RELATIONSHIP BETWEEN TIMBER CONSUMPTION AND ECONOMIC GROWTH IN THE OECD COUNTRIES WITH RESPECT TO THE EFFECT OF THE OIL PRICE EXPLOSIONS

Tibor Bencze

National Planning Office
H-1370 Budapest, Hungary

CONTENTS

RELATIONSHIP BETWEEN TIMBER CONSUMPTION
AND ECONOMIC GROWTH IN THE OECD COUNTRIES
WITH RESPECT TO THE EFFECT OF THE OIL
PRICE EXPLOSIONS

The relations between the consumption volume of timber manu-
facturing products and economic growth has already been
stated by several investigations. There are also such analyses
which indicated a very close relationship between the level of
economic development and per capita consumption. It should
also be mentioned that the recognition of these relationships
played an important role in the formation of timber consump-
tion forecasts elaborated by FAO.[1]/

In my study I intend to publish those results and experiences
which I managed to obtain in the course of analysing the facts
and figures in relation to the OECD countries between 1960–1982.
I carried out my investigations in three major groups of
timber manufacturing products. The product groups "sawnwood
and sleepers", "wood-based panels" and "paper and paperboard"
practically represent the whole scale of manufactured products.
At the judgement of the economic development level and economic
growth, respectively, I used the per capita GDP values in
constant 1975 year US $ prices for certain countries. In case
of the three product groups the analyses comprise every year
of the period and every OECD country. In the course of investi-
gations I applied on one hand graphic analitical methods and
on the other hand correlation-regression-analitical methods
as well.

1/ EUROPEAN TIMBER TRENDS AND PROSPECTS
    From 1950 to 2000
    Food and Agriculture Organization
    Geneve 1976

During my work I primarily investigated the following major
issues:

What kind of a relationship can be observed between
economic growth and the development of the consumption
of timber manufacturing product groups in certain
countries?
Are the relationships suitable to be used for making
forecasts by taking into consideration the constantness
and intensivity of the trend?

To what an extent did   oil price explosions[1]
influence the relationship between economic growth and timber
consumption[2]?

Did their effect result in steady or temporary changes?
How did the relationship develop between economic develop-
ment level[3] and timber consumption in case of investigated
countries? To what an extent did the character and the
intensity of the relationship change during the more than
two decades?

1/ Under oil price explosions the sudden change of the oil
   prices in 1973 and 1979 is to be understood.

2/ Hereinafter under "Timber consumption" the consumption of
   the three manufacturing product groups – defined in the
   introduction – is to be understood.

3/ In the investigation the economic development level is
   characterized by the level of the per capita GDP value in
   1975 constant US $ prices in certain countries.

Development of timber consumption as a function
of economic growth

The worked up data of certain countries are to be found in
the enclosed diagrams No. 1-16. To illustrate the developed
trends more clearly - in case of every country - I used one
figure for the three product groups. The specific consumption
data of the product groups are plotted in the diagrams against
the per capita GDP value in the given year.

>Under specific consumption in m^3/1000 capita
>is to be understood in the case of "sawnwood and
>sleepers" and "wood-based panels" while in the
>case of "paper and paperwood" kg/per capita value
>is to be understood. The per capita/GDP level is
>represented by the 1975 values in constant US $.

I connected the represented points in the diagram according
to the consecutive years. So I got a continuous line

- which gives an extremely clear review of the connec-
  tion between economic growth and timber consumption;

- where the degree of the intensity of the relation-
  ship becomes immediately apparent;

- which represents the development of specific timber
  consumption as a process - comprising a period of
  twenty two years;

- which shows how the change of conditions strongly
  influencing economic growth - eg. the oil price
  explosions in 1973 and 1979 - effected on one hand
  economic growth itself and on the other hand the
  development of the relationship between economic growth
  and timber consumption;

- which enables us to judge whether - after such a
  strong shock affecting all countries - any change
  can be expected and what kind of a change can be
  expected in the development of the trend of the
  relationships;

- and while there really exists a relationship between
  the development of timber consumption and the develop-
  ment of economic growth and while it is especially
  close in case of product groups "wood-based panels"
  and "paper and paperboard" the development of the
  consumption trend in time can considerably well
  followed in the diagram.

On the basis of the analysis of the diagram and the numerical
investigations of the relationship the following conclusions
can be drawn:

- Until the first oil price explosion - apart from
  the development of "sawnwood and sleepers" consump-
  tion in Australia and New Zealand - a positive rela-
  tionship can be observed between timber consumption
  and economic growth in the case of the three product
  groups in all countries;

- the relationship is considerably closer in case of
  "more up-to-date" timber manufacturing products
  - panels, paper and paperboard - than in case of
  of the "traditional" sawnwood and sleepers - product
  group.

The relationship can almost be considered as "function like"
between economic growth and the consumption of "more up-to-date"
assortments especially until the first oil price explosion in
several countries. Primarily, Austria, France, Ireland, Italy
and Spain belong to this group of countries.

The relationship between the product group "sawnwood and sleepers" and economic growth can clearly be observed in the investigation period. This can be stated despite the fact that after the second oil price explosion /1979/ a new phenomenon can be observed in several countries /Canada, the United States, Sweden and Japan belong to here/, in particular a very definite decline of specific sawnwood consumption. The intensity of the relationship is considerably weaker than either in case of wood-based panel or in case of paper and paperboards. This statement is true of the North European countries in an increased extent - where great wood resources are available the major part of which they export - /mainly Finland and Sweden/. It is, however, true in the case of Austria, Norway and Denmark as well.

> The proper explanation of these phenomena requires further investigation. It can, however, be supposed that the intensity of the relationship would improve if the calculation could be carried out on the basis of effective/real actual consumption data instead of the apparent consumption values /production + import - export = consumption/. The changes in stock are generally greater in this product group than in case of panels or paper and paperboards.

It is remarkable that while specific sawnwood product consumption rapidly increases - apart from the period after the second oil price explosion - in Canada, it hardly increases in the United States or it even stagnates during the same period. Apart from a short period - between 1960 and 1973 - specific sawnwood and sleepers consumption did not change in Great Britain either. The per capita values of the wood-based panels and paper and paperboard consumption consistently increased.

In the case of Australia and New Zealand - in an absolutely diverse way - negative correlation can be observed between economic growth and the specific consumption of "sawnwood and sleepers".

> The development of the trend is presumably the
> consequence of the fact that the removal volume
> of basic materials necessary to the production
> of "sawnwood and sleepers" products reduced and
> their procurement from other continents - due to
> price reasons etc. - was not possible or it would
> not have been expedient. By all means, this condi-
> tion could provide a good possibility for us to
> analyse the relationship between the consumption
> of sawnwood product and the consumption of "substi-
> tuting" products. The increase of the consumption
> volume of wood-based panels, paper and paperboards
> could not substitute   the falling out
> quantity of sawnwood.

On the basis of the graphic analysis <u>the conclusion can clearly be drawn that besides the permanent economic growth of a longer period and the "consistent and not sudden change" of conditions considerably influencing economic development a very definite relationship has developed between timber utilization and economic growth.</u> The closeness of this relationship achieves such an extent in case of wood-based panels, paper and paperboards that it would provide a possibility of forecasting consumption in most of the countries under investigation. I controlled the intensity of the relationship by correlation calculation as well.

The relationship could be best characterized by linear regression functions calculated on the basis of time series.

Only the development of the consumption of wood-
based panels in Denmark showed an absolutely
diverse trend.

The development of the specific consumption values of the
investigated rapidly developing countries /Japan, Greece or
Spain/ did not show a considerable difference from the general
tendencies. In case of Japan the linear relationship is very
definite between 1960 and 1973. As for Spain - after the
rising trend started in 1962 - the linear relationship is clear
as well. In the case of this country a close linear relation-
ship has developed in the sawnwood product group as well.
Greece can be characterized by the linear relationship as well.

However, should the development of economic growth be broken
- as a result of the considerable change of conditions-
/eg. oil price explosions in 1973 or in 1979/, the relation-
ship between timber consumption and economic growth undergoes
basic changes. The development of consumption - in case of
the three product groups - are under such conditions extremely
strongly influenced by other factors as well. However, this
forms the matter of the second chapter of my study.

However, before dealing with that problem I should like to
outline those major conclusions which can be determined in rela-
tion to the place of the three product groups in the structure
of consumption on the basis of the diagram:

    - On the basis of the analysis of the diagram   it is
      clear that in the timber exporting countries - and
      it is as true of Norway, Sweden and Finland as of
      Austria or Canada and also of the timber consumption
      in New Zealand - sawnwood products take a considerable

greater place in consumption structure [1] than also
in other countries under investigation. But also
the specific consumption of "up-to-date timber products"
is very high in these countries.

- It can also be stated that "paper and paperboards"
  represent a considerably greater proportion in timber
  consumption in Great Britain in comparison to the
  consumption structure of most countries.

- It can be seen from the diagram that in the major
  part of the South European and West European countries
  - in comparison to the timber exporting countries -
  "up-to-date" timber products represent greater weight,
  like "paper and paper boards" and "wood-based panels".
  The consumption data of Italy, Holland, the Netherlands,
  Luxemburg and the Federal Republic of Germany justify
  this fact.

- Finally, this graphic method also clearly proves that
  the proportion of "wood-based panels" and "paper and
  paperboards" grew - during the period under investiga-
  tion - in the consumption structure.

These statements already forecast that the relationship between
economic development level and specific timber consumption
is influenced besides development level by other factors as well.

1/ It should be taken into consideration that the position in
   the diagram is only relative while I used specific consump-
   tion values for all three product groups in their natural
   unit of measure, thus paper and paperboard products are
   characterized by kg/per capita while the two other product
   groups are characterized by m^3/per 1000 capita.

The influence of oil price explosions
on the development of economic growth
and specific timber consumption

The graphic method clearly and unanimously reflects how the
change of economic growth influences the development of
specific timber consumption. Generally, the effect of small
changes can be well followed in the diagram. Naturally, the
change of economic growth and economic development level in
certain countries can be seen from the diagram as well.

The oil price explosions had a considerably strong effect on
the development of the OECD countries. This effect - if not
to the same extent - was unconvenient for all countries under
investigation. Generally as a result of it the rate of economic
development reduced to a great extent and in the case of most
countries the achieved development level declined.

This change had a strong effect both on the development of
specific timber consumption and on the relationship between
timber consumption and economic growth. It is characteristic
that the reduction of specific consumption, achieved a far
greater extent that would have been justified by the - estab-
lished - relationship between economic growth and timber consump-
tion.

Thus, the development of timber consumption was influenced - be-
sides economic growth - by other factors to a far greater extent.

The change of relationship showed similar secondary signs during
the period of both oil price explosions. It can also be stated
that the deepest point of the negative effect could be observed
in the year - generally the second year - after the sudden price
change, namely in 1975 after the oil price explosion in 1973 and
in 1981 after the second oil price explosion in 1979.

The intensity of the negative effect - similarly to the extent of oil price change - was weaker in 1981 than in 1975.

Concerning the period between 1973 and 1975 it is noteworthy by all means that <u>in the specific timber consumption of Norway</u> - similarly to other countries - a considerable decline could be observed in comparison to the economic development level but it was the only country where economic growth <u>did not slow down</u> but even accelerated. This condition also justifies that during this period not the development of economic growth but other factors played the main role in the reduction of specific timber consumption.

Generally, <u>the decline concerned the consumption of sawnwood products to the greatest extent</u> but the specific consumption of "wood-based panels", "paper and paperboards" decreased strongly as well.

<u>Thus, under the influence of the oil price explosions the relationship which became established between timber consumption and economic growth under the relatively consistent economic development of previous periods broke off.</u> The question arises in any case: What happens or what can happen after the recovery of economic growth? Does the former relationship develop again or the formation of another different relationship can be expected?

The following question should be answered as well:
Which factors can primarily lead to such a great change in the relationship between timber consumption and economic growth under such an intensive change of conditions?

The investigation of the period between the two oil price explosions and that of the period following the second oil price explosion enables us to give certain answers.

Primarily, it can be stated that as far as the trend itself is concerned generally, the reformation of the linear relationship can be rendered probable which was otherwise characteristic of the period before oil price explosions.

It is also probable that this new relationship occurs at a lower level of specific timber consumption projected to the unit of the GDP. It seems to be possible especially in case of the timber exporting countries. This conclusion can be drawn from the development of the consumption trends in France, Belgien, Luxemburg, the Federal Republic of Germany, Japan and Great Britain. But the development of a similar trend becomes outlined in Austria and in Finland among the timber exporting where the development does not make impossible the recovery of the relationship-level of previous periods. In this respect Switzerland, Italy, Denmark and Australia should be mentioned first of all.

> Otherwise I note that the trend according to
> which relationships develop at a lower level seems
> to be justified by the investigation concerning
> the timely development of economic development
> level and specific timber consumption which will
> be dealt with in details later on.

Besides general tendencies it should be mentioned that in countries with especially high specific consumption after the second oil price explosion a considerable great decrease of specific consumption took place. The decrease is especially apparent in the case of sawnwood and sleepers product group. It achieves such a great extent primarily in the case of Canada and the United States that it makes the steadily lower level of specific consumption probable.

However, taking into consideration the fact that similar
phenomena can occur in some other timber exporting countries
generally with large wood stocks so it can be judged that the
extremities of specific consumption indexes can moderate. It
is probable in the sawnwood and sleepers product group that
the especially high specific values of the timber exporting
countries come narrower to the lower indexes generally, of
the timber importing countries.

For sake of the future utilization of the investigation results,
the better judgement of expected tendencies it is extremely
important to become familiar with those results which are
primarily to be blamed for the considerable change - outlined
above - of the tendencies.
Answering this question is not an easy task because - and it
is clearly justified by the investigations - it is about the
summarizing effect of several factors.

Out of the factors, primarily the extremely strong increase,
and the considerable decline of fixed assets consumption
/construction activity/ - strongly exceeding the rate of modera-
tion of economic growth - should be mentioned.

> As for timber prices it can be observed that so
> after the oil price explosion in 1973 as in 1979
> they suddenly rose. The highest timber price level
> - in the given period - was achieved in the first
> or in the second year after the oil price explosion.
> A drastic decline of timber consumption can also be
> observed during this period. Thus, it is the sudden
> change of prices which is essentially "responsible"
> for the change of consumption tendencies during a
> period when conditions underwent such great changes.

At the same time it should also be stated that
- after one or two years after the shock - the
relationship between economic growth and timber
consumption became restored besides the consi-
derably higher timber price level. This relation-
ship was, however, not influenced either by smaller
or permanent price changes. <u>Concerning a longer
term, the development of timber consumption is
actually determined by economic growth!</u>

I think, however, that answering these questions require
further investigations. Taking into consideration the out-
lined factors brings nearer up to a better knowledge of the
relationships between economic growth and timber consumption
and other factors, respectively.

The relationship between timber consumption
and economic development

The results of former chapters indicated that between the
development of the specific consumption indexes of the investi-
gated product groups and of economic growth in the OECD countries
there exists a very close - although different by product groups -
correlation relationship.

The diagrams clearly show that the type of relationships can
be considered as nearly identical in all countries and they
make probable an actual relationship between the specific
indexes of economic development level and timber consumption.
Otherwise it was already stated by several other investigations.[1]

---

[1] eg. Ferenc Jánossy: The measurability and a new measuring
method of economic development level
Budapest, 1963
EUROPEAN TIMBER TRENDS AND PROSPECTS
1950-2000
Food and Agricultural Organization

In the course of investigations "the economic
development" level was characterized by the
level of per capita GDP in constant 1975 year
US $ price.

