

System Dynamical Analysis for Interdisciplinary Research on Human Resource Development

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Abstract

Taking into view career decisions of IT professionals around the year 2000 a system dynamic model using real data demonstrates how individual market orientation leads to high unemployment rates in the IT labor market. In the context of the gender equity program of the Civil Services in Germany system dynamic analysis elucidate – likewise using real data – the significant difference between institutionally and individually perceived realities.

Keywords: IT professionals, unemployment, gender equity, workforce promotion rate

1. Introduction

In an interdisciplinary research on economics and social sciences one does not infrequently encounter dynamic processes which have continued in existence for several years before revealing their effects. Often, these effects are evaluated differently from different points of view. In the present contribution two examples are given for this purpose:

- A reconstruction of the average career development and the relating problems for IT professionals on the condition of rapid technological and economic change around the turn of the millennium. In this case, it can be made clear, by what kind of disruptive changes specialized labor markets are determined in particular from the point of view of the involved professionals. They are looking for the continuity of the vocational biography on the one hand and for the amortization of their educational investments on the other hand.
- A model calculation regarding the impact of the gender equity program on the career development of senior-level civil servants in North-Rhine-Westphalia, Germany, between the end of 1999 and the end of 2003. By system dynamic calculations, it becomes obvious, which dramatic difference there is between the institutionally and the individually perceived reality.

Before elaborating on both of these examples in chapter 3 and 4 of this paper, some theoretical remarks will be emphasized at first in chapter 2. Thus, the objective of the study becomes obvious: The methodical powerfulness of system dynamics shall be elucidated for economic and sociological interdisciplinary researches. The powerfulness results – as it may be demonstrated in particular by the politically explosive issue of gender mainstreaming – from the visually and mathematically supported inter-subjectivity of this methodology.

After the presentation of the examples, chapter 5 summarizes the results of the paper.

2. Theoretical remarks

In the centre of attention of the presented models and their dynamics, there are several socio-economic factors. These factors inhibit a dual contingency problem:

On the one hand, they elucidate objective coupling opportunities or economic functional requirements which are conveyed via the market in the form of professionalized competition structures on specific conditions – in the sense of current offers to the interested subjects demanding for labor, success, income and so on.

On the other hand, virtually from the perspective that has been reversed from objective to subjective – it always concerns the question of practicability of career- and income opportunities as a consequence of mostly individual decisions and self-organized constructions of the individual functional, educational and performance structures when striving for vocational biographical aims.

Beyond this process dialectics, questions are attended not only to the subjective career development as a result of one's own capability and the corresponding performance qualifications, but also to the capability substantially as a dependent variable of political systemic and socio-cultural factors – namely as a mixture of overlapping structural conditions, which determine the career success microscopically and macroscopically in a permanent manner as the "hidden curriculum" (Dewey 1916). Four such intervention effects are in particular of central interest:

- Primary effect: the individual potential of effort, motivation and performance.
- Secondary effect: the socialization and positioning objectives within the framework of the subjectively experienced primary and secondary socialization. This analytical level corresponds to a great extent to fundamental assumptions of the disposition concept of Bourdieu (Bourdieu 1997, Ecarius 1999).
- Tertiary effect: the current socio-political discourse as well as the appropriate regulating philosophies in comparison with the equity of opportunity, distributional equity, social security, just to name a few.
- And in the fourth place, it finally concerns the question, how socio-political expectations and regulatory approaches have been translated into the organizational culture and business strategy – in this case, in particular the corresponding profiling and controlling measures of the organizational and human resource strategy.

3. IT labor market in Germany around the year of 2000

Around the turn of the millennium, in Germany as well as in many other countries prevailed an unparalleled euphoria on the IT labor market. The number of the employed IT professionals rose by 69% between 1995 and 2002. When this development came to a standstill, the unemployment rate among the IT professionals reached an unusual high level of 12%, although the number of jobs did not decrease (fig. 1).

This development, above all the high unemployment rate around the year of 2003, is intended to be reconstructed to some extent by the simple model presented in fig. 2. It is presumed that the increased demand between 1995 until 2002 has been met by newcomers from the training system as well as by the career changers. While career changers are able to react immediately to the market changes, there is a system conditioned delay among the trainees. For the calculation, the real unemployment figure in the year 1993 and the real values of the annual

changes of the number of the employed IT professional are made use of. The model calculation is used to estimate the share of career changers ("Changing Q": "Training Q") and the duration of delay ("Training Duration") caused by the training.

