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1. The Relationship Between the Directional Components of Migration

Recent work by Cordey-Hayes and Gleave (1973, 1974) and Renshaw (1972, 1974) has drawn attention to the rival hypotheses that exist for the relationship between the directional components of migration rates (i.e. between $\frac{\Sigma M_{ij}}{j \overline{p}_i}$ and $\frac{\Sigma M_{ij}}{i \overline{p}_j}$). This work has described how traditional economic theory predicts an inverse relationship between these components; this is because in-migration to an area is considered to be related to high wages and low unemployment whilst out-migration is related to high unemployment and low wages. Numerous experimental tests of these hypotheses have fairly conclusively shown that in-migration is related to these concepts of economic attractiveness, but the evidence on the rates of out-migration is mixed with a strong school of thought arguing that out-migration is relatively insensitive to the economic characteristics of the origin (Lowry, 1966; Lansing and Mueller, 1968). Therefore there has existed for some years the two rival hypotheses:

(i) that rates of in-migration and out-migration are inversely related, and

(ii) that out-migration is independent of the economic characteristics of the origin.

These two hypotheses are schematically summarised in Figures 1(a) and (b).

An explicit test of these hypotheses (Cordey-Hayes and Gleave, 1973, 1974) on inter-regional migration data for the U.K. and indirect tests in U.S.A. and Canada (Miller, 1967 and Stone 1971) indicate that neither hypothesis is correct

and infact there exists a strong positive correlation between the directional components of the per capita rates of migration. This positive relationship is schematically shown in Figure 1(c) and the actual relationship based on U.K. data is shown in Figure 2. It is important to note that these are per capita rates of migration so that the expected correlation due to population size effects has been normalised out.

This positive correlation has been interpreted in terms of a selective concentration of mobile population into attractive growth areas and this in due course leads to high out-migration rates for those city regions. Development of this interpretation leads to the view that migration between urban regions is movement from "economic strength to strength" rather than arising from push-effects operating on the economically weak in declining regions. This theory has been elaborated in detail in the earlier papers of Cordey-Hayes and Gleave and need not be repeated here. Suffice it to say that the rate of out-migration depends on the magnitude of two competing forces, one of which is the differential mobility characteristics of the population within the region and this is a dynamic variable that is strongly dependent on previous migration into that region, and the second force is an economic push effect on the economically weak in lagging regions. It is argued that for migration between a system of post industrial cities the first force dominates, this is because the economic push effects operate only on a small fraction of the total population (typically 2 or 3% unemployed) and that these also have the lowest propensity to migrate.

The relative size of these postulated competing forces will vary from country to country depending on, for example, the degree of urbanisation and the magnitude of rural to urban migration. Presumably in rural areas the economic push effects act on a sizeable proportion of the community and the relationship between the directional components of

migration may then be nearer to that shown in Figure 1(a). It is of interest therefore to compare these relationships for a number of countries. In Section 3 a preliminary comparison is made of these migration flows for U.K., U.S.A., F.D.R., Italy, France and Canada. It is hoped that we will be able to obtain data on Eastern European countries later.

2. The Relative Rates of Population Re-Structuring Implied in the Various Models of Migration

Differing relationships between the directional components of migration lead to different rates of population re-structuring within a country. Clearly the push-pull model of Figure 1(a) leads to a rapid re-structuring as people leave weak regions to settle in economically attractive regions. The second model (Figure 1(b)) gives a somewhat lower rate of re-structuring because population leave all regions at an equal per capita rate but attractive regions differentially attract more of these migrants--this may be called a spontaneous re-structuring rather than a pushed re-structuring. The third model (Figure 1(c)) produces a slower rate of population redistribution because attractive regions have both a high in-migration and a high out-migration, while declining regions have low out-migration and minimal in-migration--this we call a damped re-structuring effect. There is of course a fourth model in which no redistribution of population occurs, that is when all regions have equal and opposite flows of migration. This gives a 45° correlation between the directional components (Figure 1(d)) and corresponds to a random movement of migrants in which there is a turnover of population but with no restructuring. Thus when comparing the migration data for the different countries it is of interest to note the slope of any correlation between the two components--the nearer the slope to the 45° line the slower the re-structuring and the angle subtended with 45° line can be used as a coefficient of re-structuring.

Some of the above figures can be identified with formal models of migration. The correspondence between Figure 1(a) and economic theory has already been outlined. The population gravity model developed in geography corresponds more closely to Figure 1(d) because it describes exchange migration rather than differential movements. However, Figure 5 is not formally equivalent to the gravity model because the figure considers per capita migration rates rather than gross flows.

3. The Observed Relationships

Figure 2 - presents the positive correlation observed between the directional components of migration for twenty city regions of England and Wales during the one year prior to 1961. This positive correlation has been discussed in Section 1 and interpreted in terms of a selective concentration of migrants into attractive areas. It can be seen that the graph corresponds to a slow, damped re-distribution of population. The directional flows of this re-distribution could be usefully illustrated by a flow map of the kind recently described by Tobler (1974).

Figure 3 - gives the directional components of migration for most of the large SMSA's in the U.S.A. and the data is the mean annual migration rate for the period 1959-65 (Morrison, 1974). Again there is a strong positive correlation and this further undermines economic push-pull theories for migration movements between SMSA's. In this case the correlation lies much closer to the 45^{o} line indicating a similar turnover but with a slower rate of re-structuring than in the U.K. However, there is a small but significant deviation from the 45^{o} line with the points at the

top right being the growing SMSA's San Jose, Lauderdale, Orlando, San Berardino, Jacksonville, Phoenix whilst the bottom left includes the following SMSA's: Buffalo, Detroit, Erie, Pittsburgh, New York, Chicago, Baltimore and Boston.

