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NOTES ON THE CONCEPT OF SPREAD

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ABSTRACT

The concept of spread is widely used in regional planning and is integral to the strategy of growth centres. In this paper the author attempts to define, analyse and clarify the concept. After a review of the classical antecedents of the concept, the formative statements of Myrdal, Hirschman and Hoselitz are discussed and compared. Elements of controversy are delineated. To assess the current state of knowledge, fourteen current works are systematically analysed along with the three formative studies. Separate analyses of theoretical, methodological and case-study-implementation approaches are followed by a discussion of a series of attributes of the selected studies. The role of diffusion in the spread concept is inspected and the spread-backwash dichotomy is critically assessed. In conclusion, the concept of spread is restated by specifying the processes which are elemental to spread and delineating factors which influence the extent of core-periphery spatial relationships.

The concept of spread is widely used in regional planning and is integral to the strategy of growth centres. Spatially, spread may be defined as the complex set of processes whereby the absolute level of development of a peripheral area is increased due to spatial relationships with a core area. The explicitness of this definition, however, contrasts with the limited existing level of understanding of the components and behaviours of this complex set of processes and their spatial impacts. In this paper I will attempt to briefly review the historical development of the concept of spread, investigate some of its specific attributes and offer a reconceptualisation of the spread idea.

CLASSICAL ANTECEDENTS OF THE CONCEPT

Although Myrdal (29) is generally credited with the explicit original statement framing the concept of spread, elements of the concept were recognised centuries earlier.

A chapter in Adam Smith's The Wealth of Nations (42) is entitled "How the Commerce of the Towns Contributed to the Improvement of the Country".¹ Smith describes three ways in which this was brought about:

First, by affording a great and ready market for the rude produce of the country, they /commercial and manufacturing towns/ gave encouragement to its cultivation and further improvement.... Secondly, the wealth acquired by the inhabitants of cities was frequently employed in purchasing such lands as were to be sold, of which a great part would frequently be uncultivated. Merchants are commonly ambitious of becoming country gentlemen;

1. The meaning of 'country' is not entirely clear. On the one hand Smith uses it concurrently with terms like 'cultivation' and 'country gentlemen' seemingly indicating a meaning such as 'rural area'. At other times he uses it seemingly to mean 'political entity' (or 'nation'). Perhaps he had interpreted it in a feudal context (42, pp. 388-390) wherein either definition might be consistent.

and when they do, they are generally the best of all improvers. A merchant is accustomed to employ his money in profitable projects....Whoever has had the fortune to live in a mercantile town situated in an unimproved country, must have frequently observed how much more spirited the operations of merchants were in this way, than those of mere country gentlemen.... Thirdly, and lastly, commerce and manufactures gradually introduced order and government, and with them, the liberty and security of individuals...(42, pp. 348-385)

Ricardo's (34) theory of rent also postulates a type of quasi-spatial² diffusion of development.³

The classical capitalists, however, had not cornered the concern over differences and interaction between town and countryside which are at the core of the concept of spread. According to Engels, the "merging of town and countryside" would result from the elimination of the old division of labour in a classless society. (26, vol. 20, p.308) Engels stated a need for "bringing the rural population out of the vegetation and torpor, in which it has been vegetating for a thousand years" (26, vol. 18, p. 277), but, other than an apparent advocacy of a unified system of settlement, no direct processes were specified.

Lenin did specify some elements of spread in a broad spatial policy for eliminating differences between town and countryside:

2. Although Ricardo bases his theory largely on differential land fertility levels resulting in different profits, it is not difficult to interpret the theory in terms of profits related to transport costs, 'marginality' being defined by distance.

3. In Ricardo's expanding economic world, capitalists acquired capital and built new shops and factories, which caused a demand for labourers, which caused better wages, which caused population to expand which caused 'marginal land' to come into cultivation to satisfy the increased food demands. In Ricardo's schema, however, development does not actually spread since the landlord receives all profits (regardless of his location).

(1) harmonious development of productive forces according to a single plan, (2) a more uniform distribution of large-scale industry and population throughout the country, (3) achievement of close internal links between individual and agricultural production, (4) expansion of the means of transportation, (5) reducing the concentration of population in large cities (assuming the destruction of the capitalist mode of production). (20, p. 91)

Lenin stated that socialism would produce a "new pattern of settlement for mankind with the destruction of both backwardness, isolation, and wildness of the villages and the unnatural concentration of gigantic masses of population in large cities". (23, p. 74)

The capitalist-communist-socialist economic systems controversy set the stage for the further development of the spread concept by stimulating the vigorous academic debate between 'balanced' and 'unbalanced' growth among development theorists. The specific concepts of external economies (36, 39) and agglomeration economies (44) were emphasised in strong support for the geographic concentration of economic activities in large urban areas.

Apart from the controversy regarding development, but focussing on the spatial aspects of urbanism, was Colby's (7) specification of 'centrifugal and centripetal forces'. Centrifugal forces encouraged the migration of functions to the periphery and centripetal forces tended to retain certain functions in the core and attract others to it.

THE CONCEPT'S FORMATIVE PERIOD: HOSELITZ, MYRDAL, HIRSCHMAN

Spread and Backwash Elements Identified

Hoselitz's seminal work on "Generative and Parasitic Cities" (16) integrated Colby's dynamic spatial perspective on core-periphery relationships with the largely aspatial concepts of the economic development theorists. Hoselitz viewed cities as initially parasitic. After a period they became generative such that "in this phase / of cultural heterogeneity / a city most exerts generative impact on the

economic growth of the region it dominates". (16, p. 283) This generative impact would come from the diffusion of new techniques, the increase of trade and commerce, migration, increased food demand, and increased demand for export crops. Hoselitz listed the parasitic effects as the excessive depletion of natural resources and exploitation of the peasants and other primary producers.