The diagrammatic procession of data - diagrams No. 17-18-19 -
has also indicated that there exists the relationship
- between 1960-1982 - during the investigated period as well.
However, it can also be stated that the relationship can not
be described by the same regression function neither in case
of "sawnwood and sleepers" nor in case of "paper and paper-
board". In case of both product groups two different groups
of countries are separated.

However, such a definitely diverse trend can not be determined
in "wood-based panels". The data of all countries indicated
a relationship of identical character.

In order to get an answer to the development of the types
of relationships and the intensity of relationships in time
I used the cross-cut data of four different years in case of
all three assortment groups.

Using the time series of the latest OECD
statistics concerning the years between
1964-1982 I carried out the regression
analyses for the years 1964, 1973, 1979 and
1982.
In selecting the years I was guided by two
points of view. On one hand I wanted to know
the relationships between the first and the
last year of the investigated period, on the
other hand the relationship between those
years which - as being the years of oil price

explosions - practically mean the end of the
development period as well.
The year 1973 was otherwise the medium year
of the period.

In case of the "s a w n w o o d a.n d s l e e p e r s"
/diagram No. 18. it can clearly be stated that the relation-
ship between specific consumption of timber importing and
timber exporting countries and economic development level is
different. Primarily, the North European countries where great
timber stocks are available /Finland, Norway, Sweden/ the
North American countries rich in timber/ Canada, the United
States/ and furthermore Austria, Portugal, and New Zealand
which also export timber belong to the "timber exporting
countries".

Taking into consideration the place of specific consumption
data in the diagram, however, even Denmanrk and Japan can be
classified into this group. It is characteristic of this group
that the specific consumption of the countries belonging to
here exceeds the specific consumption values of countries
with similar development level.

> Although I called this group "timber exporting
> group" but naturally no expert leaves it out of
> consideration that in this group also timber
> importing countries are to be found. Denmark,
> Japan and the United States belong to this
> cathegory. It shows that - although a higher
> consumption level of "sawnwood and sleepers" is
> generally characteristic of timber exporting
> countries - its development is, however, influenced
> besides available timber stocks and economic develop-
> ment level by other factors as well. For instance
> the consumer habits of the region where the
> country is situated.

A further characteristic of the countries belonging to this cathegory is that the relationship between economic development level and specific consumption is considerably looser - the correlation coefficient shows only 0.77 value which is calculated on the basis of 1979 data - than in case of the "timber importing group". This also indicates that in this group the redundance of timber material and regional effect is a strong influencing factor.

I investigated the adjustment of various regression functions in relation to the 13 "timber importing" countries in four years. Concerning the years 1964, 1973 and 1982 the

$$\lg y = a + b.\lg x - \text{type of function proved to adjust in the best way.}$$

Concerning the relationship of 1979 the correlation was the closest in case of the application of the

$$y = a + b.x \quad - \text{type of function}$$

$$\text{where} \quad y = \text{per 1000 capita consumption of sawnwood and sleepers}$$

$$x = \text{per capita GDP value in constant 1975 US } \$$$

The parameters of the regression functions and the correlation coefficients developed in the years under investigation as follows:

Year	a	b	r
1964	- 0.9238	0.9035	0.94
1973	- 0.3782	0.7345	0.92
1979	70.09	0.02527	0.90
1982	+ 0.0156	0.6045	0.83

r = correlation coefficient

The calculations show that <u>the relationship between sawnwood</u>
<u>consumption and economic development level</u> - especially after
the second oil price explosion - is considerably more uncertain
than it used to be. It can also be observed that <u>the intensity</u>
<u>of the relationship gradually decreased in the period under</u>
<u>investigation.</u>

The diagram shows that the specific consumption of "sawnwood
and sleepers" decrease in comparison to GDP. It also demonstrates
that the type of regression curves changes. The regression
curve of 1979 is linear in comparison to the three other years.

> In the diagrams - and the same is true of
> the graphical illustration of wood-based
> panels and paper and paperboards - four
> calculated regression curves and data series
> of 1973 are illustrated. The countries are
> marked by the usual abbreviations used on
> transport equipment.

Such a diverse tendency - as in case of sawnwood products -
can not be observed in case of "w o o d - b a s e d p a n e l s".
At the same time it also indicates that the development of
specific consumption depends to a less extent or does not
depend at all from the timber production facilities.

In every year under investigation the

$$lg\ y = a + b \cdot lg\ x$$ type of function proved to adjust
in the best way.

The parameters of the function and the correlation coefficients
developed as follows in the given years:

Year	a	b	r
1964	- 2.9781	1.2846	0.93
1973	- 2.7249	1.2543	0.91
1979	- 2.0480	1.0607	0.92
1982	- 1.8072	0.9816	0.91

In comparison to the previous product group some differencies can immediately be observed concerning diagram 18 and the figures.

While in case of "sawnwood and sleepers" the specific consumption values belonging to the same development level decreased gradually and permanently it did not occur in case of "wood-bassed panels". The 1973 regression curve shows clearly an increase of specific consumption. According to the relationship in 1979 a unit of GDP value/that is development level/ implies higher specific consumption than in 1964. This diverse trend also indicates a substitutional relationship between the product groups of "sawnwood and sleepers" and "wood-based panels". Although 1982 year data - obviously as a result of the effects of oil price explosions - show here the relative decrease of specific values and the relationship between the two product groups seems to be proved the contradictory nature of their regression curves.

While in case of "sawnwood and sleepers" the intensity of correlation steadily decreased in time - between 1979 and 1982- such a definite tendency can not be observed in case of "wood-based panels". The intensity of the relationship did not essentially change between 1973 and 1982. The 1979 value indicated that the reformation of the 1964 level of relationship is probable.

On the basis of the diagrammatic analysis of the specific
consumption indexes of product groups "paper   and paper-
boards" /Diagram 19./ also two definite groups can be determined.
Great Britain, Ireland, Finland, the United States, Japan and
New Zealand belong to the first one. It is characteristic of
this group that their specific consumption values belonging to
the same development level considerably exceed the indexes of
the other group. In this case the difference can not be
explained by timber stocks of the concerned countries which
exceed the average while four out of the six countries can
clearly be classified into the group of timber importing
countries. The reason for it is probable the difference of
the consumer habits due to which - although in close connec-
tion with the development level - a relatively higher level
of specific consumption has developed in comparison to other
countries.
The other 17 countries under investigation belong to the
second group. Concerning these 17 countries the

$$lg \ y = a + b \cdot lg \ x \quad - \text{type of function}$$

proved to adjust in the best way - as in case of panels -
in this group as well.
The parameters of the function and the correlation coefficients
developed as follows in certain years:

Year	a	b	r
1964	- 2.7164	1.2701	0.97
1973	- 2.1881	1.1287	0.97
1979	- 1.9824	1.0678	0.96
1982	- 2.05539	1.0789	0.94

In the aggregate it can be stated that the specific consump-
tion indexes of the six countries having different consumption

level have also developed in close connection with economic
growth. It shows that the correlation coefficient calculated
on the basis of the indexes in the four years under investiga-
tion - besides the $y = a + b \cdot x$ type of linear relationship -
equals to 0.96.

In the aggregate it can be stated that the relationship bet-
ween development level and specific consumption indexes proved
to be most intensive in case of paper and paperboards among
the three investigated product groups. Although the timely
reduction trend of the specific consumption value - belonging
to the same development level - can also clearly be observed,
the reduction of the index is far smaller than either in case
of "wood-based panels" or "sawnwood" products.

I think that on the basis of the diagrammatic and numerical
investigations concerning relationships the conclusion can
clearly be drawn that there is a close conncection between
the development level of certain countries and the specific
consumption of the main timber manufacturing product groups.
The consumption level is determined by the development level
to a great extent.

It is also clear that the closest connection can be found
in case of paper and paperboards.

The oil price explosions did not essentially change the type
of connection. At the same time they also confirmed and
formulated, respectively, in the development of the consump-
tion of "up-to-date" timber product groups what was previously
characteristic of "sawnwood and sleepers" - namely the trend
of reduction of specific consumption - belonging to the same
development level - in time.

It can also clearly be stated that the relationship is not identical in case of "sawnwood an sleepers" and "paper and paperboards" in all OECD countries. In both product groups two different type groups of countries have developed indicating diverse relationships.

In case of "sawnwood and sleepers" the timber exporting group of countries indicates a definitely different relationship. Its major characteristic is that here there is a considerably looser relationship between economic development level and specific consumption than in case of other product groups or groups of countries because here "redundance of timber" plays a presumably important role in the development of consumption.

In case of "paper and paperboards" a system of the relationships of six countries - mainly Anglo-Saxon countries - can be distinguished from the remaining 17 countries. Here, however, the reasons can primarily be attributed to the consumer habits and not to the redundance of timber. It is indicated by the fact that the intensity of the relationship - taking into consideration the total data series of the investigated four years - corresponds to the intensity of the relationship of a greater group of countries.

Finally, it should also be stated that although the correlation coefficients - especially in case of paper and paperboards - indicate an extremely close relationship, the regression function adjusted on the base of development level - due to their high scatter values - is not suitable for forecasting the development of specific timber consumption in certain countries.

In case of "wood-based panels" and "paper and paperboards" it is expedient to use the regression relationships determined on the basis of the economic development in certain countries for this purpose.

The relationship between the economic
development level and specific consump-
tion seems, however, to be improvable
if we use the indexes expressing "actual"
economic development level for their
determination.
It is shown by the results of the investi-
gation which I carried out through the
application of corrected GDP values
expressed in ECU and PPS gained as a result
of the "Comparison of the GNPs in EEC
countries".[1]

Besides the application of the GDP values expressed in 1975
US $ in the course of investigations I investigated
the relationships concerning "paper and paperboards" also
with the help of corrected GDP indexes calculated in ECU and
PPS. In the analyses I used the data of 11 countries /9 member
countries of the EEC and two candidates/. The diagrammatic
illustrations of the relationships are to be found in diagrams
20, 21 and 22/.

The three tables clearly show that on one hand the development
of the functions and on the other hand the intensity of the
relationship are changed to a great extent if we use consumption
values in the corrected GDP function - measured in ECU or in PPS -
instead of GDP level expressed in US $.

The most apparent is the way how well the specific indexes of
Ireland and Great Britain belonging to a separate group adjust
to the consumption indexes of other countries.

The numerical investigation further confirms the possibility
of the improvement of the relationship. The application of GDP

[1] Comparison in Real Values of the Aggregates of ESA
    Eurostat, Luxemburg, 1983

values measured by corrected indexes improves the intensity
of the relationship by about three percantage points in com-
parison to the GDP values measured in US$.

I think that this condition also justifies the fact that the
reliability of the description of the relationship can further
be improved on one hand by a more accurate judgement of develop-
ment level, on the other hand by a better knowledge of the
factors causing differences.

Budapest, 24th October 1984

Dr. Tibor Bencze

References

BENCZE, T.

The Development of Timber Consumption in Europe and some
Extra-European Countries between 1960-1979. Problems and
Possibilities of More Reliable Forecasting with Special
Respect to the Oil Price Explosion.

Doctoral Dissertation

Budapest, 1982

Comparison in real values of the Aggregates of ESA
EUROSTAT, Luxemburg, 1983

EUROPEAN TIMBER TRENDS AND PROSPECTS
1950 to 2000
Supplement 3 to Volume XXIX
of the Timber Bulletin for Europe
FOOD AND AGRICULTURE ORGANIZATION
Geneva 1976.

JÁNOSSY, F.
The measurability and a new measuring method of economic
development level
Budapest, 1963.

NATIONAL ACCOUNTS
OF OECD COUNTRIES
1950 - 1979
VOLUME I. Paris, 1981.

MATIONAL ACCOUNTS
OF OECD COUNTRIES
1962 - 1979
VOLUME II.
DETAILED TABLES, Paris, 1981

NATIONAL ACCOUNT
of OECD COUNTRIES
VOLUME I.
1953 - 1982
Paris, 1984.

NATIONAL ACCOUNTS
of OECD COUNTRIES
DETALILED TABLES
VOLUME II
1964 - 1981
Paris, 1984.

WORLD FOREST PRODUCT STATISTICS
A TEN-YEAR SUMMARY
1954 - 1963
FAO of THE UNITED NATIONS
Rome, 1965.

YEARBOOK OF FOREST PRODUCTS
1964 - 1975
FAO of THE UNITED NATIONS
Rome, 1977.

YEARBOOK OF FOREST PRODUCTS
1968 - 1979
FAO of THE UNITED NATIONS
Rome, 1981.

YEARBOOK of FOREST PRODUCTS
1971-1982
FAO of THE UNITED NATIONS
Rome, 1984.

