Does random auditing reduce tax evasion in the lab?

Mohamed Ali Bchir, Nicolas Daures, Marc Willinger, . Economic Science Association

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Motivations

- Empirical context
  - Water extraction from aquifers in coastal zones
  - High risk of saline intrusion
  - Under-reporting of water extraction
- Designing mechanisms to reduce misreporting
  - Random auditing + Fine
  - Collective penalties (e.g. ambiant tax, …)

This study

- Authorities have limited information and limited budget
- Objective : minimizing the number of agents who cheat
- Mechanism with probabilistic audit
- Conditionnal audit probability (conditionned on past observed behavior)

  Greenberg (1986)

Assumptions (1)

- In each period, each agent receives a random income y
- Players report income $z \leq y$
- Net income
  - If not audited : $y - T(z)$ (N.B. $T(y) \leq y$)
  - If audited :
    - Truthfull reporting : $y - T(y)$
    - Cheating : $y - T(z) - P(y,z)$ with $P(y,z) > T(y) - T(z)$

- Audit probability : $p > 0$
- Audit is perfect

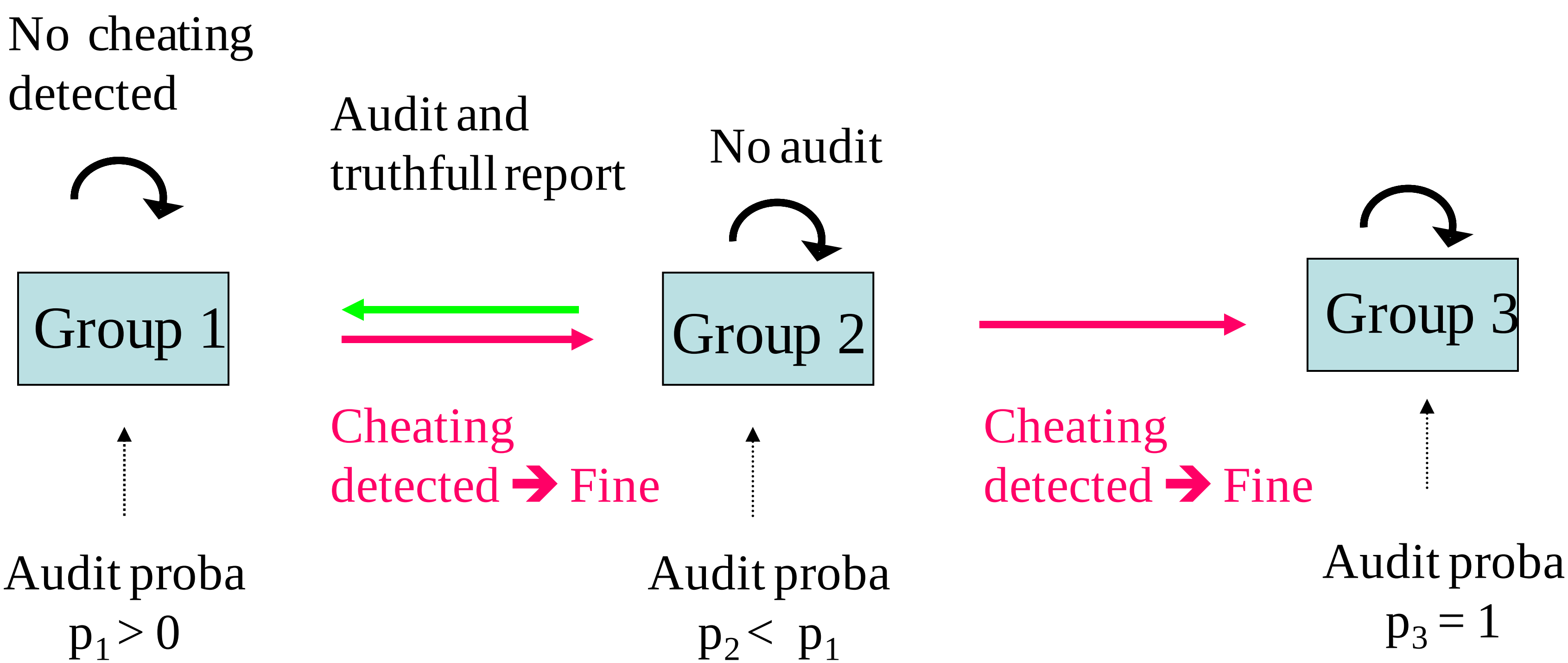
Assumptions (2)

- Agents live an infinite number of periods
- Agents are risk-neutral
- Myopic behaviour
- $p_i(y)$ is the smallest audit probability for which player i reports truthfully
- Myopic players cheat for $p < p_i(y)$ whatever y
- (there exists $\rho > 0$, such that for all y and all i $p_i(y) > \rho$)