Perroux also explicitly integrated Colby 's spatial forces with development in his growth pole schema:

... the firm has a space defined as a field of forces. As a field of forces economic space consists of centres (or poles or foci) from which centrifugal forces emanate and to which centripetal forces are attracted. Each centre being a centre of attraction and repulsion, has its proper field, which is set in the fields of other centres. Any banal space whatever, in this respect, is a collection of centres and a place of passage of forces. (32, p. 95)

Perroux did not proceed to identify the nature and extent of these spatial forces and thus cannot be considered a major contributor to the concept of spread.

Myrdal's (29) was the first explicit reference to spread and its antithesis, backwash, and it appeared in a work which was widely read not just for these notions, but also for Myrdal's eloquent statement of his principal of 'circular and cumulative causation'. In justifying these "certain centrifugal 'spread' effects of expansionary momentum" Myrdal states:

It is natural that the whole region around a nodal center of expansion should gain from the increasing outlets for agricultural products and be stimulated to technical advance along the line. (29, p. 31)

Myrdal also defined backwash effects:

For easy reference I shall refer to all relevant adverse changes, caused outside the locality, as the "backwash effects" of economic expansion in a locality. I include under this label the effects via migration, capital movements, and trade as well as the whole gamut of other social relations exemplified above [noneconomic factors]. (29, pp. 30-31)

Myrdal maintained that, in countries with low levels of development, these problems are exacerbated by the weakness of the spread effect. Thus spread neutralises backwash only at a high level of development. Further:

...the higher the level of development that a country has already attained the stronger the spread effect 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 communication of ideas and values -- all of which tends to strengthen the forces for centrifugal spread of economic expansion or remove the obstacles for its operation. (29, p. 34)

Thus Myrdal has explicitly stated three stimulators of spread, two factors of spread (more agricultural outlets, technical advance), and three factors of backwash (migration, capital movements and trade).

Hirschman (15), in his major treatise on 'unbalanced growth', defines effects admittedly similar to spread and backwash as 'trickling down' and 'polarisation'. Hirschman uses two hypothetical regions to define these effects -- the North is the region which "has been experiencing growth" and the South is "the one that has remained behind" (15, p. 187):

The favorable effects consist of the trickling down of Northern progress: by far the most important of these effects is the increase of Northern purchases and investment in the South, an increase that is sure to take place if the economies of the two regions are at all complementary. In addition the North may absorb some of the disguised unemployed of the South and thereby raise the marginal productivity of labor and per capita consumption levels in the South. (15, pp. 187-188)

Hirschman also identified negative effects of interregional transmission:

On the other hand, several unfavorable or polarization⁴ effects are also likely to be at work. Comparatively inefficient, yet income-creating, Southern activities in manufacturing and exports may become depressed as a result of Northern competition. To the extent that the North industrializes along lines in which there is no Southern production, the South is likely to make a bad bargain since it will now have to buy Northern manufactures, produced behind tariff walls, instead of similar goods previously imported from abroad at lower prices. (15, p. 188)

Hirschman then notes that migration may also be a negative effect if, instead of the disguised unemployed, those that migrate are the "key technicians and managers" and the "more enterprising young men".

Thus Hoselitz, Myrdal and Hirschman (seemingly independently)⁵ arrived at similar dichotomous categorisations of sets of core-periphery effects. Indeed, 'spread-backwash', 'generative-parasitic' and 'trickling down-polarisation' should be considered to be synonymous concepts.⁶ Furthermore, the specific factors which were identified by these authors as prime contributors to these complex dichotomous sets also bore marked similarities to each other as can be seen in Table 1.

4. It is this author's recommendation that the terms 'polarised' and 'polarisation' be avoided in future growth centre research due to their increasing ambiguity. Hirschman uses the term as referring to unfavourable peripheral change (negative growth or backwash) as do others. (18) Some (9, 14) use it relatively neutrally referring primarily to inter-dependence relationships. Casetti, King and Odland (4) use the term in reference to positive peripheral growth.

5. Neither Hirschman nor Myrdal cite the earlier work of Hoselitz. Hirschman cites Myrdal in a "footnote added in proof".

6. For purposes of consistency, 'spread-backwash' is used throughout this study except for certain explicit references.

Table 1. Specific Factors Identified in Dynamic Core-Periphery Relations.

Hoselitz	Myrdal	Hirschman
Diffusion of new techniques	Stimulation of technical advance	-----
Migration	Migration	Migration Absorption of disguised unemployment
Increase of trade and commerce	Trade Capital movements	Shift in terms of trade
Increased food demand	Increasing outlets for agricultural products	Increase of purchases and investment
Increased demand for export crops		

It is also interesting to note that two of Adam Smith's factors were capital investment in the periphery and a greater market for agricultural products -- a striking parallel to the twentieth century theorists. Smith's third factor, the introduction of order and government, may be more relevant than it initially seems (especially considering the distribution of state or county tax benefits) and should probably have been included by his successors.

