# THE VELOCITY OF INTEGRATION**

BY

JAN TINBERGEN*

## 1 INTEGRATION AND ITS VELOCITY

Integration is the combination of previously sovereign areas into a larger sovereign area. Its opposite is disintegration or secession. Throughout history a large number of both has occurred, but the integration process has been stronger and the net result is a considerable degree of integration. Two main measures may be used to characterize the phenomenon: the *reduction* per annum $r$ of the number of sovereign areas and the *growth* per annum $g$ of the number of areas which become member of the larger area into which they have been integrated.

Both $r$ and $g$ are fractions; in $r$ the numerator is the new number of areas and the denominator the previous number. In $g$ the numerator and denominator are, respectively, the denominator and the numerator of $r$. If the process takes more than one year, say five years, the fifth root of the fraction must be taken; likewise for other figures.

Obviously $g = 1/r$ and $r = 1/g$. The numerical outcome of a measurement may be said to constitute the integration's velocity; velocity of growth $g$ or velocity of reduction $r$.

## 2 COMPARISON OF VELOCITIES OF VARIOUS INTEGRATION PROCESSES

So far integration processes have practically always been composed of steps of unequal velocity. In 1973 Denmark, Ireland and the United Kingdom joined the European Community (EC) after the 'EC of the Six' (Belgium, France, the German Federal Republic, Italy, Luxembourg and The Netherlands) had been integrated in 1958. This is a gap of 15 years with $g = \sqrt[15]{2} = 1.047$. In 1981 Greece joined the EC and that step, taken after 8 years, showed a growth rate

of $g = \sqrt[8]{2} = 1.091$. In order to measure the complete integration process under review here, we replace the set of consecutive steps by their geometric average. (In fact this is what we have already done for the single steps).

## 3 INTEGRATION PROCESSES CONSIDERED

In the present study five integration processes of the past supply the data used: (i) the integration in Europe studied by Tilly (1975, p. 15), shown in Table I; (ii) the Western European integration process between 1948 (Benelux Treaty) and 1986 (when Portugal and Spain joined the EC), Table II; (iii) the integration of France between 1205 and 1919, Table III; of Switzerland between 1291 and 1815, Table IV, and of the United States of America between 1787 and 1959, Table V.

## 4 STUDY OBJECTIVES

The objectives of this study are (i) the comparison of the velocities of the observed integration processes, (ii) the study of the steps involved in each of them, (iii) the formulation of hypotheses concerning the differences found, (iv) the time period in which the addition of the next sovereign unit may be expected and (v) the anticipated time for the conclusion of the process, in particular for the Western European and the total European integration, and (vi) the time expected for the completion of world integration. In several cases the time

TABLE I – INTEGRATION OF EUROPE, 1500–1975

| Year | Number of Sovereign Units |
|------|---------------------------|
| 1500 | 500 |
| 1900 | 25 |
| 1975 | 5 ('large countries' only) |

Source: Charles Tilly (ed.), 1975: The Formation of National States in Western Europe, Ch. 6.

TABLE II – WESTERN EUROPEAN INTEGRATION, 1948–1986

| Year | Member nations of the European Community |
|------|------------------------------------------|
| 1948 | Belgium, Luxembourg and The Netherlands start co-operation |
| 1958 | Belgium, France, German Federal Republic, Italy, Luxembourg and The Netherlands start co-operation (Rome Treaty) |
| 1973 | Denmark, Ireland and United Kingdom join EC |
| 1981 | Greece joins EC |
| 1986 | Portugal and Spain join EC |

Source: European Almanac, 1986.