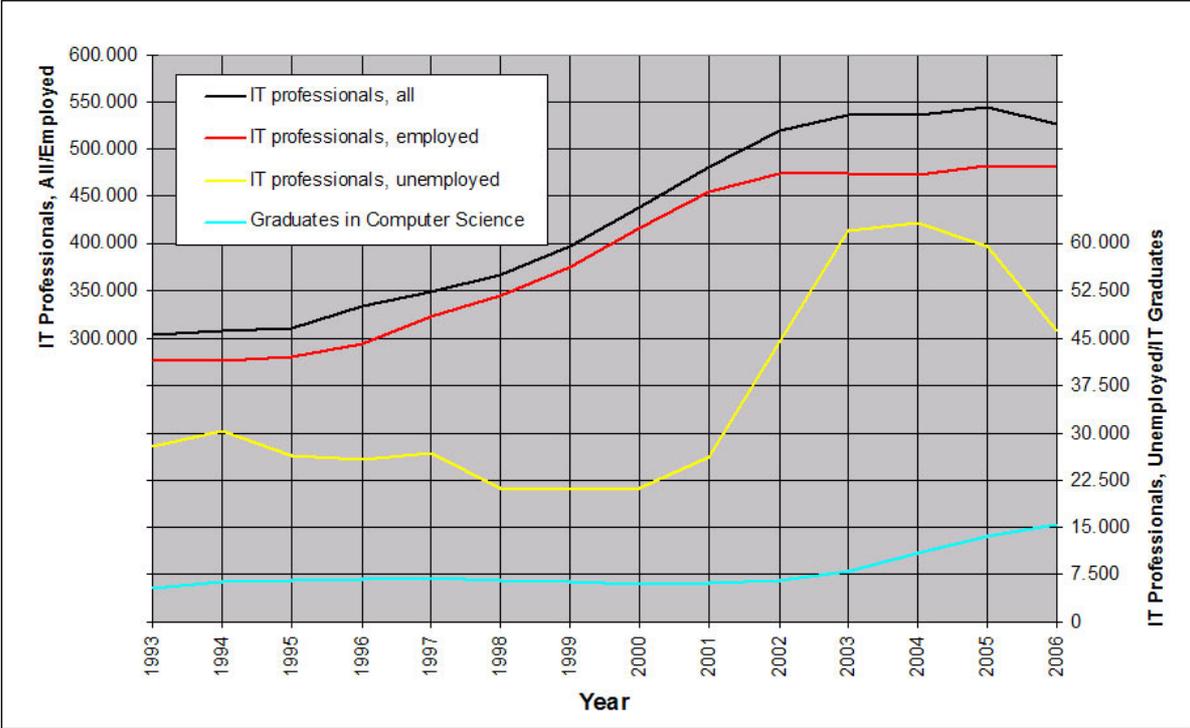


Fig. 1: Development of the labor market for IT professionals in Germany. Data sources: (Dostal 2001, IAB 2006, VDI 2008)