Controversy over Direction and Extent of Spread-Backwash Factors

However, a more detailed analysis of the factors assigned as spread or backwash by Hoselitz, Myrdal and Hirschman indicates that the similarities are illusory. Keeping these listed factors in mind, a study of the authors' statements reveals a basic incongruity in opinion as to whether a specific factor contributes to spread (is beneficial to the periphery) or backwash (is detrimental to the periphery). Hirschman has argued that capital movements are beneficial to the periphery; migration and trade can be either beneficial or detrimental to the periphery. Myrdal views all three factors as detrimental to the periphery. Hoselitz views the same factors as beneficial to the periphery

(except in cases of exploitation of peripheral residents). This basic conflict has not yet been resolved, perhaps due to a lack of comprehensive empirical research.

A further point of contention is the final developmental outcome of the dichotomous sets of factors acting together. Hoselitz, as previously mentioned, concludes that cities would become generative after an initially parasitic stage. Hirschman concludes that:

... we should feel confident that in the end the trickling-down effects would gain the upper hand over the polarization effects if the North had to rely to an important degree on Southern products for its own expansion. (15, p. 189)

Myrdal contended that the initial imbalances would set off a chain of "circular and cumulative causation" which would prevent a happy egalitarian ending to the schema. Hirschman takes issue with Myrdal's "excessively dismal" analysis and states:

In the first place he fails to recognize that the emergence of growing points and therefore of differences in development between regions and between nations is inevitable and is a condition of further growth everywhere. Secondly, his preoccupation with the mechanism of cumulative causation hides from him the emergence of strong forces making for a turning point once the movement toward North-South polarization within a country has proceeded for some time. Finally, the picture he paints of international transmission of growth is also too bleak in my opinion as he overlooks that the polarization (backwash) effects are much weaker between nations than between regions within the same country. (15, p. 187f)

It is agreed that differences and growing points will probably arise during development, but there is no reason to believe as Hirschman does that this "is a condition of further growth everywhere". It may be possible, in a planned economy, to avoid this imbalance and still achieve growth, or it may be that in some instances such imbalance is actually detrimental to further growth. Secondly, Hirschman speaks of an eventual turning point but gives weak supportive evidence. The turning point is achieved, according to Hirschman, only after a great

imbalance has been achieved. The growth which is in reaction to this imbalance cannot be shown to do any more than prevent the imbalance from proceeding past a certain threshold. Thus Hirschman has failed to specify any mechanisms which would lead toward an eventual balance. His third point on weak international backwash effects would be countered by Prebisch (33) and is argued by Myrdal himself:

... internationally, however, the backwash effects of trade and capital movements would dominate the outcome much more, as the countervailing spread effects of expansionary momentum are so much weaker. (29, p. 54)

Kuznet's (21) empirical findings tend to support Myrdal's view, although Kuznets remains optimistic despite his own admittance that in the last two centuries "an epochal innovation [the industrial revolution] has spread to only a quarter of the world's population". (21, p. 462)

The confusion surrounding usage of the growth centre concept has been documented to a limited extent.⁷ The preceding discussion indicates that the spread concept (elemental to the growth centre concept) was also developed in a setting of diverse terminology, lack of formalisation and contradiction relative to the normative understanding of the influence of its component processes, especially regarding their concomitant spatial impact.

CONTEMPORARY RESEARCH ON SPREAD

To assess the current state of knowledge regarding the spread concept, fourteen recent studies (2,3,4,9,11,12,18,24,28,37,40,41,43,46) and the three studies by Myrdal, Hoselitz and Hirschman were analysed to discover their approaches to the concept and also in terms of a specific set of attributes. The contemporary studies selected are a broad sample designed to indicate the major research directions now being investigated. The approaches to the concept which were analysed are the theoretical approach (including both formal and non-formal theory), the methodological approach and the case-study-implementation approach.

7. See other works by this author and (8, 27).

The Theoretical Approach to Spread

Considering the vagueness of the original hypotheses concerning growth centres, spread and backwash, it is this author's opinion that the most important approach to research on these topics is that of formalising theory. Significant work in this respect has been done by Friedmann (9) using a postulate framework to state definitions and testable hypotheses. He postulates many testable hypotheses relating concepts of innovations, authority-dependency and behaviour to spatial core-periphery interaction. Casetti et al (4) have stated in mathematical terms the following two formal relationships that must hold if spread has occurred:

$$\frac{\partial Z}{\partial t} > 0 \text{ for all } \underline{t}\text{'s and } \underline{s}\text{'s} \quad (1)$$

$$\frac{\partial^2 Z}{\partial s \partial t} < 0 \text{ for all } \underline{t}\text{'s and } \underline{s}\text{'s} \quad (2)$$

Where \underline{Z} is "a measure of the intensity of the phenomenon at some point", \underline{t} is time and \underline{s} is euclidean distance. (4, pp. 377-387) Equation 1 simply states that the intensity of the phenomenon increases with time and equation 2 states that the increases are smaller the greater the distance from the centre. Expansion of research along similar formal lines should be encouraged. Berry (2) has specified some mathematical relationships relative to innovation diffusion in this context. Siebert (41), too, attempts to develop formal theoretical statements, but his simplistic 'two-space' approach yields few useful results. The bulk of the remaining theoretical statements are 'non-formal'⁸ statements with supportive examples.

