

Identifying broken careers and vulnerable groups

CANPI_HU Research

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CANPI_HU Analysis of career paths

CANPI paper

Analysis of typical career paths according to gross salary of new male old age pensioners in 2010 [Gyula Császár, Judit Marosi]

Objective of the paper

- › Identifying individual career patterns and
- › Characterize [them] according to relative position and stability of the salaries of the individuals in the group

Source of data

Administrative information available at retirement for the determination of new pensions , i.e. the basis of the resolution by the pension authority establishing the pension payment

⇒ Conclusions from *á posteriori* information

Relevance for the AAE SSSC: Illustrating the use of administrative data for

- › Identifying vulnerable groups and
- › Calculating detailed group specific replacement ratios



Scope

- › Men [Women: no retirement this year because of rising retirement age rules]
- › Benefits: old age and other alike (early retirement) benefits
- › Gross annual wages up to contribution/accommodation limit, years 1988 – 2009 [22]

Records of 34.000 male retirees in 2010

- › Analysis of a 34.000 x 22 matrix (retirees x annual pensionable earnings)

Method

- › Step 1: Scaling of the salaries: Real salaries were substituted by a simplified rank scores: 1, ..., 40
- › Step 2: Cluster analysis giving 50 clusters of the retirees, grouping the „similar“ similar careers
- › Step 3: Describing the 50 clusters (characteristic groups) using additional data *[next]*

Additional data included in the description of the results:

- › gender
- › type of benefit
- › amount of benefit
- › average base wage*
- › gross annual pensionable salary* since 1988
- › number of salaried days (denominator days) since 1988

Relevant features of the Hungarian pension system

- › Use of 1988: the year since salary data recorded electronically and since the average earnings in the DB pension formula is calculated (the formula is growing into a career average formula as years pass)
- › Service years are used for the real whole career, years before 1988 also taken into account

Explanation to the career graphs:

- › The change to free market economy in the early 1990s in Hungary came with high unemployment and inflation greatly influencing the career paths of those retiring in 2010.