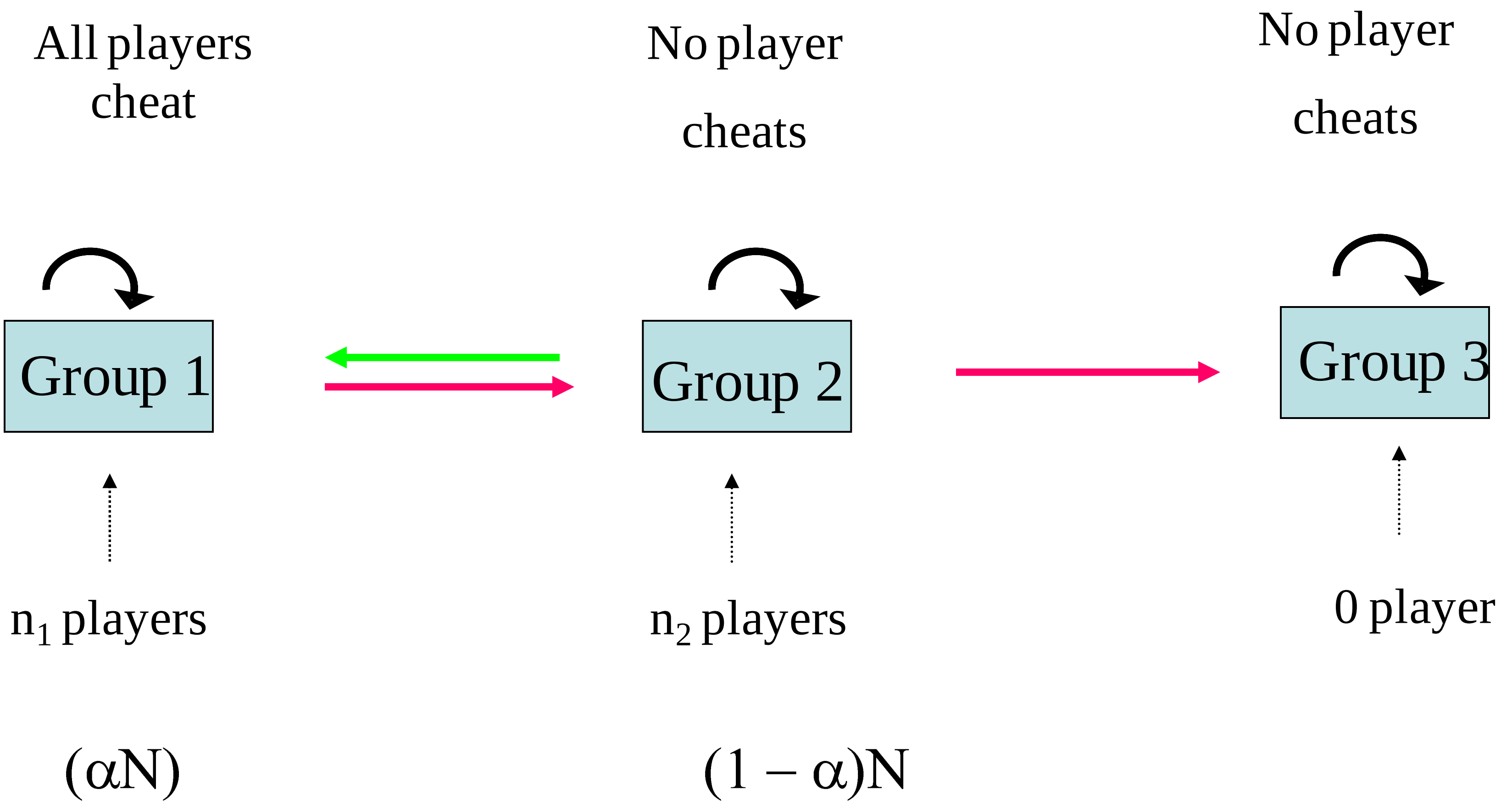
Assumptions (3)

- r = audit probability determined by the tax authorithy's budget constraint (exogenous)
  - If r = 1 all players report truthfully
  - If $r < \rho$ all players will cheat
  - If $\rho < r < p_i(y)^{max}$ some players will cheat
- ➔ they can increase their utility by cheating until they are audited, and then stop cheating
- The tax authorities try to minimize the number of tax evaders in the population n_1

Predictions (1)



Predictions (2)



Experimental design (1)

- Income stream : each subject receives a randomly selected income between 100 and 1000 yens at each period
- Infinite lifetime (cont. prob = 0.9)
- Many lives : each subject experiences several lives.
- Ending : end time announced at the beginning. After end time, no new sequence could start. Running sequence were allowed to be continued during a maximum extra-time of 15mn.
- Payment : One sequence randomly selected and paid out

Experimental design (2)

- Two-treatments :
  - T1 = low audit probability :
    Group 1 : $p_1 = 1/3$
    Group 2 : $p_2 = 1/4$
  - T2 = high audit probability :
    Group 1 : $p_1 = 1/2$
    Group 2 : $p_2 = 1/3$
- Penalty
  $P(y,z) = (y - z) \times a$

