2D4 Establishing Priorities for S and T Policies in Region Development. The Case of Japan.

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INTRODUCTION

Just few decades ago, economic theories were paying little if any attention to the spatial dimension of the economic activities when dealing with the mechanisms of growth. With a continuously booming industry however, it became clear that the built up disparities were not only to be sustained, but also to become self amplified -if regionally oriented intervention was not to be put into action.

Yet however the solution of the growing regional problems has been totally entrusted to purely economic or industrial policies, with the S&T policies being mainly in charge of improving global national competitiveness.

Nevertheless, it didn't take much time for technology to internationally emerge as a full scale independent factor of production, directly engaging S&T policies in the regional issues, while now in Japan "S & T activities in regions are the motive power of regional activation .." as the 18th recommendation of Japan's Prime Minister's Council for S&T [1] suggests.

Meanwhile, all over the world regional development problems have surged, adding new reasons for policy intervention to the long list of the ones which justified the regional economic policies in their early stages. Japan not being an exception, is nowadays facing urging problems associated with the cost of maintaining life standards in the metropolitan areas as well as with the extensive aging/decline of its population. With the first of them already present and the second to soon affect the nation's working force availability, solutions are urging as never if the situation is to be prevented from becoming irreversible.

1. JAPAN and the NEED for REGIONALLY ORIENTED POLICIES.

Examining the development process of Japan from its early stages to the present situation, it is more than clear that the industrialization process has been triggered from only the metropolitan areas of Tokyo, Nagoya and Osaka, and this has led to a strong concentration of population, activities, income and employment opportunities in the areas named above.

Although there has indeed been an industrial relocation process in the course of development, it has not been effective enough to change the centralized pattern built around the three industrial poles, as it has mainly been a relocation towards the surrounding areas. Moreover, relocation has been dampened last decade, with the structural changes towards new and more competitive sectors of the economy once again originated from the same highly developed regions [2]. Consequently, the urban congestion problems coexist with the underdevelopment of the rural areas (fig.1) [3], bringing to a dead end any efforts for reversing population movements.

On the other hand, with the unfavored regions already drained of their active population, and the employment force shortage to become

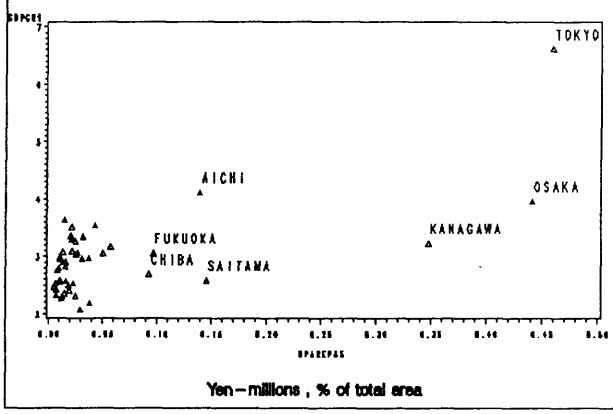
one of Japan's major problems in the near future, it is not of surprise that companies following the microeconomically best location strategy are -and will be more- reluctant to relocate to areas where, on the top of infrastructure and peripheralization problems, a substantial human resources shortage is foreseen.

Apparently enough, the reduction of regional disparities through the considerably faster development of the backward regions is the only feasible long term solution. And as it is no more accepted that development is something to occur naturally, '..These major problems in regional development require powerful policy measures to reverse the trend..' according to the Basic concepts of the Fourth Comprehensive National Development Plan for Japan [4]. We only have to add, that if a balanced development is to be the result, strongly differentiated policies, giving the higher boost to the most unfavored regions is a must, meaning that regional priorities have to be established for both the intensity of intervention by region and the regional distribution of the available for policy implication funds.

As however all regions are ready to bring up tens of reasons justifying their need for structural assistance, robust criteria are needed to decide on which regions -facing the severest problems- qualify for participating in any global development plans. In this sense, eligibility criteria are equally important as the policies themselves, and that's where the question of defining the real problems and the effective problem indicators comes straight-forward.