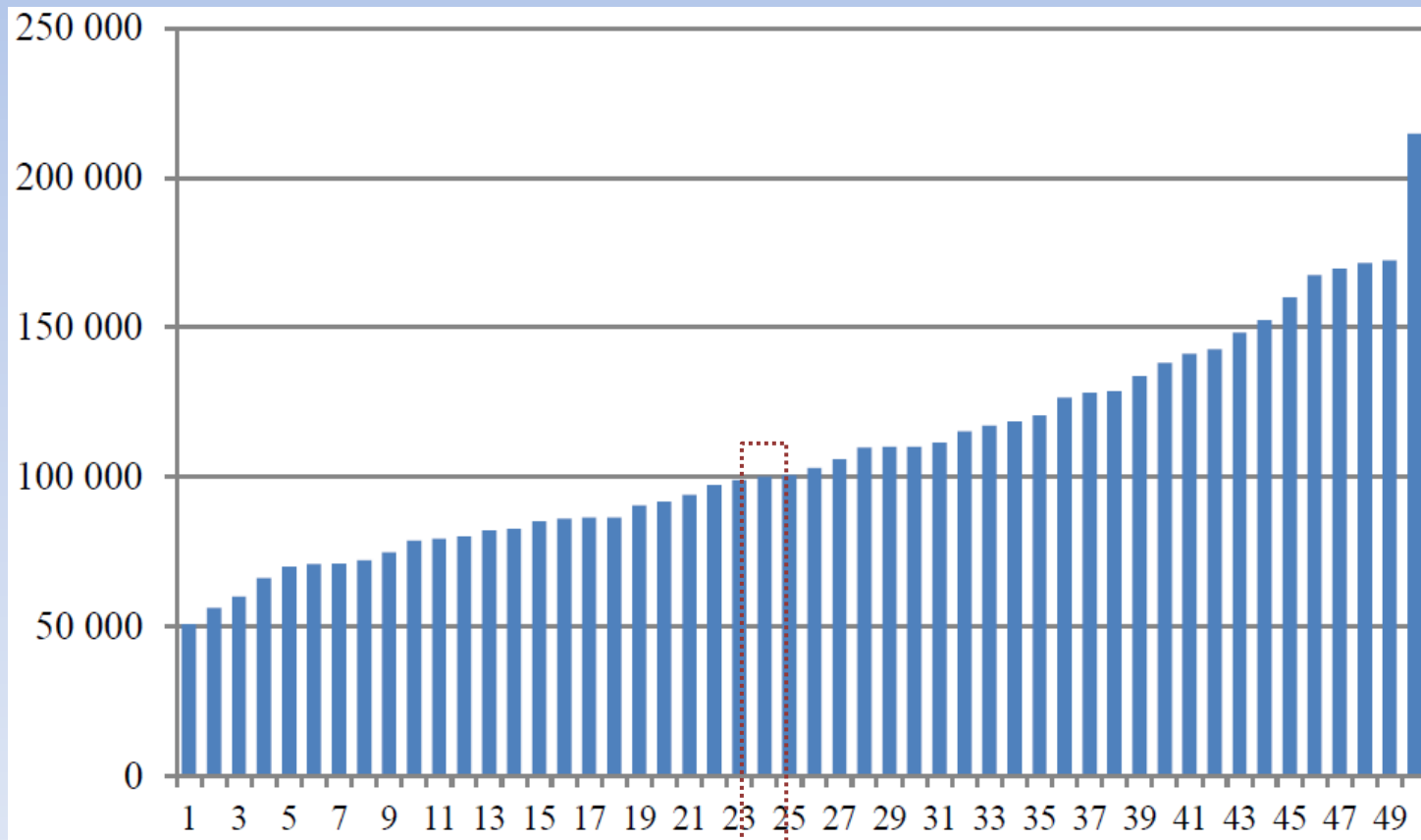
Results



50 salary development patterns „by definition”

The average* pensions of the 50 groups

* Average: representing the cluster, and as calculated in the DB pension formula at retirement

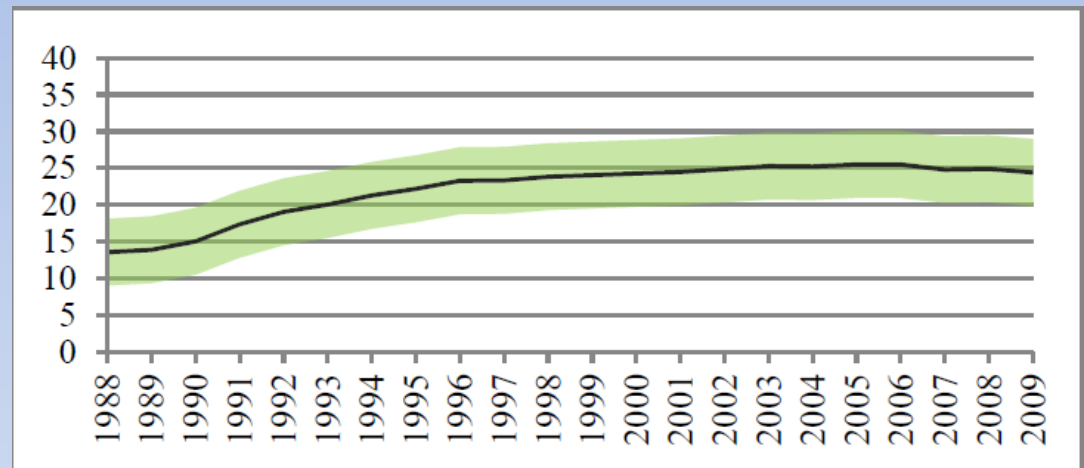




Example

*Group 24: [Position] Improving from
lower third to middle*

Cases [out of 34000] 1219
Average salary (HUF) 115 780
Relative level of salary (1988-2010)
 0.8
Standard deviation 4.2
Service period (years) 43.7
Service years (1988-2010)
 21.6 [max 22]
Pension (HUF) 99 985
[total ave.: 104 000]
Pension vs avg pension 96.14%
RR : 86%



Graph: Salary scores by year

Risk groups – compared to other groups:

Smooth careers



CS-50 Always on the top

› Cases in the group	2 526	
› Average salary (HUF)	258 461	
› Relative level of salary (1988-2010)	2,2	
› Standard deviation	2,9	
› Service period (years)	42,0	
› Service years during (1988-2010)	22,4	
› Pension [av: 104 000] (HUF)	214 814	[206%]
› RR: 83%		

