Analytical history

Bertrand M. Roehner

Provisional. Version of 10 February 2017. Comments are welcome.

1: Institute for Theoretical and High Energy Physics (LPTHE), University Pierre and Marie Curie, Paris, France. Email: roehner@lpthe.jussieu.fr

The purpose of this note is to explain what is “analytical history”, a modular and testable analysis of historical events introduced in a book published in 2002 (Roehner and Syme 2002). Broadly speaking, it is a comparative methodology for the analysis of historical events. Comparison is the keystone and hallmark of science. For instance, the extrasolar planets are crucial for understanding our own solar system. Until their discovery, astronomers could observe only one instance. Single instances can be described but they cannot be understood in a testable way. In other words, if one accepts that, as many historians say, “historical events are unique”, then no testable understanding can be developed.

Fig. 1  Exoplanet. Comparison is the linchpin of science. Knowing the characteristics of extrasolar planetary systems will give us a testable understanding of our own solar system. In the same way, comparison with other stars allows us to test our understanding of the Sun. It is true that each exoplanet or each star is in its way unique but that should not preclude comparison.

Because taking a comparative view is really the key of the approach that we propose, it will be illustrated in the following section through two examples.
Manifest for viewing the world in comparative perspective

The following case suggests that in human affairs making comparisons does not come naturally. It requires an effort. It is easier to remain focused on the little world in which one lives than to look outside.

How to manage street cleaning

In the past two or three decades the streets of Paris have become more and more dirty. Papers, empty cans, plastic bags, cigarette buts litter the sidewalks. Actually, even shortly after being cleaned the streets are nevertheless not really neat which shows that there is a deep flaw in how cleaning is performed. Although several mayors and city councils alternated they were all unable to solve the problem in spite of the promises made to their electors. Yet, this is a challenge to which all cities are confronted and which many are able to handle successfully. Therefore the solution seems quite obvious. What should one do? One needs only to study the management and techniques in use in successful cities such as for instance Geneva or Munich and then implement them in Paris.

The fact that this is not done suggests that to adopt a comparative standpoint is not something natural.

Needless to say, this reflection is not limited to street cleaning. As basically all cities are confronted to the same issues a close examination of the solutions that worked the best elsewhere should always be a mandatory first step ahead of any policy selection. At least it would give a clear understanding of the means that do work even if putting them into effect may, for a variety of reasons, represent a challenge.

In order to show that the adoption of a comparative framework really makes a crucial difference in many important issues we give a second illustration.

How to end secessionist movements and civil wars

In French, the American “Civil War” is called the “Guerre de Sécession” (“Secession War”). Whereas not all civil wars are caused by secessionist movements, it is true that separatist movements often lead to civil wars. In our time (2017) many civil wars are under way and a majority of them are caused by separatist movements. Yet, is it not remarkable that when accounting and explaining such events American media people seem to be completely oblivious of how the Civil War came to an end in their own country? Even a cursory comparative view would tell us two things.

- Civil wars are always bloody and “dirty” wars. One only needs to recall “Sher-
man’s March to the Sea” in Georgia at the end of 1864 to emphasize that the civilian population suffers a lot in such wars.

- The clearest effect of foreign intervention is to make such wars drag on longer. The “Thirty Year War” in Germany (1618–1648), the Civil War in China (1919–1949) or the Vietnam War (1945–1975) are cases in point.

It is hoped that, despite their brevity, the previous indications will convince readers that in many areas adopting a comparative perspective is not just a matter of academic inclination but has in fact far reaching implications.

It can also be observed that experimental physics, which so far has been the most successful of all scientific fields, is entirely based on comparing the results of experiments performed under different conditions. In other words, for physicists the comparative approach presented in this paper should be quite natural. That was indeed the case at the end of the 19th century but no longer nowadays for over the past century physics has become more and more theoretical.

Analytical, modular and testable

The purpose of the rest of this note is to describe the comparative methodology developed in “Pattern and Repertoire in History” (Roehner and Syme 2002).