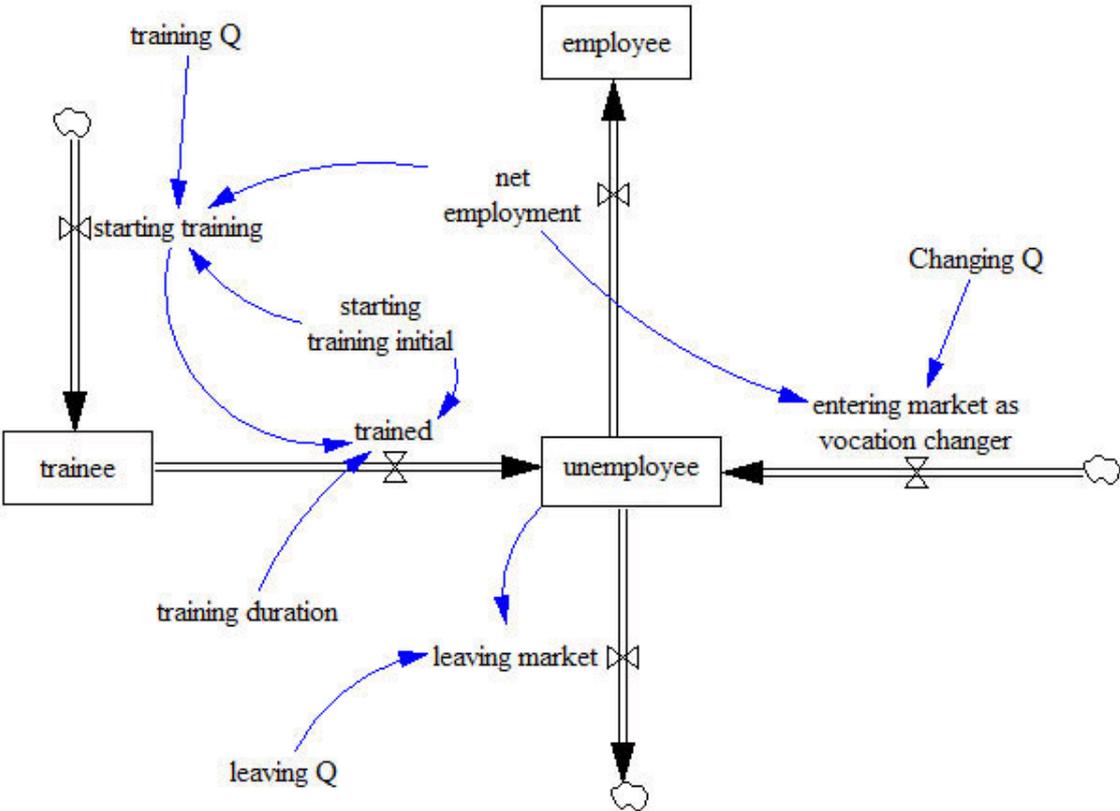


Fig. 2: A labor market model for IT-specialists

As a result it turned out that the increase of unemployment around 2003 is simulated best by a delay of three to four years as well as an approximate 50:50-ratio between the trained persons and the career changers around 2000 (fig. 3). It is remarkable that the universities having a higher duration of delay of four up to six years made no contribution to covering the increased demand. A look at fig. 1 confirms this result of the model calculation. When the number of university graduates in Computer Science started to rise beginning from 2003, the unemployment rate for the IT-specialists decreased again.