CS-20 Stagnating middle

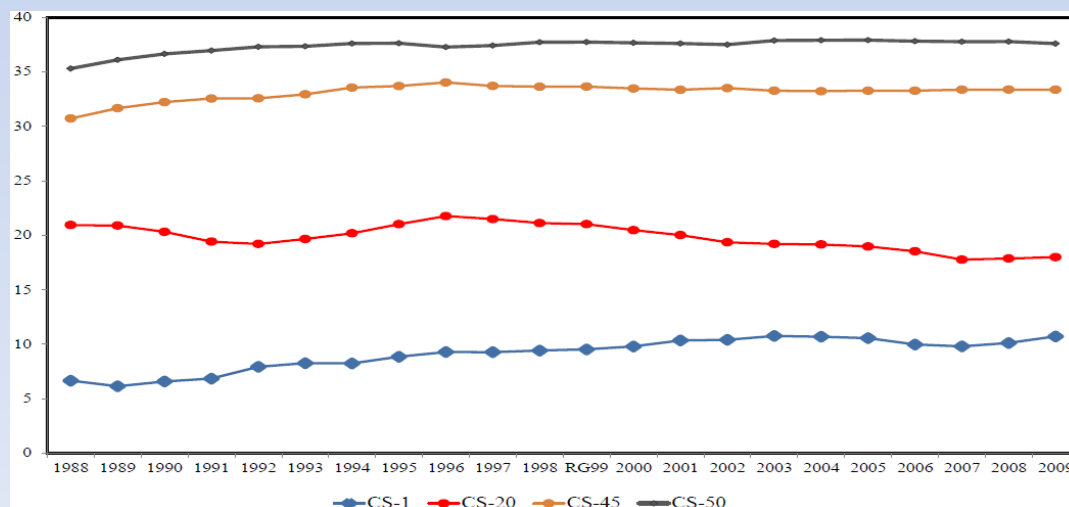
› Cases in the group	993	
› Average salary (HUF)	105 494	
› Relative level of salary (1988-2010)	0,7	
› Standard deviation	4,6	
› Service period (years)	44,0	
› Service years during (1988-2010)	21,2	
› Pension [av: 104 000] (HUF)	91 796	[88%]
› RR: 87%		

CS-41 Always in the quartile

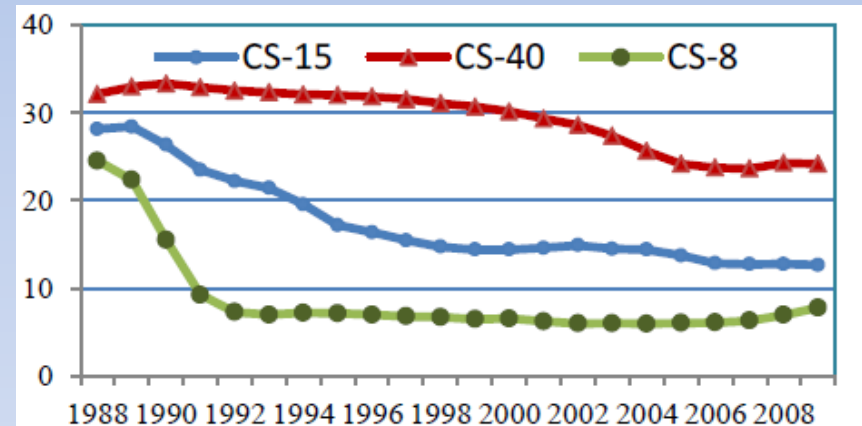
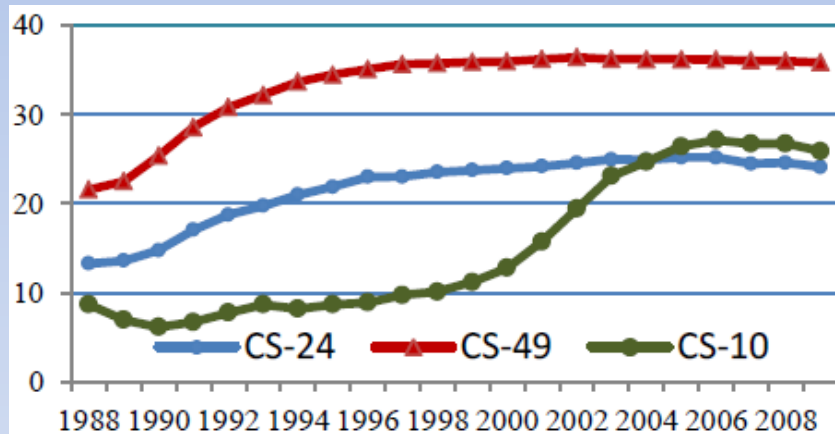
› Cases in the group	1 592	
› Average salary (HUF)	191 776	
› Relative level of salary (1988-2010)	1,5	
› Standard deviation	3,7	
› Service period (years)	42,2	
› Service years during (1988-2010)	22,2	
› Pension [av: 104 000] (HUF)	160 062	[154%]
› RR: 83%		