Figure 4 - presents similar data for the Federal Republic of Germany. Again there is a positive correlation close to a 45^{o} line with low re-distribution effects. With only ten data points fewer conclusions can be drawn, but it is of interest to note that the overall rates of migration in the U.K., U.S.A. and F.D.R. are quite similar.

Figure 5 - presents the migration components for Italy for the year prior to 1971. Perhaps Italy is the instance in which one would expect regional imbalances to produce a significant push-pull relationship of the kind given in Figure 1(a). Instead we observe an interesting mix of 1(a) and 1(c). There appear to be two correlations: the developed regions of Turin, Genoa, Roma, Milano, Firenze, Bologna, Trieste and Venice illustrate the positive correlation noted above and which can be explained in terms of the concentration of mobile population but in this case all the developed regions lie below the 45^{o} line and are thus all growing as a result of gains from the South. The underdeveloped regions have a significantly higher rate of out-migration than the developed regions and to this extent follow economic push-pull reasoning, but nevertheless these also show a positive correlation amongst each other

that is inconsistent with economic theory alone. If out-migration is plotted against net-migration for the under-developed regions then a significant negative correlation is obtained and this supports an economic interpretation of net-migration for the under-developed regions of Italy.

Figure 6 - presents migration data for France for the six-year period 1954-62. A "trained eye" can observe effects similar to those reported for Italy but in this case the disaggregation into two groups is less marked. The developed regions of Paris, Marseille-Nice, Lyon-Grenoble, Alsace and the North form a positive correlation similar to that for the U.K. but the rural areas data are more scattered. However Figure 7 in which per capita out-migration is plotted against per capita illustrates the two sets of regions more clearly.

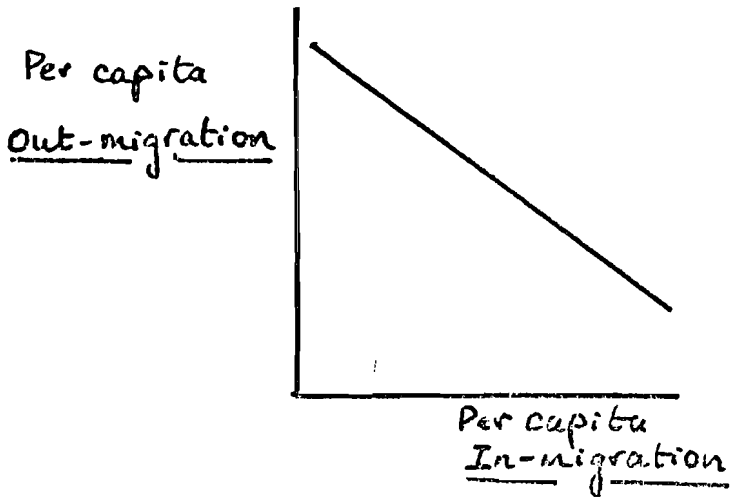
Figure 8 - gives the out-migration against in-migration relationship for 1962-68; note the decrease in in-migration and increase in out-migration for Paris.

Figure 9 - summarises the migration data for Canada for the period 1966-71. This shows a more scattered distribution with no clear correlations present. The results perhaps indicate some consistency with a positive correlation but the large out-migration rates for Regina, Saskatoon, and Halifax are consistent with economic effects. It is of interest to note that Stone (1971) reported a strong positive correlation on the basis of 1961 data.

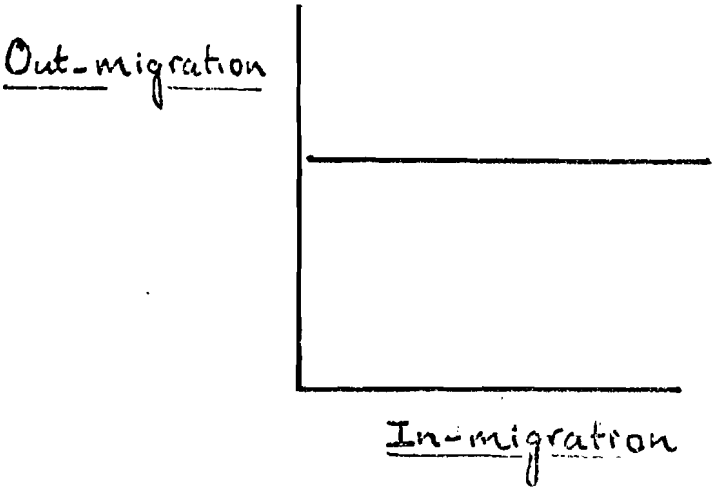
It is concluded that the feedback type of mobility theory proposed by Cordey-Hayes and Gleave for the U.K. has some relevance for migration between urbanised areas in most of the countries so far studied, but in underdeveloped and rural areas economic effects become more apparent although not in the manner expected from a push-pull theory. A simulation model that is able to generate the observed relationships for the U.K. has already been developed and the next step is to introduce into this a stronger mix of economic effects with the mobility differentials to reproduce the behaviour observed for Italy and France. A number of "policy runs" will then be made on the various versions of the model.

Acknowledgement: the data for France and Germany was obtained by Jean Marie-Gambrelle, for Italy by Agostino Labella and for Canada by Ross MacKinnon and Harry Swain.