Fig.1: Urbanization and economic development

GDPper cap.(1989)versus densely pop.area(1985)



Yen-millions , % of total area

2.REGIONAL PROBLEMS and POTENTIAL PROBLEM INDICATORS

In order to confirm the existence of disparities in a comprehensive area, measurements of variance among the values of regional indicators is an effective and space saving technique. However for identifying problems by region, the geographical segregation has to be retained. This additional complication on the data handling and interpretation calls for the use of more compact indicators, and since several of them can be proposed, their advantages and limitations are always the main concern.

Among the single indicators of potential use in quantifying regional problems, the measurements of demographic factors, employment and income opportunities, as well as industrial and economic variables in the meso- and macro-level are the first to be considered. Still, in both urban and regional studies, most of the work is exclusively based on population statistics, the latter being usually the most readily available ones. This is also justified by the fact that, even in cases of decentralization, where employment remains the main concern, there is no doubt for a strong causal relation between population and employment movements [5].

It is however essential that policy measures are prompted by the

problems themselves instead of the resulting population change, and that means that more potential problem indicators (from the whole range of geographical, demographic, industrial, economic and social factors) have to be examined.

On the other hand, individual possible problem indicators can not always help drawing conclusions if they are examined separately, as it happens with industrial indicators showing developed areas to face problems if the shift of their economies to the tertiary sector is ignored, or when the same out-migration figures for two regions are interpreted as problems of the same degree, with the latter possibly being far from truth if age structures of the migrants are considered.

Furthermore, we can not overlook the fact that funds allocation should be proportional to an overall estimation of the degree of problems each region faces, and for this purpose an overall weighted estimator of the problems has also to be obtained, the latter clearly being of more importance in cases when eligibility criteria for global development projects are considered, or when the results of those policies are to be globally evaluated.

A brief example of using both single and composite indexes in detecting problems and assessing regional development levels, drawing from a range of possible problem indicators in the meso-and macro-economic level for Japan comes in the next.

3.RURAL IMPOVERISHMENT and INDUSTRIAL DECLINE

Before however going on examining problem indicators in detail, it must be pointed out that since regional development problems can have different forms, a basic -yet crucial- question when interpreting forthcoming results, is whether rural impoverishment or industrial decline is the case.

The question though of which prefectures are agricultural, is a very relative one under the continuous fall of agricultural output as a share of the total GDP both in Japan and worldwide. With the share of the primary sector's GDP to the total being in Japan as low as 2.2% in 1989, (the equivalent -only from agriculture however- for EC countries having been 3% in 1988 [6]), Japan is definitely industrially oriented, and if general criteria are to be applied, agricultural areas in Japan can be well identified as industrial ones. For this reason, the nomination of prefectures as agricultural or not seems more appropriate if done according to whether the prefecture has or not a higher than the national average primary/secondary sector's GDP ratio (1989), and this leads to the identification of 14 prefectures out of 47 as industrial ones. Cross-checking for the significance of this classification, the agricultural/total GDP ratio has been also used as the criterion, giving the same results with the single exception of Toyama. As the latter however has traditionally been engaged in industrial activities, and its policies are defacto planned for coping with industrial decline [7], the first classification has been retained and the 14 prefectures, in decreasing order of engagement in industry are: Osaka,Tokyo,Kanagawa,Aichi,Kyoto,Saitama,Hyogo,Shiga,Hiroshima, Shizuoka,Okayama,Gifu,Toyama and Fukuoka.

4.SINGLE PROBLEM INDICATORS

In the case of Japan, it has been clear, that groups of regions facing strong and continuous depopulation, could be easily identified

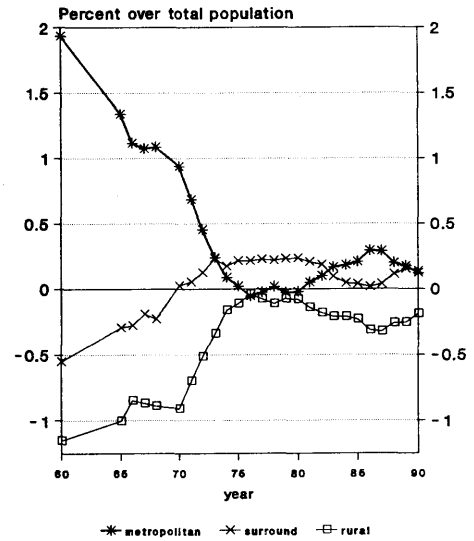
[2]. Still, population loss can generally result from demographic factors, net migration or a combination of both, with the relative significance of those factors depending on the stage of the development process, as well as on the nature of the problems being of interest.