The Methodological Approach to Spread

The methodological developments for testing growth centre-related hypotheses have advanced more significantly. Casetti et al (4)

8. 'Non-formal' is the assignation of theory-like statements that are not posited in the easily testable form of hypotheses or mathematical relationships. The statements of Myrdal, Hoselitz and Hirschman are all of the non-formal variety.

have demonstrated a spatial regression method. Robinson and Salih (37) have demonstrated the usefulness of trend surface analysis to depict generalised centre-specific spatial patterns. Berry (2) has traced the hierarchical diffusion of an innovation using Pedersen's (31) methods. The empirical studies of Harvey and Greenberg (12), Semple et al (40), and Moseley (28) have expanded on these studies by using one or more of these methods. Lewis and Prescott (24) use a simpler regression method in 'two-space' and Waller (43) demonstrates the use of an input-output technique. These latter methods seem less useful because of the crudeness of their spatial resolution.

Despite the relative sophistication of the methodological developments, the widely debated aspects of the Myrdal, Hirschman and Hoselitz models remain unsolved, and the amount of empirical research which has been generated in testing the spatial aspects of the elemental processes is disappointing.⁹

Case-Study-Implementation Approach to Spread

Almost half of the selected studies investigate a specific case.¹⁰ None of these studies, however, have the case-specific aspects

9. A number of studies of capital flows seem to favour the argument of Myrdal concerning a net loss of capital from the backward regions. This pattern has been empirically noted in Indonesia (47), Nigeria (13) and Spain (22), and other studies show similar results in Pakistan and Brazil.

Myrdal's skepticism regarding the effects of commodity flows is supported by research on Italy (6) and in other studies of Belgium, Britain and Brazil.

The migration effects are more debatable empirically with considerable doubt on a theoretical level being raised by Okun and Richardson. (30)

The explicit evidence of composite spread effects is less clear. Other than the studies surveyed, the positive effects of massive government transfers have been demonstrated by Chenery (5). The positive effects of industrial dispersal (a part of capital movement) are shown by Manners (25) and Keeble. (19)

10. Many of the case studies drew their examples from the United States. (2, 4, 11, 24) Other studies drew examples from Brazil (40), Sierra Leone (12), England and France (28), Peru (43), Malaysia (37) and from the whole range of less developed countries. (18)

as the major focal point of the research, but rather use the case to demonstrate theoretical and/or methodological concepts developed in the research. An analysis of these cases indicates that often analogues are quite hyperbolic and the indices used are capable of substantial improvement.

Attributes of the Studies Selected for Review

Having considered the various approaches to research on the concept of spread, we now analyse the chosen studies in terms of a selected set of attributes.¹¹ These attributes include the terms used; definitions; spread and backwash factors identified; positive or normative orientation; various contexts (planned vs. natural poles, past-present-future orientation, developed vs. underdeveloped); identification of primary phenomenon affected by spread and index used; spatial vs. aspatial orientation; goal of identifying growth centre locations or identifying growth around centre; scale; recognition of hierarchies; temporal frame; certain methodological considerations; single or multi-centre consideration; equity or efficiency orientation; and conclusion. In Table 2 the categorisation of the selected studies is summarised in terms of the attributes listed in order above. A more detailed discussion follows.

Terms Used, Definitions and Spread and Backwash Factors Identified: The general call for a semantic reworking of the growth centre concept applies equally well to the concept of spread. Although the term 'spread' is used in a majority of these studies, the terms 'trickle down', 'filtering' and 'diffusion' are often used alternatively or concurrently. (See Table 2, col. 2.) The term 'backwash' is less widely used, often being replaced by 'polarisation' or 'parasitic'. The labelling by Siebert of "levelling and withdrawal effects" which are admittedly parallel to spread and backwash is semantically a move in the wrong direction.

11. The format of analysis of the attributes is a derivation of that used by Moseley. (27)

Darwent's (8) entreaty for a logical separation of the terms 'growth centres' and 'growth pole' has not as yet been widely heeded judging from this survey.

Moseley's (27) skepticism about the concept of growth centres was in part heightened by the fact that the concept was seldom defined in the literature. The concept of spread suffers similarly. It is defined (often simplistically) in only about half of the studies surveyed. Backwash is defined less often. (See Table 2, col. 3.)

Terminology, though important, is less critical than other clarifications and advancements which can be made regarding the state of knowledge of the spread concept. Of primary importance are the advances which have been made in identifying the component factors (or processes) of the spread concept. (See Table 2, col. 4.) From the previous discussion it was seen that about five processes were agreed upon by the initial investigators. Some of the studies surveyed (3, 43, 46) simply reiterated processes which had been previously identified. Other studies (4, 40) did not address themselves to the process content of the concept.

Hale's work identified eight mechanisms of spread: 1) the transportation system, 2) geographic separation of economic functions of business firms, 3) commuting, 4) migration, 5) local industrial development subsidies, 6) wage differentials, 7) urban development and zoning, and 8) investment in social overhead capital. Whereas some of these had previously been identified and some are more structure-oriented than process-oriented, Hale's work does indicate the importance of commuting and governmental intervention (e.g., subsidies and zoning) in the process of spread. (11)

Case studies have noted processes that are relevant within the context of the specific example. Harvey and Greenberg (12) show the positive spread effects related to banking facilities and cooperatives in their study of Sierra Leone. Lewis and Prescott (24) show the relationship of an expanded job market and wholesaling in their