CS-5 Very low but increasing

› Cases in the group	1 927	
› Average salary (HUF)	64 818	
› Relative level of salary (1988-2010)	0,4	
› Standard deviation	4,3	
› Service period (years)	39,0	
› Service years during (1988-2010)	16,5	
› Pension [av: 104 000] (HUF)	50 776	[49%]
› RR: 79%		



Risk groups – compared to other groups: Opposite career trend groups



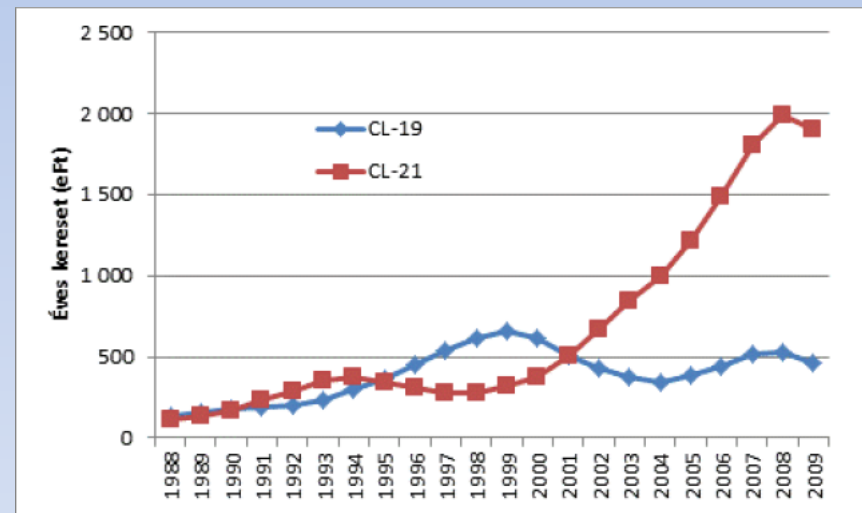
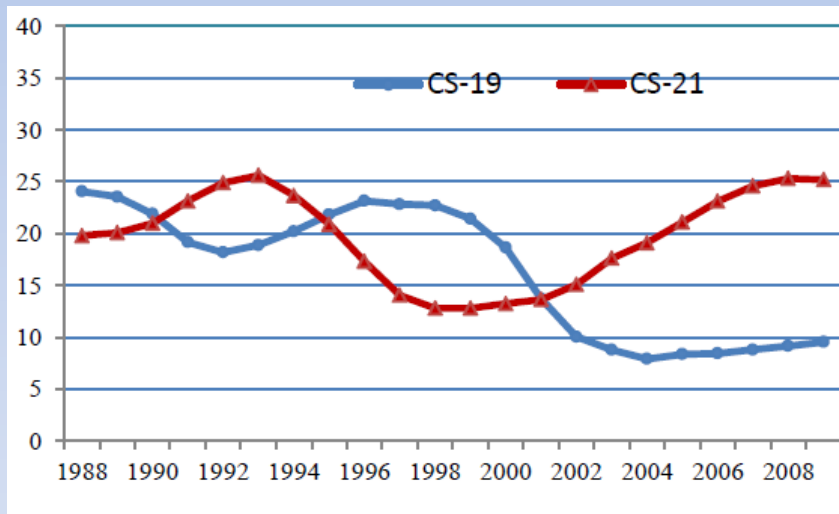
Risk groups – compared to other groups: Middle cases



Mirror cases?

The two groups are close in average terms...