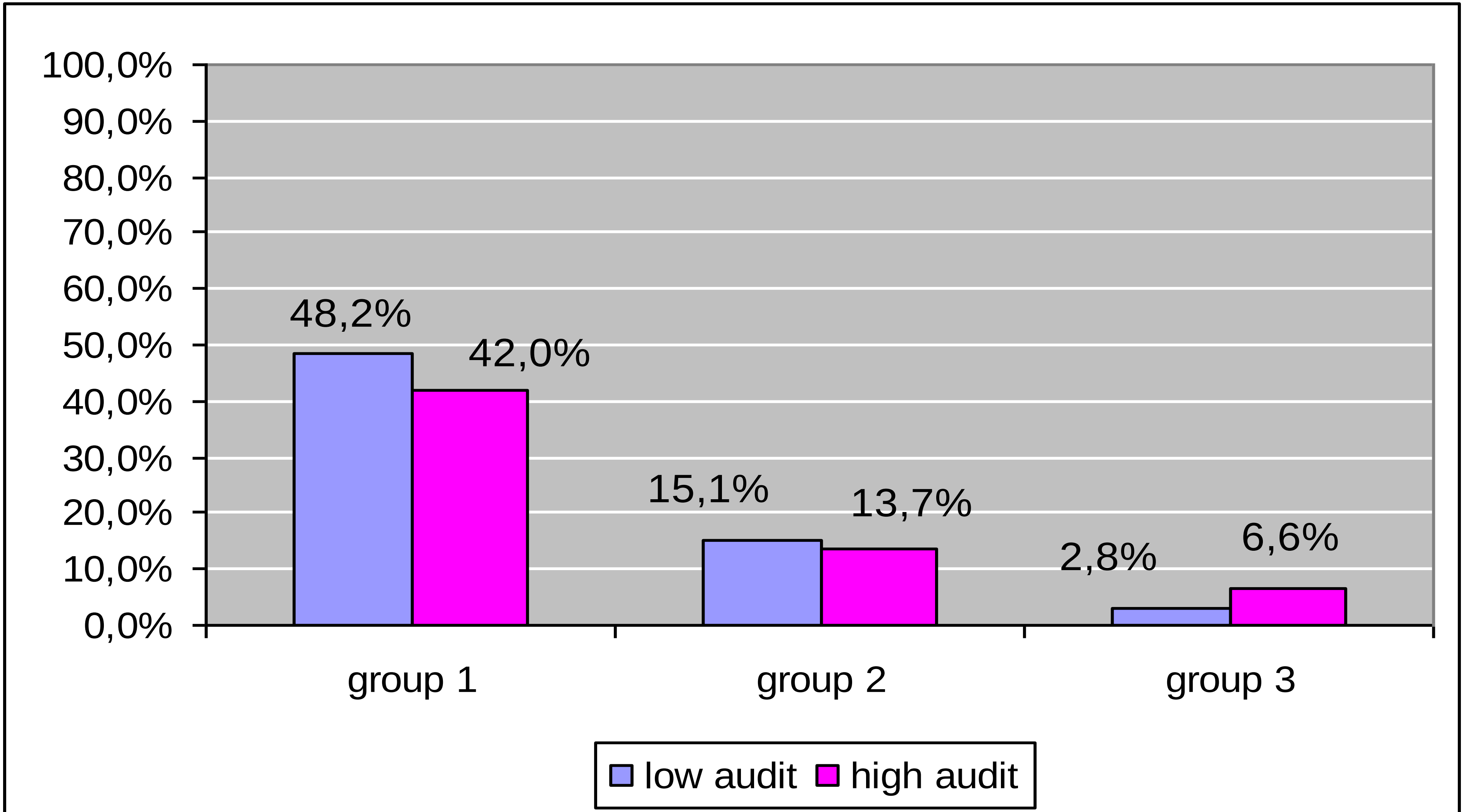
Summary of the data

	Low audit	High audit
Number of subjects	36	38
Average number of sequences (min/max)	7 (3/12)	9 (4/16)
Average number of periods (min/max)	31 (21/82)	30 (21/82)
Number of observations	7630	10180