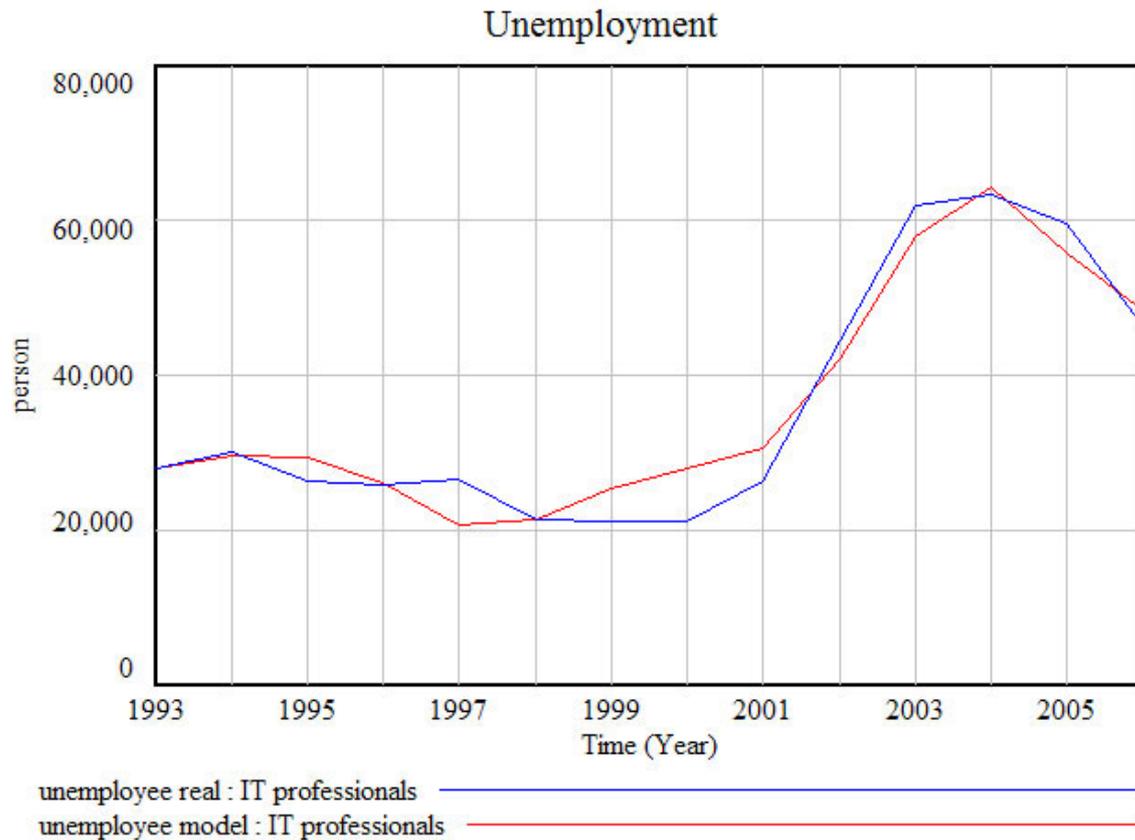


Fig. 3: Model calculation in comparison with statistical data

4. Gender Equity in Senior-level Civil Service

Gender equity is a principle anchored in the Basic Law of Germany as in many other countries. “Men and women have equal rights. The state promotes the factual implementation of equal rights for women and men and works towards removing existing disadvantages” (Deutscher Bundestag 2006). The state organizations take this task, as a rule, very seriously. Fig. 4 shows the composition of female and male civil servants within the senior-level service in North-Rhine-Westphalia, Germany. Between 1999 and 2003, the number of female civil servants increased at all career stages, while the one of their male colleagues remained unchanged or decreased slightly.

The government of North-Rhine-Westphalia has drawn positive conclusions about the report and wanted to continue to drive forward the promotion of women (Landesregierung NRW 2005, P. 3). However, from an individual point of view, a different picture presents itself. In order to elucidate this, a system dynamic model is been drawn up following Dudley (Dudley 2007).