TABLE III – INTEGRATION OF FRANCE

| Year | Units attached | Cumul.No.* | Year | Units attached | Cumul.No.* |
|------|----------------|-----------|------|----------------|-----------|
| 1205 | Touraine | 1 | 1559 | Rousillon | 20 |
| 1229 | Languedoc | 2 | 1568 | Lyonnais | 21 |
| 1285 | Champagne | 3 | 1607 | Comte de Fois, | |
| 1360 | Dauphiné | 4 | | Limousin | 23 |
| 1369 | Aunis | 5 | 1620 | Béarne | 24 |
| 1373 | Poitou | 6 | 1648 | Exilés | 25 |
| 1375 | Saintonge | 7 | 1659 | Artois | 26 |
| 1434 | Berry | 8 | 1663 | Nivernais | 27 |
| 1450 | Normandie | 9 | 1668 | Flandre | 28 |
| 1453 | Guyenne, Gascogne | 11 | 1678 | Franche Comté | 29 |
| 1477 | Bourgogne, Picardie | 13 | 1693 | Auvergne | 30 |
| 1481 | Provence, Maine | 15 | 1768 | Corse | 31 |
| 1487 | Anjou | 16 | 1793 | Venaissan | 32 |
| 1527 | Bourbonnais, | | 1860 | Savoye, Nice | 34 |
| | Marche | 18 | 1919 | Alsace-Lorraine | 35 |
| 1532 | Bretagne | 19 | | | |

\* Cumul.No.: cumulated number.
Source: Petit Larousse illustré, Paris.

TABLE IV – INTEGRATION OF SWITZERLAND

| Year | Units attached | Cumul.No.* | Year | Units attached | Cumul.No.* |
|------|----------------|-----------|------|----------------|-----------|
| 1291 | Schwyz, Nidwalden, | | 1481 | Fribourg, Soloturn | 11 |
| | Obwalden, Uri | 4 | 1501 | Basel S, Basel L, | |
| 1332 | Luzern | 5 | | Schaffhausen | 14 |
| 1351 | Zürich | 6 | 1513 | 2 Appenzell | 16 |
| 1352 | Zug, Glarus | 8 | 1803 | Aargau, Gruschins, | |
| 1353 | Bern | 9 | | St. Gallen, Vaud, | |
| | | | | Thurgau, Ticino | 22 |
| | | | 1815 | Valais, Genève, | |
| | | | | Neuchâtel | 25 |

\* Cumul.No.: cumulated number.
Source: *Herder's Neues Volkslexikon*, Freibug i.B., 1974.
In 1978 a secession of the canton Jura from Bern took place.

periods found are long, much longer than is desirable for the solution of a number of important problems: maintaining peace, stopping pollution of the environment and creating a sustainable rate of development. The time needed for some of these objectives will be derived from other studies which are sometimes available.

TABLE V – INTEGRATION OF THE UNITED STATES OF AMERICA

| Year | Units attached | Cumul.No.* | Year | Units attached | Cumul.No.* |
|------|----------------|------------|------|----------------|------------|
| 1787 | Delaware, N.Jersey, | | 1845 | Florida, Texas | 29 |
|      | Penns. | 3 | 1846 | Iowa | 30 |
| 1788 | New Hampshire, | | 1848 | Wisconsin | 31 |
|      | Mass., Conn., N.Y., | | 1850 | California | 32 |
|      | Virg., S.Carolina, | | 1858 | Minnesota | 33 |
|      | Georgia | 11 | 1859 | Oregon | 34 |
| 1789 | N.Carolina | 12 | 1861 | Kansas | 35 |
| 1790 | Rhode Island | 13 | 1863 | West Virginia | 36 |
| 1791 | Vermont, | | 1864 | Nevada | 37 |
|      | Dist.o.Col. | 15 | 1867 | Nebraska | 38 |
| 1792 | Kentucky | 16 | 1876 | Colorado | 39 |
| 1796 | Tennessee | 17 | 1889 | N and S Dakota, | |
| 1803 | Ohio | 18 | | Montana, | |
| 1812 | Louisiana | 19 | | Washingt. | 43 |
| 1816 | Indiana | 20 | 1890 | Idaho, Wyoming | 45 |
| 1817 | Mississippi | 21 | 1896 | Utah | 46 |
| 1818 | Illinois | 22 | 1907 | Oklahoma | 47 |
| 1819 | Alabama | 23 | 1912 | New-Mexico, | |
| 1820 | Maine | 24 | | Arizona | 49 |
| 1821 | Missouri | 25 | 1959 | Alaska, Hawaii | 51 |
| 1836 | Arkansas | 26 | | | |
| 1837 | Michigan | 27 | | | |

\* Cumul.No.: cumulated number.
Source: *Herder's Neues Volkslexikon*, Freiburg i.B., 1974.