TABLE 1

Study	g.p.=growth pole g.c.=growth center pol.=polarisation t.d.=trickle down Terms Used	Definitions	Spread Factors Identified	Backwash Factors Identified	Positive-Normative -Natural or -Planned Poles	Past-Future Context	Developed (DEV) or Underdeveloped (UND) Context	Case Study- Method- Theory	What Spread? /what index is used?	Primarily Spatial (S) or Aspatial (A)	Identify loca- tion (loc) vs. growth (gr)	Scale	Hierarchical Effects Recognized	static (st) cooperative stat dynamic (DYN) dynamic (DYN) Center-Specific city Regional Initial line Structural Recognized	Equity or Efficiency Emphasized	Conclusion	
Kyrdal	spread, backwash, centers of expansion	backwash, spread	see pg. 4	see pg. 4	Norm pl.	all	both- contrast	non-formal theory & examp	economic expansion	S	gr	interreg	Yes	DYN	- Y -	Equity	Tendency toward greater inequality
Moselitz	generative, parasitic	generative, parasitic	see pg. 3	see pg. 3	Norm --	past- present	UND	non-formal theory & examp	economic growth	S	gr	nat'l.	Yes	DYN	- N -	Equity	Initially parasitic then generative
Hirschman	pol., t.d., g.p.	trickling down, polarization	see pg. 5	see pg. 5	Norm pl.	present- future	both	non-formal theory & examp	progress	A	gr	interreg internat	No	DYN	- - -	Efficiency	With government intervention t.d. prevalent than pol.
Hale	spread, backwash	none	see pg. 9	see pg. 11	Norm pl.	past- present	DEV	non-formal theory & examp	economic develop- ment	A	gr	interreg intrareg contiguous	No	DYN	- - -	Equity	Partial integration of backward region; spread effects work spread is smaller than expected; pol. is great
Johnson	spread, pol.	-----	promotion of trans- railroad branch	-----	Norm nl.	all	UND	non-formal theory & examp	economic change	S	both	intrareg.	Yes	DYN	- Y -	Equity	-----
Liebert	levelling effect, withdrawal effect, r.p.	levelling effect, withdrawal effect, regional r.p.	see pg. 10	attraction of resources; migration	Norm pl.	present- future	both (un- differentiated)	formal theory	increase in welfare of a region	A	gr	interreg	No	DYN	- Y -	Efficiency	-----
Terry	filtering, t.d., spreading, r.p.	Hierarchical fil- tering; household vs. entrepren. innov.	innovation adoption	none	Fos nat.	past	DEV	all	growth opportuni- ties; television stations/ radio	S	gr	interreg intrareg	Yes	DYN	- Y -	equity	hierarchical and spread diffusor = all growth of innov.
Chauvin et al	pol., r.p.	none	none	none	Fos nat.	past	DEV	all	economic growth /non-agricultural sectors	S	gr	interreg	Yes	DYN	N N N	Efficiency	Polarization occurs in the given case
Semle et al	pol., r.p., g.p.	r.p.	none	none	Fos nat.	past	UND	Method Case	growth impulses /9 variables	S	loc	intrareg	No	COMP	Y N Y	Efficiency	growth poles identified
Harvey and Prescott	t.d., pol., spread	r.p. or r.c.	for case only; banking & coops	none	Fos nat.	past	UND	Method Case	ideas, innovations /banks, coops/	S	both	national	No	COMP	Y N Y	Efficiency	Spread & Hierarchical Diffusion vary with innov.
Lewis and Frederick	spread, r.c.	none	expanded job markets; wholesale	none	both nat.	past	DEV	Method Case	growth of economic activities	A	gr	intrareg.	No	COMP	Y N Y	Efficiency	Spread not in retail; Balanced investment better spread eventually greater than backwash; zones vary
Reinhard	spread, backwash, r.p. & r.c.	growth, development spread effect	Kyrdal's	Kyrdal's	Norm ---	future	UND	non-formal theory	some of the benefits of growth	L	gr	intrareg	No	ST	N N N	Efficiency	spread eventually greater than backwash; zones vary
Brown	spread, backwash, pol., t.d., neo- micro diff., r.p.	none	Kyrdal's	Kyrdal's	Norm ---	present- future	both	non-formal theory	growth pole effects; innova- tions	S	gr	intrareg	Yes	COMP	- Y -	both	polarization greater than trickle down.
Moseley	backwash, spread, t.d., g.c., pol.	backwash, spread, t.d., pol., g.c.	see pg. 10	Kyrdal's	Fos pl.	past- present	DEV	all	promotion of high- er levels of dev. /development factor	S	gr	intrareg	Yes	ST	Y Y Y	Equity	spread not effective in periphery part some distance
Friedmann	pol., spread, feedback effects	wide range of many definitions in a formal statement	dominance see pg. 10	dominance see pg. 11	Norm nat.	present- future	both (UND emphasized)	formal theory	innovations, info- rmation, core region	S	gr	all	Yes	DYN	- Y -	Equity	core dominates; varied possibilities for periphery
Waller	spread, generative, parasitic, r.p.	spread, g.p.	Kyrdal's	none	Fos nat.	past- present	UND	Case Method	economic growth /imports from the hinterland/	A	gr	intrareg	No	ST	N N N	Equity	spread effects are small
Robinson and Salib	backwash, spread, r.p.	none	Kyrdal's + commuting & change inducement	not specified	Fos nat.	past- present	UND	Case Method	economic develop. /hypothetical level/	S	gr	intrareg.	No	ST	Y N Y	Equity	method is useful

case study of two centres in the Midwestern United States. Johnson (18) advocates railroad branches to increase spread in India. Robinson and Salih (37) identify the 'classical' factors in their study of Kuala Lumpur. Berry (2), on the other hand, is more abstract and refers to Pedersen's (31) concepts of "entrepreneurial and household innovations" and refers to spread simply as "innovation adoption". Siebert (41) is equally abstract referring to such general concepts as "immobile negative pecuniary external effects", "interregional multipliers", and "terms of trade".