In Japan, strong migration during the high growth period has been indeed the case, yet however after the development process had reached a certain level, total population movements have shown a notable downward trend (fig.2).

Nevertheless, regional migration -although an indisputable indication of regional decline-, under certain conditions, can not by itself provide information on the nature of the existing problems. This is especially true when highly urbanized regions are included in the analysis, since population movements can be the result of -and suggest for- significant regional structural economic problems in undeveloped regions, for urban decline in old metropolitan areas, or be of no concern for developed yet healthy urban areas. This is the case in fig.3, where the cumulative percentage of the prefectural net migration over population (1986 thru 1990) is mapped, grouping together however the metropolitan areas with regions facing severe peripheralization problems.

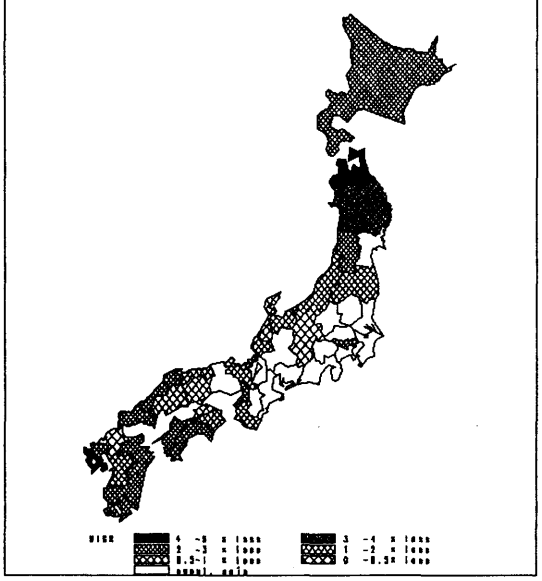
Without reducing the significance of net migration as a problem indicator, yet taking into account the stage of development and the special importance of the employment availability for Japan, active population (15 to 64 years range) measurements are a better - yet complementary- indicator of current and future regional population problems. In fact the strong association between percentages of active population for 1990 and their changes from 1985 to 1990, is proving that even if net migration does no more constitute a major problem, depopulation continues due to the altered age structures of the unfavored regions. And if both

Fig.2: Net Migration by region



Raw Data source:Japan Statist.Yearbooks
GDCJ11011f

Fig.3: POPULATION MOVEMENTS
Cummulative net migration figures 1986–90



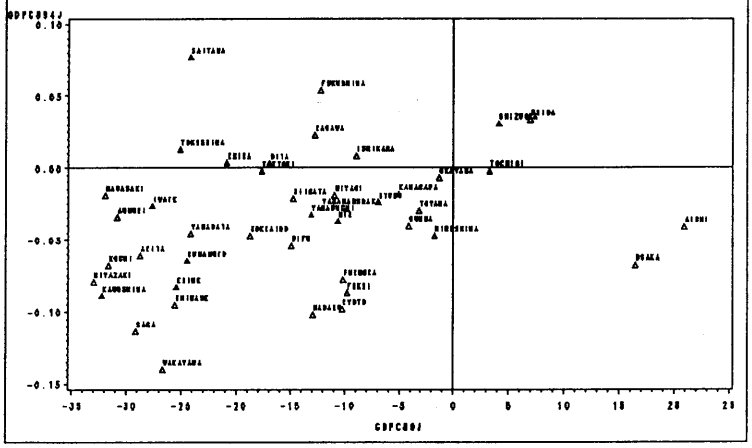
active population and its change are used for ranking the prefectures, the map looks like the one in fig.4, where the intensity of shading represents intensity of problems. Consequently both fig.3 and 4 have to be considered in identifying where the most severe depopulation problems are met.