APPENDIX: DIAGRAMS

FIGURE 1: GREECE,

m³/1000 capita
kg/capita

CONSUMPTION

SAWNWOOD+SLEEPERS
1975
1973

PAPER+PAPERBOARD
WOOD-BASED PANELS

GDP per capita in constant 1975 US$

AUSTRIA

m³/1000 capita
kg/capita

SAWNWOOD+SLEEPERS
1973
1979

CONSUMPTION

PAPER+PAPERBOARD

WOOD-BASED PANELS

GDP per capita in constant 1975 US $
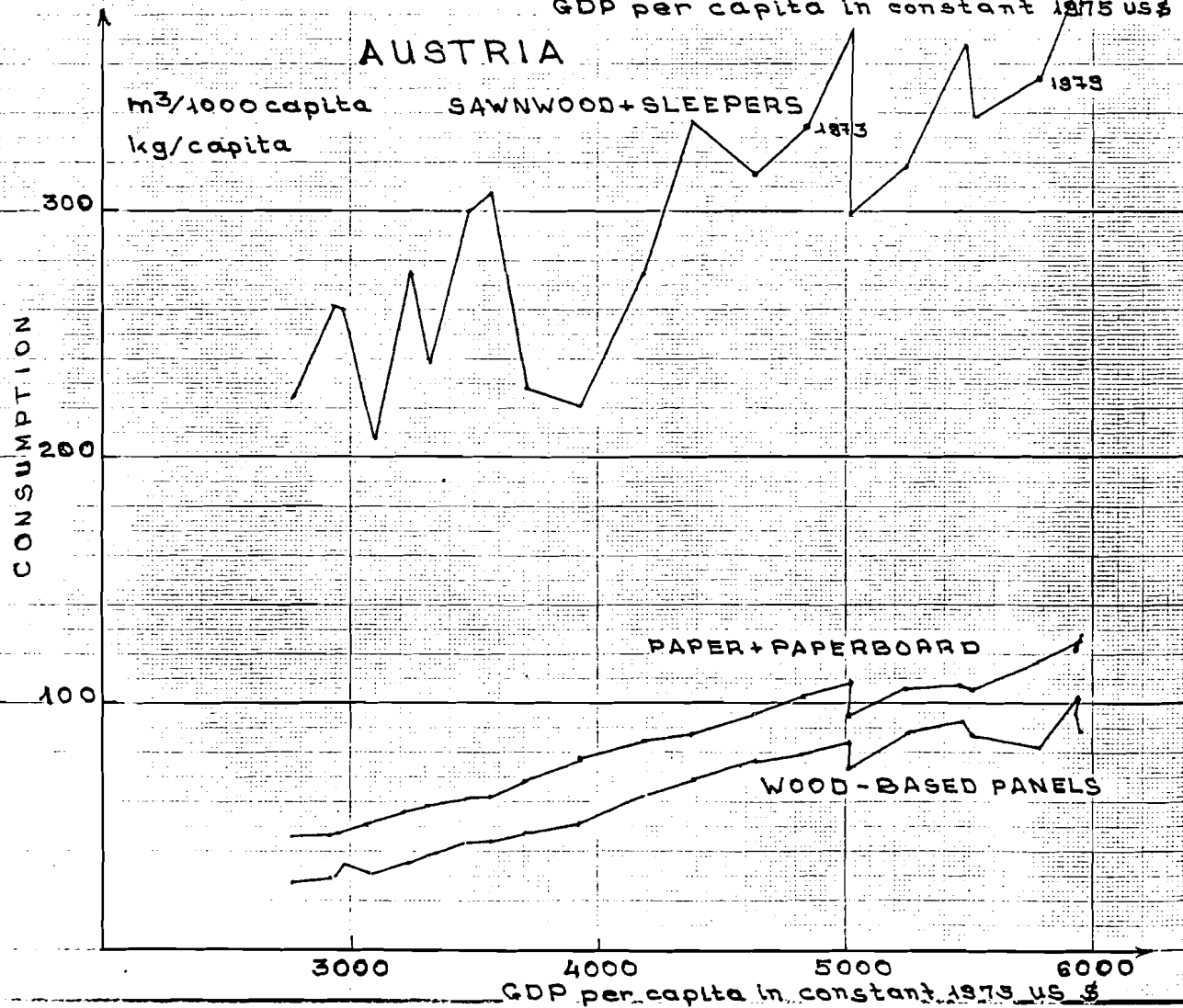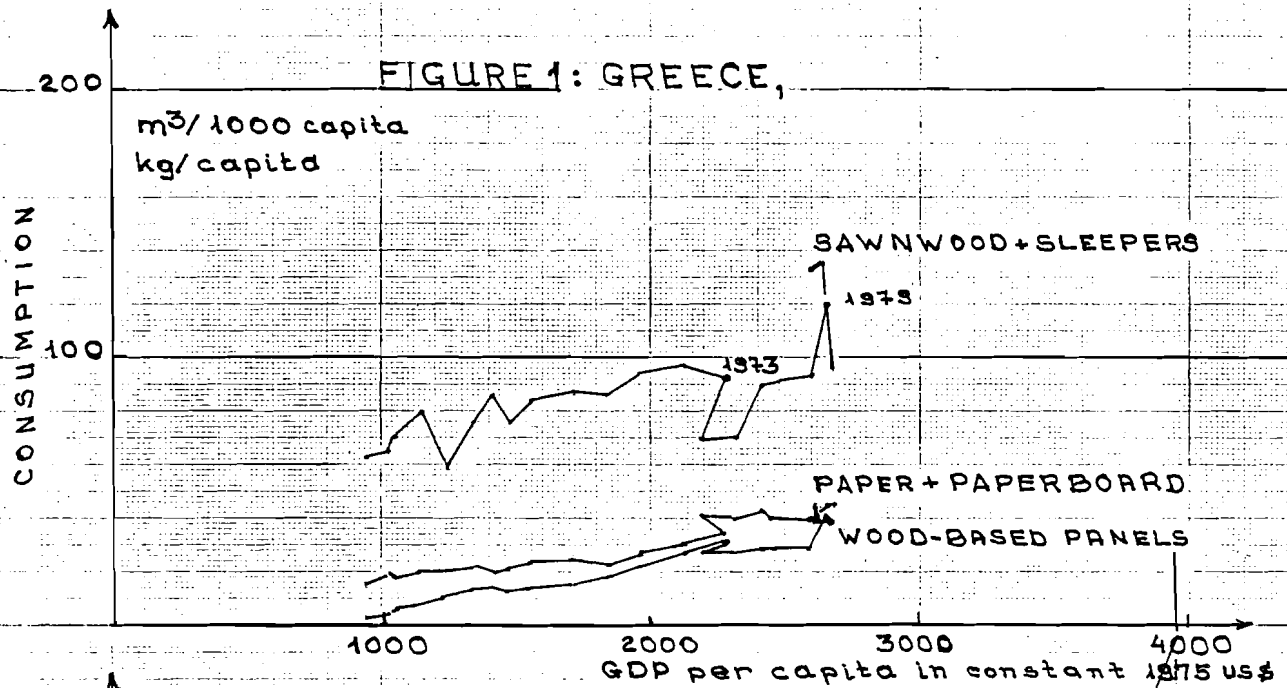
FIGURE 2: FRANCE,
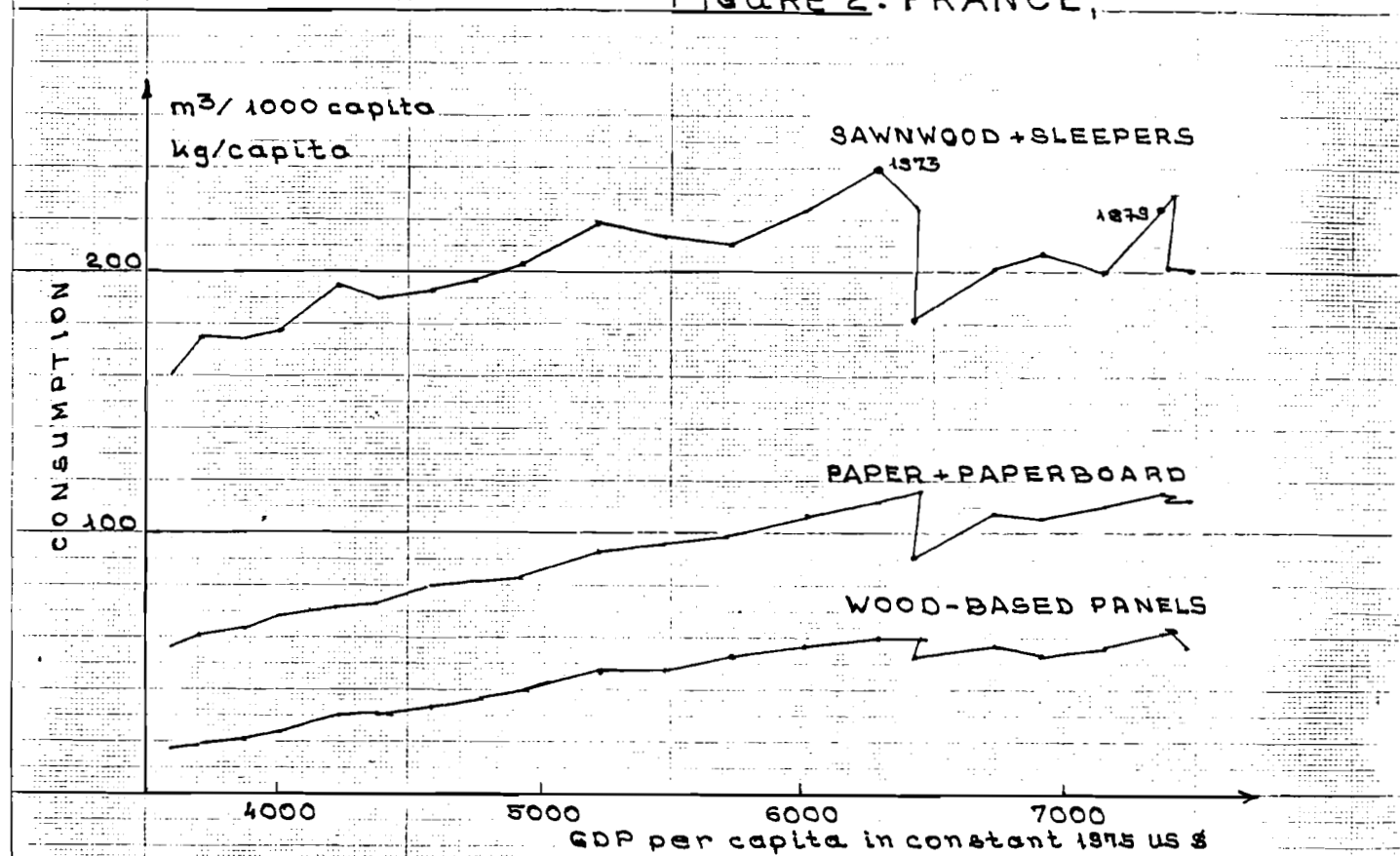
BELGIUM-LUXEMBOURG

FIGURE 3: DENMARK
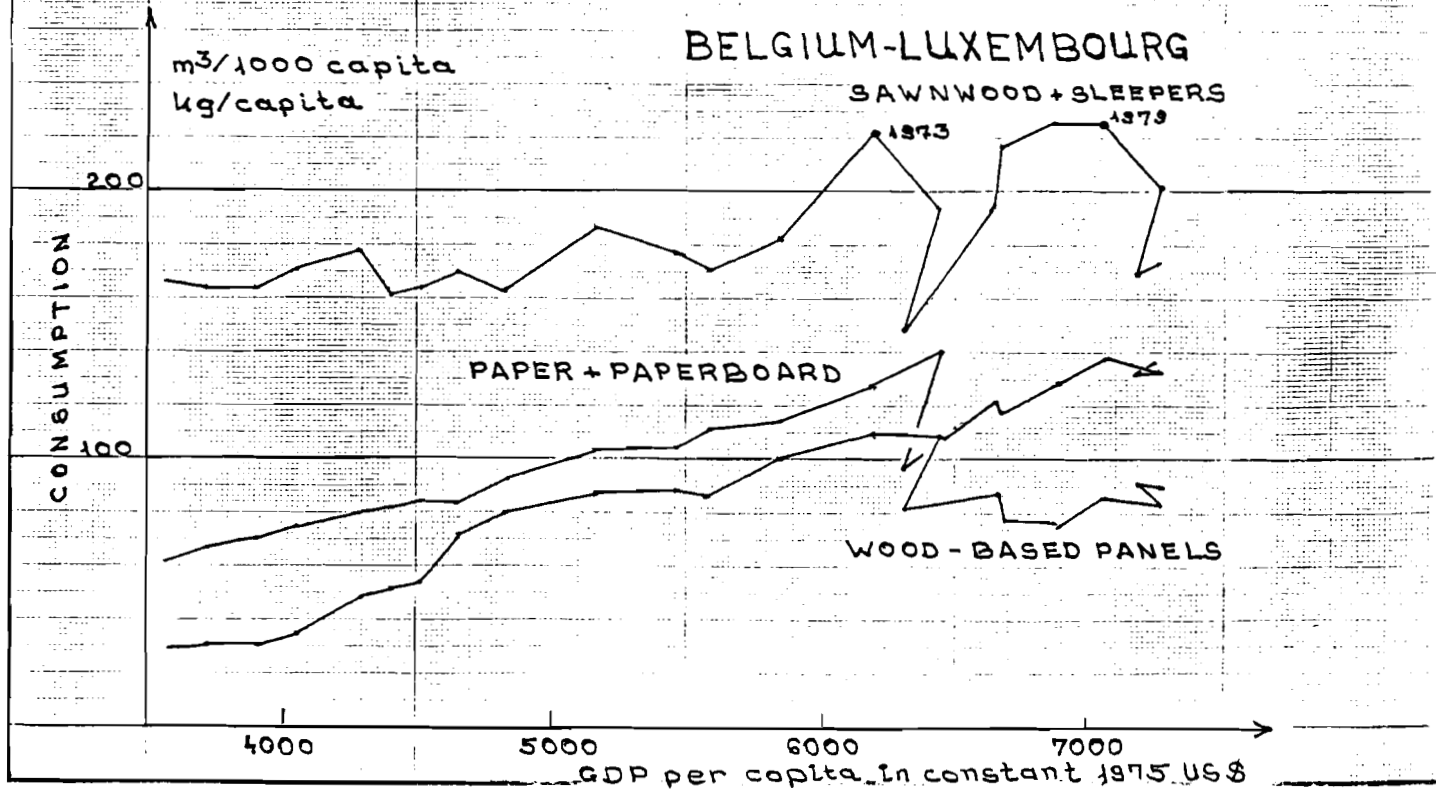
FIGURE 4 : FINLAND
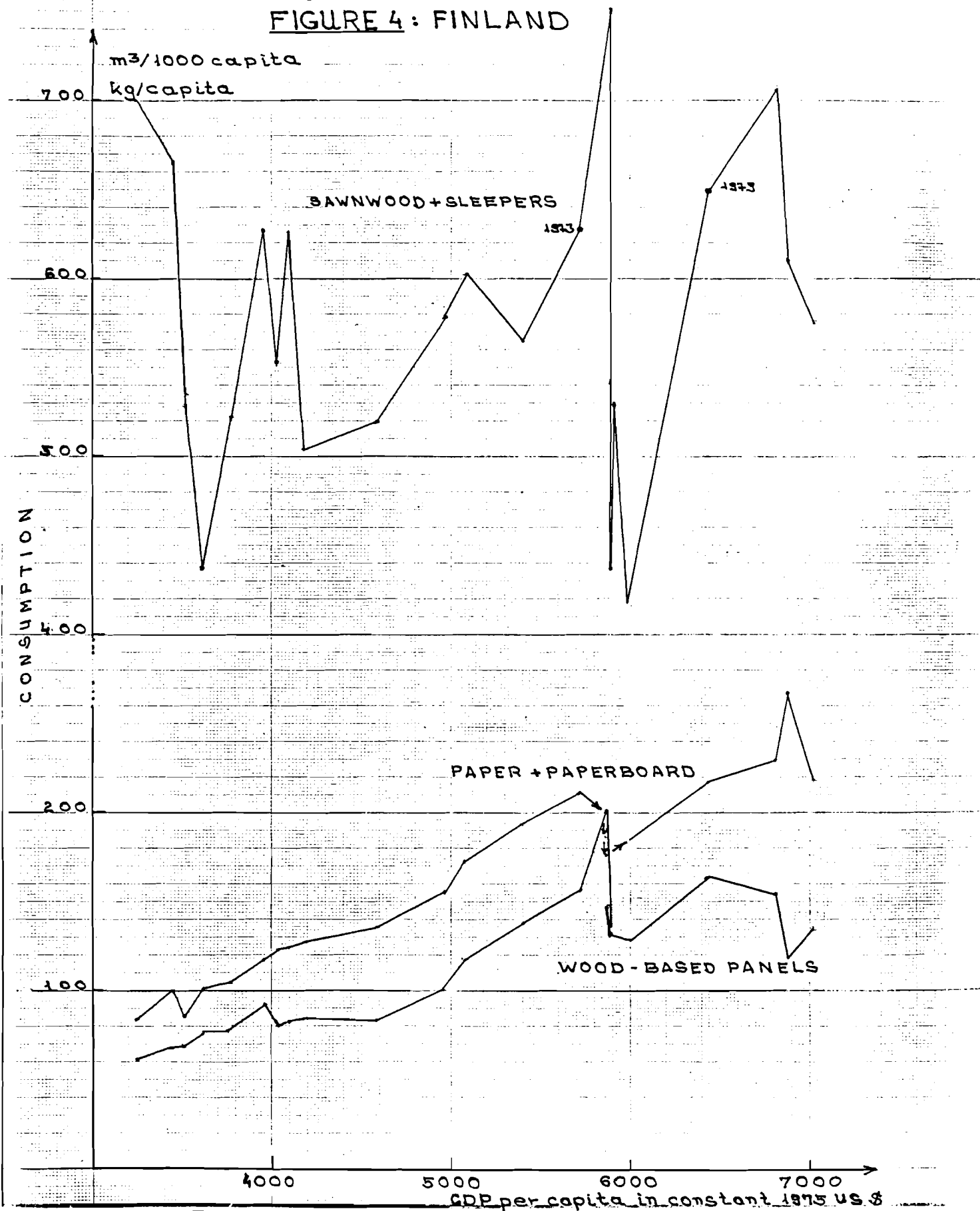
FIGURE 5 : IRELAND,

