of import-ease-deficit goods in a region.

The price effect induced by siphon-off phenomenon, has multiple ramifications. The nature of ramifications may differ sector-wise. The price impact of accessibility involves different ramifications in agriculture than in industrial Sector. Hence Sector-wise analysis of accessibility-effect is highly pertinent and essential.
Theoretically, we can say that the local price is a direct function of price in terminal market and inverse function of economic distance between primary market and terminal market. The relationship can be expressed as follows:

\[ P_1 = aP_2 - bD \]

- \( P_1 \) = Price in local market.
- \( P_2 \) = Price in terminal market.
- \( D \) = Economic distance.
- \( a \) & \( b \) = Parameters.

With given terminal price the local price tends to diminish as economic distance between terminal price and local and primary markets increases, *ceteris paribus*, leading to spatial price disparity.

In this particular context of spatial price spread phenomenon, supply area is more pertinent owing to distinguishing feature of agricultural production and marketing function. Agricultural production is dispersed over wide area comprising of innumerable production centres. So we can say that movements of agricultural produce are from innumerable centres to few terminal markets. Further the other difference in marketing process can be mentioned. In the case of industrial production the number of sellers is small but number of buyers is very large. So there is greater possibility of prevalence of monopolistic element; on the other hand, in the agricultural sectors the number of sellers (i.e. producers) is very large but the number of buyers (i.e. commercial agents) is very small in primary markets.
The accessibility impact on spatial price pattern is crucial for our analysis. The provision of extensive services like timely water, chemicals for fertilizers, pesticides and credit tend to increase the agricultural production in the region. The lack of accessibility by roads tends to make all efforts abortive. The more supply tends to result in very low prices as there is no outlet for increasing production owing to absence of transport link to the marketing centres. In consequence, the development in agricultural sector may thrust bankruptcy on poor farmers in isolated villages. To provide credit without a road may prove a curse in disguise as productive investment will have positive impact on agricultural production reflected in increase of production implying greater supply. If this greater supply does not have an outlet, it results into falling prices; consequently, the farmer cannot get adequate total revenue by selling the production. The result is heavy financial burden, increasing degree of indebtedness due to interest charges and repayment of principal amount. This particular falling price tendency as a result of lack of accessibility may in the long run discourage the farmers from producing greater and better production by applying extensive and
intensive techniques. This phenomenon can be generalised by analysing the relationship between supply effect on local price level and degree of accessibility. We can say that the lower the accessibility higher will be the absolute fall in price with the same magnitude of increase in supply. This is reflected in the figure. Suppose dp indicates the change in price level and ds indicates the change in supply the ratio of dp and ds as dp/ds indicating the price sensitivity to supply, would be inverse function of accessibility by road. As shown in the diagram we shall take a very simple case of two villages having marketing centre for agricultural produce with the same change in supply (ds) the dp i.e. the change in price level would be greater in the case of village having no road as compared to the change in price due to supply change of same magnitude in the case of the village having a road.

The diagram(op.page) indicates that the supply price curve is having higher sensitivity in the context of village without road as compared to village with road accessibility. We must be cautious about interpreting the supply price curve. From diagramatic point of view it appears like a demand curve with reference to that
particular marketing centre, but from analytical point of view this curve is different from the demand curve, owing to following reasons.

1) Demand Curve represents the quantity demanded as function of price assuming other things constant. This supply price curve indicates the effect of change in supply on the price level, that means the price as a function of supply is represented by the supply price curve.

ii) Demand curve ultimately is influenced by the consumer's behaviour generally explained by utility analysis. Supply price Curve is directly influenced by the number of commercial agents in the village, their financial capacity and the road accessibility. The effect of utility is highly remote and indirect.

This supply price curve is also different from the supply curve usual supply curve implies that supply is direct function of price, other things remaining same. On the contrary, supply-price-curve indicates price as inverse function of quantity supplied, *ceteris paribus*.

Further taking into account the dynamic interaction of these components it can be indicated that owing to lack
of accessibility the number of commercial agents would be probably less in the case of village without road. Further the commercial capital available for business would be also relatively less. In the case of village having no road, the cost of financial capital would be more owing to high rate of interest greater risk and non development of financial institutions like banks and co-operative societies. All these factors are interdependent and will ultimately increase the price sensitivity of the agricultural produce to supply.