5 COMPARISONS OF THE VELOCITIES OF INTEGRATION

Table VI shows the velocities of integration of the areas and periods in-
vestigated, in rising order for the rates of growth and falling order for the rates
of reduction. Interesting features are that the Swiss and French integration pro-
cesses have been slow and the integration of Europe before 1900 only a little
quicker. In the lower half of the table we observe that the American and the
Western European integration show a comparable dynamism, although the
forces behind these processes are quite different.

   Let us now formulate some hypotheses about the causes of the differences in
velocity. The main force behind Western European integration may have been
fear of the Soviet Union in the pre-Gorbachev era. This, it may be said, pushed
the West Europeans into an American dynamism; the United States were, of
course, participating in this process.

   Eight years after the United Kingdom, Ireland and Denmark joined the EC,
the admission of Greece to the European Community was accepted. However,
whereas in 1973 the United Kingdom, Ireland and Denmark and in 1986 Spain

TABLE VI – VELOCITIES OF INTEGRATION ($g$) AND REDUCTION ($r$), IN RISING ORDER OF $g$

| Area | Period | $g$ | $r$ |
|------|--------|-----|-----|
| Switzerland | 1815–1978 | 1.0002 | 0.9998 |
| Switzerland | 1291–1978 | 1.0027 | 0.9973 |
| Switzerland | 1291–1815 | 1.0035 | 0.9965 |
| France | 1205–1919 | 1.0050 | 0.9950 |
| Europe | 1500–1900 | 1.0075 | 0.9926 |
| Europe | 1973–1981 | 1.0133 | 0.9869 |
| Europe | 1900–1975 | 1.0217 | 0.9788 |
| USA | 1787–1939 | 1.0231 | 0.9774 |
| W.Europe | 1958–1986 | 1.0251 | 0.9755 |
| W.Europe | 1958–1973 | 1.0274 | 0.9733 |
| USA | 1787–1912 | 1.0316 | 0.9694 |
| W.Europe | 1981–1986 | 1.0371 | 0.9642 |
| W.Europe | 1948–1986 | 1.0676 | 0.9367 |

and Portugal were accepted with 'American dynamism,' Greece was accepted with some hesitation.

Can this hesitation be explained by Greece's difficulties with Turkey, with its competitive position in maritime transport or its deviating script?

Another force at work in the integration of Western Europe was the wish to become, economically speaking, a great power, and to become more prosperous.

A third force that may have an impact on the velocity of integration is the difference in language. For an area such as Latin America this may be of considerable interest. Our data do not contain much information on this force: we only have material on Switzerland. But in Table IV we see that until 1481 only German-speaking cantons joined the *Eidgenossenschaft*. In 1481 the bilingual canton Fribourg/Freiburg joined, but it was not until 1803, almost threehundred years later, after some of the last German-speaking cantons, Aargau, Thurgau and St. Gallen had joined that Romanic-speaking cantons became part of Switzerland, *e.g.* Gruschins (Graubünden or Grisons) with its two Rhaeto-Romanic dialects, Francophone Vaud and Italian-speaking Ticino (Tessin). In 1815 Francophone Genève (Geneva) and Neuchâtel and bilingual Valais (Wallis) were added. The addition of the Francophone part of Bern, Jura, is hardly a case of integration: actually it is a case of secession and might have been omitted from Table VII, making it more homogeneous.

A distinction has been made between periods in which nuclear arms are known and periods in which they were not. Nuclear arms generate major forces which operated, for instance, in Western Europe. They may have contributed to the high velocity of integration after 1958. On the other hand, these forces do not play a role in the Swiss figures on the upper two lines of Table VII.