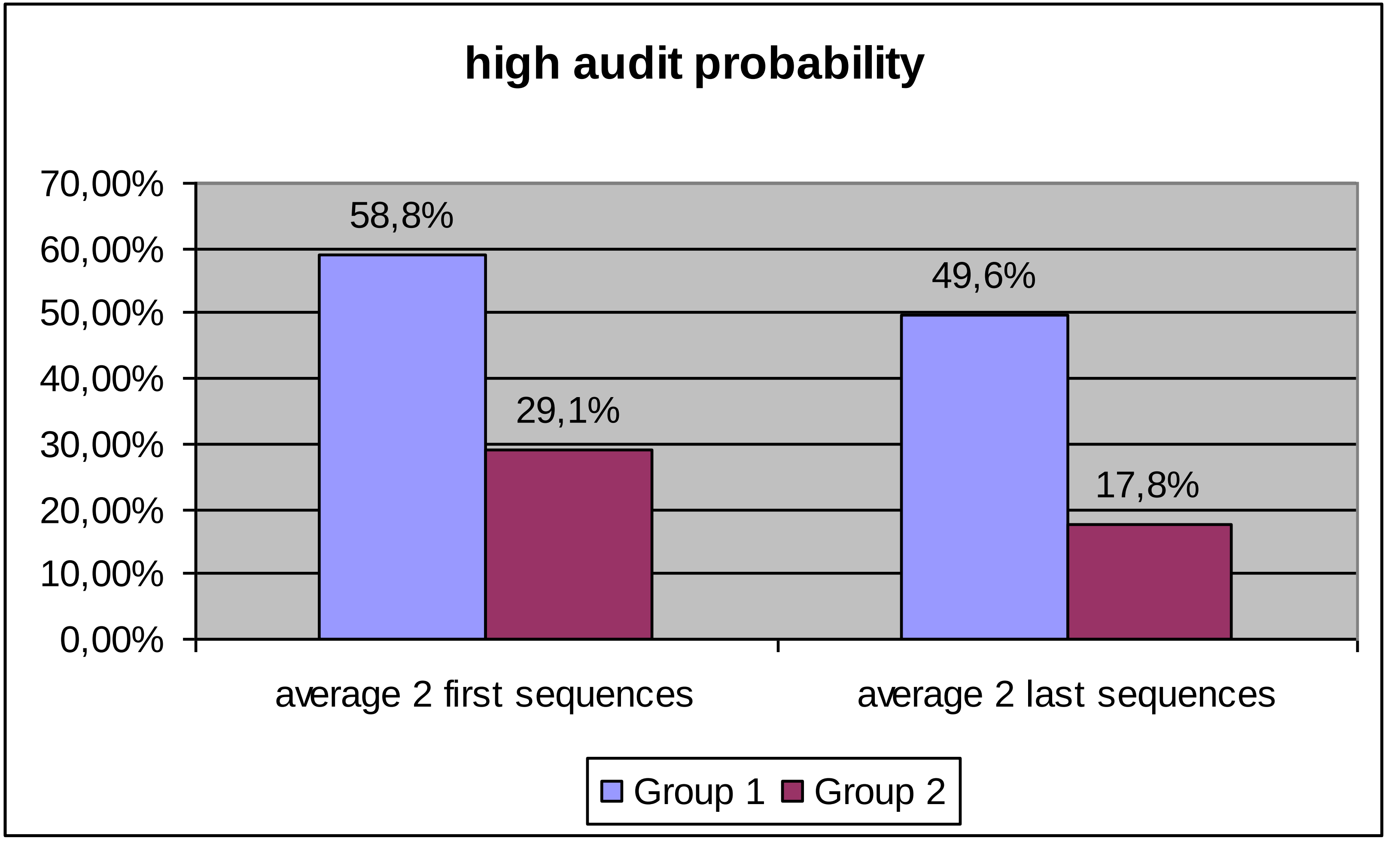
Proportions of subjects in groups

	Low audit ($p_1 = 1/3$, $p_2 = ¼$)		***High audit*** ($p_1 = 1/2$, $p_2 = 1/3$)	
	Predicted	**Estimated**	**Predicted**	**Estimated**
Group 1	**43%**	**50%**	**40%**	**46%**
Group 2	**57%**	**28%**	**60%**	**28%**
Group 3	**0%**	**20%**	**0%**	**26%**