FIGURE 6: ITALY,

m³/1000 capita
kg/capita

SAWNWOOD + SLEEPERS
1573   1979

100

PAPER + PAPERBOARD

WOOD-BASED PANELS

2500   3000   3500   4000

GDP per capita in constant 1975 US $

m³/1000 capita
kg/capita

1573   ICELAND

SAWNWOOD+SLEEPERS

300

1979

200

WOOD-BASED PANELS

100

PAPER + PAPERBOARD

4000   5000   6000   7000

GDP per capita in constant 1975 US $
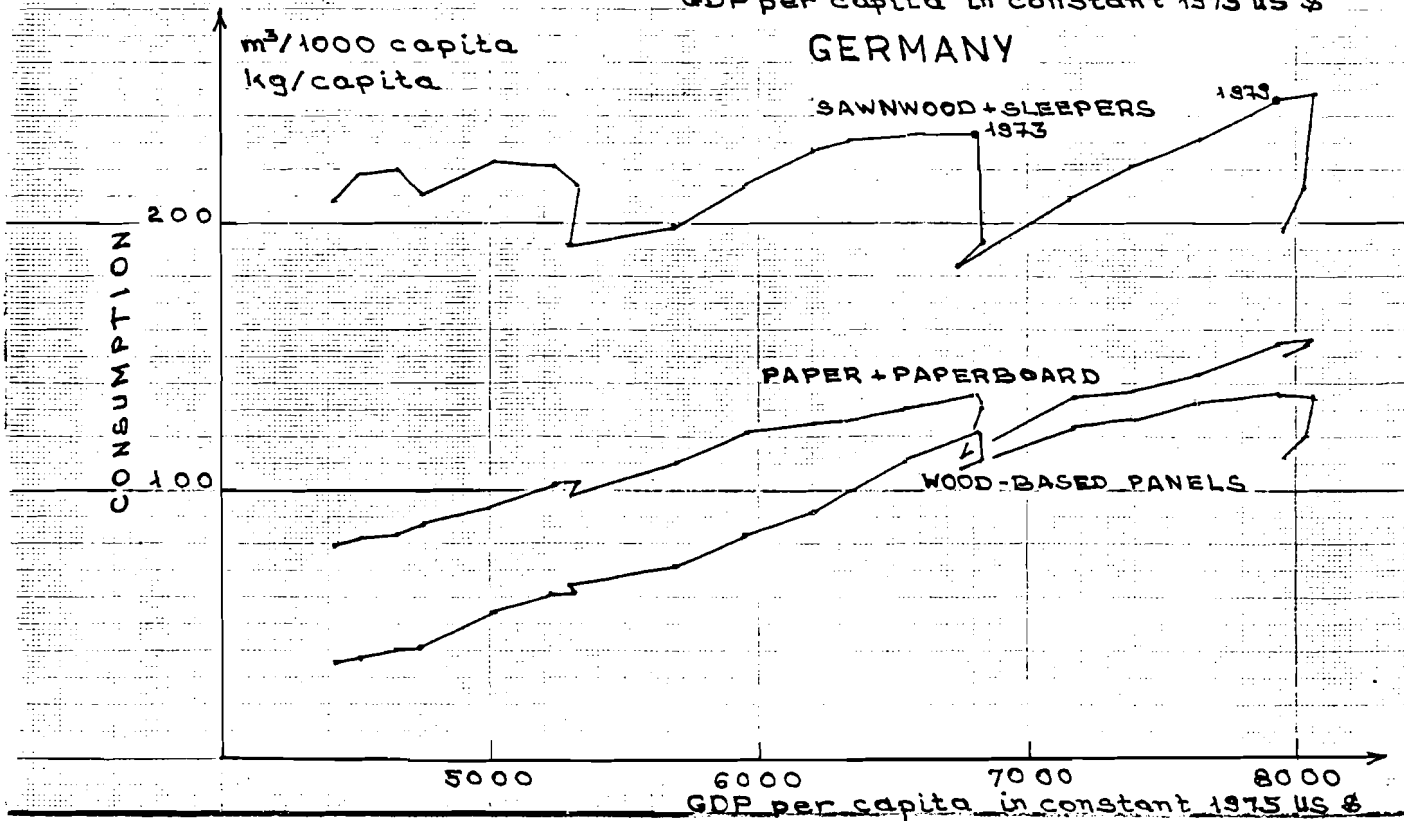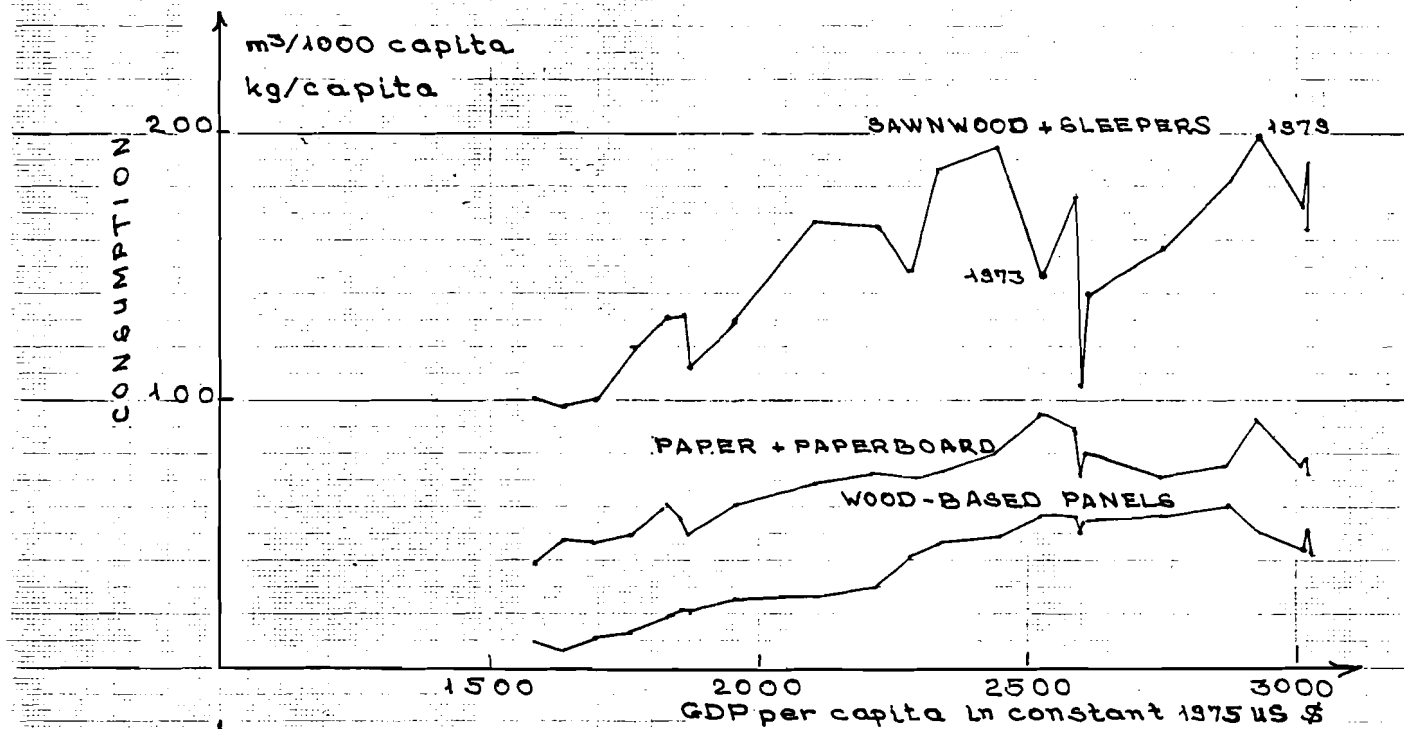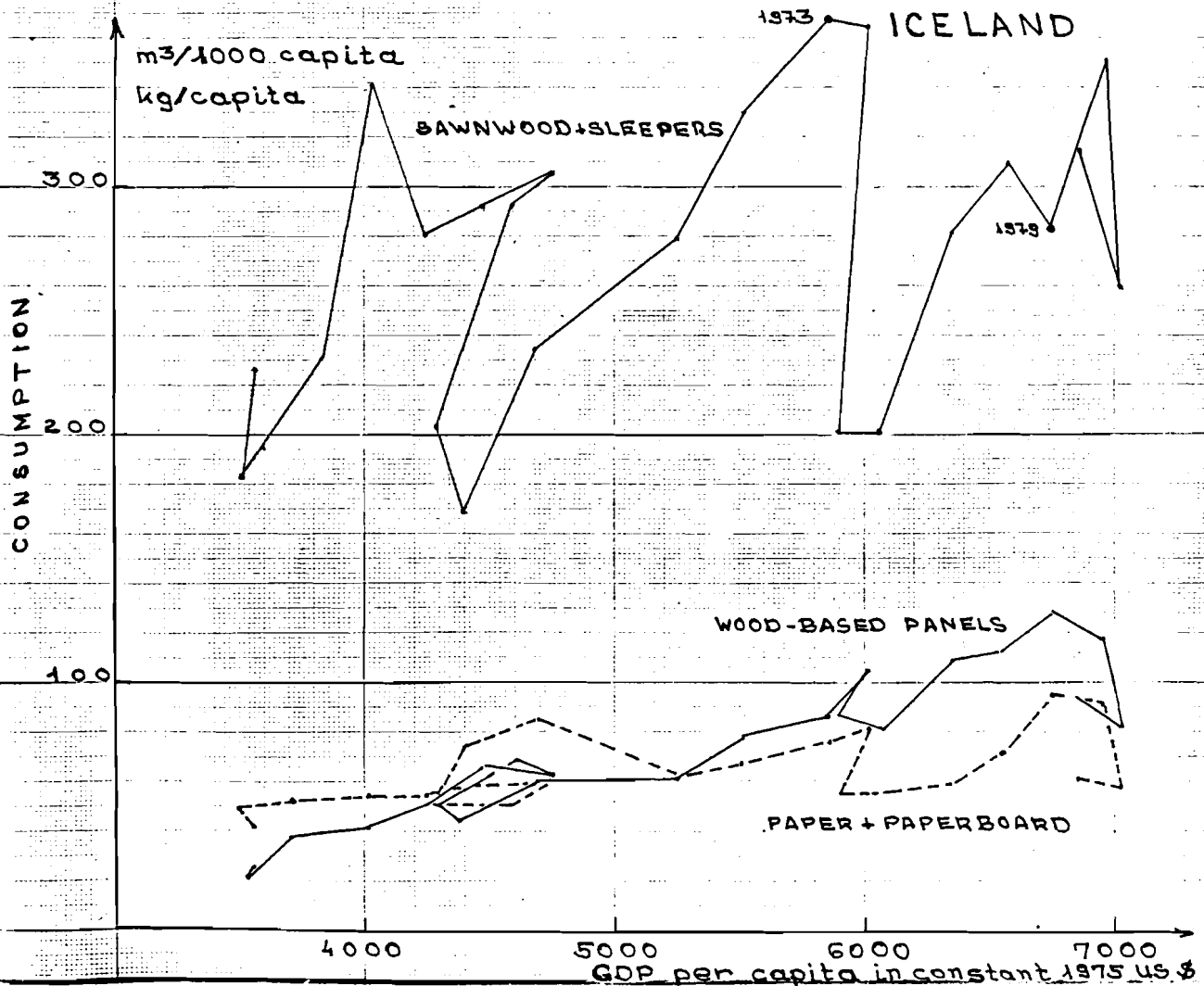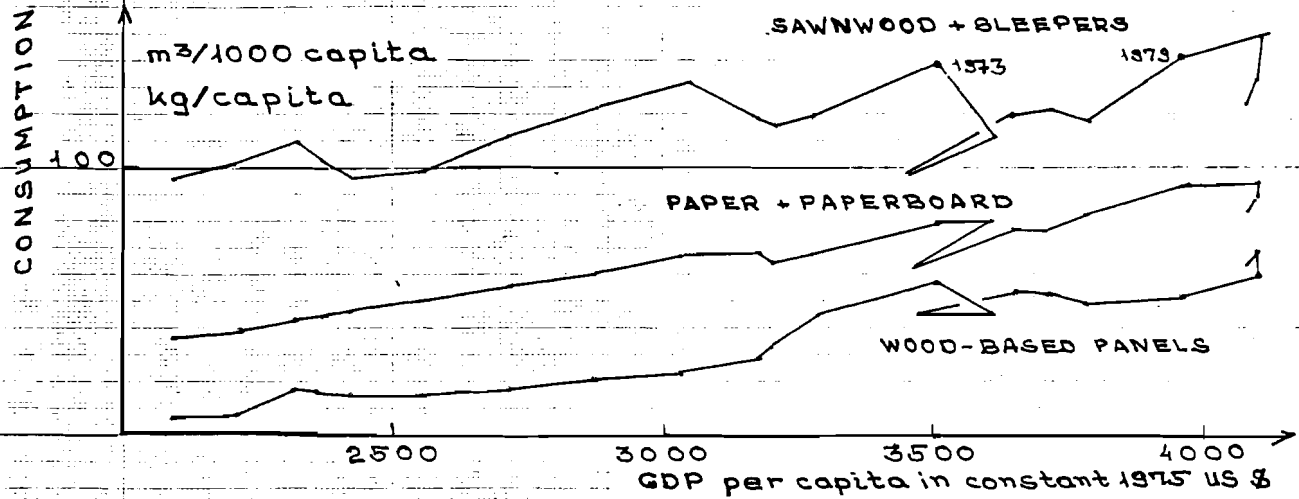
FIGURE 7: PORTUGAL,
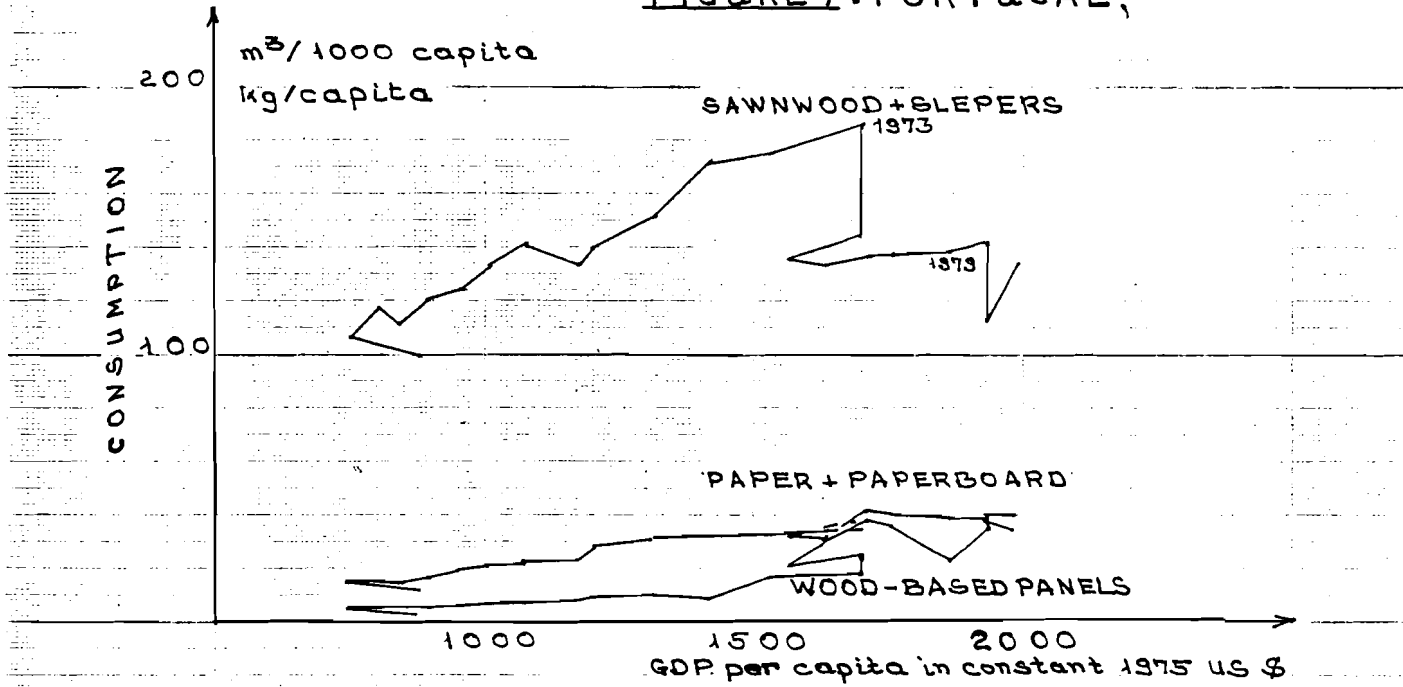
NETHERLANDS