TABLE VII – DECOMPOSITION OF SWISS INTEGRATION PROCESS

| Step number | Growth rate | Reduction rate | Cantons added to CH |
|---|---|---|---|
| 10 | 1.0002 | 0.9998 | JU |
| 8 | 1.0010 | 0.9989 | AG, GR, SG, TG, TI, VD |
| 5 | 1.0015 | 0.9984 | FR, SO |
| 6 | 1.0031 | 0.9968 | BS, BL, SH |
| 1 | 1.0054 | 0.9946 | LU |
| 2 | 1.0096 | 0.9905 | ZH |
| 9 | 1.0107 | 0.9894 | VS, GE, NE |
| 7 | 1.0119 | 0.9882 | AI, AR |
| 4 | 1.1250 | 0.8888 | BE |
| 3 | 1.3333 | 0.7500 | ZG, GL |

*Explanation of symbols:*

| | | | |
|---|---|---|---|
| AI | Appenzell Innerrhoden | LU | Luzern |
| AG | Aargau | NE | Neuchâtel |
| AR | Appenzell Ausserrhoden | SG | Sankt Gallen |
| BE | Bern | SH | Schaffhausen |
| BL | Basel-Land | SO | Soloturn |
| BS | Basel-Stadt | TG | Thurgau |
| CH | *Confoederatio Helvetica** | TI | Ticino |
| FR | Fribourg | VD | Vaud |
| GE | Genève | VS | Valais |
| GL | Glarus | ZG | Zug |
| GR | Grischuns | ZH | Zürich |
| JU | Jura | | |

\* Latin name for Switzerland
The four original cantons (Urkantone) are NW (Nidwalden), OW (Obwalden), SZ (Schwyz) and UR (Uri).

## 6 DECOMPOSITION OF TWO INTEGRATION PROCESSES

Sometimes the decomposition of an integration process into successive steps may teach us something about the nature of the process. For two of the smaller processes i.e. the Swiss integration and the Western European integration we shall illustrate this. The vast material about France and the United States will be tackled on later occasions.

In section 5 we drew a possible conclusion on the impact of languages. The Swiss integration process consisted of ten steps. In Table VII these have been ordered to growth rate. These rates show a considerable dispersion, between 1 (practically no growth) and 1 1/3. We stated before that at the fifth step for the first time a non-German-speaking canton joined the confederation. In Table VII we see that the most rapid growth appeared at step 3, in the middle of the

'German' part of the integration process. The next step was the second quickest. Later steps in the process were much slower.

Comparing the figures on the velocity of integration of Switzerland with those of Europe for 1500–1900 (cf. Table VI), we found that the Swiss integration was considerably slower than the average European integration in a comparable period. The Swiss are, obviously, very cautious.

Table VIII shows the same information as Table VII, this time for the integration process of Western Europe.

The main feature of this table is that the velocity of integration was by far the highest for the first step, independent of what starting year we choose. In 1947 the European Movement was established; 1948 was the year in which the Benelux was starting to operate and in 1951 the Paris Treaty on the integration of the Coal and Steel Community was concluded.

The hesitation about the membership of Greece was mentioned before. We may add that the velocity of adding the United Kingdom, Ireland and Denmark came closest to the average integration velocity between 1958 and 1986. When the establishment of the first six-member Community is included, we obtain a growth rate of 1.0676 (and a reduction rate of 0.9367), surpassing all other figures shown in Table VI. This growth rate is the growth rate between 1948, the year in which the Benelux was formed and 1986, when the EC had 12 members: $g = \sqrt[38]{12}$.

## 7 COMPLETION OF WESTERN EUROPEAN INTEGRATION: ONE MORE MEMBER

In the present section we shall discuss item (iv) mentioned in the beginning of section 4: the time period in which the next member nation will be added, assuming that the integration velocity remains equal to the velocities observed,

TABLE VIII – DECOMPOSITION OF WESTERN EUROPEAN INTEGRATION PROCESS

| Step number | | Growth rate | Reduction rate | Countries joining EC |
|---|---|---|---|---|
| 3 | | 1.0133 | 0.9869 | GR |
| 2 | | 1.0274 | 0.9733 | GB, IRL, DK |
| 4 | | 1.0371 | 0.9642 | E, P |
| | (a) | 1.1769 | 0.8497 | |
| 1 | (b) | 1.1962 | 0.8360 | B, D, F, I, L, NL |
| | (c) | 1.2917 | 0.7742 | |