Moseley (28) reviews spread factors at length, referring to the classical factors of capital movement, core purchase of food and materials from the periphery and migration. He also refers to commuting and Richardson's (35) comments on transforming social attitudes, "demonstration effects" and higher wages. Finally he notes the importance of government intervention as a factor of spread.

Friedmann (9) speaks of spread primarily as the "introduction of innovation". He introduces the notion that one effect of core dominance will be increased political-social conflict. The pressure from conflict may result in a policy to promote decentralisation from the core. Friedmann also identifies the process whereby the core regions extend their institutions into the periphery, thus rediscovering Adam Smith's notion of introducing order and government.

In summary, the progress in identifying factors of spread has been disappointingly slow.

The specification of processes of backwash has proceeded even less satisfactorily. Many studies do not even recognise this negative aspect of growth centres, and others that do make no new statements concerning it. (See Table 2, col. 5.) Hale states that backwash may result "because of only partial integration of the backward nation or region into a national system of public and/or private resources utilization". (11, p. 444) Siebert speaks broadly about "attraction

of resources" to the core and the migration of capable workers (a classical factor). (41) Moseley discusses backwash in classical terms and refers to "economies of scale ..., external economies ..., transfer economies ..., and the crossing of thresholds which makes viable the progressive attraction of higher order 'non-basic' activity". (28, p. 58) These economies will tend to exacerbate "spatial disparities".

Friedmann refers specifically to backwash in his "dominance effect" which is the "steady weakening of the peripheral economy by a net-transfer of natural, human, and capital resources to the core". He proceeds to identify five other effects (information, psychological, modernisation, linkage and production) all of which are processes by which core regions consolidate their dominance in a self-reinforcing manner over their peripheries. (9, pp. 94-95)

One untried approach to specification of spread-backwash processes would be by interview/survey where peripheral residents would be asked to specify ways in which they felt urban growth centres had beneficial or detrimental effects on their locales. Other more traditional studies of individual processes would also be useful.

Contexts: As can be seen from Table 2, columns 6-9, a wide range of contexts were surveyed in the studies sampled. There is an approximate balance between positive and normative studies and between 'natural' and 'planned' poles. This is somewhat reflected in the breakdown of 'past-present-future' emphasis, although both normative and positive studies tend to use historical evidence to ground their conclusions. There is also an approximate balance among studies focussed on the underdeveloped context, those focussed on the developed context and studies of both. The distinction is more important to the extent that strategies vary considerably with level of development. Developed countries tend to use growth centres in declining or stagnating regions which have passed their peak productivity (e.g., Appalachia, Upper Great Lakes), while underdeveloped countries tend to use the policy to open up regions that are not modernising at the same rate as the core regions.

There are significant implications for innovation diffusion since the declining regions in developed areas should have considerably stronger linkages developed within the system than do those of the never-integrated regions in underdeveloped countries. Thus strategy in a developed area with declining regions may be focussed on finding innovations which would lead to development in the regions and letting these innovations diffuse along existing channels. In the underdeveloped context, the innovations which would foster development may well exist in the core regions but it is necessary to make the channels of diffusion more efficient in order to generate adequate spread.

Other Attributes: The phenomenon which spreads is usually categorised either as economic growth, development, change or expansion, or as innovation or new information. (See Table 2, col. 11.) In the case studies it is measured in a variety of ways, from the technically complex use of factor-analytic scores of a development dimension to rather strained surrogate indices of non-agricultural employment, imports or television stations. Robinson and Salih (37) manage to skirt this problem in the demonstration of their trend surface technique by assigning hypothetical levels of development.

Most of the studies are explicitly spatial (See Table 2, col. 12.), although the analyses of Siebert (41), Lewis and Prescott (24), Waller (43) and Hirschman (15) are confined to a two-space framework. Hales's (11) discussion is largely aspatial.

As would be expected, most studies of spread are primarily concerned with growth around the centre rather than the problem of actually locating the centre. (See Table 2, col. 13.) Of the studies surveyed, however, Johnson (18), Harvey and Greenberg (12) and Brown (3) address themselves to both spatial problems. The study of Semple et al (40) addresses itself only to the locational problem.

The scale of the study is a very important attribute that is too often overlooked and unfortunately sometimes confused. (See Table 2, col. 14.) Alonso (1) and others have noted that a growth centre strategy

which may lead to interregional equity may exacerbate intraregional inequity. A variety of scales have been used in the studies surveyed. There is a trend, however, to analyse spread specifically on the intraregional scale as opposed to the interregional scale of the original studies on the subject. Explicit reference to scale is strongly advocated for all studies of growth centres and spread.

Related to the notion of scale is the notion of hierarchical diffusion. Specifically, diffusion is hypothesised to operate with a stronger hierarchical element on the interregional scale and a stronger contagious (spread) element on the intraregional scale. It is unfortunate that half the studies surveyed did not even consider hierarchical diffusion. (See Table 2, col. 15.) The six studies that explicitly refer to hierarchical diffusion (2,9,12,18,28,29) should be praised for their attempts at rigorously including this attribute in their analyses.

