

The dynamics of divorces: socio-economic models of different societies

Freezing a lot, tying a knot

Assumptions:

- civil state has its mechanistic equivalent in state of matter;
- people can be in two states: free (single) and coupled (married) and are allowed to transmit between these states;
- analogy to phase transition from physics, described in general as a function of temperature and pressure;
- social and economic freedom has impact on numbers of weddings or divorces;
- this theory is a framework to all analyses.

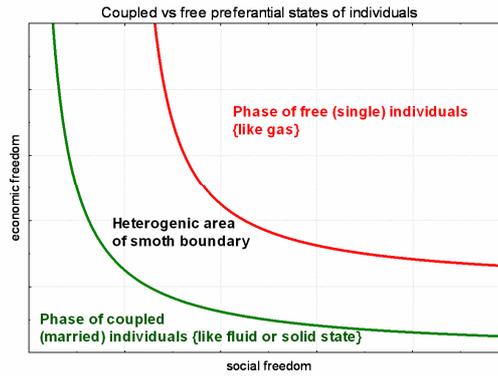


Fig. 1) Framework of marriage-divorce model

What if errors?

- sensitivity to local phenomena, called idiosyncrasy;
- difficulty in comparative analysis of different countries;
- demographic structure of society changes in time, and is different for each country.
- both simple socio- or economic models fall as we show [Fig. 8,9].

Norm breaking rule and social change [1]

Collective effects induced by imitation and social pressure were analyzed many times for different areas of social life. Changes of opinions can occur either abruptly or continuously, depending on the importance of herding effects, sometimes called *Zeitgeist* in literature. Particularly interesting and generic "Random Field Ising Model" (RFIM) has been primarily successfully proposed to model hysteresis loops in random magnets. The model was easily translated to represent a binary decision situation under social pressure, influenced by some global information. Transmission driven by social pressure can have two possible realisations:

- 1) with social pressure only - when polarization of opinion changes smoothly with time dependent social pressure;
- 2) with social pressure and imitation effect - when decisions change dramatically with a certain threshold value.

In our analysis, we investigate an increase of number of divorces, or rather the scaling between the height h of the peak respectively to its width w as Bouchaud did for birth rates and cell phones [Fig. 3]. The speed of change generically peaks at a certain time; the main prediction is a scaling relation $h \sim w^k$. In the mean field model, the parameter k close to 1 corresponds to model 1 with a simple pressure function, but close to 2/3 calls for model 2 with imitation. Unfortunately, the pure sociological model does not agree with data [Fig. 6,7].

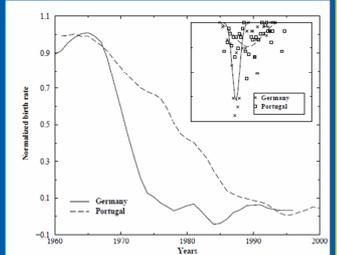


Fig. 2) Birth rates in time [J-P. B.]

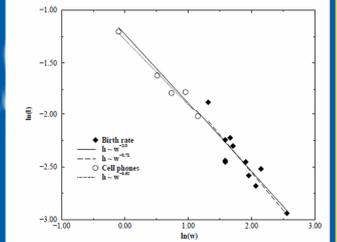


Fig. 3) Scaling, births and cells [J-P. B.]

Social change model: technics

In an idealized situation, if the increase of the divorce rate were Gaussian, our calculation would be easy (as Bouchaud postulated [Fig. 4]). Real trajectories are much more noisy [Fig. 5].

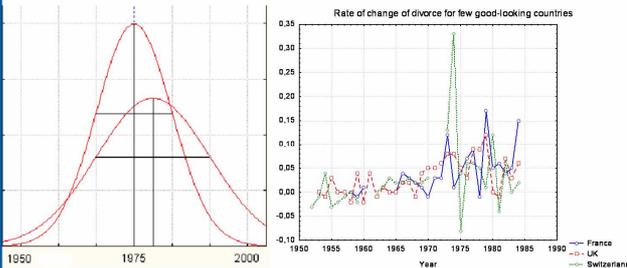


Fig. 4) Ideal fitting procedure

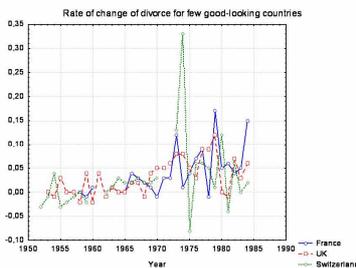


Fig. 5) Real trajectories of divorces to fit

Two estimators of w and h for each country

Inverse variance method [2] bases on the calculation of volatility of data [Fig. 6]. Bayesian method [3] uses different cumulated percentiles of data distribution and integrate over all possible cases [Fig. 7].

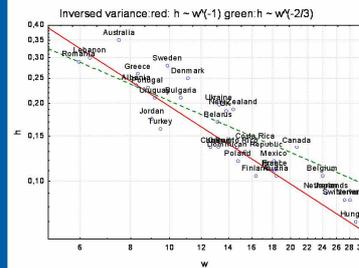


Fig. 6) Inverse variance (not so good fits)

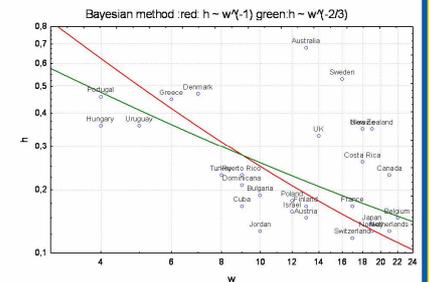


Fig. 7) Bayesian method (failed definitely)

Pure economic approach

We run regressions on Polish data, where independent variable is an average salary in region and dependent one is the rate of divorces. Unfortunately, there is no significant relation, although some regularity is observed. E.g. the richest state (Warsaw) has three times bigger rate than the poorest one (Galicia). Other observed decreases of divorce number can be locally explained from temporal national economy state [Fig. 8].

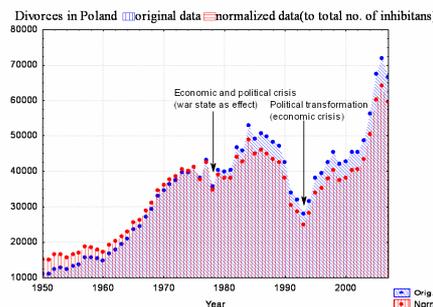


Fig. 8) Divorces in time with some demographic

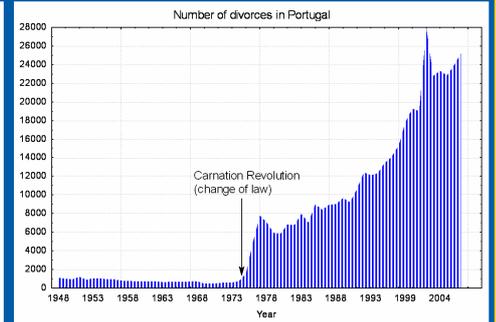


Fig. 9) The biggest divorce's rate change in Portugal was driven by law regulation (not socio-economic issue)