First of all a comment about the book’s title may be useful. It was not chosen by the authors but by the publisher in conjunction with Prof. Charles Tilly who was one of the book’s reviewers.

How should the word “repertoire” be understood? “Repertoire” means a set of actions but here it refers to a limited set of actions. In reacting to an event a country (or more generally a group of people) will pick up a type of action in the limited repertoire of its past actions. Most often the selected action is one that had already occurred several times in the past or a mixture of two or three past actions.

In other words, the emphasis here is on recurrent actions which means that the repertoire will be limited to two or at most three items. If, instead of being a very narrow repertoire, it would contain many items, then the analysis would not have any predictive power whatsoever and would be quite useless.

The authors’ suggestion for the book’s title was “Analytical History” which is indeed the title of its first chapter. With the benefit of hindsight we are not sure it would have been a better title.

---

4It is claimed that Sherman’s campaign was conducted in agreement with the “Lieber Code” (Instructions for the government of Union armies in the field) which had been approved by President Abraham Lincoln in 1863. However, to our best knowledge, even today there is no reliable estimate of the number of civilian casualties. Therefore it is difficult to know how this total war campaign was really carried out.
What is the main idea behind these notions of pattern and recurrent events?

Let us assume we are interested in separatist movements of a given type. If we can collect historical evidence about 100 such episodes and all of them failed, then there is a strong likelihood that the 101st which we see developing under our eyes, will fail also.

This, in a nutshell, is the approach of analytical history: it relies on studying sharply defined events on a large number of cases. Not surprisingly, its practical implementation raises a number of questions.

We will see that in fact there are three successive steps (Fig. 2).

(i) Decomposing complicated events into simple modules.

(ii) Collecting evidence about a large number of cases involving these modules.

(iii) Proposing testable predictions.

These steps broadly correspond to the three expressions used in the title of this section: analytical refers to the decomposition process, modular refers to the study of simple modules on a large number of cases, testable refers to the fact that the previous investigation must be confronted to new evidence in order to check whether or not it is confirmed by observation.

The last step is essential as explained in the next subsection.

**Testable predictions**

In a general way in the social sciences for any observation one can propose an infinite number of explanations. None may be really wrong for in fact each one will just address a different facet of the observed effect. Similarly, it is not wrong to say that the movements of a pendulum are under the influence of the gravitational field of the Sun and Moon. However, this effect accounts for only a minute fraction of the actual movement; thus, this effect cannot be seen unless one can perform high accuracy measurements.

How then can one distinguish between main factors and accessory factors? The answer is very simple.

Each “model” (whether mathematical or not) should be, not just a closed explanation, but at the same time should provide testable predictions. If in the course of time the predictions turn out to be correct there will be a good likelihood that the “model” is able to capture the bulk of the phenomenon under consideration.

**The sunrise paradigm**

Why did we write the word “model” within quotes? The reason again is fairly simple.

For most economists and economic historians the word “model” refers to a mathe-
Fig. 2 Presentation of the successive steps in investigating complex events. First any complex event is decomposed into simpler modules which will then be studied separately. For each module the second step is to collect historical evidence in the form of a sample of realisations. Then, these realisations must be studied comparatively in order to find which rules they obey. These rules will then lead to testable predictions. If such predictions are confirmed by observation the proposed mechanism will be comforted.

Suppose that on a given day, let us say Monday, you have observed that the sun rises at 8:36 am. Then, on Tuesday and Wednesday you see it rise at 8:37 and 8:38 respectively. You will of course be tempted to predict that on Thursday it will rise at 8:39, a prediction indeed confirmed by observation. Emboldened by this success, you may feel assured that on Friday sunrise will happen at 8:40. Alas, it occurs also at 8:39. This may suggest that to give the times in minutes is perhaps not accurate enough. Data expressed in minutes and seconds are as follows (from Monday to Friday): 8:36:45, 8:37:37, 8:38:27, 8:39:14, 8:39:58. For these data the day-to-day changes, namely 52s, 50s, 47s, 44s, 42s display indeed a fairly regular pattern. In short, once one has a regular pattern, one can propose predictions. There is no need of a mathematical model. Actually, for the sunrise example astronomy does not offer...