... but in “real” terms the downward path of Group-19 should be regarded more risky

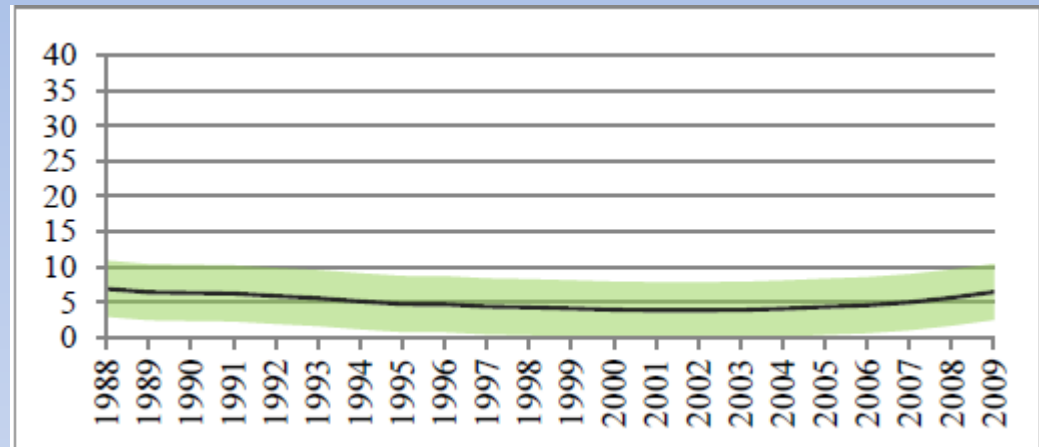




An obviously high risk group

CS-2: Very high risk group

- › Cases in the group 2 589
- › Average salary (HUF) 85 806
- › Relative level of salary 0.5
- › Standard deviation 3.7
- › Service period (years) 28.0
- › Service years during 6.0
- › Pension [av: 104 000] (HUF) 56 278
- › ***Pension vs avg pension 54.11%***
- › ***RR 65.6%***



And by the number of cases this is the largest group with

- › *lowest service year,*
- › *lowest salary during the whole service period [i.e. also having earnings before the 1990s]*

This group is a special case of ... [see next]

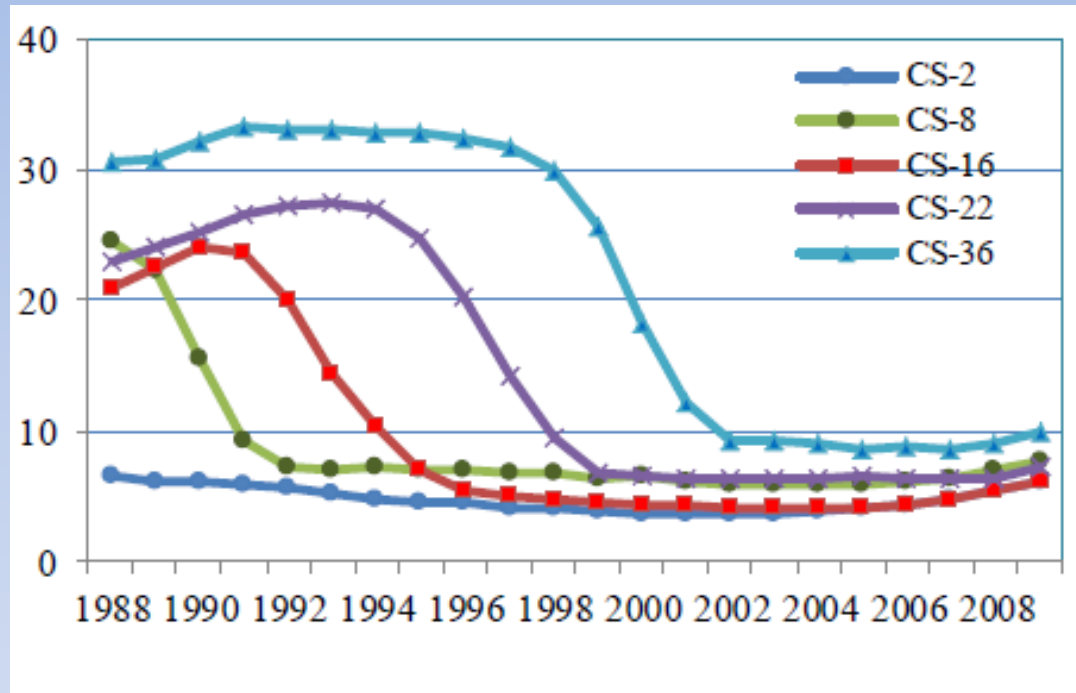


[cont'd]