FIGURE 8: SPAIN,

m³/1000 capita
kg/capita

200

CONSUMPTION

100

SAWNWOOD+SLEEPERS   1973   1979

PAPER + PAPERBOARD

WOOD-BASED PANELS

1500   2000   2500   3000

GDP per capita in constant 1975 US $

SWITZERLAND

m³/1000 capita

300

kg/capita

SAWNWOOD+SLEEPERS   1973   1973

CONSUMPTION

200

PAPER + PAPERBOARD

100

WOOD-BASED PANELS

7000   8000   8000
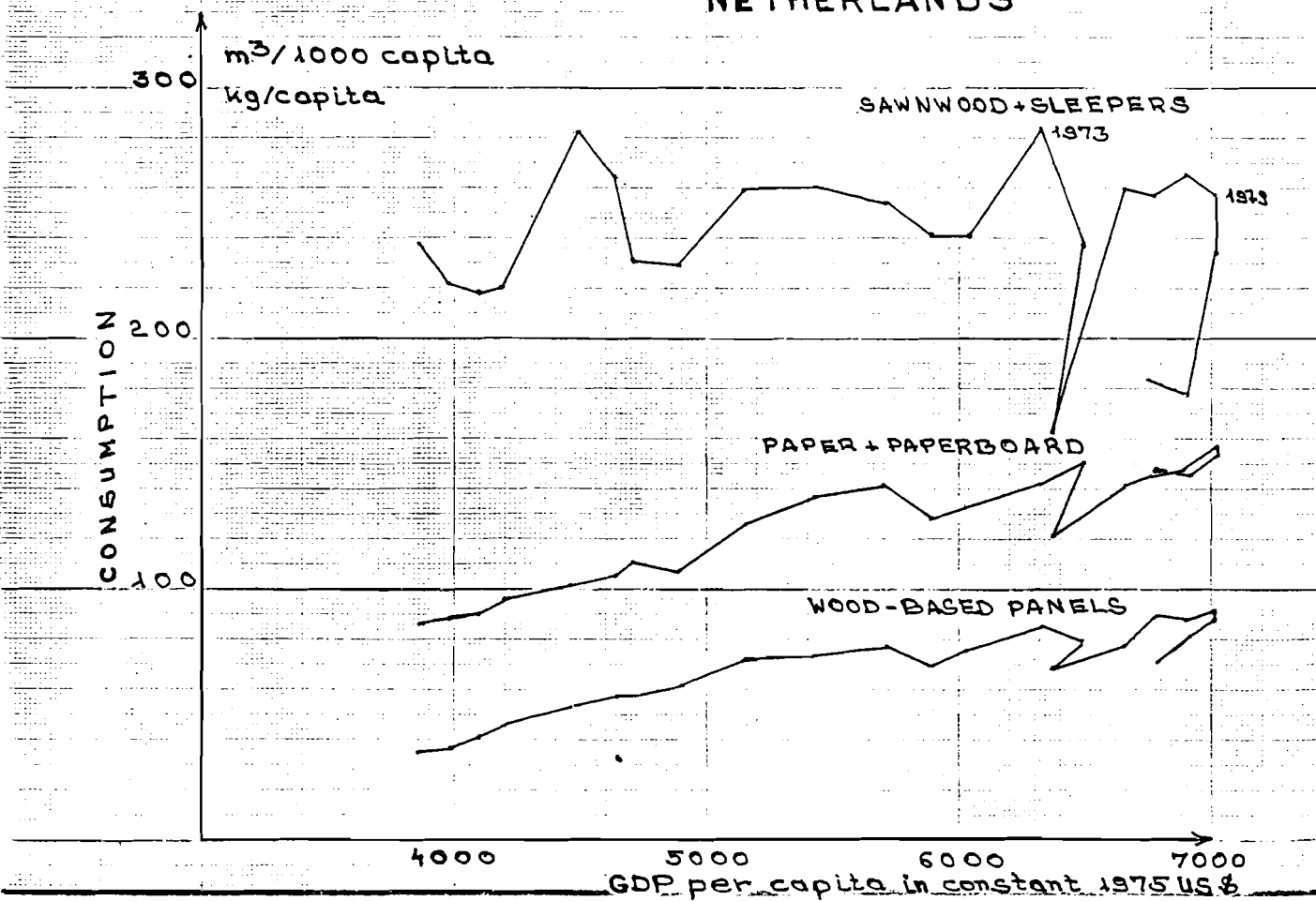
GDP per capita in constant 1975 US $
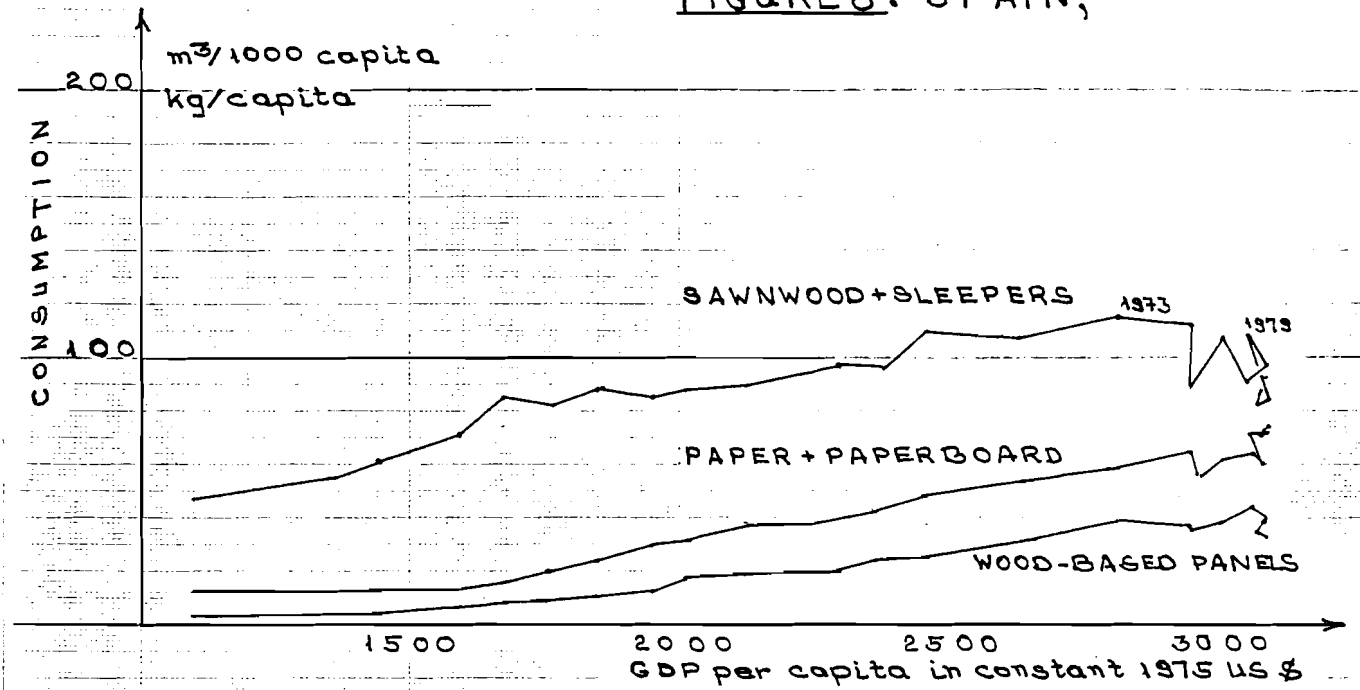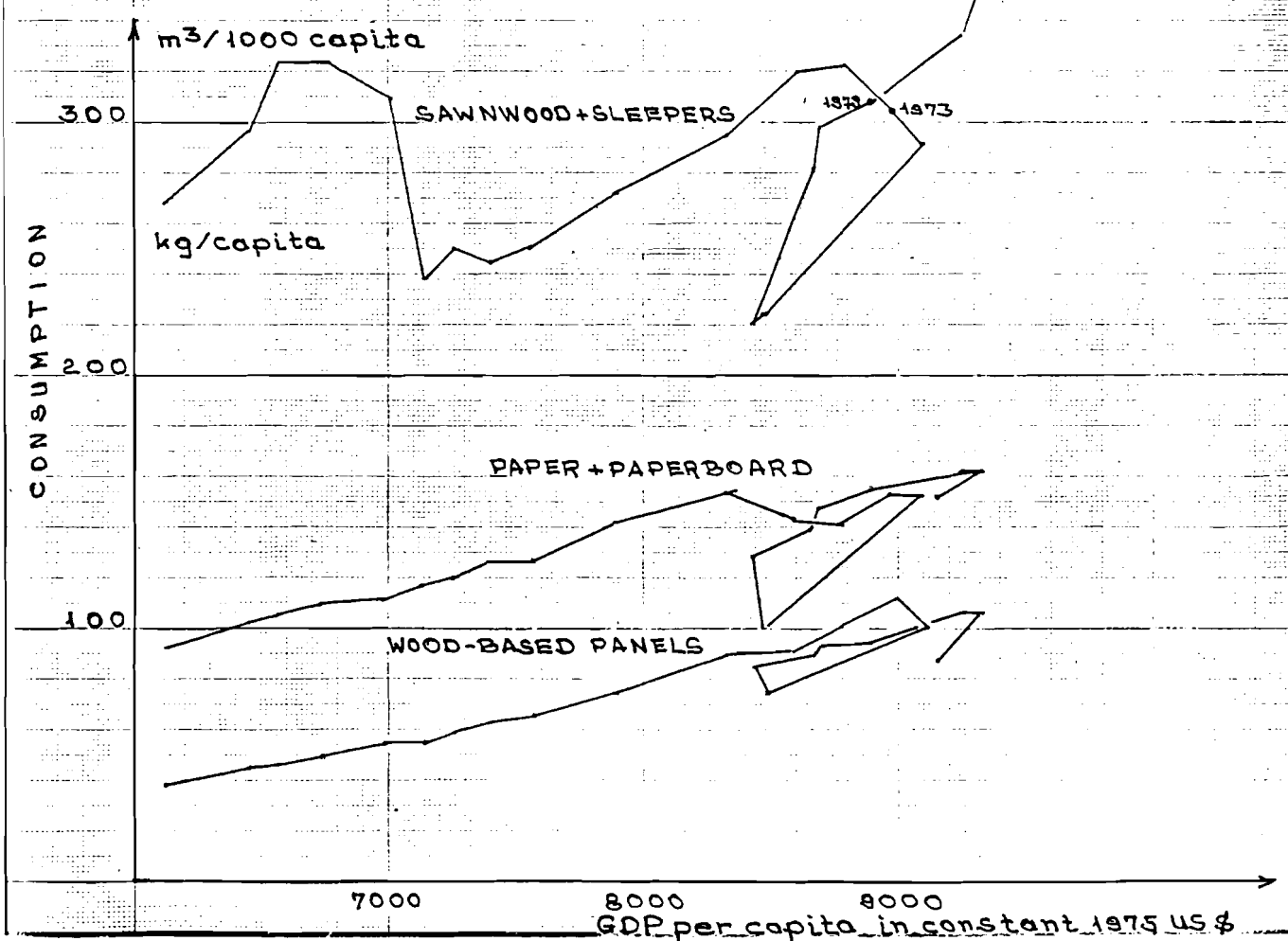
FIGURE 9: NORWAY
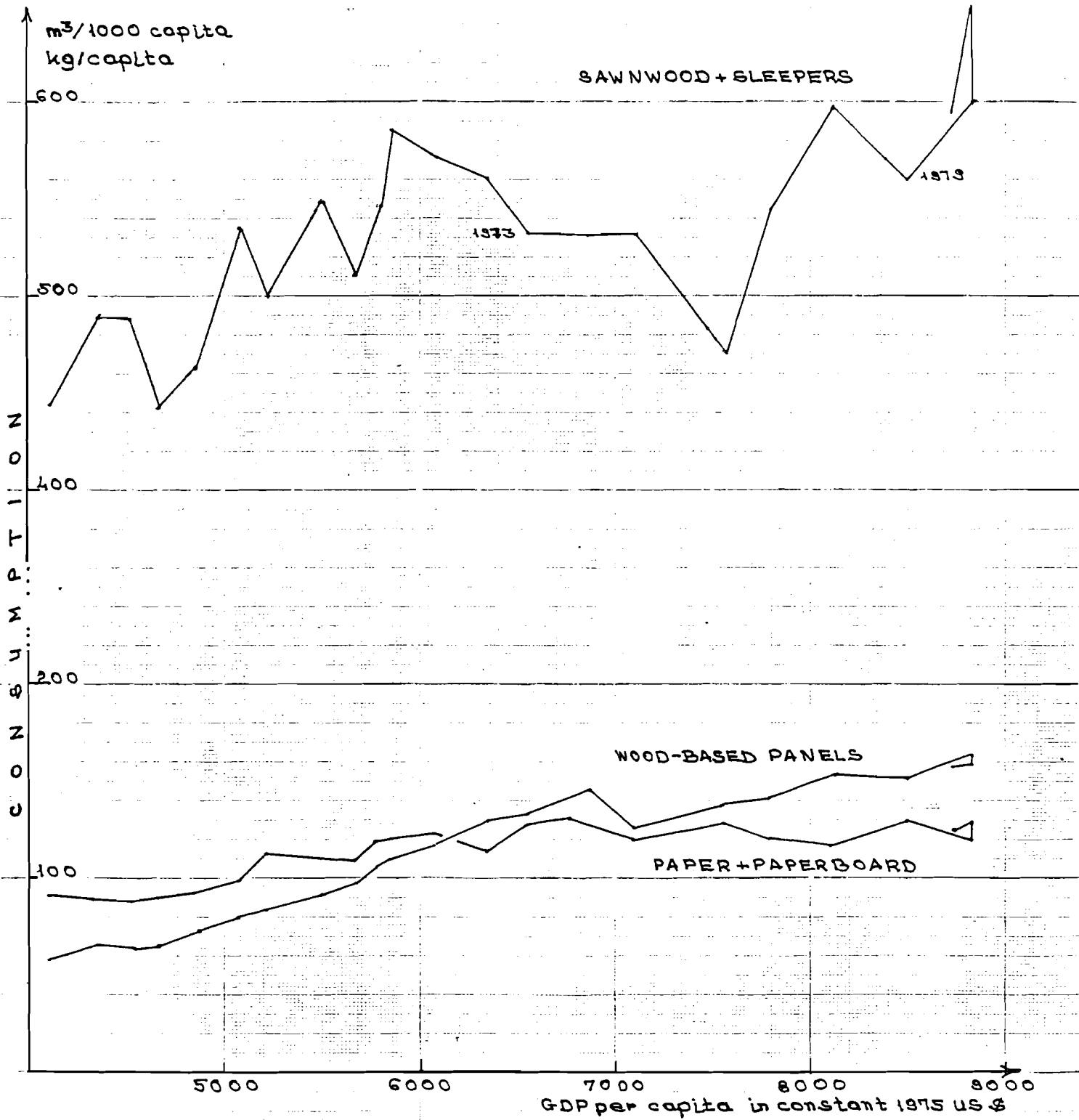
FIGURE 10 : SWEDEN