Most of the studies surveyed can be considered dynamic. (See Table 2, col. 16.) This desirable attribute is less easily achieved in some empirical case studies. The case studies of Waller (43), Robinson and Salih (37) and Lewis and Prescott (24) are all in the static mode. This is unfortunate in that inference towards spatial process (i.e. spread) is less reliably made from a static analysis. Semple et al's (40) case study and Weinand's (46) oblique non-formal theory are in the comparative static mode. Fortunately the methods developed by Casetti et al (4) (also used by Harvey and Greenberg (12) and by Berry (2) are dynamic techniques. The unfortunate aspect of these studies is the crude indices which were used due to limited availability of adequate-resolution, relevant, spatial-temporal data. A technical assessment of the studies indicates that few of them possess the desirable attributes of centre-specificity, initial time, directionality and multi-polar foci.

The last attribute to be considered is that of efficiency versus equity orientation. (See Table 2, col. 21.) Although it could be argued that the orientation is largely an ideological issue, often this is not the case. Unfortunately, some statements (4,24) indicate a lack

of cognisance of the goals of growth centre strategy. Most of the studies tend to emphasise the equity features of the concept. Some (15, 41) emphasise efficiency and argue for a lagged secondary equity effect. It is important to note that all too often the concept of growth centres is stated without specific accompanying statements relative to goals (in terms of efficiency and equity) towards which the growth centre strategy implementation could be focussed. Efforts to derive a mathematical specification of efficiency-equity patterns are currently underway.

Conclusions: The conclusions of the various contemporary studies of spread are as diverse as were those of the concept's initial authors. If a trend is discernable it is towards an awareness that spread effects are either smaller than expected (18, 24, 43), limited in geographic extent (28) or less than backwash effects (3). Friedmann (9) sees four possibilities for the counter-elites of the periphery given continued dominance by the core: suppression, neutralisation, cooptation or replacement. He sees initial positive effects becoming dysfunctional unless spread can be accelerated and dominance reduced. Other studies argue that spread does exist (2,4,11,46) or that it varies with type of innovation.(12)

SYNOPTIC ANALYSIS OF SPREAD

From the preceding analysis it is evident that the conflicts in the formative period of the concept of spread have not been resolved by the current research on the topic. Further, the approaches of the current research have not developed a consensual basis for further research. This is reflected in the preceding section's analysis of attributes which indicates the diverse foci of the selected studies. This lack of consensual basis is consequential to research that has neglected a theoretical focus. There is a distinct need for rigorously formalised models which can be tested by refined methodologies utilising data from actual case studies. Rodwin argued this point previously:

What we need to get, however, from future historical studies, is better evidence on possible or more effective sequences or stages by which growth and urban development spread to lagging regions, and on the types of urban patterns which exert the maximum influence over the lagging hinterlands. (38, p. 53)

Should a sufficient fusion between theoretical, methodological and practical approaches be realised, each approach would benefit from the developments in the others. This is a logical next step in a scientific approach to an analysis of the concept of spread.

Diffusion and the Spread Concept

If there is a predominant trend in the scientific approaches to the study of spread it is in the incorporation of actual diffusion processes or diffusion analogues as the organising concepts in the theoretical models advanced. Given the relatively strong theoretical roots of diffusion research (10, 17) and the inclusion of diffusion processes as one element in the formative studies of spread by Hoselitz (16) and Myrdal (29), the evolution of this emphasis on diffusion is understandable. But caution must be exercised. Diffusion of innovation is but one of a complex set of processes that comprise spread. The attractiveness of the diffusion paradigm has led Berry (2) and Brown (3) among others to overemphasise the role of diffusion in development. As I shall attempt to show in this study, peripheral development is also heavily dependent upon integrated structural change which can be analysed using diffusion analogues, but which should not be categorised as either household or entrepreneurial innovation. Further, in using a diffusion analogue it is important to both explicitly (preferably theoretically) demonstrate that the interactions of the complex set of processes comprising spread behave in a manner truly analogous to a specifiable diffusion process and to disclaim those connotations carried by the analogue which are inapplicable to the phenomena studied. One specific connotation which warrants immediate rejection is that of the ease with which diffusion can be affected. As Johnson notes:

....unless the euphoric, though false, myth of urban magnetic fields that automatically diffuse development is dispelled, the tough, up-hill job of creating the needed intermediate urban structure cannot even be programmed, much less begun. (18, pp. 377-378)

The Spread-Backwash Dichotomy

The conflict over whether specific dynamic spatial factors contribute to spread or to backwash is yet to be resolved. Indeed, there is little agreement as to the nature of the dividing line in the definitions of spread and backwash. In this study an absolute change is the criterion, i.e., spread is the complex set of processes whereby the absolute level of development of a peripheral area is increased due to spatial interaction with a core area; backwash results when the same set of processes affect a decrease in the absolute level of development of a peripheral area. These definitions raise two points of contention: 1) whether the dividing criterion should be absolute or relative; and 2) whether the same set of processes cause both effects.

The definitions stated above posit that the criterion for the dichotomisation of spread and backwash should be the absolute change in the level of development. Other authors have argued that relative change in levels of development should be the dichotomisation criterion. Using the absolute criterion, spread may be greater than backwash and the periphery may still be declining in level of development relative to the core. Using the relative criterion, if spread is greater than backwash the periphery is necessarily tending towards equalisation with the core. Using this relative criterion, the earlier stated condition (p. 10, eq. 2) posited by Casetti et al (4) would have to be reversed so that:

$$\frac{\partial^2 Z}{\partial s \partial t} > 0 \quad (3)$$

where Z is the level of development, s is the distance from the core and t is time. It should be noted that equation 3 is a possible condition of spread > backwash relationships regardless of whether the criterion adopted is a relative or absolute one. Thus Casetti et al's (4) second

condition (p. 10, equation 2) is limited to only one out of a set of possible outcomes.