5These are real data for Paris between 12 December 2016 (Monday) and 16 December (Friday). The source is the website http://sunsetsunrise.com
any mathematical model whatsoever because the rotation of the Earth around its axis in 24 hours is a purely empirical fact (contrary to the rotation time around the Sun which is controlled by the distance to the Sun).

In all sciences the first significant steps were the discovery of patterns. For instance the three Kepler laws which rule the orbits of planets can be seen as a pattern. It was of utmost importance because it opened the road to Newtonian mechanics.

Readers may think that the task of finding patterns was easier for planets than for socio-economic events because the later are much more diverse. It is quite right that defining and setting up an homogeneous set of events is a major challenge. However, as explained in the next subsection, this difficulty is also present in other fields such as medicine.

**Homogeneous sets of events: the paradigm of medical diagnosis**

When you visit your doctor because (for instance) you feel stomach pains, she will ask you a number of questions. Are you feverish? Do you feel pain immediately after your meals? And so on. Then, based on your answers, your doctor will try to establish a connection with some recognized pattern of symptoms. May be, she will be led to the conclusion that it is a gastroenteritis, that is to say a viral infection. This example has several similarities with the task of defining an homogeneous set of events.

- The symptoms of two persons suffering from gastroenteritis are not exactly the same. Depending upon their age, their diet, the season there will be differences. Whether these differences are of significance or merely accessory is a difficult decision. Each patient in some way is unique and to some extent each illness is unique too. That is why, not infrequently starting from the same set of symptoms, two doctors may draw different conclusions.
- In order to reduce the uncertainty one must get additional evidence for instance by performing a blood test.
- The ultimate test for deciding whether the diagnosis was correct is to see whether the treatment is able to cure the patient. This is the analogue of the successful predictions mentioned above.

At the source of each illness there is usually a “mechanism”: viral infection, cancerous cells and so on. A well-defined mechanism (e.g. infection by an adenovirus) will produce fairly reproducible symptoms. Similarly, focusing on a well-defined mechanism is a good way to create a fairly homogeneous sample of events. Examples are given in the next section.

**Analytical history**

So far our explanations concerned modular history. Before we close this introduction
we must explain the purpose of the analytical procedure. It is obvious that major historical events are unique. There has been only one French Revolution of 1789 and only one American Revolutionary War. However, such events have many facets which it is possible to study separately. This process is schematized in Fig. 2. It is in fact similar to what is done in chemistry when a mixture is separated into its components, i.e. the chemical compounds which compose it. For instance, whiskey is a mixture mostly of water and alcohol.

Examples of mechanisms

What we call a mechanism is what Vilfredo Pareto called the “residue” of a class of events (see below). This notion plays a key role because one (or several) mechanisms are associated with each class of events. In this section we give several examples of mechanisms. The first corresponds to the case of Fig. 2; the second and third belong to economic history; the fourth is about separatist movements. Finally, the last concerns the history of the American Revolutionary War.

Insurrections of the Parisian population

The insurrections of the Parisian population were an important element of the French Revolution. The one which took place on Bastille day is well known but there were many others some of which are listed in Fig. 2. Most of them followed the same scenario. Thus, it makes sense to analyze a sample of such events. Just as an illustration of the conclusions that can be derived, it turns out that a key-element in the success or failure was the attitude of the “National Guard”. This was a military unit whose men and officers were ordinary citizens. Whenever the National Guard sided with the rebels the insurrection was successful. Clearly, this rule can be used for making predictions.