In these groups the average salaries deviates the more from the average of total employed average during the 22 years, and

with a downward career trend

Including service period in the analysis will show that these groups' service period is lower than the average

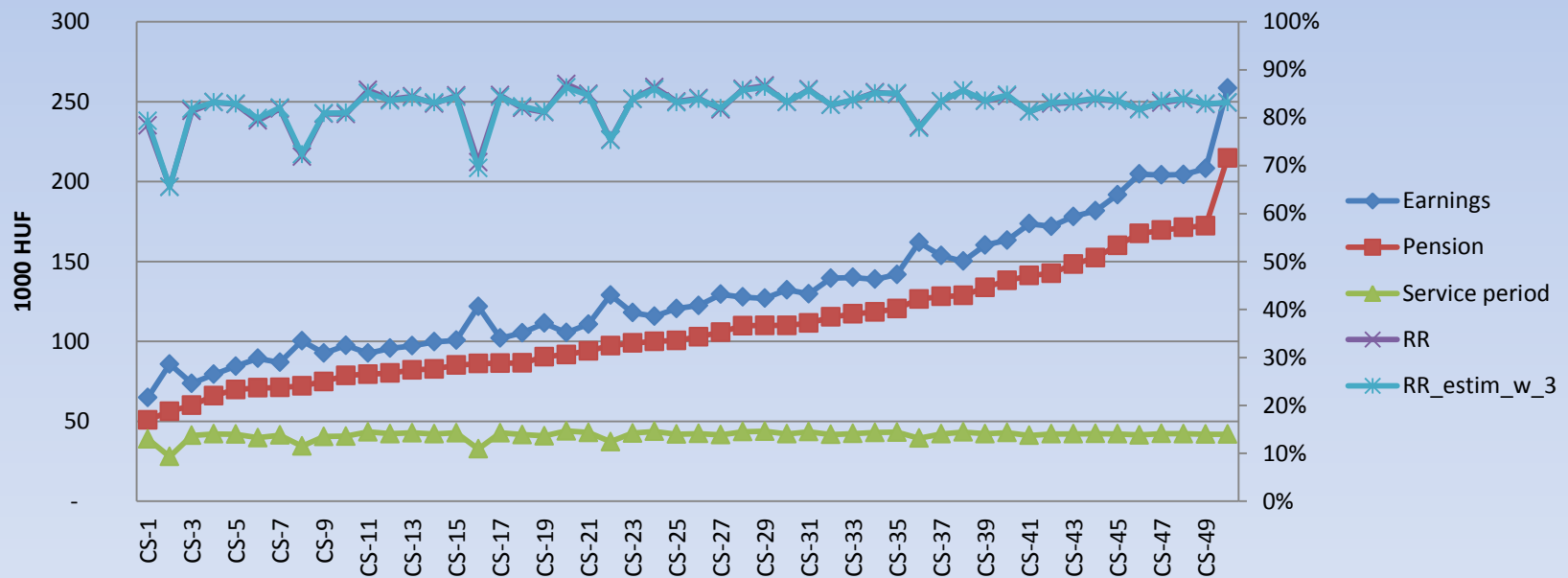


Explaining the RR with DB formula variables



The graph of the RRs can be reproduced by a regression curve – using Earnings, Pension and Service period – at 99.25% fitting to the original values

Estimation of the RR with three variables (Pension and Earnings and Service) by characteristic groups