m³/1000 capita

kg/capita

SAWNWOOD + SLEEPERS

700

600

C O N S U M P T I O N

500

1973

1979

200

PAPER + PAPERBOARD

WOOD-BASED PANELS

100

6000   7000   8000   9000
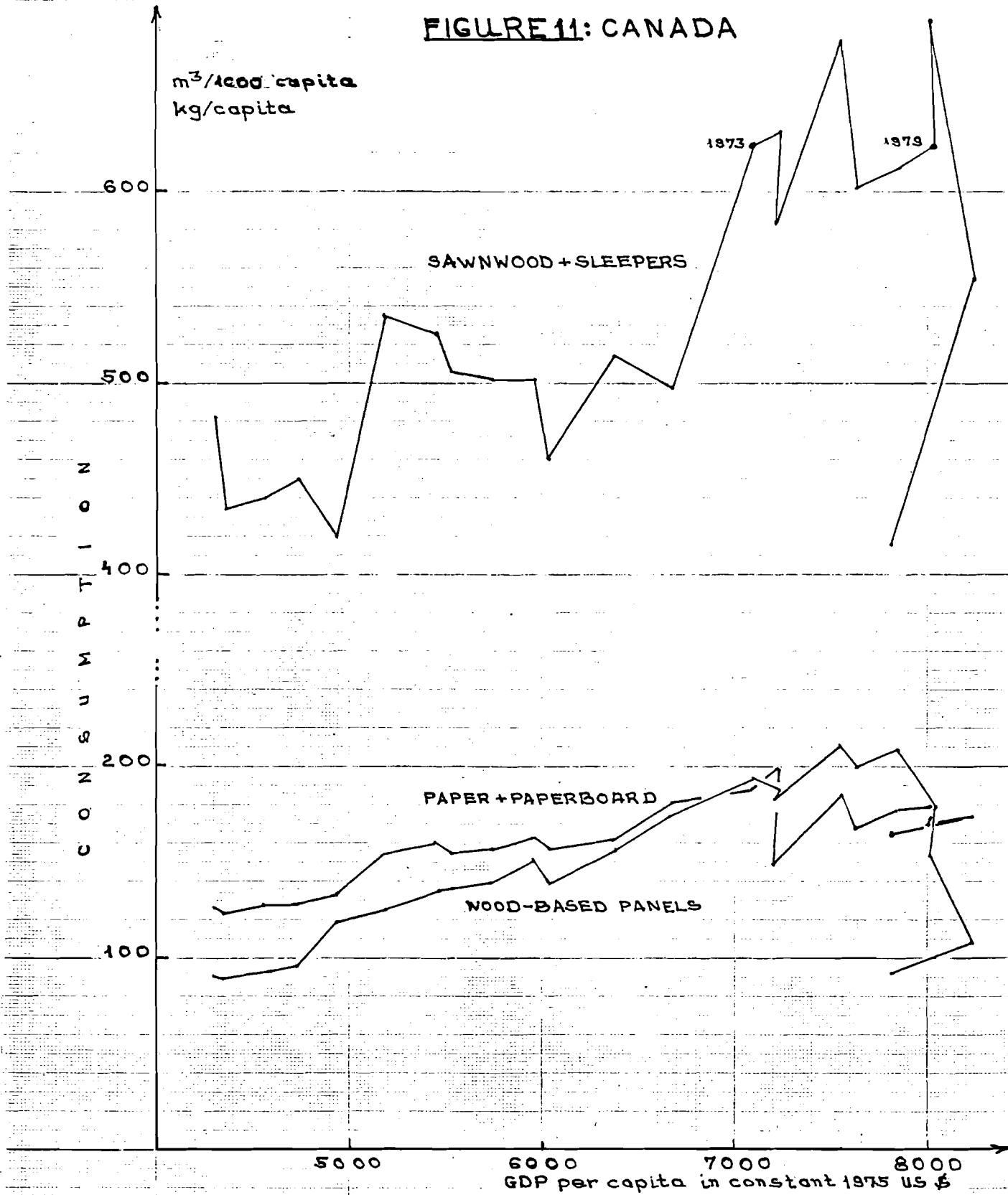
GDP per capita in constant 1975 US $