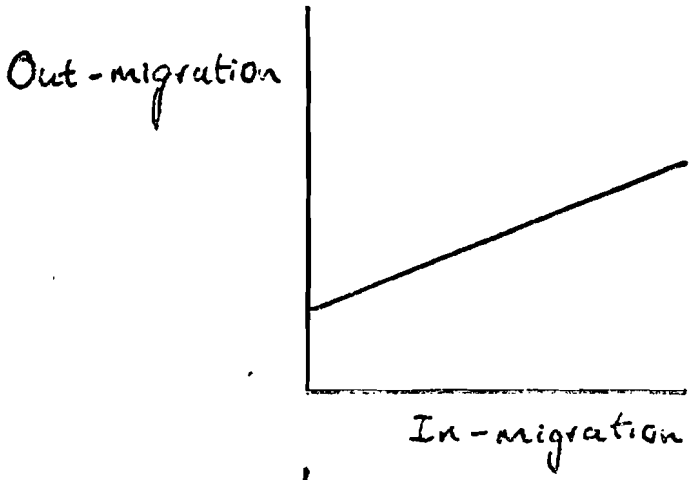
FIGURE 1 : Various relationships between the directional components of migration.



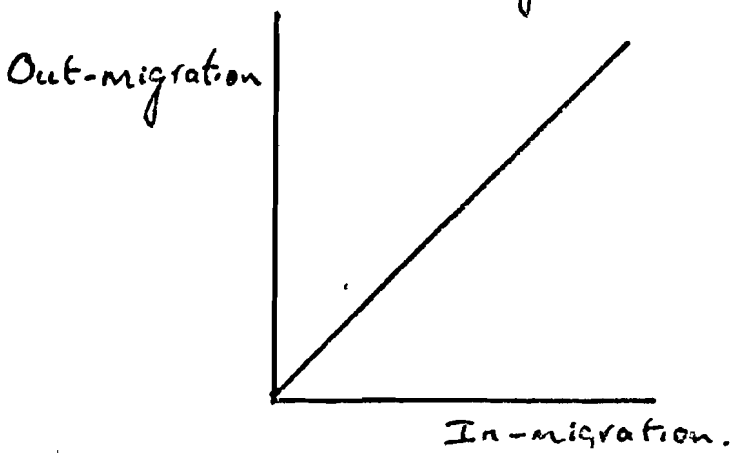
(A) push-pull theory



(B) Invariant out-migration.
- spontaneous re-structuring



(C) Positive relationship
- damped re-structuring



(D) Random turnover
- no restructuring.

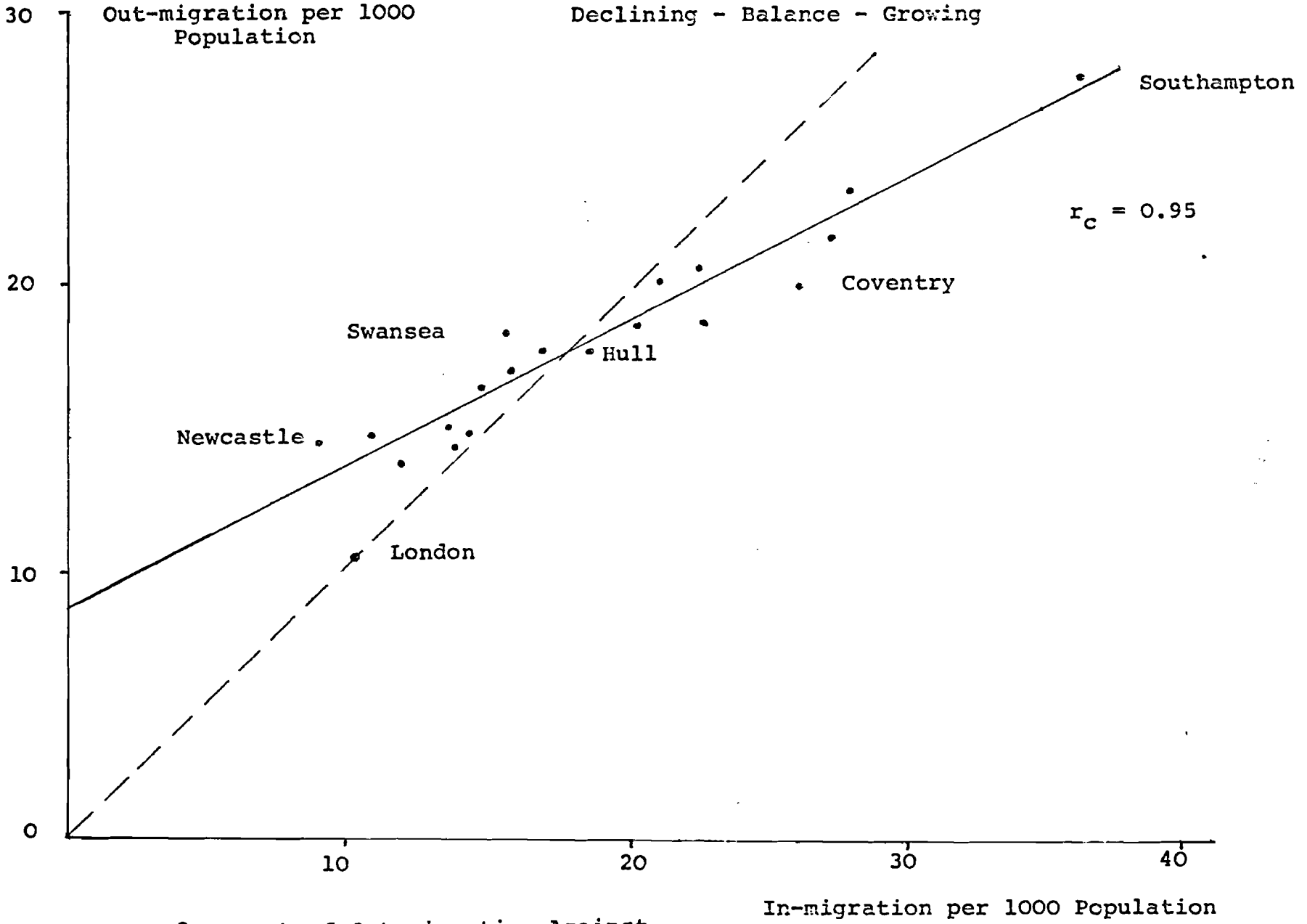


Figure 2 Graph of Out-migration Against In-migration Per Capita

U.S.A (Morrison, 1969)