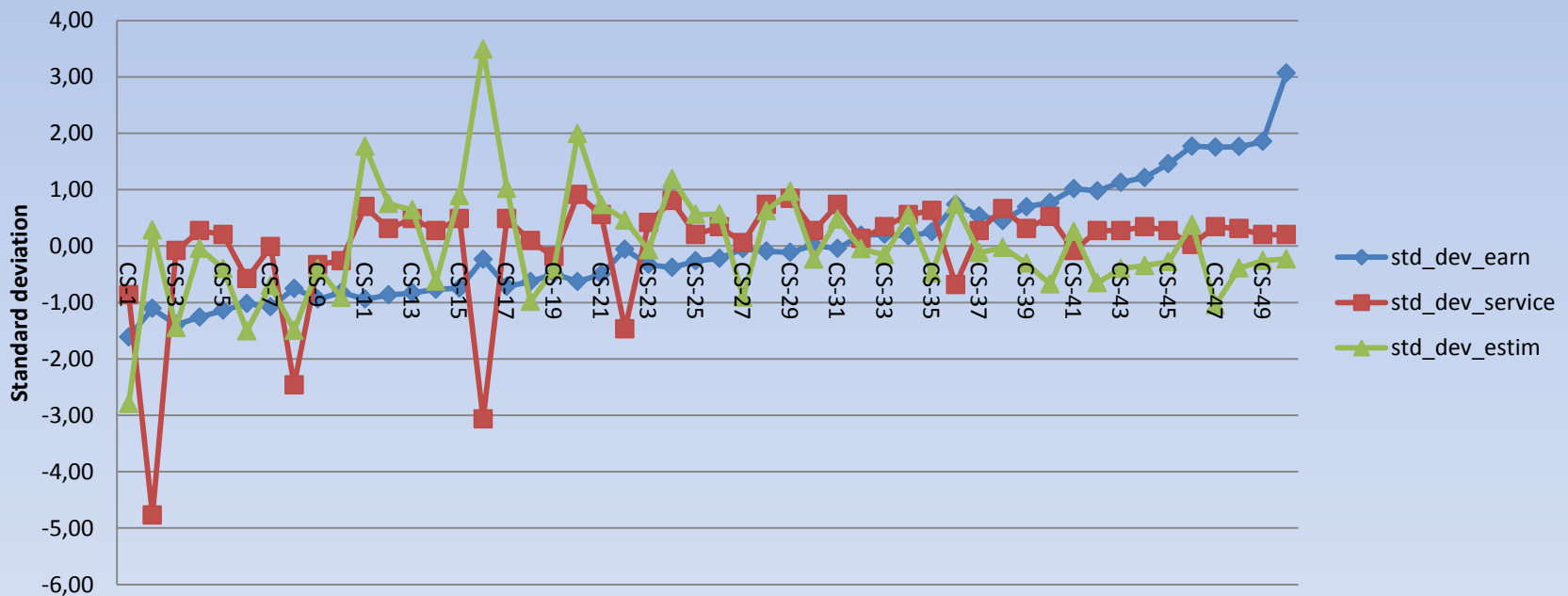
Having a DB formula this should be just evident. But we might be interested in the outlier cases – CS-2, CS-8, CS-16, CS-22, CS-36 – where in spite of higher average earnings the RRs are lower

Explaining the RR with DB formula variables



So let's examine the estimation error vs the deviation from average earnings and service

Deviations of earnings and service periods and the estimation



Conclusions:

- › Estimation error is good indicator of the outlier career paths
- › Lower pension careers more risky (expectation confirmed)
- › The DB formula provides incentives to work longer: higher salaries do not balance much lesser service period