*Explanation of symbols*

| | | | | |
|---|---|---|---|---|
| B | Belgium | GR | Greece | *Starting year:* |
| D | Federal Republic of Germany | I | Italy | (a) 1947 |
| DK | Denmark | IRL | Ireland | (b) 1948 |
| E | Spain | L | Luxembourg | (c) 1951 |
| F | France | NL | The Netherlands | |
| GB | United Kingdom | P | Portugal | |

in various areas, in the past. This period of time may be of some interest to governments interested in becoming a member. There are various types of governments interested. Firstly, one of the members of the European Free Trade Association may wish to join the EC. Secondly, some countries outside Europe (or partly so: Turkey) have shown such interest. And, more recently, Eastern European countries have more possibilities of joining the EC. As a matter of course, our assumption of a constant velocity of integration is only an assumption and may be rejected. The method may be extended to a larger number of newcomers (*cf.* section 8).

We shall restrict ourselves to using velocity figures of European integration processes, in particular (a) the one between 1500 and 1900, (b) the one from 1900 to 1975 and (c) the process between 1958 and 1986. This leaves the process among the first six members of the EC open for further study (*cf.* the end of section 6). Our choice also leaves open the possibility to study the velocity of integration observed in the United States of America, France and Switzerland.

We shall approach the time period issue in two ways. In Approach A we will examine how many years it will take before we can expect a thirteenth member nation to join in the EC if the velocity of integration of the process remains constant. Approach B tries to answer the question how many years after the first member we can expect Number 13 to become a member country. Algebraically, Approach A reads:

$$r^t = 12/13 \text{ and } t = ln(12/13)/ln\ r \tag{7.1}$$

and Approach B:

$$r^t = 1/13 \text{ and } t = ln(1/13)/ln\ r \tag{7.2}$$

where $t$ is the unknown time period and $r$ the rate of reduction of the integration process chosen as the base.

Table IX shows the results.

These results show enormous uncertainties. Integration velocity during the period 1500 to 1900 was much lower than we observe today, as was also shown in Table VI. The remaining figures in column A seem to reflect a tendency of

TABLE IX – TIME PERIOD (YEARS) BETWEEN MEMBER 13 AND (A) MEMBER 12 OR (B) MEMBER 1 JOINING EC

|  | A.<br>Member 13 after Member 12 | B.<br>After Member 1 |
|---|---|---|
| Base Europe 1500–1900 | 10.7 | 342.5 |
| 1900–1975 | 3.7 | 119.5 |
| 1958–1986 | 3.2 | 103.6 |
| 1948–1986 | 1.2 | 39.2 |

the 12-member-EC to feel satiated. According to column A a thirteenth member should have joined in 1989 or 1990. In column B the last figure opts for 1987. Only the figures in column B derived from the median velocities seem to be in less of a hurry. In the final section they will be discussed in a wider context.


## 8 COMPLETING THE EUROPEAN INTEGRATION

In this section we are going to discuss subject (v) mentioned in section 4 i.e. the time needed for the completion of European integration. Again, this discussion is based on the assumption that the velocities of integration processes are constant and again we apply these velocities of various processes of integration in order to calculate how much time is needed to raise the membership of the EC from 12 to 19. The seven additional members are Austria, Switzerland, Iceland, Norway, Sweden, Finland and Turkey.[1] In the present section we also propose to calculate the time needed to integrate Western and Eastern Europe – a possibility opened by recent political changes. This means the addition of five more countries: Czechoslovakia, Hungary, Poland, Romania and Yugoslavia.

The enormous differences between the figures for various areas and time periods reflect the tendencies moted before: low velocities in the early periods, American dynamism in Europe 1958–1986 and a much higher velocity of integration for the first six EC member nations. In our concluding section the meaning of even the lowest figures will still be considered as too high.


## 9 TIME NEEDED FOR WORLD INTEGRATION

In tackling problem (vi) mentioned in section 4, we calculate figures for world integration, which we simply translate into attaining a total number of 160 member countries in the United Nations. Table XI shows the results.