The definition of spread in terms of relative change is rejected on the grounds that: equation 3 is a rare event in the real world; it is not consistent with the intent of the developers of the concept; and the conditions necessary to satisfy equation 3 would require not only that the component processes of spread in the periphery be spatially-related to the core, but that these relationships work more to the benefit of the periphery than the core. This is a very doubtful relationship in all but the very late stages of urbanisation.

The other possible point of contention raised by the above definitions of spread and backwash effects is that the same complex set of processes brings about both effects. As noted previously, the assignment of each component process into either a spread or backwash category has remained an unresolved issue in the development of the concept of spread. A rigorous analysis of the complex set of processes reveals that each process (except, perhaps, for certain aspects of the diffusion of innovations¹²) can have either positive (spread) or negative (backwash) effects on the periphery, and that the strength of these effects varies with distance from the centre and other factors. Each process will be analysed in studies that are part of this author's ongoing research. Suffice it to say now that the spread-backwash dichotomy is based on the direction of the change in the periphery and not on the specific component processes involved. Thus the early dichotomisation of the spread-backwash set was somewhat misguided in its emphasis on categorisation of component processes. The following restatement of the concept considers spread-backwash as a set of processes which can cause different impacts on the core-related periphery.

12. Given the classical interpretation of the diffusion of innovations, it could be argued that an individual would not adopt an innovation if it is known to be detrimental to him in terms of his own values. This would assume no ignorance on his part and no coercion to adopt.

RESTATEMENT OF THE CONCEPT OF SPREAD

In the preceding analysis of the genesis and current state of the concept of spread (and its negative, backwash) I have attempted to resolve some of the central conflicts and have indicated directions of research which would enhance understanding of the concept. A restatement of the concept of spread summarises the central conclusions already reached. Included in this restatement are the factors influencing spread which will be formalised as part of a growth centre model in this author's ongoing research.

Spread and backwash effects are brought about by a complex set of processes. The essential elements of this set are:

- 1) Government spending and taxation. This often-overlooked process accounts for large amounts of differential core-periphery development and is of major significance in normative considerations. The processes of governmental devolution and decentralisation (45) are subsumed under this heading.
- 2) Diffusion of innovations. Although innovations can be broadly defined, here they are defined as new techniques, organisations or useful commodities which are adoptable to benefit individual families (Pedersen's household innovations (31)) or groups larger than the family (Pedersen's entrepreneurial innovations).
- 3) Migration. The effects due to migration are not simply measured in terms of where a person earns his wage, but rather the concomitant effects on the social structure and the economy of the people in both the site of emigration and the site of immigration. That is, the concern is more one of people prosperity rather than place prosperity. Commuting is subsumed under this heading as a restricted form of migration.
- 4) Private capital flows. Money is saved in many areas of a country and is often channelled through financial institutions to investment projects. The site of investment is often a function of the rate of return on investment, and a differential rate of return on investment often exists between the core and periphery. The process of credit extension is part of this set.

- 5) Trade. A highly interactive core-periphery relationship often rests on the trade of peripheral commodities for core-produced goods and services. The volume of trade, the terms of trade and the bearing of transport costs all affect the development of the areas involved.

Although other processes have been identified as part of the spread concept by other authors, it is contended that the above five processes produce the great majority of effects in the spatial relationship between core and periphery.

Apart from the actual complex set of processes which comprise spread are a set of factors which influence the extent of core-periphery spatial relationships:

- 1) Distance from the core. It will be shown in my future work that each of the five processes identified above is either directly or indirectly a function of distance.
- 2) The size of the core. Larger urban cores provide a greater range of functions to their peripheries, and core-periphery interactions could be expected to be a positive function of core size.
- 3) The growth rate of the core. A more dynamically growing core area should be expected to have a greater amount of interaction with its periphery.
- 4) The existing spatial distribution of development. Disparities in levels of development between core and periphery may indicate dominance-dependency relationships and provide evidence regarding the degree of impact of spread in the past.
- 5) The presence of smaller urban places in the periphery. Although it is posited that hierarchical diffusion is most predominant between urban cores, some hierarchical effects are also present at lower levels in the urban hierarchy. Further, spatial interaction between the core and smaller urban places in the periphery is probably greater than interaction with the remainder of the periphery since the level of development in the smaller urban places is probably greater than the level in the remainder of the periphery.
- 6) The structure of the transport network. The structure of the transport network, primarily as related to transport costs, will greatly influence the degree of core-periphery spatial

relationships. The result is an important component of directionality in the development surface. The effects of the transport network on trade and the commuting aspects of migration are evident. The transport network can also be shown to affect government expenditures and to some degree diffusion of innovations. The importance of the transport network as an organising concept for the study of spread effects has been too often understated.

Again, although other authors may argue that other factors influence the extent of spread on the intraregional level, it is contended that the six factors listed above produce the majority of spatial influence on the processes comprising spread.

The conflict remains unresolved. What is the final developmental outcome of the spread-backwash set of processes acting on the core and periphery? Will peripheral deserts and core reservoirs of economic development be caused by a dammed trickle down? Or will spread be great enough to bring the rural population out of its "vegetation and torpor"? This author is attempting to resolve this conflict in his current research by positing a rigorously formalised model which should facilitate the decision-making relative to optimal size and spacing of growth centres leading to the desired distributions of levels of development.

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