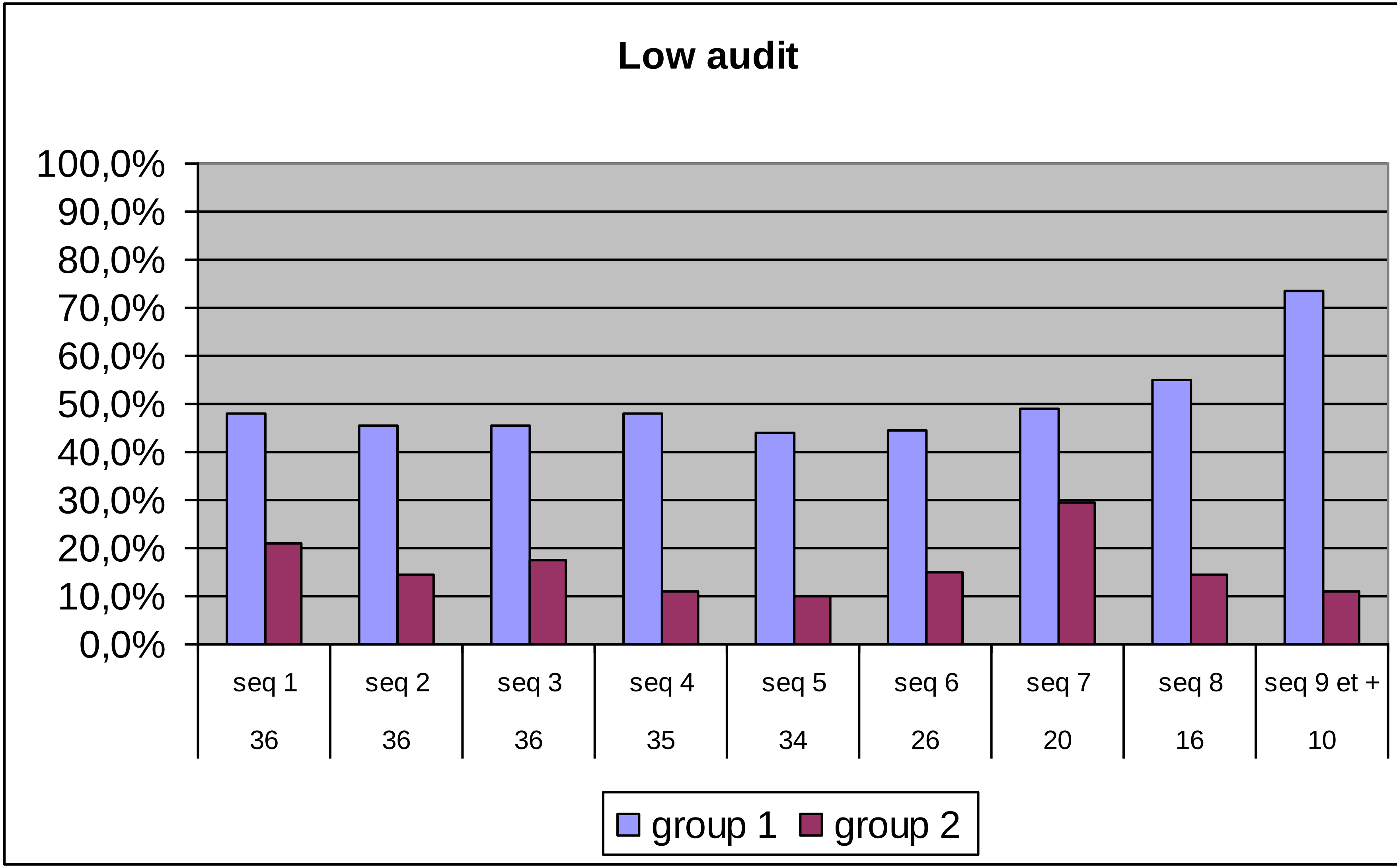
Under-reporting

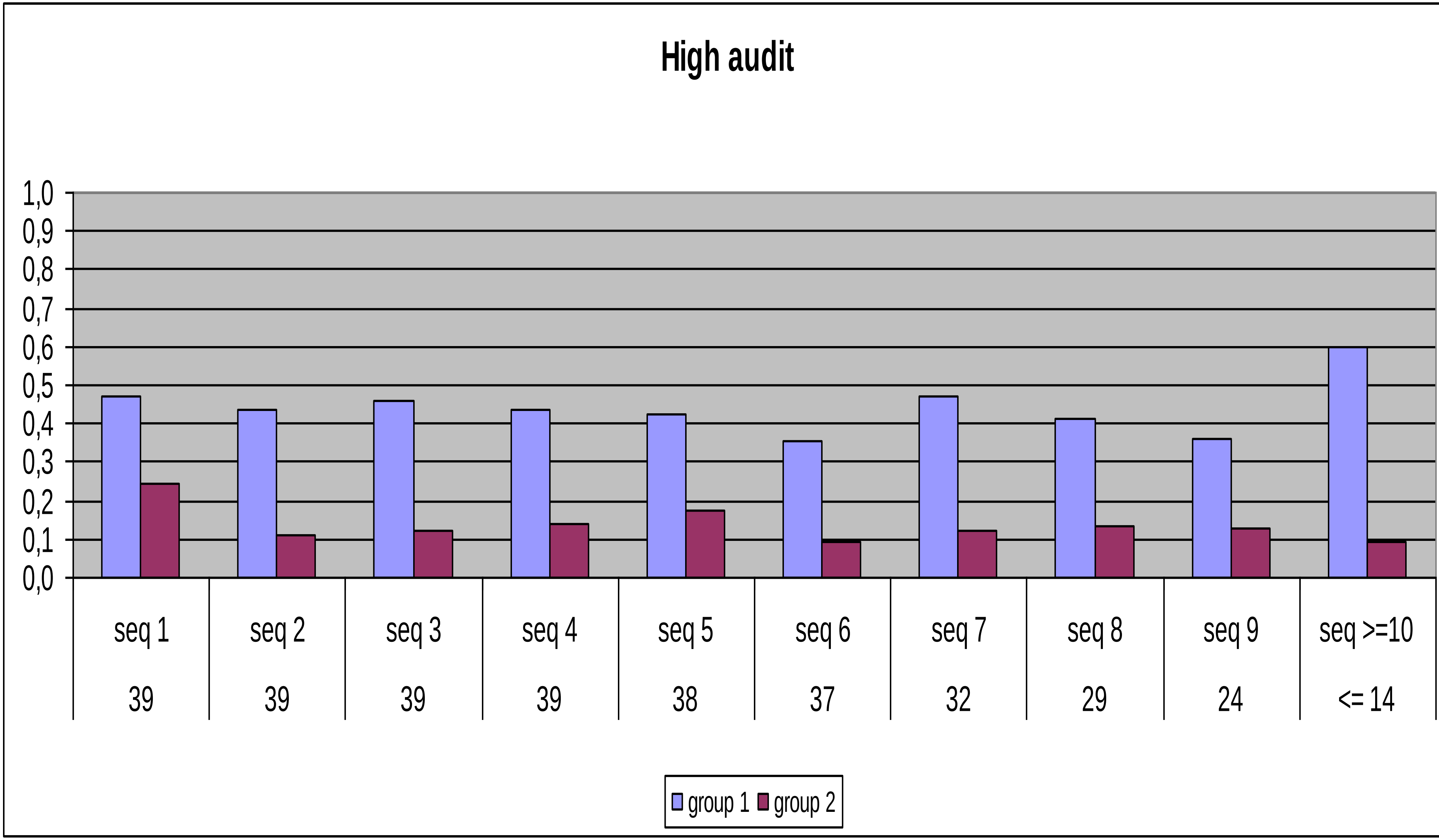


Beginning and end behaviour

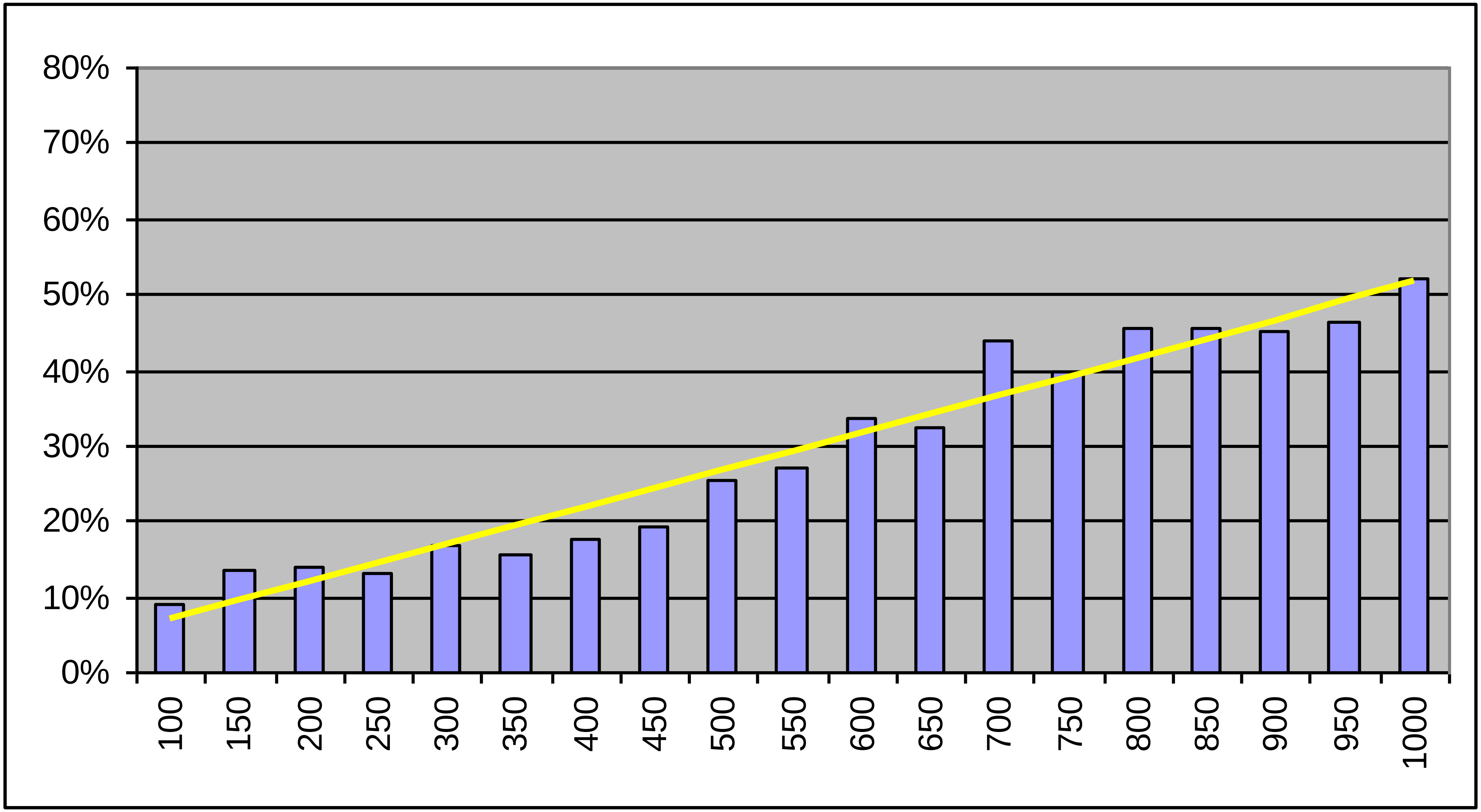