FIGURE 11: CANADA

m³/1000 capita
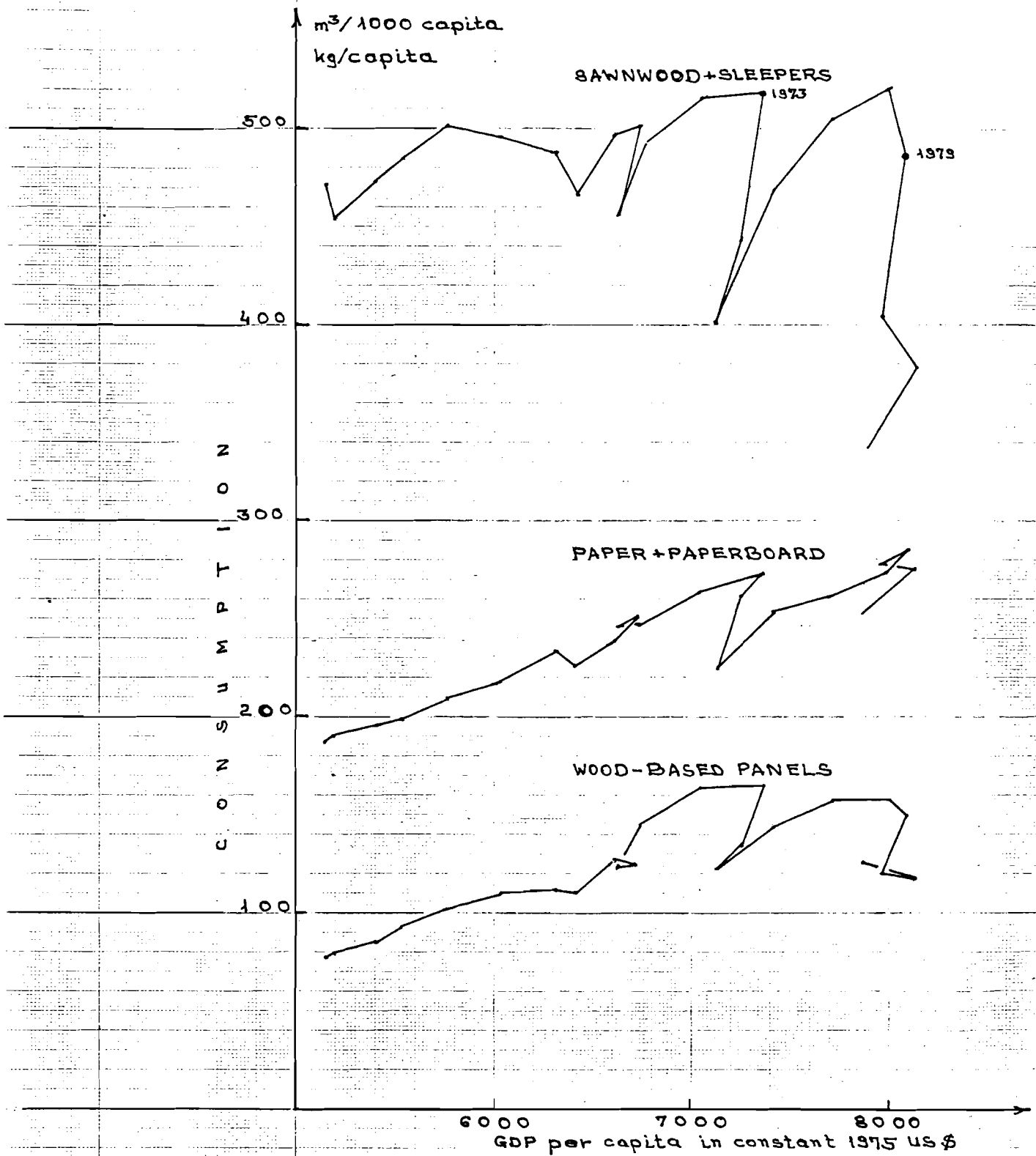kg/capita

600

SAWNWOOD + SLEEPERS

1973

1979

500

400

200

PAPER + PAPERBOARD

WOOD-BASED PANELS

100

5000

6000

7000

8000

GDP per capita in constant 1975 US $

FIGURE 12: UNITED STATES

m³/1000 capita
kg/capita

SAWNWOOD+SLEEPERS

1973

1979

CONSUMPTION

PAPER + PAPERBOARD
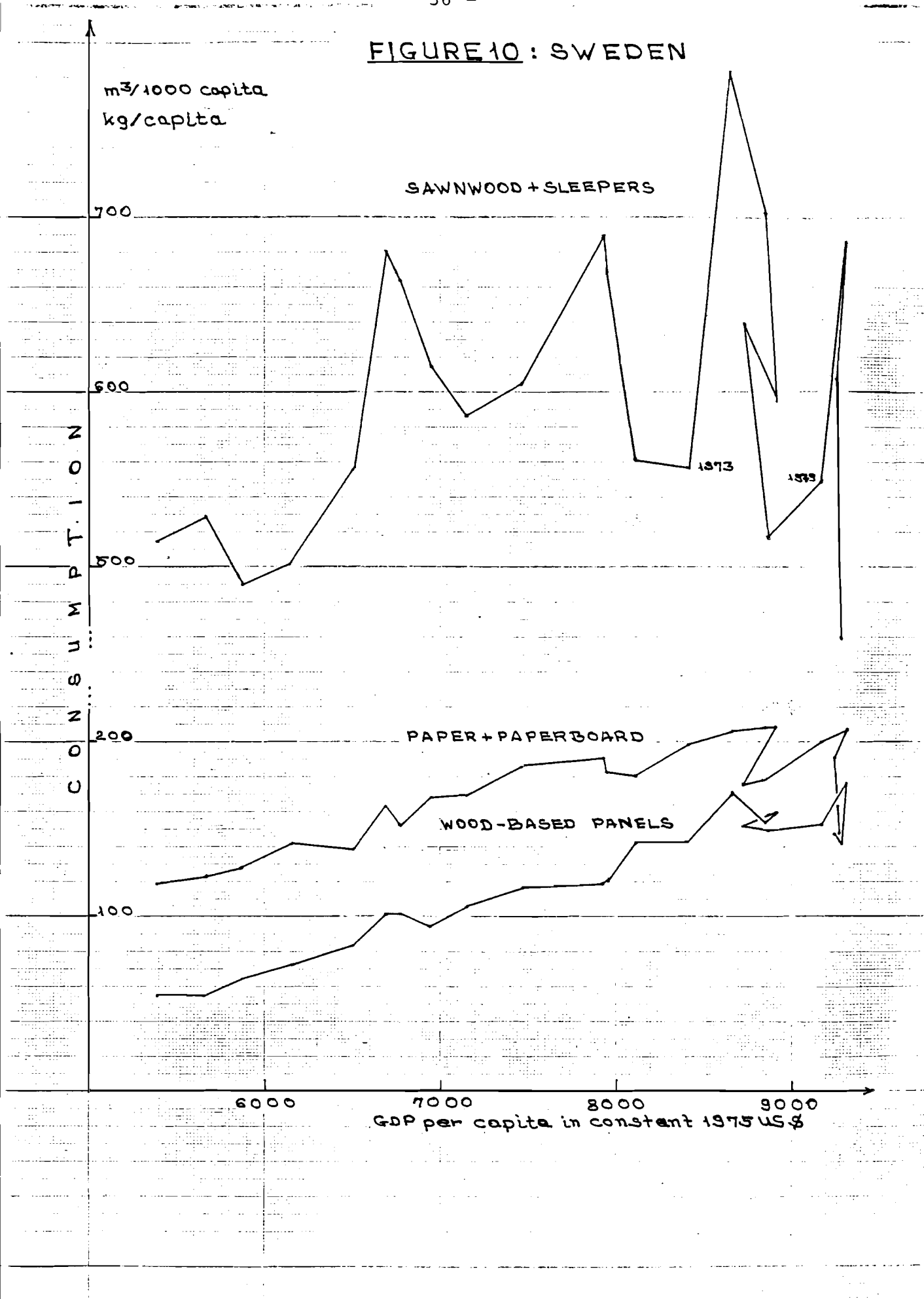
WOOD-BASED PANELS

GDP per capita in constant 1975 US $

FIGURE 13: JAPAN

FIGURE 14: TURKEY,

m³/1000 capita

kg/capita

CONSUMPTION

100

50

SAWNWOOD+SLEEPERS

1973

1973

PAPER+PAPERBOARD

WOOD-BASED PANELS

700   900   1100

GDP per capita in constant 1975 US $

UNITED KINGDOM

m³/1000 capita

kg/capita

CONSUMPTION

200

100

SAWNWOOD+SLEEPERS

1973

PAPER+PAPERBOARD

1973

WOOD-BASED PANELS

3500   4000   4500

GDP per capita in constant 1975 US $
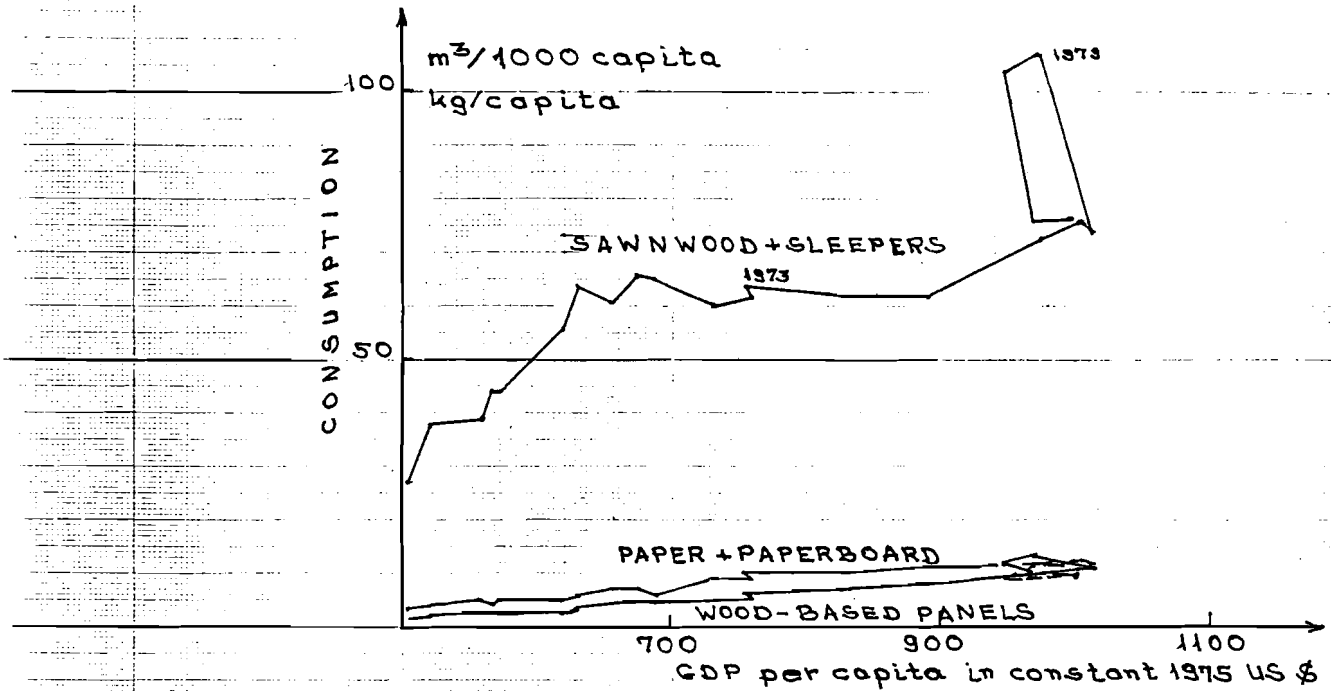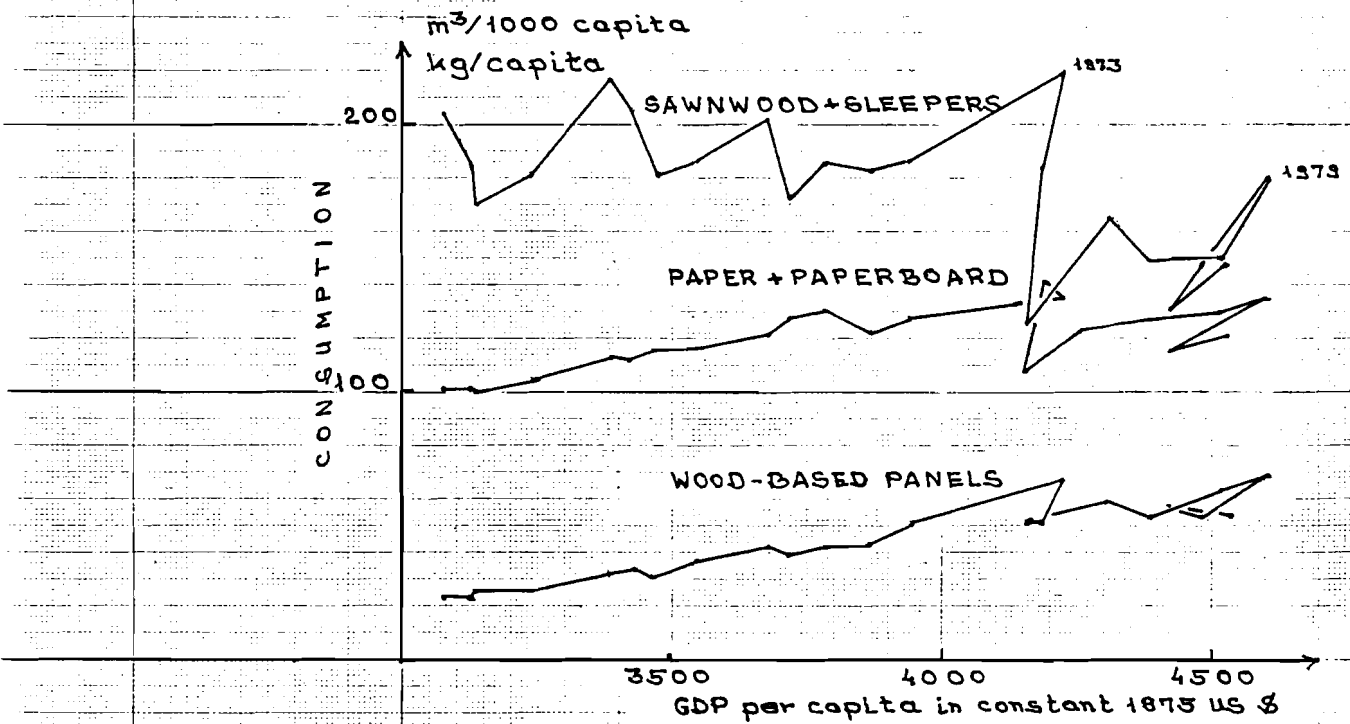
FIGURE 15: AUSTRALIA

FIGURE 16: NEW ZEELAND

m³/1000 capita
kg/capita

SAWNWOOD+SLEEPERS

1873

600

500

1573

CONSUMPTION

PAPER + PAPERBOARD

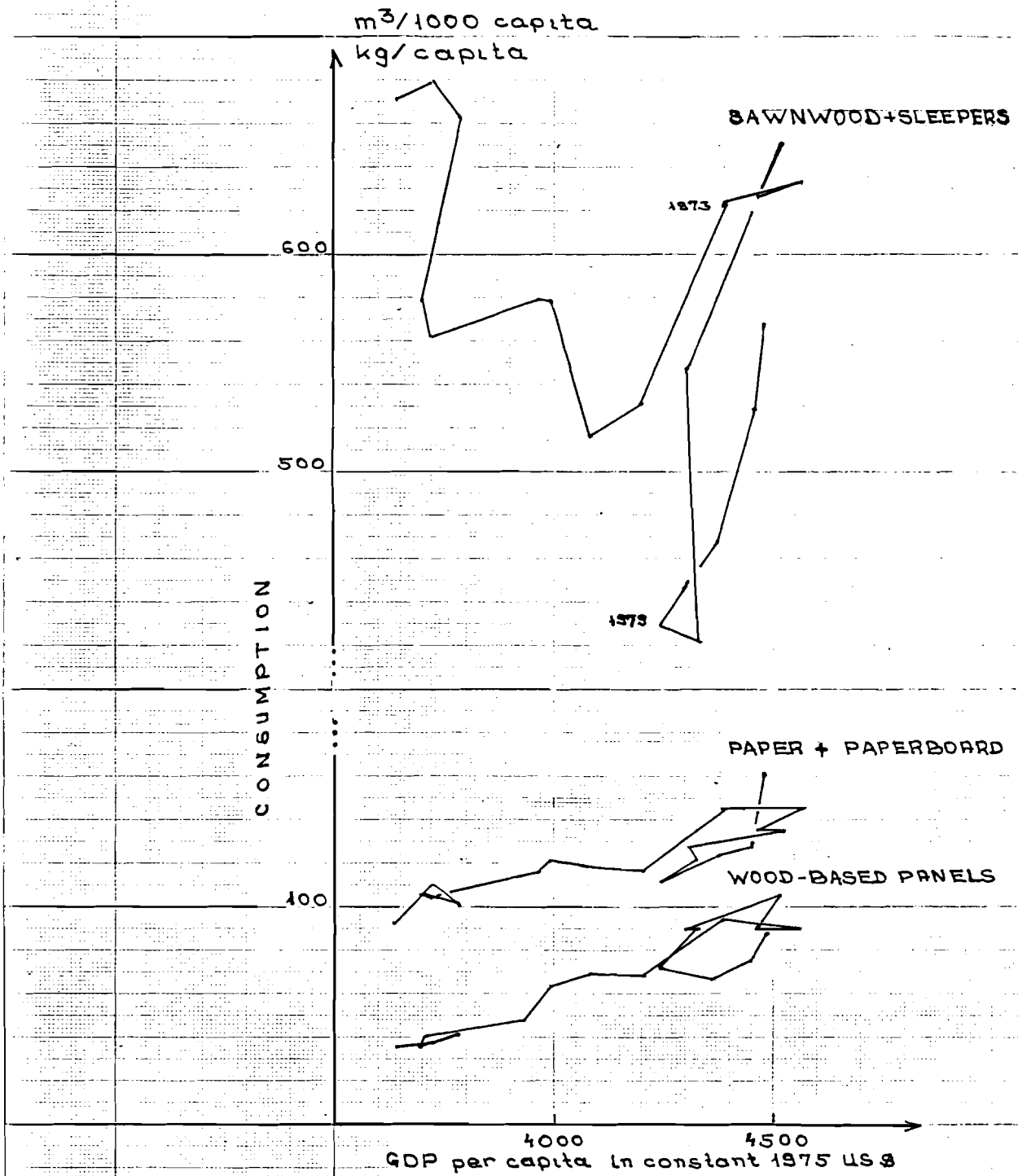WOOD-BASED PANELS

100

4000   4500

GDP per capita in constant 1975 US $

FIGURE 17: RELATIONSHIP BETWEEN PER 1000 CAPITA CONSUMPTION OF WOOD-BASED PANELS AND PER CAPITA GDP (US $) IN THE OECD COUNTRIES

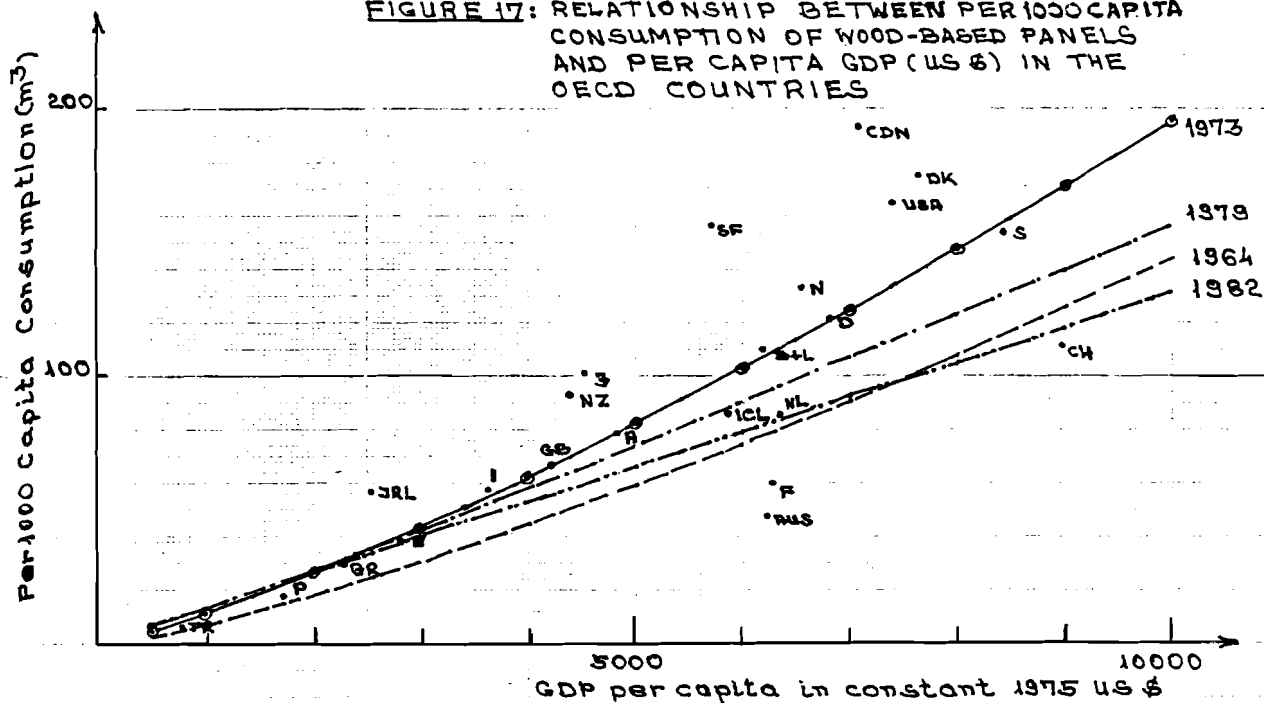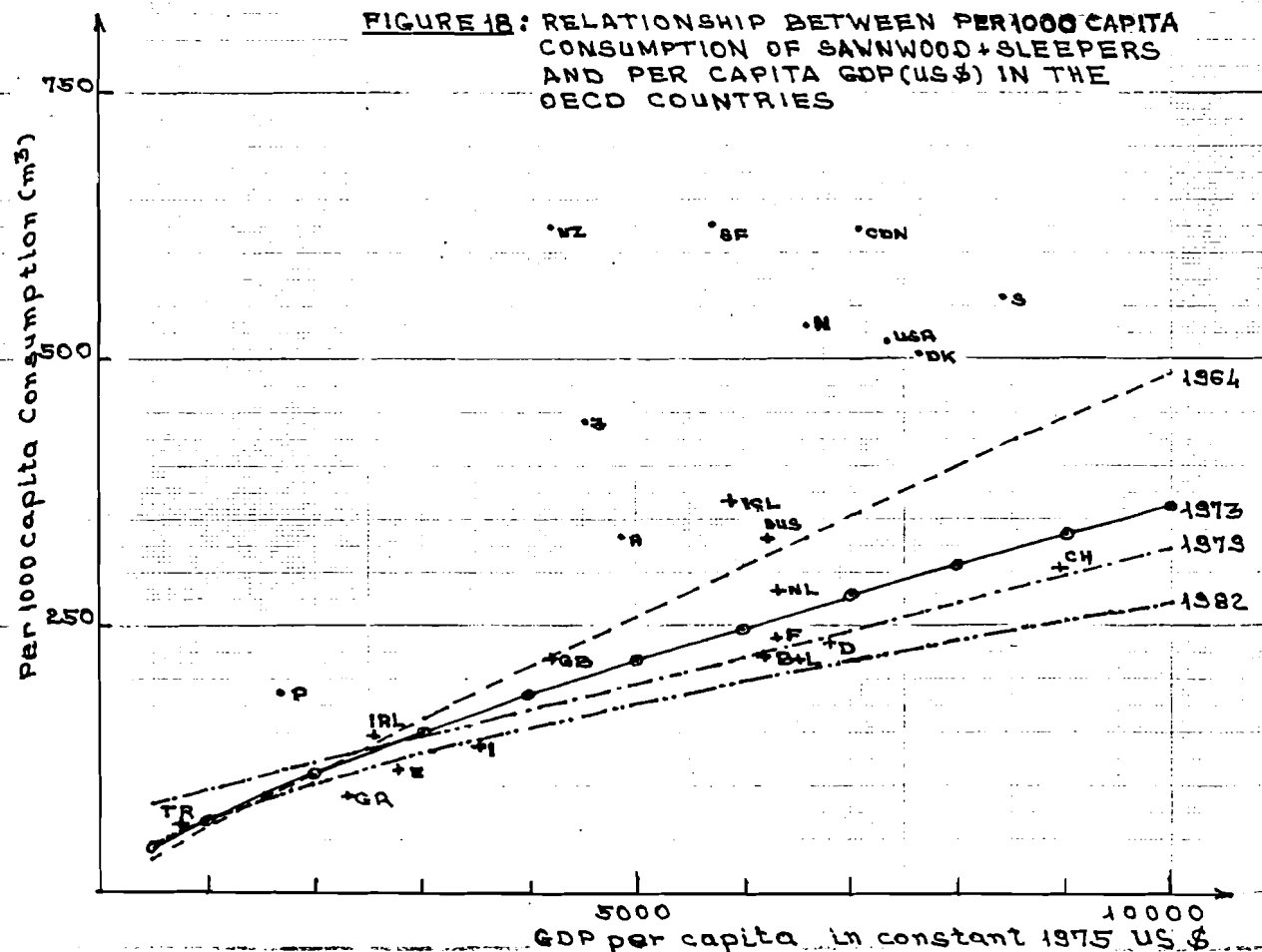Per 1000 capita Consumption (m³)

200

100

1973
1979
1964
1982

•CDN
•DK
•USA
•SF
•S
•N
•D
•L
•CH
•3
•NZ
•ICL NL
•GB
•A
•I
•JRL
•F
•AUS
•P
•GR

5000

10000

GDP per capita in constant 1975 US $

FIGURE 18: RELATIONSHIP BETWEEN PER 1000 CAPITA CONSUMPTION OF SAWNWOOD + SLEEPERS AND PER CAPITA GDP (US $) IN THE OECD COUNTRIES

Per 1000 capita Consumption (m³)