Mean annual migrations 1965-65

(Selected large SMSA's)

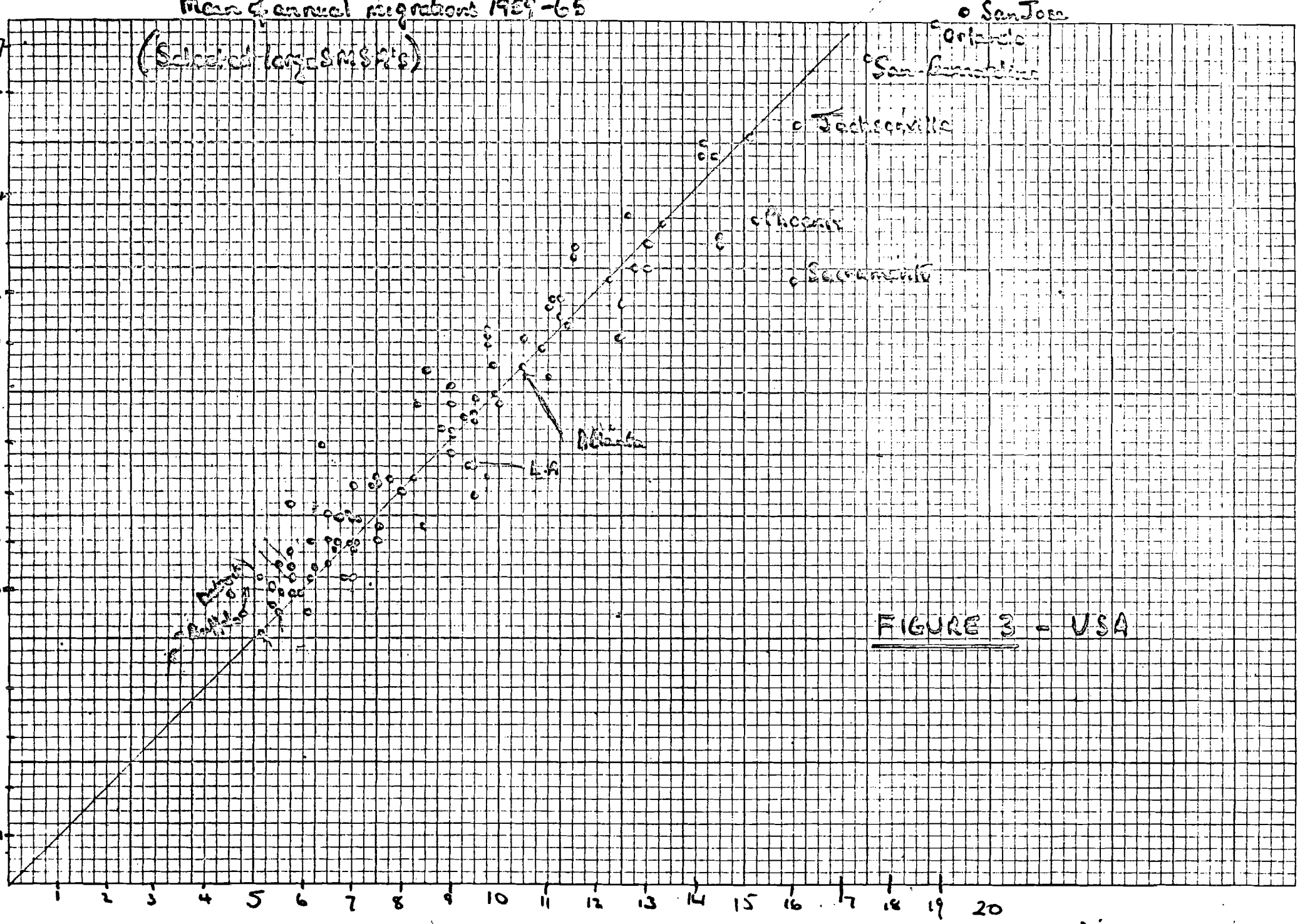


FIGURE 3 - USA

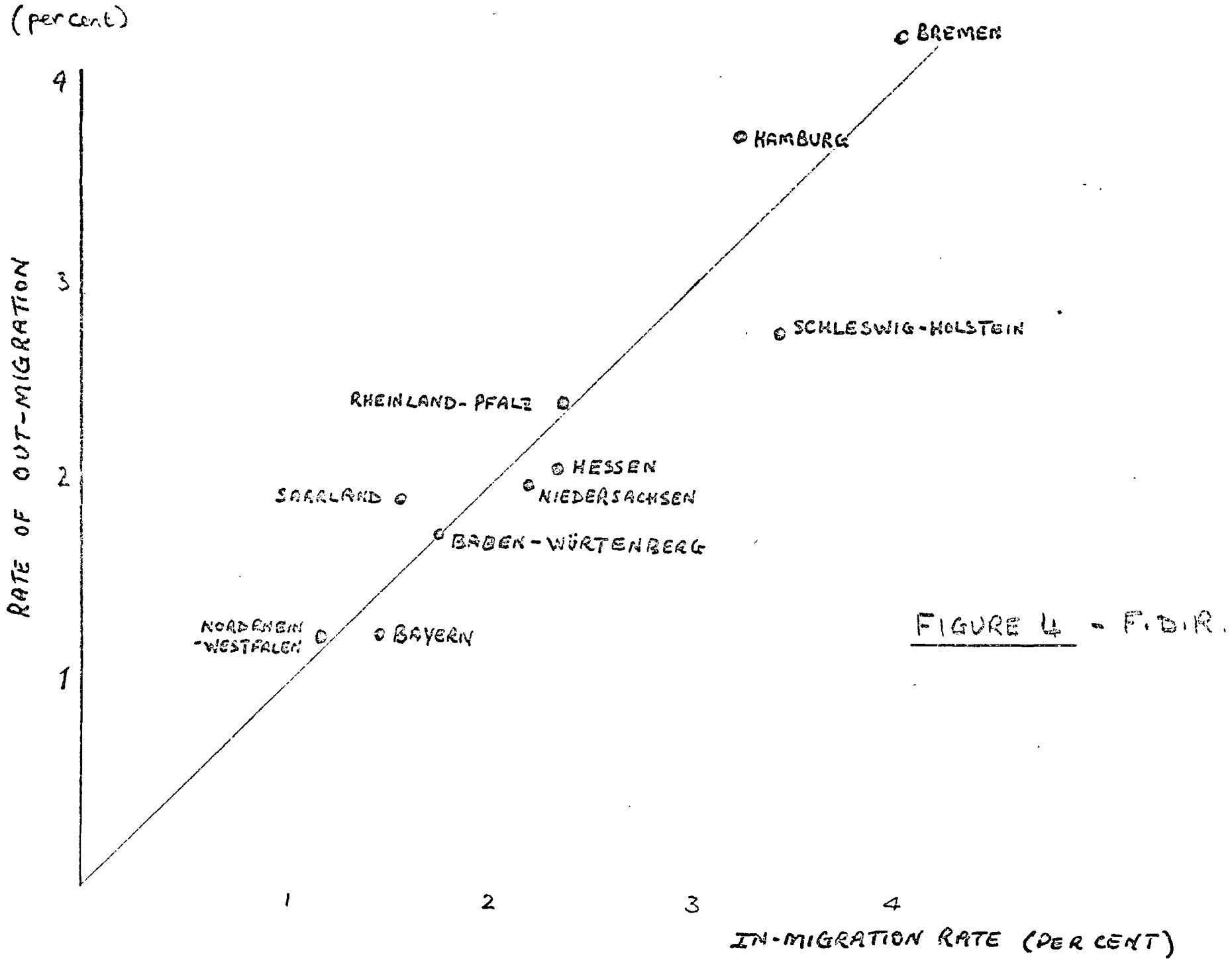

(per cent)
RATE OF OUT-MIGRATION
4
3
2
1
BREMEN
HAMBURG
SCHLESWIG-HOLSTEIN
RHEINLAND-PFALZ
HESSEN
NIEDERSACHSEN
SAARLAND
BADEN-WÜRTENBERG
NORDRHEIN-WESTFALEN
BAYERN
1
2
3
4
IN-MIGRATION RATE (PER CENT)

FIGURE 4 - F.D.R.