This table shows the same features as Table X, but understandably at higher levels for the time period needed. In the next section they will be compared with figures which may be said to be desirable and which are considerably lower.


## 10 AN EXAMPLE OF THE TIME PERIOD OF INTEGRATION NEEDED

Humanity is facing great problems which can only be solved by supranational decision-making. They may be briefly indicated as the problems of security, environment, development of poor countries and sustainable development. Although many governments give attention to these problems, the solution methods used are far from optimal. These solutions could be much more effec-

---

1   We did not include the mini-states Andorra, Liechtenstein and San Marino nor the Holy See; of course these could have been included. They would have raised the figures.

TABLE X – TIME NEEDED TO COMPLETE (A) WESTERN EUROPEAN INTEGRATION
WITH 19 AND (B) TOTAL EUROPE WITH 25 MEMBER STATES, BASED ON THE
VELOCITIES OF INTEGRATION OF VARIOUS AREAS AND TIME PERIODS

| Areas and time periods | A | B |
|---|---|---|
| Europe 1500–1900 | 393 | 430 |
| Europe 1900–1975 | 137 | 150 |
| Europe 1948–1958 | 16 | 18 |
| Europe 1958–1986 | 119 | 130 |
| USA 1787–1912 | 129 | 141 |
| France 1205–1919 | 591 | 646 |
| Switzerland 1291–1815 | 842 | 920 |
| Switzerland 1291–1978 | 1031 | 1181 |

TABLE XI – TIME NEEDED FOR WORLD INTEGRATION

| Base | Time | Base | Time |
|---|---|---|---|
| Europe 1500–1900 | 678 | USA 1787–1912 | 163 |
| Europe 1900–1975 | 237 | France 1205–1919 | 1019 |
| Europe 1948–1958 | 78 | Switzerland 1291–1815 | 1863 |
| Europe 1958–1986 | 205 | Switzerland 1291–1978 | 1451 |

tive if supranational authorities with considerably more competence would
apply them. Apart from this competence there is also a time dimension in-
volved. Experts of, for instance, environmental problems warn us that, if no
action is taken, it may be too late. In the present section an example will be
given of that time dimension concerning the problem of sustainability. In order
for all future generations to maintain the present level of consumption, it is
necessary that the productivity of natural resources continues to grow and that
the present generation maintains a consumption level determined by the pro-
ductivity growth rate. In the case of energy, each year the reduction in energy
needed to produce a unit of national product is about 0.983. For the next few
decades experts anticipate that this rate of reduction of the energy needed will
indeed continue.[2] In order to maintain the world production level the main-
tenance of technical development must be accompanied by a constant popula-
tion and a consumption of energy of no more than 1/56 of the total stock of
energy resources. If energy policy deviates from this energy consumption level
damage can be done to the economy. If corrections are delayed, the damage
that is done increases very quickly. The damage after correcting the policy, i.e.
saving energy, after one year is small; if that correction is postponed another
year, the damage is 3 times as severe, if postponed one year more 6 times, and
in subsequent years 10 and 14 times as severe. This illustrates that a solution to

2   *Cf.* J. Tinbergen, 'Le incognite del terzo millennio,' *Dimensione Energia*, 38 (1990), pp. 36–41.

one of the most important problems must be found in preferably less than ten years – a preference shared by experts on environmental policy and the other urgent problems mentioned. If these preferences are compared with the time needed, *cf.* Tables IX and X, to create supranational authorities – one of the necessary steps to solve these problems – it is clear that measures to stimulate integration ought to have very high priority.

## *Summary*

### THE VELOCITY OF INTEGRATION

Throughout history small territories were integrated into larger units. Sometimes disintegration occurred. A quantitative characteristic of this process is its velocity, *i.e.* the reduction $r$ of independent territories per annum or the growth $g$ of the number of members of a larger unit. These figures were measured for France, Switzerland, Europe 1500–1900 and for the Western European integration. Velocities vary between 1.0002 and 1.0676. Variations can be partly explained, but require further explanation. Velocities may be used to estimate the time needed for the acceptance of additional members, the completion of European integration and world integration.