Economic growth by sector

Between 1980 and 2014 the Chinese Gross Domestic Product (GDP) per employee in the primary, secondary and tertiary sectors (let us denote these variables by $g_1, g_2, g_3$) all increased exponentially and in fairly parallel ways. That is why their ratios remained comprised within fairly narrow intervals. On average: $g_2/g_1 = 5.5$, $g_3/g_2 = 0.75$. Thus, an expanding secondary sector will increase the global GDP per employee $g$ whereas an extension of the tertiary sector will decrease it (if at the same time $g_2/g_1$ remains constant). This is a very simple mechanism but it can explain both the rapid development of China and the leveling off of wage increases in developed countries that was observed in past decades.

\[^{6}\text{In Baaquie et al. (2016), in analogy with the well-known demographic transition, this effect was called a “wage transition”.}\]
If one assumes that in its development China will experience the same changes of sectorial weights as industrialized countries, then one can propose a long-term prediction for the evolution of $g$. This is what was done in Baaquie et al. (2016).

**Real estate speculative bubbles**

When real estate prices go up markedly there is a critical level above which people who wish to buy for their own need (let us call them “users”) can no longer afford to buy. Above this threshold, the market is more and more dominated by investors who buy with the objective of selling at a higher price some time later. However, as prices continue to climb, less and less investors are willing to buy for the following reason. Usually during such a speculative episode prices increase faster than rents. As a result the yield of capital invested in housing falls. The first sign of a coming crash is the contraction of the transaction volume as investors become less eager to buy. Not surprisingly, this contraction is particularly severe in the “buy-to-let” market.

This mechanism can be seen at work in many speculative episodes. As a matter of fact observation shows that during such episodes prices display almost always the same pattern of changes. First over a period of time that may range from 5 to 10 years, there is a multiplication of real prices by a factor 2 or 3; this is then followed by a downturn and a period of falling prices which is usually of same length as (or slightly shorter than) the upward phase. The existence of such a pattern opens the possibility to make predictions.

One such prediction was made in September 2003 in a reply to a review of “Pattern and Repertoire” (Roehner 2003a):

> “Some economists claim that demand is strong and will remain so; others contend that there may be a small correction in the next two years. But surprisingly few researchers have tried to take a close look at former price peaks to better understand what may be in store. Yet people in Boston, New York or San Francisco may remember that 13 years ago the bust of a housing bubble brought about financial troubles for many saving institutions. Will the same phenomenon repeat itself in the 5 or 6 years to come?”

Two subsequent papers (Roehner 2003b, 2006) gave a prediction for how prices will fall in California which turned out to be fairly correct (see Richmond et al. 2013).

**Separatist movements**

“Pattern and Repertoire” was published together with a companion volume entitled “Separatism and Integration” (Roehner and Rahilly 2002, a more recent presentation can be found in Roehner and Rahilly 2016), Whereas “Pattern and Repertoire” gives several short (and mostly qualitative) descriptions of recurrent events, “Separatism
and Integration” proposes a thorough analysis of separatist movements. It turns out that the key-factors in such movements are always very much the same. For instance, they originate mostly in islands or in remote corners of a country. Moreover, historical roots are a crucial element. These connections can be expressed in a quantitative way in the forms of graphs (see Ch. 8 of Roehner et al, 2002).

The ordeal of loyalists

Consider a war between two sides $A$ and $B$. Let us further assume that a city $a$ belonging to side $A$ is about to be invaded by the army of $B$. In addition let us suppose that among the citizens of $A$ some (let us call them loyalists) who openly showed their preference for $B$ have been put in prison. Obviously, if left in prison they will be freed as soon as the forces of $B$ will have overtaken the city. Then they will probably join the army of $B$. This is clearly an outcome that any responsible commander of the $A$ forces should try to avoid. There are not many solutions. The prisoners must be either transported away or eliminated that is to say executed.

Numerous examples of this scenario can be observed in the history of all countries who experienced this kind of conflict. As it follows almost always the same rules one can use them to make predictions. For instance, during the “American Revolutionary War” every time an area was under the imminent threat of being invaded by the British one would expect the loyalists to be rounded up (if they were not in prison already), tried and possibly executed. Three cases of this kind are mentioned in Roehner (2003a).