Fig.4: POPULATION PROBLEMS
active population share and its change 1985 – 90

shading density represent problem intensity

The second set of indicators comes from what usually we call income and employment opportunities. Among them, the GDP per capita is probably the most widely accepted estimator of economic development, and can be directly used for identifying backward prefectures. Fig.5 clarifies the intensity of this problem while also taking into account its dynamic nature, in terms of GDP growth for the period from 1984 to 1989. Not surprisingly, Tokyo showing in 1989 a GDP per capita as higher than the average as 94% and a growth 18% higher than the nation's one for the same period, had to be excluded from the graph. Obviously, prefectures in the lowest left part of the graph not only lack behind the rest of the country as far as development level and income opportunities are the concern, but also widen their gap from the rest of the country.

Fig.5: Development level & Income opportunities
GDP per cap.1989 versus 1984–89 change, adjust.by national avg.



Unemployment on the other hand, a usually fair indicator of both urban and regional problems, in the case of Japan seems to have less discriminatory power than other indicators. The reasons lie in many facts, only to mention here that in such a low unemployment environment, and under the special employment policies and ethics, any causes for concern are mostly to come from the nature and the wages level of the jobs existing, rather than from their availability itself.

The list of possible problem indicators certainly does not

expire here, still under the space limitations, and as the last group of them including industrial performance, growth, and specialization indicators has been widely enough discussed in [2], it will be suppressed in favor of two more specialized approaches to supplement the regional problems identification effort.

5.SHIFT and SHARE analysis

Shift and Share analysis is the mathematical formation of a regional development theory which uses the regional subsectoral structures of the economy to explain the dynamics of the development process in the regional level [8]. Practically, as the method breaks down the regional -total or industrial- employment growth into components reflecting the character of the growth as well as the nature of structural problems for the region under question, becomes an indispensable tool for policy formation.

In a very general mathematical notation the method can be expressed as Mr = Sr + (Sor+Sdr), where the actual change of employment (Mr) is equalled to the National Share (Sr) and the Regional Shift (Sor+Sdr).

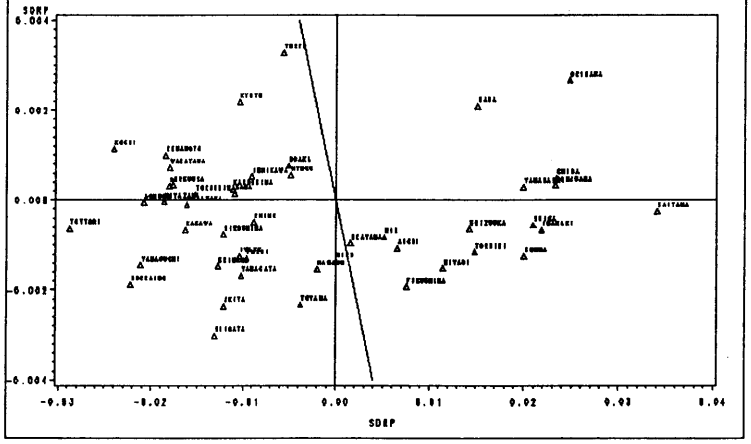
The first component (or National Share) is the hypothetical change in employment to have taken place, in the region in a specific time period, if the regional employment growth had followed the national pace. The last two components added together represent the total 'Regional Shift' from the above hypothetical change, apparently being positive for the faster growing and negative for the declining prefectures. Furthermore, the first component (Sor) of the Regional Shift is weighting the existence in the region of dynamic/fast growing sectors in the national level, while the second (Sdr) expresses the part of the growth due to the subsectors which grow faster in the prefecture than in the whole country.

Among declining areas (having negative total Regional Shift), the problems of the ones showing negative Sor are said to be due to their sectoral structures, while a negative Sdr suggests for the existence of local disadvantages. In terms of policy intervention the first group is in need of industrial or economic sectoral restructuring, while for the second, improvement of its infrastructure becomes the first priority. Needless to say that regions with both components negative are facing the severest problems.