This particular point has been substantiated by empirical findings. Prices of rice during second five year plan period at selected market centres in the southern zone of India are of a greater relevance. Following inferences are possible from this study of divergences in prices. Market prices are influenced by the situation of the market in or near a deficit or surplus area. Market centres situated in or adjacent to deficit area generally record higher prices than other centres in the State.

The poor or good transport facility of the centre has an influence on prices. The direction in which the prices are influenced depend upon the nature of the area where centres are situated i.e. whether the
area is deficit or surplus. The market centre situated in the poor transport area but in a surplus district record lower F.A prices than even a high surplus district with better transport. Nizamabad in Andhra Pradesh and Shimoga in Mysore State are good examples to substantiate this point. 1

The lower prices in Marathawada of many agricultural produce can be attributed to the relatively lower level of road accessibility in the region. 2

*Increase in Price Disparities and Availability of Transport.*

Lack of transport facilities appears to have played an important role in increasing price differences among markets. Traders indicated that transport bottlenecks are quite frequent. Trucks are widely used in India for short-distance hauls within a State. When trucks are not readily available, movement of goods within the State is affected. When railway wagons are not available, interest movement of commodities is affected, since most of out-of-state shipments are made by rail. This situation leads to excessive accumulation of goods and to artificially low prices in the primary markets and high

2. NCAER Techno Economic Survey of Maharashtra State.
prices in the terminal markets.

There is generally some difficulty in obtaining trucks during the harvest season when dispatches are made in large quantities. The difficulties in getting railway wagons are much greater. These difficulties are accentuated in the case of Barsi, which is a much larger market than Akkalkot and exports substantial quantities of jowar, brown sugar and various types of pulses to a number of southern states. Since the road that joins Barsi to the main highway is poor and particularly difficult to travel during the monsoons, Barsi depends heavily upon its narrow-gauge railway for transport. High margins in 1961 and 1963 in Barsi appear to be rather closely related to the general unavailability of transport facilities during those two years.

The annual reports of the Barsi Agricultural Produce Market Committee State that during the months of January and February 1961, only five wagons were available. The wagon supply had, moreover, completely stopped between February 22 and March 31, 1961. On March 6, 1961, 150 orders were waiting for wagons. Most traders stopped taking any further orders. By April 1961, the orders waiting had increased to 250. Again in December 1961, no exports were possible because of a shortage of wagons. In 1961, because of a constant shortage of railway wagons in January and February, orders from consuming centres
were affected. Traders in consuming markets feared that there might be loss of margin by the time wagons become available. Some jowar was sent by trucks. Similarly, in January and February 1963, booking of wagons became available. Some jowar was sent by tracks. Similarly, in January and February 1963, booking of wagons was discontinued. Consequently, 150 wagon loads of jowar and pulses were lying in the market in February 1963. Although Akkalkot market has maintained no records, discussions with traders during visits to Akkalkot indicated that the supply of wagons must have been an important factor in creating price differences.

The above analysis illustrated the problems involved in moving goods in an underdeveloped country and emphasizes the need for a study of specific situations in evaluating regional price difference.¹

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Positive acreage sensitivity to road accessibility is theoretically explained by the model elaborately developed by Walters. This model discusses the geographic consequences of transport development. The important ingredients in model are relative ton mile cost by truck and by headloading transport. Obviously, transport cost by truck is assumed lower than that of headloading. With this knowledge it has been shown that the additional acreage under crop due to improved accessibility by road would be of triangular shape with a broad base near the market and narrowing to a point on the road at a distance from the market as function of market price and ton-mile cost. The justification of it lies in lower transport cost, as a result of newly constructed road and makes cultivation of addition acreage profitable and feasible, ceteris paribus. Furthermore, the model predicts that the elasticity of demand of transport will be unity, if transport is measured in tons and two if in ton-miles. Various qualifications, due to the truncation of the road, a finite elasticity of demand on the market, etc., modified these values to some extent.