Due to the fact that during the protracted six-year long war of independence there was no clearly defined front line, there have probably been other cases in which areas previously under American control were invaded by British troops. The previous rule suggests to give a close look at the treatment of Loyalists under these circumstances. This is an interesting case because it shows that the predictions do not necessarily need to be about the future, they can also help us to identify past events which so far did not attract much attention.

Roots of modular history and previous attempts

Almost all reviews of “Pattern and Repertoire” observed that this was not the first attempt to make the study of history more “scientific”. The undeclared implication was that this attempt will probably fail just as previous ones have failed. Yet, one can be fairly sure that some time in the future this objective will indeed be realized. Why?

One possible answer can be given by considering the field of astronomy (Fig. 3). Like astronomy, history has for first objective to make observations and to do that
Fig. 3 Observation in astronomy and history. For thousands of years people have recorded the trajectories of planets without being able to make sense of their observations. Similarly for thousands of years people have recorded historical events without being able to make much sense of them. Although from planets, to asteroids, to meteorites, to comets the solar system is far from being simple, it is true that there is an even greater diversity in human events. That is why it is a good idea to start by studying classes of similar events.

As accurately as possible. Together with its parent field astrophysics, astronomy also wants to organize and analyze its data in ways which “make sense”. Although astronomical observations started thousands of years ago, astronomy became a real science only a few centuries ago.

Our objective is to raise the status of history from facts collecting to being capable of providing testable predictions. Countless events have been recorded in numerous countries and over many centuries. Our goal now is to make sense of them.

The transformation of astronomy into a science was not achieved all of a sudden but rather gradually through a succession of steps. The names of Eratosthenes of Cyrene (-276 to -195), Hipparchus (-190 to -120), Ptolemy (100 to 170) come immediately to mind. It would be a mistake to think that these persons were all “real” scientists. For instance, one the three major books written by Ptolemy was about astrology. Even Johannes Kepler wrote three books on astrology.

In short, it is stepwise that astronomy became the science that we know presently. Similarly, the transition from purely descriptive history to analytical history will come by degree. That is why in the following sections we recall some of the important landmarks on this long road. What matters is to go forward not backward. We hope that these previous achievements will give a better sense of the direction in which one needs to progress.

**Pareto: emphasis on the core of a set of events**

Vildredo Pareto was a great economist but also an important sociologist. It is unfortunate that his major work (Pareto 1917) attracted little attention and is now largely forgotten. In this work, Pareto develops an approach which is similar to ours in the sense that it is based on the analysis of samples of similar events. For instance,
speaking of (mostly magical) methods used by people to keep away storms, Pareto says (section 865):

“Would we know only one of these cases it would be impossible to infer anything from it. On the contrary, by analyzing a large sample of such events we can identify the invariant kernel of such actions” (my translation from the French version).

As can be seen from this example, Pareto’s objective is very ambitious because he includes in his analysis not only historical events but also actions dictated by superstition, tradition or religion. In other words, is is not only about facts which are well defined in time and space but also about actions described (in fairly loose ways) by commentators.

Table 1 lists the notions introduced by Pareto and the equivalent notions used in “Pattern and Repertoire”

| Pareto                                | Analytical history                                      |
|---------------------------------------|---------------------------------------------------------|
| Logico-experimental science            | Testable science                                        |
| Residue                               | Mechanism (derived from a set of realizations)          |
| Derivative                             | A realization (of a given module)                       |
| Derivations                           | Accessory features (in a realization of a module)       |
| Decomposition equation                 |                                                         |
| derivative = residue + derivations     | realization = mechanism + accessory features            |

Source: Pareto 1917, sections 865–867 (p. 458–459 in the French edition).

At first sight the choice by Pareto of the word “residue” to designate the mechanism of a module may surprise. In fact, he uses this word in the sense that it has in chemistry: when one filters a solution containing a suspension, the residue which remains in the filter is usually the most important component.

**Marc Bloch: emphasis on sharply focused comparative studies**

In 1924 the French historian Marc Bloch (1886-1944) published a book which was a landmark in the development of comparative history for at least two reasons.