In the case of Japan, separate Shift & Share analysis for the whole economy and the manufacturing sector alone has been carried out, with the results of the first case, covering the period from 1981 to 1986 given in fig.6.

Fig.6: Total employment Shift components

population adjusted, 10 subsectors, 1981–1986



6.COMPOSITE PROBLEM INDICATORS

Under the light of the individual indicators interpretation issues discussed above, the possibility of deriving a composite index capable of detecting and describing the development level and the intensity of problems by region has been examined, and an early brief summary of the method, and the constraints is given here.

The aim set above, from itself poses several questions related to the choice of the potential problem indicators to be represented in the index, as well as -and mainly that- to the weights to be attached to them for accurately explaining their relative importance. With no generally accepted method to define neither the appropriate indicators nor their weighting coefficients on an explanatory basis, it is not of surprise that the problem accepts infinite solutions, the latter being as subjective as the choice of the weights is.

Under those constraints, statistical techniques -despite their own limitations- seem to be the most appropriate ones, and among them discriminant analysis has been chosen to be used in our case.

Adapting the method to our problem, if some prefectures can be clearly identified as belonging either to the developed-problem free group or to the underdeveloped-problem facing one, all of the prefectures could be ranked according to their scoring on the discriminant function, with the latter from itself -including variables and coefficients- being the answer to the questions posed above.

Operationally, the two 'training sets' have been formed according to the averaged suggestions of 8 individuals, who have been asked to identify ten prefectures as belonging to each separate group, on the basis of their general knowledge on the development problems. All of them were Japanese researchers in NISTEP, working however on diverse research subjects, and had been in no contact with the data on which the analysis has later been based.

Despite the high degree of agreement of the answers received, some experimentation has also been done to check for the sensitivity of the method to the size and balance of the training sets.

For the example discussed here, it was decided for the training sets to be consisted of 8 prefectures each, and for the variables to include both averaged fixed time data for the past decade 1980-1990 and their changes over the same time period. In fact, the tests have started with 41 variables covering a full range of cumulative net migration, population age structures, total as well as broken down by sector GDP per capita, and several industrial growth and performance figures (establishments, employment, production, value added and productivity) in total and by major industrial sector. Through a stepwise discriminant analysis method [9], and considering the trade off between statistical significance and predictability power of the model, 6 variables have been allowed to be included in the final model, all of them being significant at the 10% level. Yet being very general, the final variables have been: averaged share of active (15-64y) population, growth of secondary sector's GDP(1982-1988), productivity of assembly industry as well as employment, averaged production and productivity from the basic/raw material's industry. Concerning the results [10], regardless of the variables chosen or their number, the members of both training sets were always correctly classified. Interestingly also, prefectures which never have been a priori chosen by our 'training sets' estimators as advantageous (i.e.NARA) have ranked equally well or better than the ones in the a

priori problem-free group, the latter also in accordance with their good ranking when using other criteria. In some cases however, some of the prefectures have moved to a higher or lower position when ranked in terms of their performance on the discriminant function, depending mainly on the kind of the variables included rather on their number. As a conclusion, we can say that discriminant analysis -being among the few feasible ways of deriving a composite index- , has performed well enough to be of practical use, yet however several tests for securing the convergence of the results are necessary.

CONCLUSIONS

As regional economics become an everyday issue, and technology finds its place among production factors, S&T policies are directly engaged in regional development. If the development is to be balanced however, eligibility criteria for regions are as vital as the policies themselves. Since several quantitative problem indicators as well as statistical techniques can be used to estimate the existence and intensity of regional problems, their advantages and limitations have always to be completely clarified before they are used in policy formation. Finally, regional development theories and statistical methods can be of great use in obtaining global indicators to be used in defining regional priorities in policy formation, greatly expanding the field of traditional single problem indicators.

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8. N.I.Konsolas, 'Regional Economic Policy', Athens 1985,(in Greek).
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10. A complete description of the method together with detailed results, as a serarate paper, is intended soon.