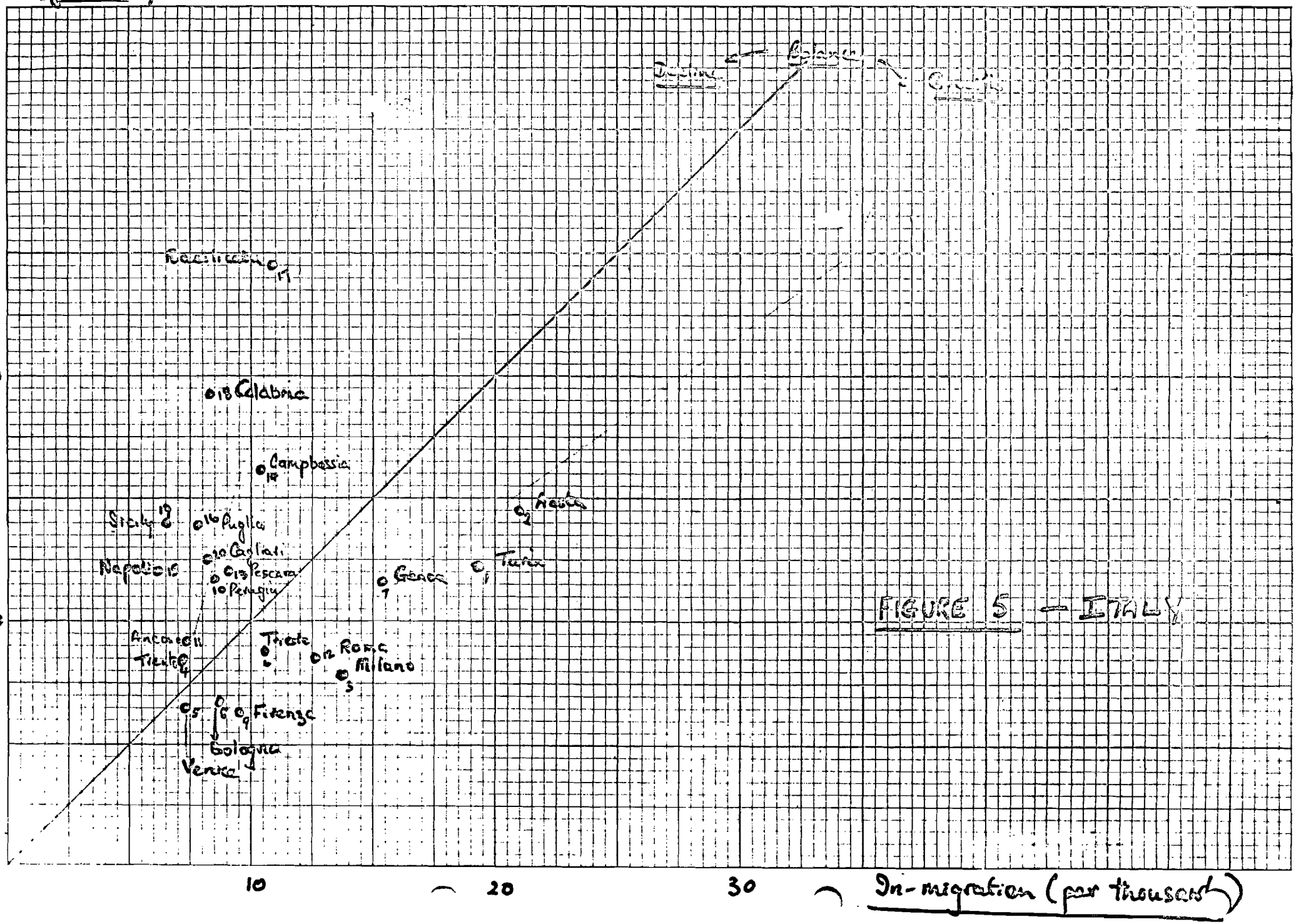
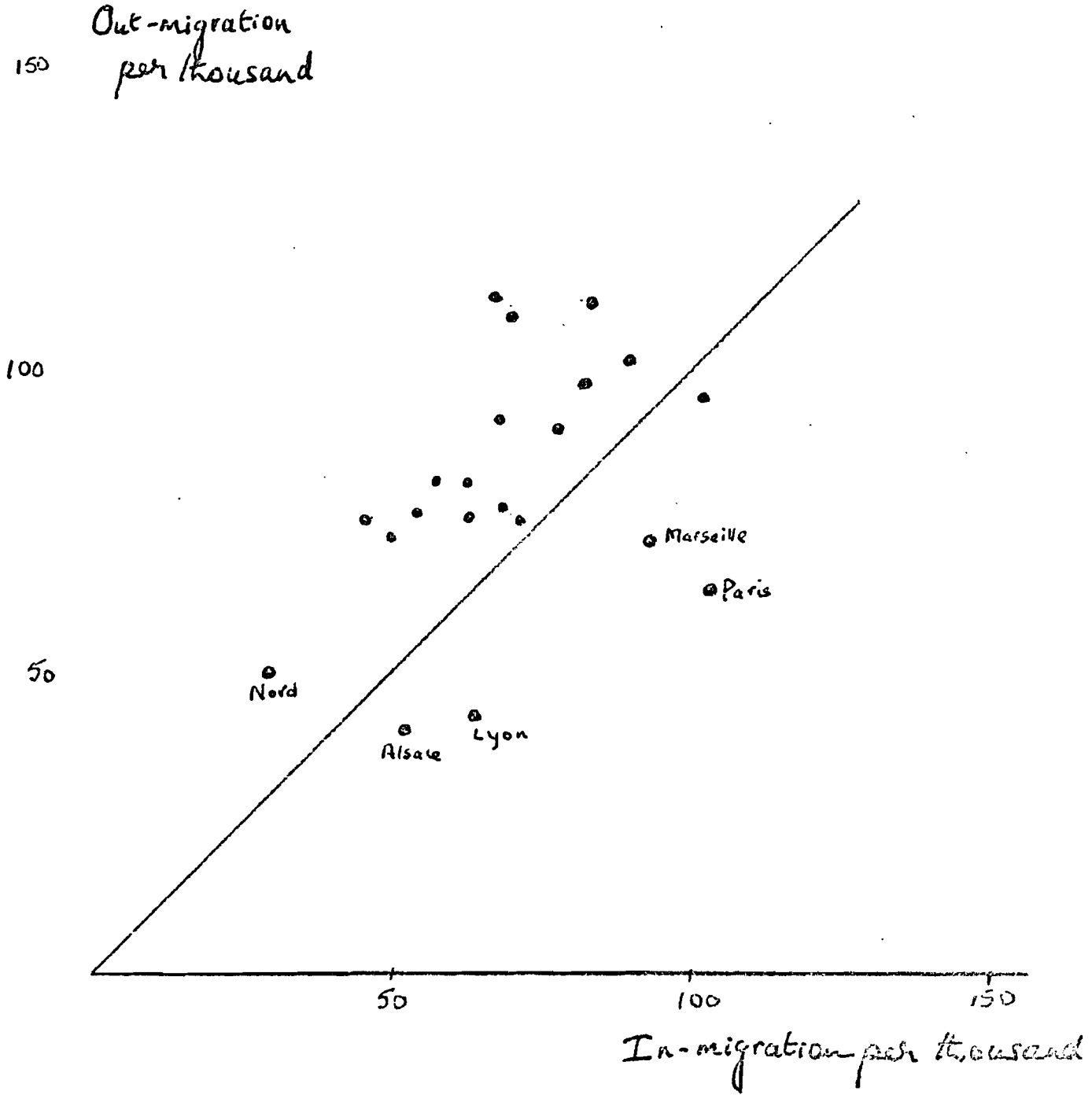


FIGURE 5 — ITALY

FIGURE 6 - FRANCE
1954 - 1962.