750

500

250

1964
1973
1979
1982

•NZ
•SF
•CDN
•S
•N
•USA
•DK
•3
+ICL
+AUS
•A
+NL
+CH
+GB
+F
+D
+B+L
•P
IRL
+Z
+I
TR
+GR

5000
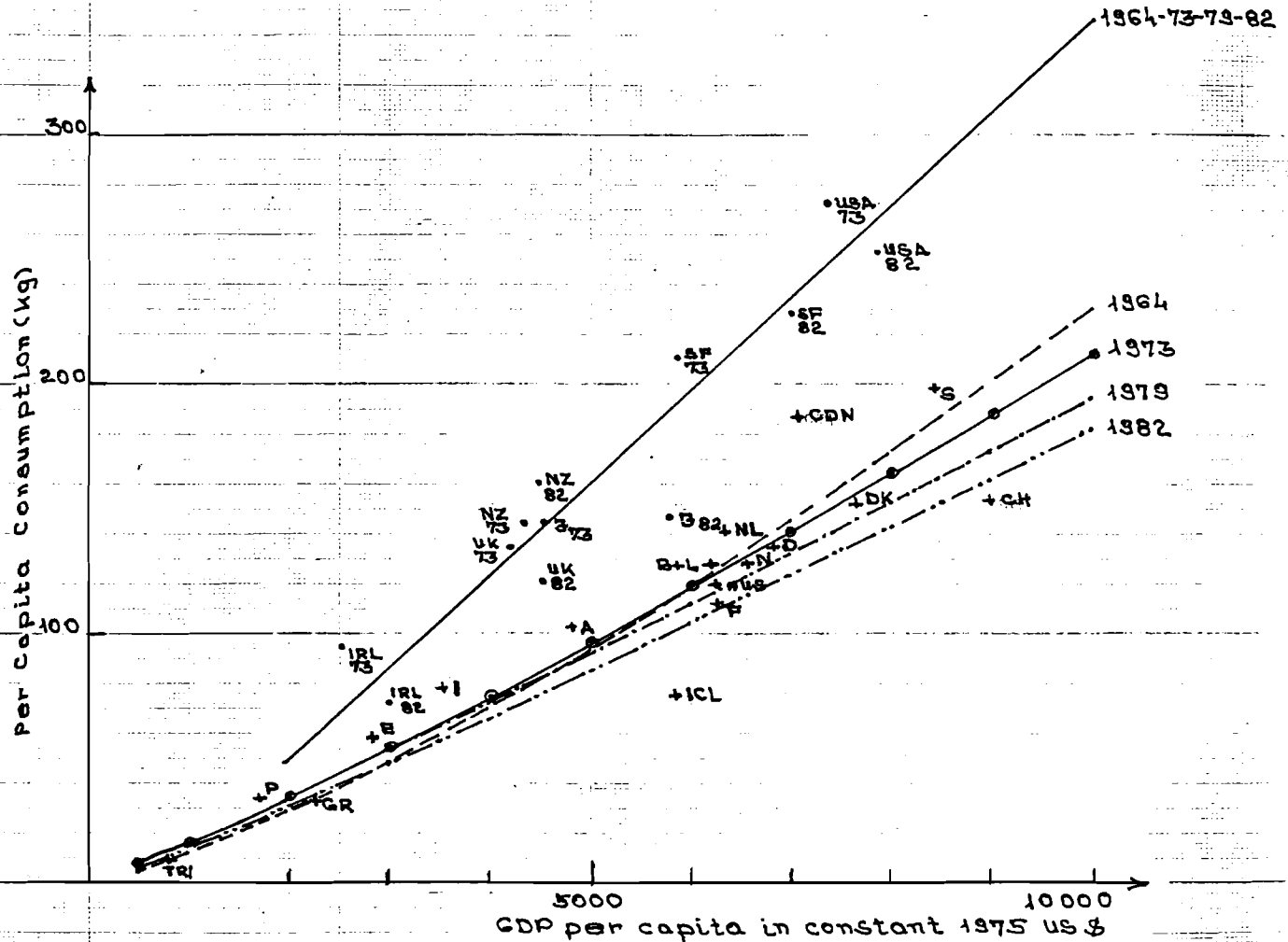
10000

GDP per capita in constant 1975 US $

FIGURE 19: RELATIONSHIP BETWEEN PER CAPITA
CONSUMPTION OF PAPER + PAPERBOARDS
AND PER CAPITA GDP (US $) IN THE
OECD COUNTRIES

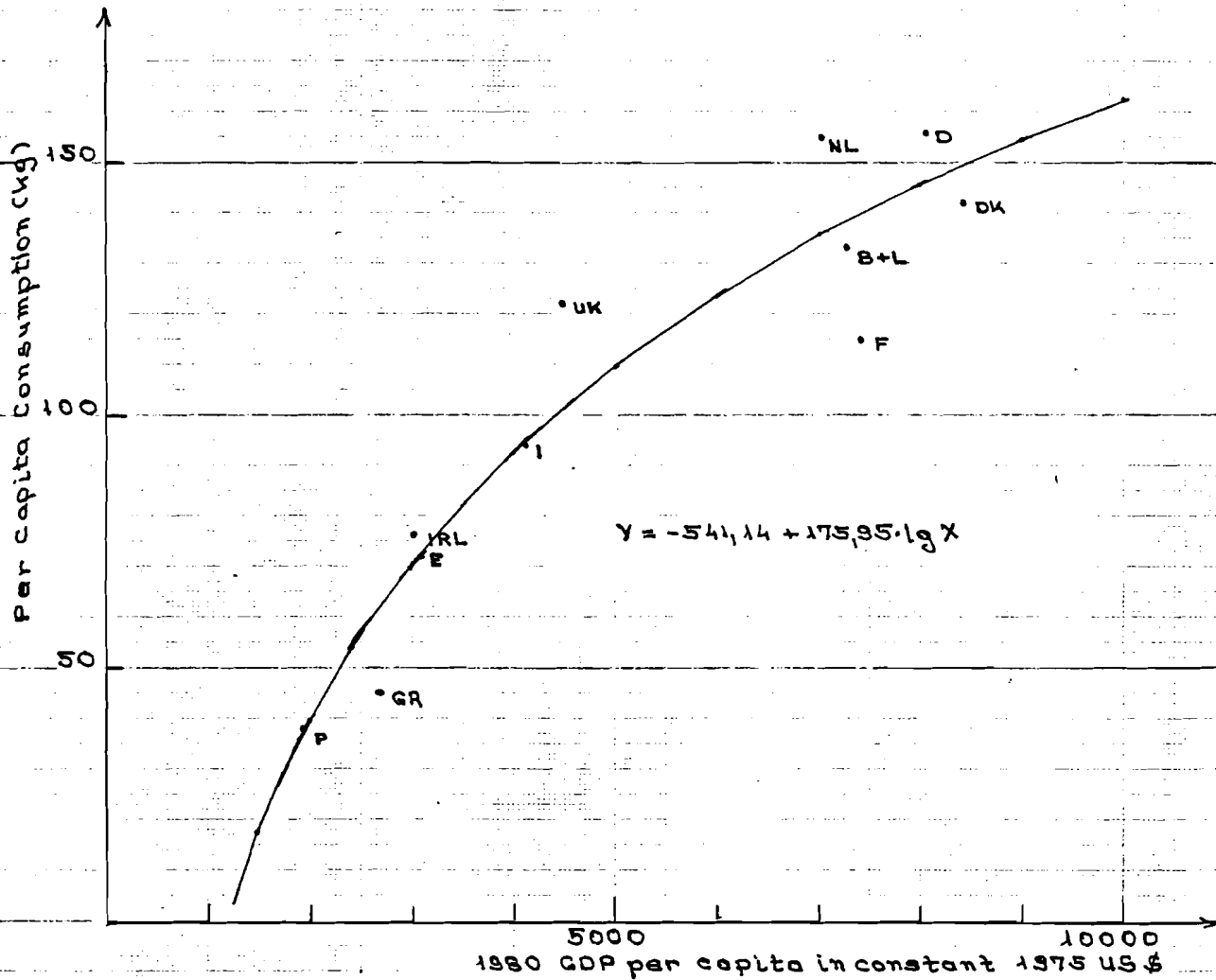FIGURE 20: RELATIONSHIP BETWEEN PER CAPITA CONSUMPTION OF PAPER + PAPERBOARDS AND PER CAPITA GDP (US $) IN THE EEC COUNTRIES IN 1980
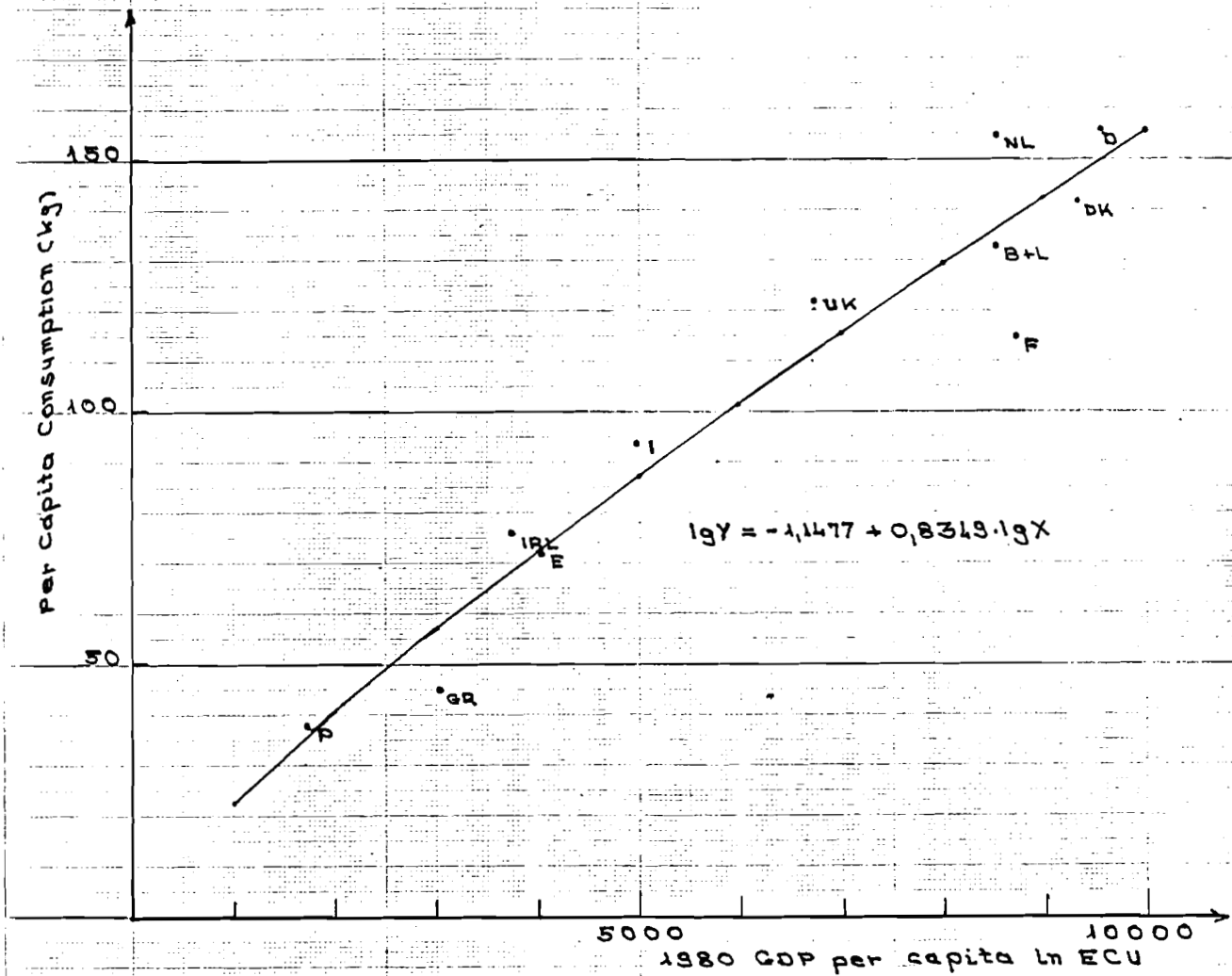
$$Y = -541,14 + 175,95 \cdot \lg X$$

X axis: 1980 GDP per capita in constant 1975 US $

Y axis: Per capita Consumption (kg)

FIGURE 21: RELATIONSHIP BETWEEN PER CAPITA CONSUMPTION OF PAPER AND PAPERBOARDS AND PER CAPITA GDP (ECU) IN THE EEC COUNTRIES IN 1980
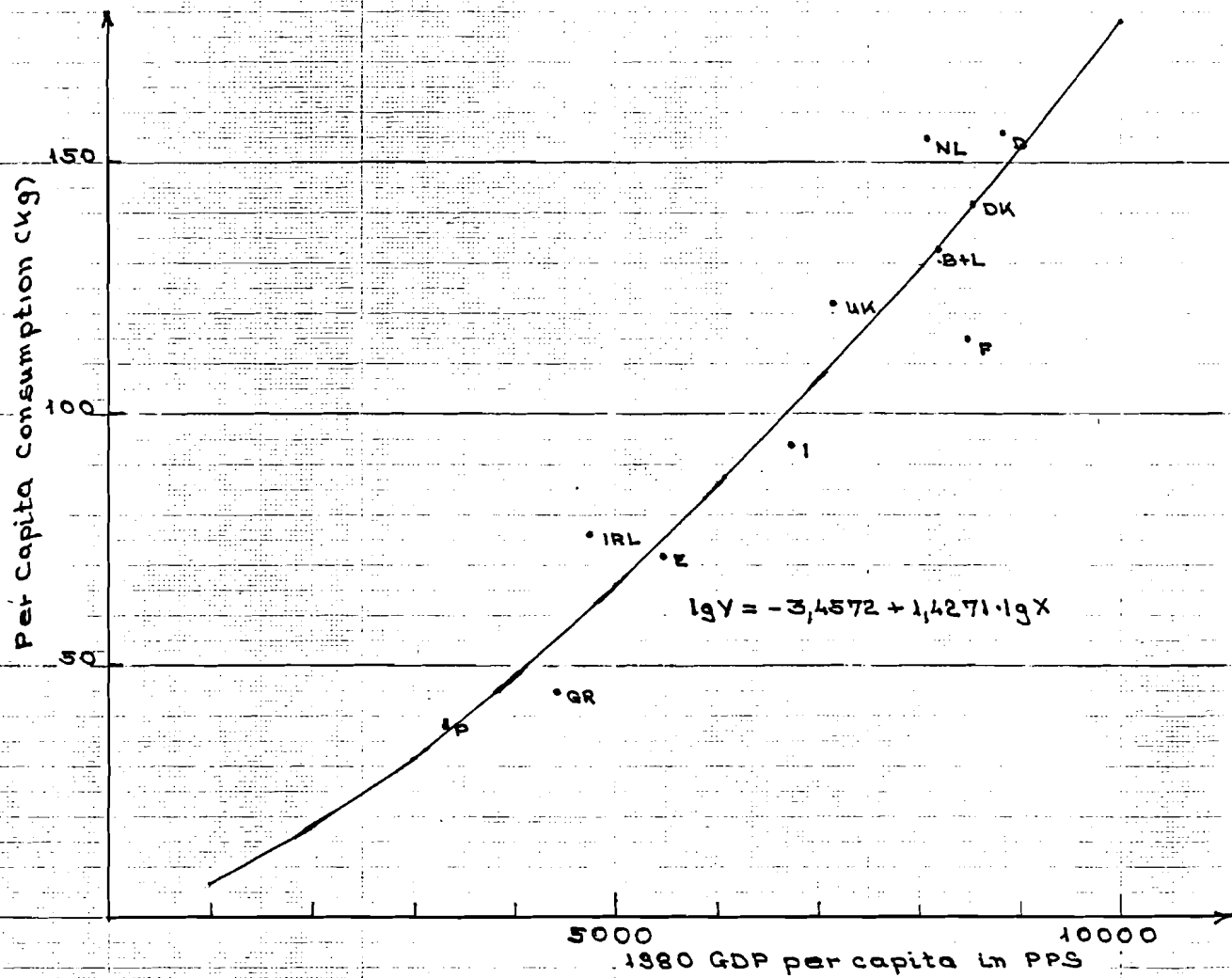
$lgY = -1,1477 + 0,8349 \cdot lgX$

FIGURE 22: RELATIONSHIP BETWEEN PER CAPITA CONSUMPTION OF PAPER +PAPERBOARDS AND PER CAPITA GDP (PPS) IN THE EEC COUNTRIES IN 1980