Evolution of the frequency of fraud with repetition

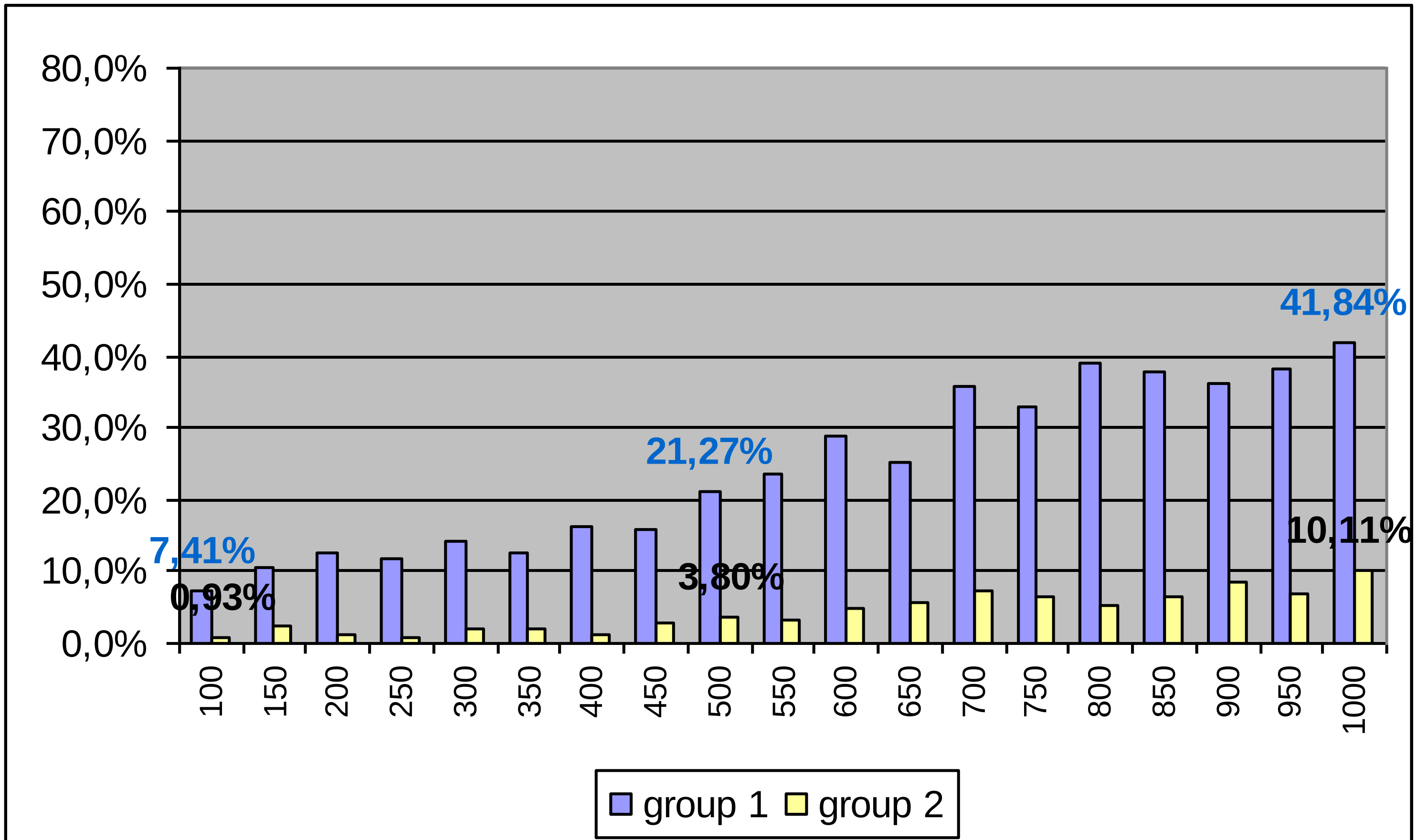



High audit
1,0
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0,0
seq 1
39
seq 2
39
seq 3