- Instead of being a broad comparison, the study was focused on a sharply defined phenomenon, namely the assumed ability of kings to cure diseases.
- This phenomenon was studied comparatively in two countries, France and Britain, over a period of several centuries. Moreover it was studied not only from the point of view of history but also from a sociological perspective.

7Most of the sources used by Pareto are works by ancient Greek and Roman writers. The fact that in the 21st century few persons are familiar with these authors is of course an obstacle. Another is the sheer size of Pareto’s book, nearly 1,800 pages; the English edition comprises 4 volumes.
What we propose in “Pattern and Repertoire” parallels these features. Of course, one may regret that the author examined only two cases. We are told that Marc Bloch knew some 10 languages which would have enabled him to consider other countries, for instance Austria, Hungary, Poland, Spain or Sweden. The existence or absence of a similar tradition and belief in such countries would have given more precise information about the key-factors which control this phenomenon.

**Charles Tilly: emphasis on large \( n \) investigations**

Back in 2002 when “Pattern and Repertoire” was published Prof. Charles Tilly (1929–2008) predicted that for historiography the book would be a sort of tornado. That did not happen, however.

Charles Tilly was in his time a very influential political scientist and historian. In his book “Popular Contention in Great Britain, 1758–1834” Tilly collected and analyzed information about over 8,000 “contentious gatherings”. This was a major step forward and a model for the investigations of large \( n \) samples.

**Stanley Lieberson: emphasis on cumulative knowledge**

In a book (Lieberson 1985) and an article (Lieberson 1992) Harvard sociologist Stanley Lieberson underlines that in the social sciences the main challenge is to achieve development in a **cumulative way**. This is indeed essential for otherwise there will be a number of bright spots but without connection with each other. That does not make a science.

What made the success of physics is that there was a cumulative development and a synergy between its different fields. This did not came by chance. Table 2 shows that over more than three centuries with a determination and a patience which in retrospect seems quite remarkable. experimental physicists improved the accuracy of their measurement of the speed of light.

This contrast with what we see in history. As already mentioned after Marc Bloch’s study of the assumed ability of kings to cure diseases which focused on Britain and France, nobody tried to extend this investigation to other countries. Instead, for instance in France, historians moved to other topics which seemed more fashionable. This was the so called “New History” which focused mostly on cultural history.

**Development of comparative data bases**

In the last fifteen years 2000–2015, especially in the United States, there has been a rapid development of data bases set up in a comparative perspective. We will mention particularly two of them.

- IPUMS (Integrated Public Use Microdata Series) data base developed by the “Population Center” of the University of Minnesota provide individual census records
Table 2  Successive measurements over three centuries of the speed of light in vacuum.

| Year | Measurement [meter/second] | Error bar [meter/second] | Accuracy [per thousand] |
|------|-----------------------------|--------------------------|------------------------|
| 1675 | 220,000,000 ± 100,000,000   | 500 ‰                    |
| 1862 | 298,000,000 ± 500,000       | 1.7 ‰                   |
| 1907 | 299,710,000 ± 30,000        | 0.10 ‰                  |
| 1926 | 299,796,000 ± 4,000         | 0.012 ‰                 |
| 1950 | 299,792,500 ± 3,000         | 0.010 ‰                 |
| 1958 | 299,792,500 ± 100           | 0.0003 ‰                |
| 1972 | 299,792,456 ± 1.1           | $3 \times 10^{-6}$ ‰    |

Notes: The speed of light in air is smaller than in vacuum by 30,000 m/s. This does not mean that it must necessarily be measured in vacuum for, knowing the index of refraction of air (namely 1.0003) it is easy to derive the speed in vacuum from a measurement performed in air. The accuracy of the measurement is defined as the error bar divided by the measurement value. Source: Wikipedia article entitled “Speed of light”. This list is certainly not complete for other measurements were probably made between 1675 and 1862.

for all US censuses and for many censuses of a sample of foreign countries which is progressively expanded. In the IPUMS label it is the word “Integrated” which is the most important. Indeed, before new data are included care is taken to ensure their compatibility with existing data.