2. As expected, sign of elasticity of demand for truck transport, derived on the basis of model, is found negative.
There are certain statistical evidences supporting this model, for instance spatial pattern of rubber farms in Liberia was found of triangular shape. But the pertinent issue for us is how far this model is relevant for the analysis of impact of road facilities on crop acreage in the region as a whole as this model refers to only one road and adjacent area.

Further the basic flaw of this model lies in supposing transport as a single effective ingredient for crop acreage in the region. But there are many other ingredients affecting magnitude of acreage under cultivation in the region.

The relevance of this model for study of accessibility effect with special reference to crop acreage sensitivity is highly questionable owing to its over-emphasis on triangular shape of development impact. The modifications of the model explained cannot put significant realism in the analysis owing to certain distinguishing features of agricultural sector in a particular country like India and a region like Marathwada.

The entire agricultural production is not marketed, for a significant portion of it is retained by producer for self-consumption. It is specially pertinent to the food-crops.

1. Walters A.A. - The Economics of Road User Charges, op. cit. p. 137.
2. Ibid - pp. 150-166.
The implication of this fact lies in reducing the impact of change in transport cost on acreage extension under crop. Further, population depending upon agriculture is widely dispersed indicating spatially dispersed demand over wider area and demand not concentrated in one market, as assumed in the model. The significant share of production for self-consumption by producer and dispersed farmer population reduce the relevance of this model as there can be sufficient acreage under food crop even if there is poor accessibility and thus, reduced transport cost attributable to new road need not affect acreage only with triangular shape.

The units of cultivation are small and owned by numerous farmers. Thus the decision for crop pattern cannot be taken by single agency. It creates uncertainty about reaction by producers. It should be noted that agricultural enterprise produces not one crop but multiple crops. Even modified multi-crop model cannot make it relevant as multiple crop pattern is not mainly and exclusively determined by variation in transport cost of the crops but also by many other factors. The choice of multiple crop pattern against single crop pattern can be explained as follows:

1) The heterogeneity of the fertility of the farm.

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ii) Farmers, especially in underdeveloped countries, tend to produce whatever they require.

iii) Multiple-crop pattern may be attributed to risk-reducing behaviour of the farmer. The farmer tends to reduce risk by diversifying his farm output.

iv) The farmer ensures greater productivity by crop sequence and cycles based on experience.

v) Inadequacy of different inputs required for the crop and varying input intensities of the crops; for instance, well water is not adequate for entire farm acreage devoted to relatively more water intensive crop. So he allocates certain acreage to the water intensive crop and remaining to the other less water intensive crops, or to other rainfed crops.

This model also ignores the cost of the production of the crop owing to variation in fertility of the land and wage rate of the agricultural labourers in the different areas. Hence, triangular shape cannot be ensured.

This model ignores the dynamics of accessibility effect and their spillover interactions. Suppose road accessibility resulted in additional acreage under crop with its argued triangular shape. Would it be stable? From dynamic
point of view, owing to its own effects this shape cannot be sustained. The instability stems from effects of generated income attributable to improved accessibility. Suppose the income level of market town and the area around the town has gone up. This increase in income would have positive income effect in the form of greater demand for perishable goods like vegetables and fruits. This would increase the prices of perishable farm goods. This would tend to bring acreage near the market town under the vegetables and other perishable goods as explained by 'Von Thumen's Concentric ring Model.' Thus, the anticipated crop-acreage continuity cannot be sustained owing to the forces generated by spill-over effects of improved road accessibility. It indicates the self-generated countering forces ignored by the model. This single representative elucidation would suffice to demonstrate the inadequacy of the model to comprehend the dynamic interactions induced by an improved road accessibility.

Though from theoretical point of view the validity of triangular shape would be highly essential, from pragmatic point of view it is not the triangular shape but the

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Implication of the model that greater road accessibility tends to bring additional acreage under cultivation is highly pertinent and significant.

There are many evidences supporting this acreage extension impact of road accessibility. A few of them may be quoted.