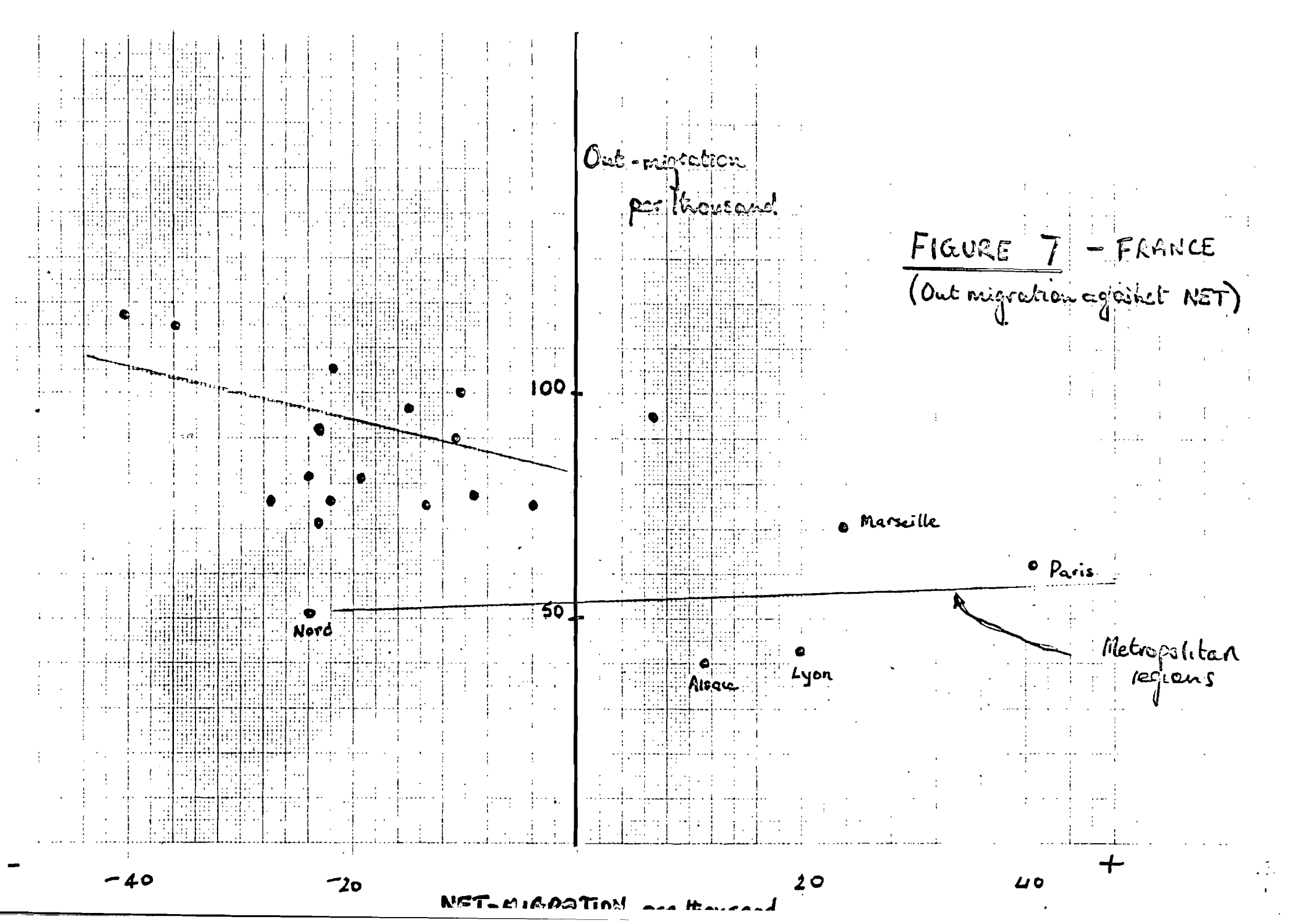


FIGURE 7 - FRANCE
(Out migration against NET)