- From its very beginning the project of Wikipedia was to be a multinational database. This was conducive to the adoption of a comparative perspective. At present time (2016) many of the non-English articles are translations or summaries of the relevant article in English but one can hope that in following decades the contribution of other countries will increase so that eventually it becomes truly multinational. In its last chapter “Pattern and Repertoire” presented the project of a “Very Large Chronicle” (VLC) which would be a systematic data source of historical events. Wikipedia was a step in this direction. However, in the VLC project each event would be connected to a set of primary archive sources. This is a fairly ambitious project but is probably the only way to ensure reasonable reliability.

**Thomas Piketty: revival of comparative analysis**

Thomas Piketty’s book “Capital in the 21st century” has had a tremendous success in the United States. Some 200,000 copies were sold (Tracy 2014). However, almost none of its numerous reviews pointed out what can be seen as a key-aspect of the investigation, namely that it was a comparative study both in time (longitudinal analysis) and across nations (transversal analysis).

With regard to comparison in time it is a common saying that for most economists the world starts in 1945. On the contrary, Thomas Piketty’s study goes back to the mid-19th century.
At first sight the fact that his study extends to several industrialized countries may not seem very impressive because some econometric studies use samples of over hundred countries. In such cases, however, the data that they use are readily available for instance on the websites of the “World Bank” or “International Monetary Fund”. On the contrary, for each of the cases he considered, Prof. Piketty had to develop specific historical datasets. This is uncommon.

Does it mean that there will be a renewal of comparative studies? Although we would be happy to answer “yes” a lucid assessment raises many doubts. Just as one swallow does not make a summer.

**Conclusion**

Some historians do not agree with the proposal that there can be laws in history. Well, in sociology there are some laws which do have a broad validity; why should it be different in history?

Perhaps the reader would like us to give an example of such a broad law for it is true that there are not many.

Detailed death statistics by cause of death became available in most industrialized countries from the mid-nineteenth century on. Similarities across countries were soon identified. One of them is the impact of marital status on age-specific death rates (Bertillon 1879). The rates for married people were found to be two or three times lower than for single, divorced or widowed persons. For death by suicide the ratios were found to be even higher (Durkheim 1897). To our best knowledge (Richmond et al. 2016) the validity of this law extends to all time intervals and all countries (including an Asian country such as China) for which reliable data are available.

In recent years Prof. Peter Turchin developed *Cliodynamics*; what is its difference with analytical history? Broadly speaking, it can be said that cliodynamics wishes to develop mathematical models (somehow as in econometrics) whereas analytical history uses the approach of *experimental* science. That does not exclude building models but only once the mechanism has been well understood thanks to well-focused observations.

It would be pointless to discuss which approach is better. Actually, all attempts of this kind are welcome. There should be a profusion of them just as there are numerous software companies in the Silicon Valley. Then, each approach should be judged on its fruits, that is to say the number of successful predictions that it can offer. In this way the best options should emerge.

A last word may be useful which concerns non-human societies. In “Pattern and
Repertoire” the chapter about wars for territorial expansion closes on the description of wars of territorial expansion in different ant colonies of the same species. Nowadays such a parallel may seem weird, but at the end of the 19th century it was fairly natural. In “The mind and Society” (sections 155–157) Pareto draws several parallels of that kind which are based on observations by the entomologist Jean-Henri Fabre. A more comprehensive study was conducted along this line by the sociologist Alfred Espinas (Espinás 1876) in his thesis entitled “On animal societies”. This was several decades before Edward Wilson developed sociobiology.

Acknowledgments The author would like to express his gratitude to Profs. Belal Baaquie, Pierre Chaunu, Zengru Di, Jack Goldstone, Peter Richmond, Qinghai Wang, Jeffrey Williamson and Jinshan Wu who welcomed the present attempt to give a new life to analytical history.

References

Baaquie (B.E.), Roehner (B.M.), Wang (Q.) 2016: The wage transition in developed countries and its implications for China. Physica A 470,197-216.