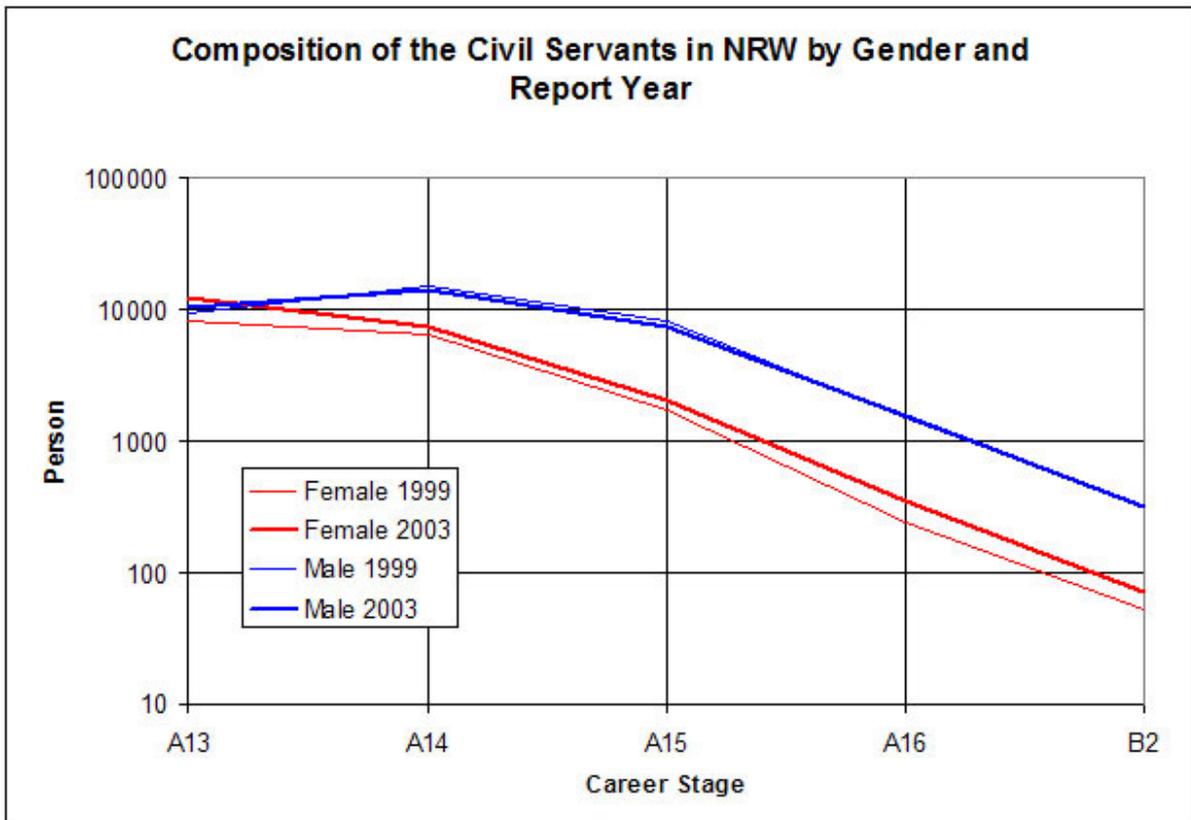


Fig. 4: Composition of the civil servants in NRW by gender and report year. Data source: Government of the Land of North-Rhine-Westphalia (Landesregierung NRW 2005, P. 50)

As shown in fig. 5, the model is composed of 5 stocks representing the 5 subsequent career stages "A13" through "B2" within the so-called senior-level service. A13 is the entry level stage for an university graduate starting her or his career as a civil servant. Since the numbers of the female and male civil servants at the beginning ("A13 99" and so on) and at the end ("A13 03" and so on) of the contemplation period are known at all stages, the model serves to calculate the personnel measures that are necessary for this development – recruitment of staff ("P1"), promotions ("P2" – "P5") as well as retirements ("R1" – "R5"). By assuming particular average entering ages and thus a definite staying duration until retirement ("T1" and so on) the average promotion rates can be calculated ("Q13"- "Q16"). On account of generous arrangements for granting leave of absence, the rare cases among the German female civil servants that definitely leave the organization and are no longer available for the career advancement are - in contrast to the model by Dudley - not considered separately in the present model.

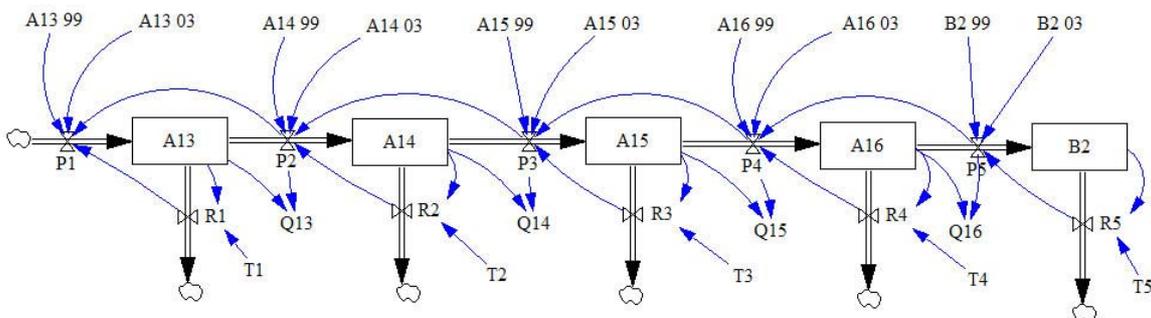


Fig. 5: Career Model for Civil Servants within the Senior-Level Service

The results are depicted in fig. 6. By the system dynamic model calculation, the drastic difference between the institutionally and individually perceived reality becomes clear. Whereas a numeric symmetry of all career stages cannot be achieved until the year 2030 or even later according to the simulation, the female civil servants at the level of A 14 or higher personally have an opportunity of being promoted that is twice as high as the one of their male colleagues. This may well be justified politically. With respect to the individual reactions, however, problematical aspects for the organization might arise. Those include for example internal dismissal and removal of the factual commitment among the qualified male employees who consider their effort and performance as being not recognized and not rewarded by the organization with respect to their career opportunities and with respect to the appreciation of their performance potential. Between different points of view and different interests can be mediated based on these figures.