Just for fun: Graphical interpretation of the groups of the pensioners



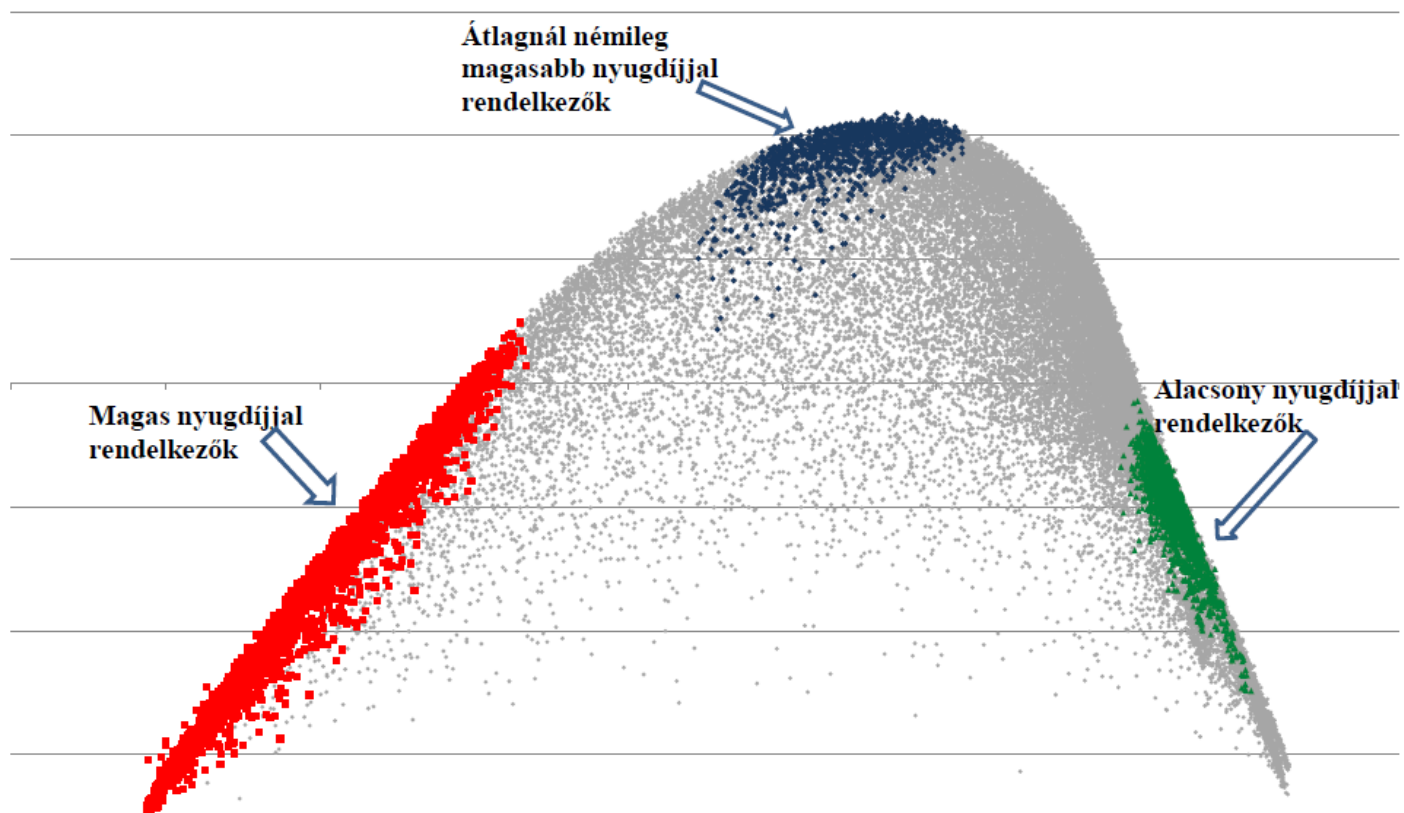
The original data are 32000 point in a 22 dimension space

The cluster analysis assigned +1 column to the table, the number labelling the cluster where the individual belongs to

The number of 22 original descriptor variables (i.e. the recorded earnings career from 1988) can be reduced* keeping the characteristics of the individual, and the points might be plot in a two-dim surface (plane) of any two of them

* Breiman, L., Friedman, J. H., Estimating Optimal transformations for multiple regression and correlation

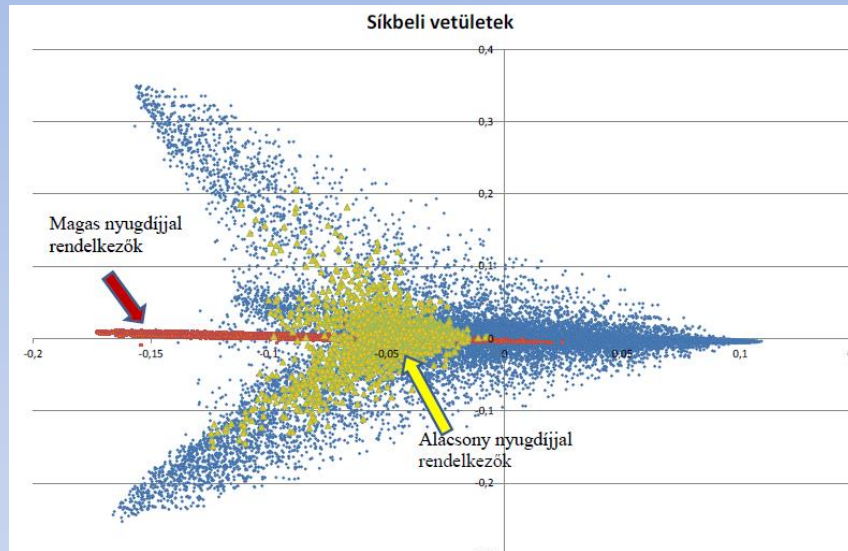
Axes 1 and 2





Axes 2 and 3 for Groups CS-19 and CS-21

All



Groups CS-19 and CS-21