The roads completed in 1950 in Mexico have opened the significant acreage for cultivation. 1 The same kind of phenomenon has been observed in countries like Jordan, Philippines and Turkey. 2

In our country the study of the impact of Remand Mandapam road of 20 miles has revealed the change in agricultural area and output in sample villages located at varying distances from the highway. As far as cultivated acreage is concerned, substantial increase in the area is said to be due to the fact that the construction of the road has made it profitable to bring under plough the lands which were hitherto marginal or intra-marginal. 3

2. Ibid pp. 49-50.
YIELD IMPACT OF ROAD ACCESSIBILITY.

We shall confine our discussion to the effect of road accessibility on average physical yield per unit area under crop. The stimulating and positive effect of road accessibility on average physical yield could be easily imagined.

The explanation of anticipated increase in average physical yield can be sought by paying attention to the following important components of the phenomenon attributable to efficient road accessibility.

i) Reduction in transport cost:

Transport cost is very important element in agricultural production. It becomes relevant in bringing inputs like fertilizers required for intensive cultivation. Improved accessibility tends to reduce the transport cost for it. Further, marketing of agricultural produce requires transportation from farm to market. This transportation burden may be also reduced by improved road accessibility. The reduction in transport cost can be explained in the light of the following factors.

1) High density of road in the area signifying high road accessibility may reduce distance between farm and marketing town. It hardly requires any elaborate explanation to convince that reduced distance tends to reduce transport burden on the producer.
ii) It has been demonstrated that improvement in road surfaces reduces the operating cost of the vehicles to the significant extent. As effective competition in truck transportation prevails in India, there is ground to argue that reduced operating cost would result in lower freight charges, reducing transport burden on the producer.

Further truck men are inclined to prefer haulage of goods on good roads even for relatively lower freight charges. It is reported that transport charges even by bullock carts are lower on good all weather roads. This may be attributed to increased capacity of the cart as a result of improved road surfaces and also to the fact that high capacity carts with pneumatic tyres can be used on good surface roads.

iii) Accessibility by road gives an opportunity to the producer to use trucks instead of carts. Truck transportation is less costly. One estimate in our country has revealed that transportation cost by truck is 40% less than that of cart transportation.

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2. Owen Wilfred, "Distance and Development" op. cit. p. 65.

3. Transport cost per mound i.e. 32 lbs. per mile has been estimated as Rs.0.055 and Rs.0.021 for carts and trucks respectively, Shrivastav A.K., Market-study of groundnut (1963-64) Reproduced by Owen Wilfred, Ibid, p. 164.
Reduced transport cost tends to increase the net income of the farmer. This increase in the net income would encourage the greater use of inputs like fertilizers, high yield seeds, and as a result, high yield is likely to materialize.

2) Reduction in spatial price disparity:

Accessibility effect of road cannot be said to be confined to reduced transport charges, but it also engenders qualitative change in marketing process of agricultural produce. As explained earlier it would be reflected in reducing spatial price disparity, increasing price of export-ease-surplus produce and reducing the price of the import-ease-deficit produce.

The rise in price of export-ease-surplus produce may act as a stimulant for producer to increase the efforts leading to higher average yield.

3) Reallocation of acreage in favour of export-ease-surplus produce:

The analogy between effect of free international trade and effect of improved road accessibility can be emphasized. In closed economy, prices of export-ease-surplus goods are lower, and prices of import-ease-deficit goods are higher. When economy is open to free international trade, the price
structure undergoes change. The prices of export-ease-surplus goods go up and prices of import-ease-deficit goods dwindle down. Similarly, poor accessibility may keep high price for import-ease-deficit produce and lower prices for export-ease-surplus produce in the area. Under these circumstances it may be found that import-ease-deficit produce has high revenue productivity despite lower average physical yield owing to high prices, and export-ease-surplus produce has higher average physical yield but lower revenue productivity, owing to lower prices. This conflict would be resolved by improvement in road accessibility as it tends to increase the price of export-ease-surplus produce and tends to reduce the price of import-ease-deficit produce. This consequent change in price structure may divert acreage from import-ease-deficit produce to export-ease-surplus produce in the area. This would increase the average physical yield owing to rationalizing allocation of acreage implying more suitable acreage under suitable export-ease-surplus crop. Yield sensitivity to inputs would be also higher when they are applied to land suitable to crops.