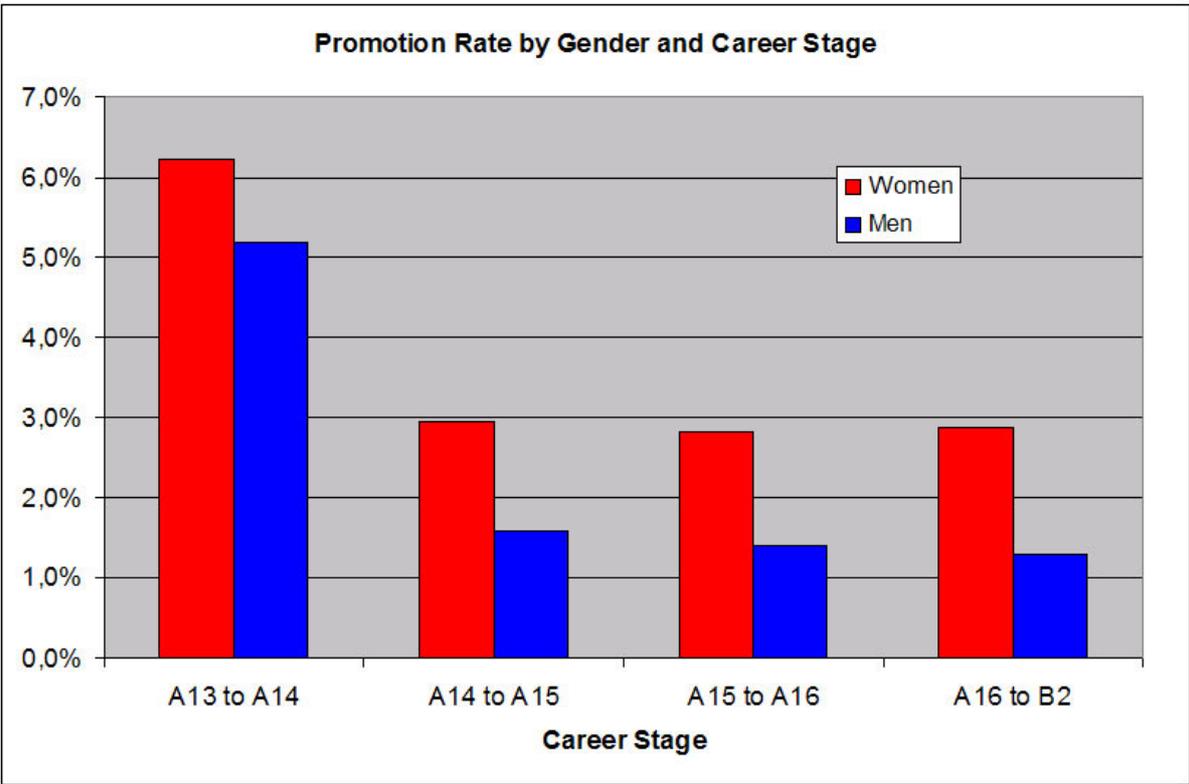


Fig. 6: Promotion Rate by Gender and Career Stage

5. Conclusion

In recent debates on managing global, demographical, technological and social change two critical success factors are always emphasized: The first one is called market orientation including lifelong learning and flexibility. The second one is to take advantage of the vocational potential of women. With respect to those dimensions real data from two sectors of German labor market have been analyzed using system dynamic models.

As shown in the first case, an individual market orientation as a whole may lead to a higher unemployment among the IT professionals. The reason for this is the – in comparison with the market rhythm – long duration of training which is, however, necessary for the specialization. Career changers may speed up the reaction of an organization to the market but also reduce the career predictability for both career changers and stayers. Caused by negative experiences like those on the IT labor market around 2000 the readiness among young people to invest into training and to specialize themselves may decrease in the long term. This may in turn

limit specialization. In respect to the further development of national economies and their levels of social security as well as of public and private welfare they have gained in the past this may be a first sign of fundamental crisis in which the successful globalized western countries will fall.

The second example as a contrast demonstrates how a policy of equal rights that is justified on the whole, may definitely signify an unequal treatment for individuals. Nevertheless, it will be possible to achieve a uniform filling of all career stages not until the year 2030 or even later. In contrast to the study of Dudley, in the German civil service we do experience the so-called pipeline-effect. Not the number of women which the next generation of executive officers can be recruited from, but an inequality that may possibly be experienced individually in an organization, which could endanger the solidarity, will then be the decisive factor limiting the speed of increasing share of female senior-level civil servants in the more exclusive career stages. The example shows as well some may be contraproductive consequences of current political implementations facing social, sexual and vocational lifestyles and career trajectories. Though virtual differentiations made by welfare politics target equality of life-style and life course they may lead in truth to further and still more complicated conditions of inequality.

Both cases elucidate the methodical powerfulness of system dynamics for economic and sociological interdisciplinary research. This results from the visually and mathematically supported inter-subjectivity of the methodology. In socio-political and business strategic context system dynamical models can be used to mediate between different interests and points of view.

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