39
seq 4
39
seq 5
38
seq 6
37
seq 7
32
seq 8
29
seq 9
24
seq >=10
<= 14
group 1
group 2

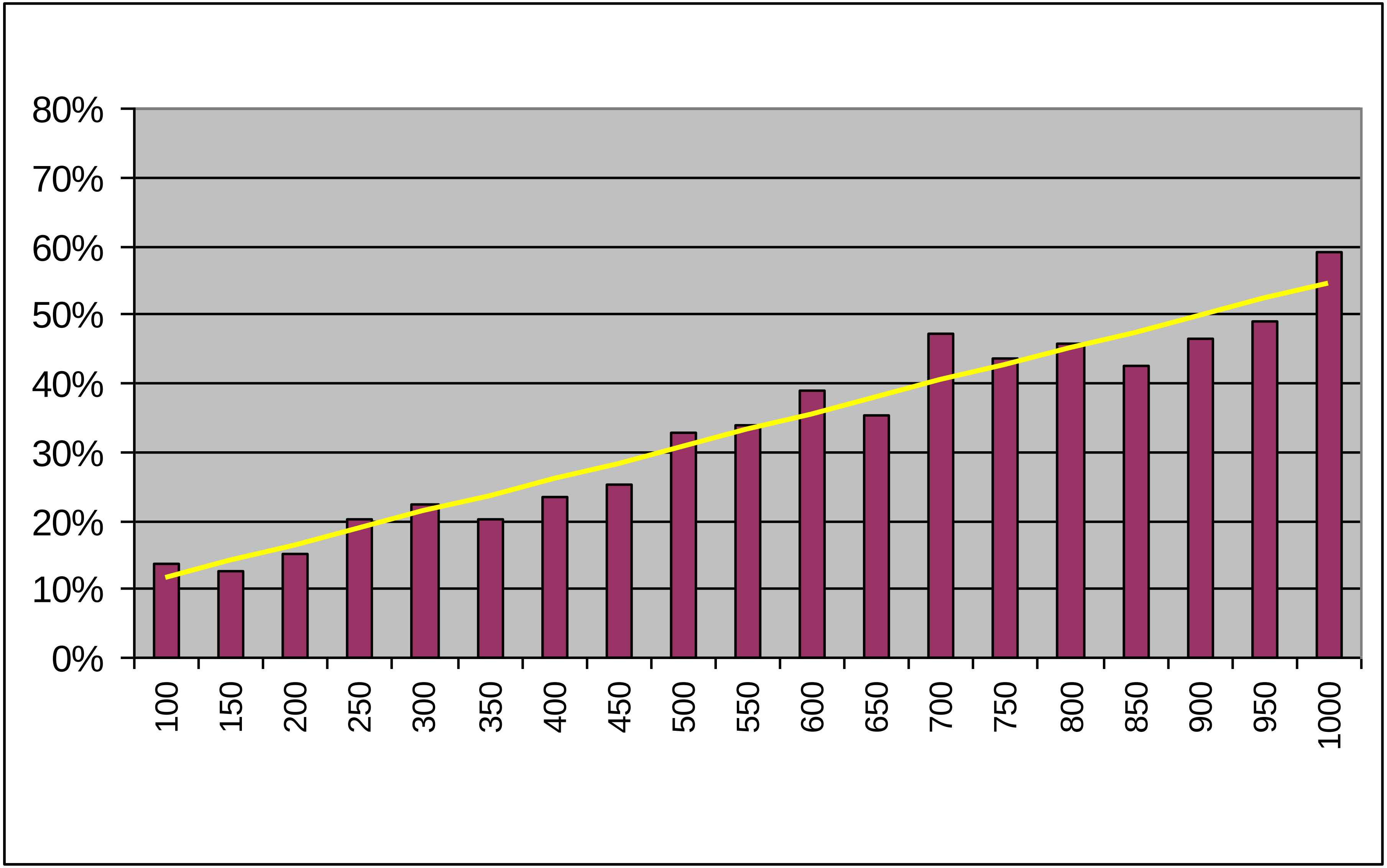
Frequency of fraud according to income (low audit)