Bertillon (L.-A.) 1879: Article “France” in the Dictionnaire Encyclopédique des Sciences Médicales, [Encyclopedic Dictionary of the Medical Sciences]. 4th series, Vol. 5, p.403-584.
[Available on “Gallica”, the website of digitized publications of the French national library at http://gallica.bnf.fr]

Bloch (M.) 1924: Les rois thaumaturges. Étude sur le caractère surnaturel attribué à la puissance royale particulièrement en France et en Angleterre. Strasbourg: Librairie Istra. Translated into English in 1973 under the title: The royal touch: sacred monarchy and scrofula in England and France. London: Routledge and Kegan Paul.

Chaunu (P.) 1964: Histoire quantitative ou histoire sérielle.[Quantitative history or serial history]. Cahiers Vílfredo Pareto 2,3,165-176.

Chaunu (P.) 1978: Histoire quantitative, histoire sérielle. [Quantitative history, serial history, not yet translated into English]. Paris: Armand Colin.

Durkheim (E.) 1897: Le suicide. Paris: Alcan. English translation: Suicide, a study in sociology. Glencoe, Ill.: Free Press.

Espinás (A.) 1878, 1935: Des sociétés animales [About animal societies]. Thesis, University of Paris.
[In 1879 the thesis was translated into German and in 1882 into Russian. It does not seem to have ever been translated into English. In 1935, it was re-edited by “Librairie Félix Alcan”, Paris.]
Goldstone (J.) 1991: Revolution and rebellion in the early modern world. Berkeley: University of California Press.

Lieberson (S.) 1985: Making it count: the improvement of social research and theory. Berkeley: University of California Press.

Lieberson (S.) 1992: Einstein, Renoir, and Greeley: some thoughts about evidence in sociology. 1991 Presidential address. American Sociological Review 57,1-15.

Pareto (V.) 1917: Traité de sociologie générale. Lausanne: Payot. It was the translation of the Italian version published in 1916 under the title: “Trattato di sociologia generale”. An English translation appeared in 1935 which was entitled: “The mind and society”. New York: Harcourt, Brace and Co.

Piketty (T.) 2013: Le capital au XXIe siècle. Paris: Éditions du Seuil. An English translation followed in 2014 with the title: “Capital in the 21st century”. Harvard University Press.

Richmond (P.), Roehner (B.M.) 2013: The predictable outcome of house price peaks. Evolutionary and Institutional Economic Review 9,1,125-139.

Richmond (P.), Roehner (B.M.) 2016: Effect of marital status on death rates. Part 1: High accuracy exploration of the FarrBertillon effect. Physica A 450,748-767.

Roehner (B.M.) 2001: Hidden collective factors in speculative trading. A study in analytical economics. Berlin: Springer-Verlag.

Roehner (B.M.) 2002: Pattern and repertoire in history. Cambridge (Mass.): Harvard University Press.

Roehner (B.M.), Rahilly (L.) 2002: Separatism and integration, A study in analytical history. Lanham (Maryland): Rowman and Littlefield.

Roehner (B.M.), Rahilly (L.) 2016: Separatism and disintegration. A comparative investigation. [Available at: http://www.lpthe.jussieu.fr/~roehner/separatism.pdf]

Roehner (B.M.) 2003a: Predictions in analytical history. Historically speaking 5,1,37-39.

Roehner (B.M.) 2003b: Patterns of speculation in real estate and stocks. in Nikkei Workshop on Econophysics (2003). Berlin: Springer Verlag.

Roehner (B.M.) 2006: Real estate price peaks: a comparative perspective. Evolutionary and Institutional Economics Review 2,2,167-182.

Tilly (C.) 1981: As sociology meets history. New York: Russel Sage.

Tilly (C.) 1995, 1998: Popular Contention in Great Britain, 17581834. Cambridge (Ma): Harvard University Press

Tracy (M.) 2014: Capital: A hit that was, wasn’t, then was again. How the French tome has rocked the tiny Harvard University Press. New Republic, 24 April.