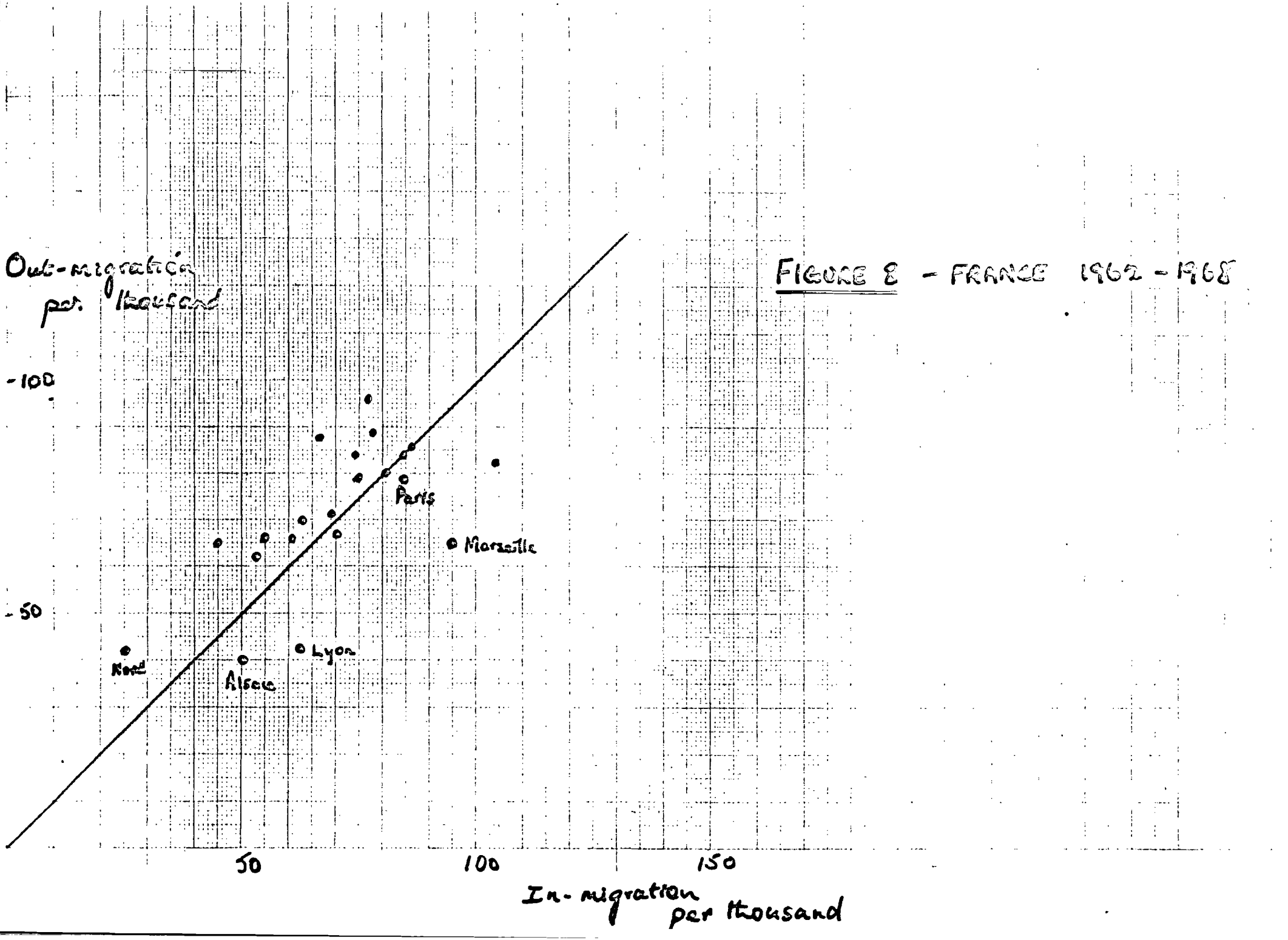


FIGURE 8 - FRANCE 1962 - 1968

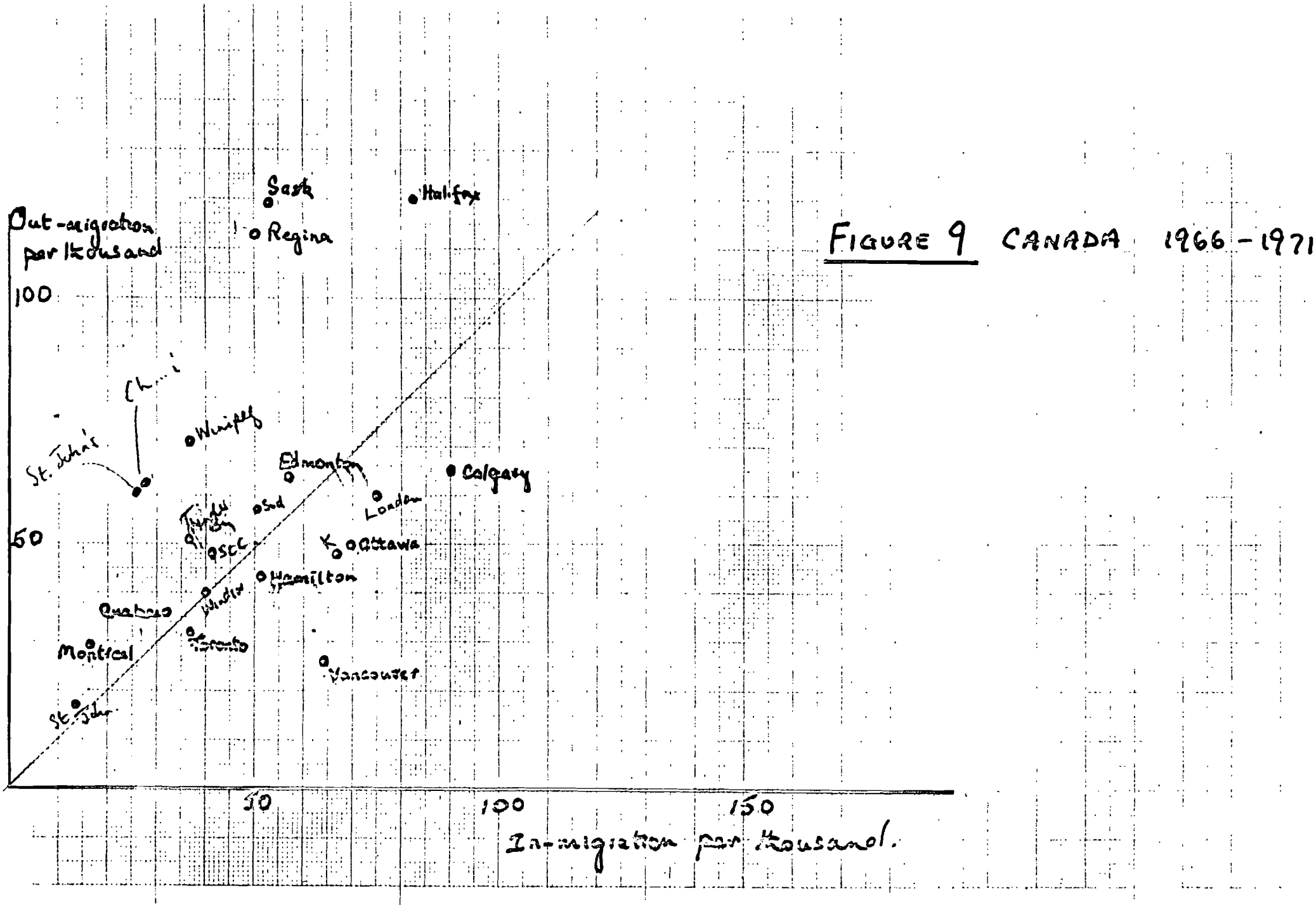


FIGURE 9 CANADA 1966 - 1971