4) Saving in time for transportation required in agriculture:

Saving in time required for transportation can be elucidated in terms of quick service by truck transportation, reduced road distance between farm and market owing to higher
road density, increase in speed of the vehicles owing to good surface roads, all these factors are attributable to improved road accessibility.

There is positive relationship between average physical yield and saving in time for transportation required. Pesticides and insecticides could be supplied to farm in time, fertilizers can reach farm side before it is too late. Further saving in time for transportation would be proved significantly valuable in the case of perishables to be transported to distant markets at appropriate time. Moreover, the spoilage of perishables could be reduced, quick delivery of sugarcane to sugar factory ensures increase in sugar percentage from same sugarcane tonnage yielding higher price per sugarcane ton. All these factors contribute to an increase in the net income received by producer which may act as an incentive for more efforts directed to higher physical yield.

5) **Expediating communication of ideas conducive to higher yield:**

Road accessibility expedites the communication of new ideas about new efficient techniques of production, new agricultural implements and tools, high-yield seeds and new scientific methods of application of inputs.

6) **Increase in dependability:**

It further makes use of new tools more dependable and
feasible as road accessibility ensures supply of spare parts, fuel required by tractors, water-pumps etc. Further, it is to be noted that the good and efficient road system is conducive to higher capital formation in the agricultural sector.

7) Making area attractive for area-developmental schemes:

In a developing country like India, there are many schemes directed towards enhancing physical yield. There is every possibility that the area deficient in transport facilities is by-passed or ignored while granting the developmental schemes for agricultural sector. The prevalence of efficient road system would attract these developmental schemes sponsored by the Government or other agencies which would promote the average physical productivity of the crop in the area.

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1. Referring Intensive Agricultural Program in India, Owen maintained "As could be expected, the areas where intensive efforts have been actually undertaken are those in which transport was good enough to permit the inputs to be moved and the output to be marketed. The Ludhiana District of Punjab, one of these areas, has a main road net that assures all weather access. There the package program led to marked increase in wheat production per acre". Owen Wilfred, Distance and Development Transport and Communication in India, op. cit. p. 62.
Crop pattern Impact:

It is generally stated that owing to lack of roads and road transport facilities, crop pattern is not market-oriented, but adjusted to the needs of self-consumption by producer. It arises, as a result of uncertainty and unreliability of getting other required goods due to lack of efficient road system.¹

The lack of road accessibility tends to increase amplitude of price fluctuations creating greater uncertainty about future price level and consequently the farmer tries to reduce the degree of uncertainty by diversifying his crop-pattern comprising multiple crops.

The improvement in road accessibility as explained tends to raise prices of export-ease-surplus produce and lowers the prices of import-ease-deficit produce in the area. The uncertainty would be reduced and as a result it is expected that farmers would tend to follow more specialization in crop-pattern. This specialization in regard of crop-pattern would

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¹ He (farmer) is also unable to specialize, for where transport is unreliable each grower has to produce a little of everything to keep his family supplied. And he retains more than he may actually need, knowing that in the event of shortage it would be difficult to obtain deliveries from other sources, Owen Wilfred, Distance and Development (Transport and Communication in India) op. cit. p. 57.
be accentuated if the soil in the area is more homogeneous. The specialization may manifest in various forms. Firstly, it may involve crop specialization implying greater proportion of acreage under a few crops. Secondly, it refers to higher inter-regional concentration of the crops in different areas according to road accessibility and its impact on crop-pattern as a result of variation in transport intensities of the crops, nature of the crop, whether it is a cash crop or food crop.

Further, it is expected that improved road accessibility would induce producer to adjust his crop-pattern according to anticipated revenue productivity indicating high sensitivity to market. This is obvious as revenue productivity is a combined result of average physical yield and its price received by the producer. It is an anticipated rational behaviour compatible with revenue maximization hypothesis. Thus, ceteris paribus, in areas where transport is poor, crop specialization would be less as compared to the same in area where transport system is adequate and efficient.