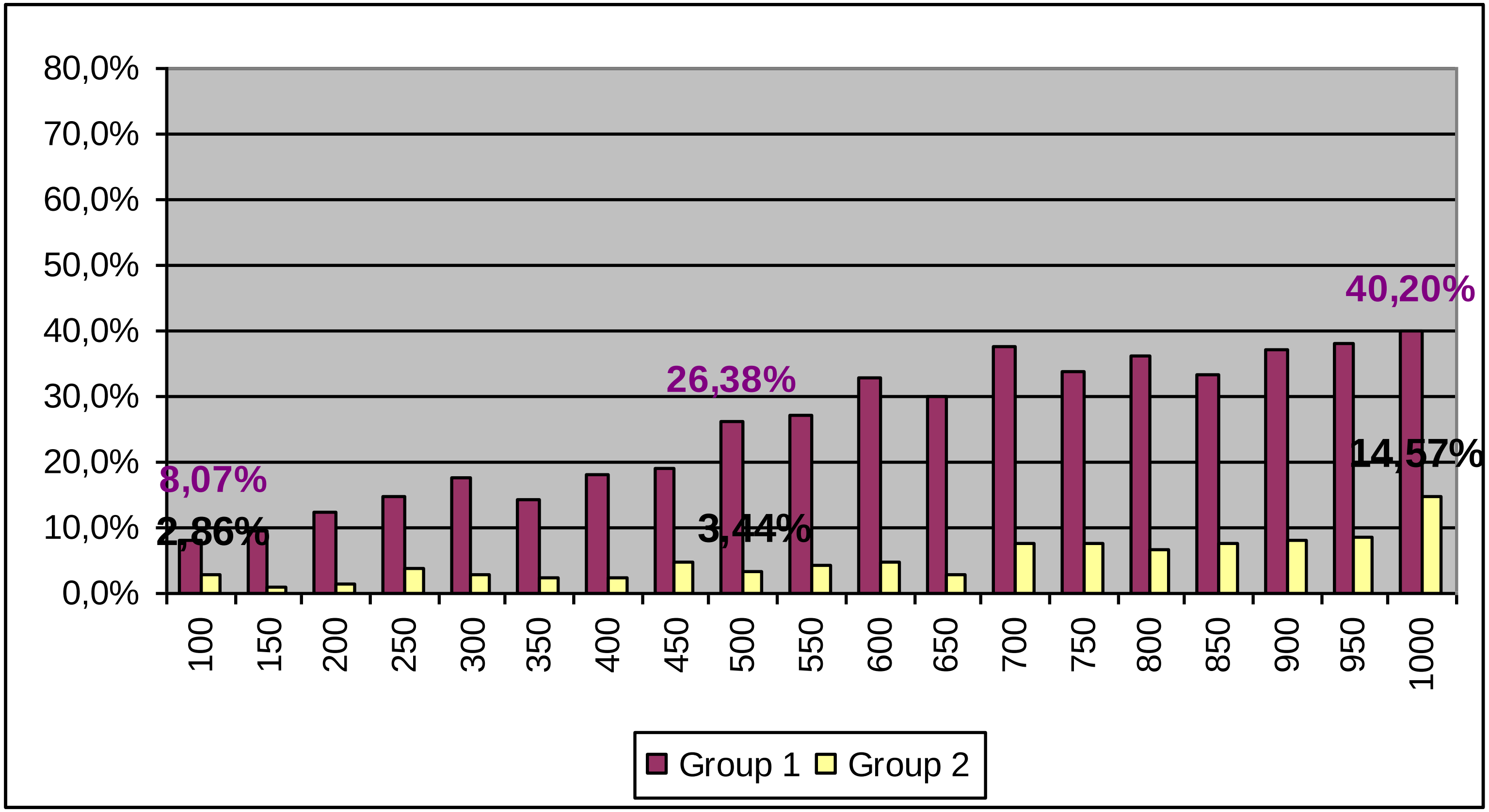
Frequency of fraud per income level for each group (low audit)



Frequency of fraud according to income (high audit)



Frequency of fraud per income level for each group (high audit)



Individual strategies

1. Predicted strategy (15%)

   Group 1 : Fraud the whole income almost always

   Group 2 : No fraud (almost always)

2. Predicted strategy for high income only (23%)

   Group 1 : Fraud the whole income only for high income

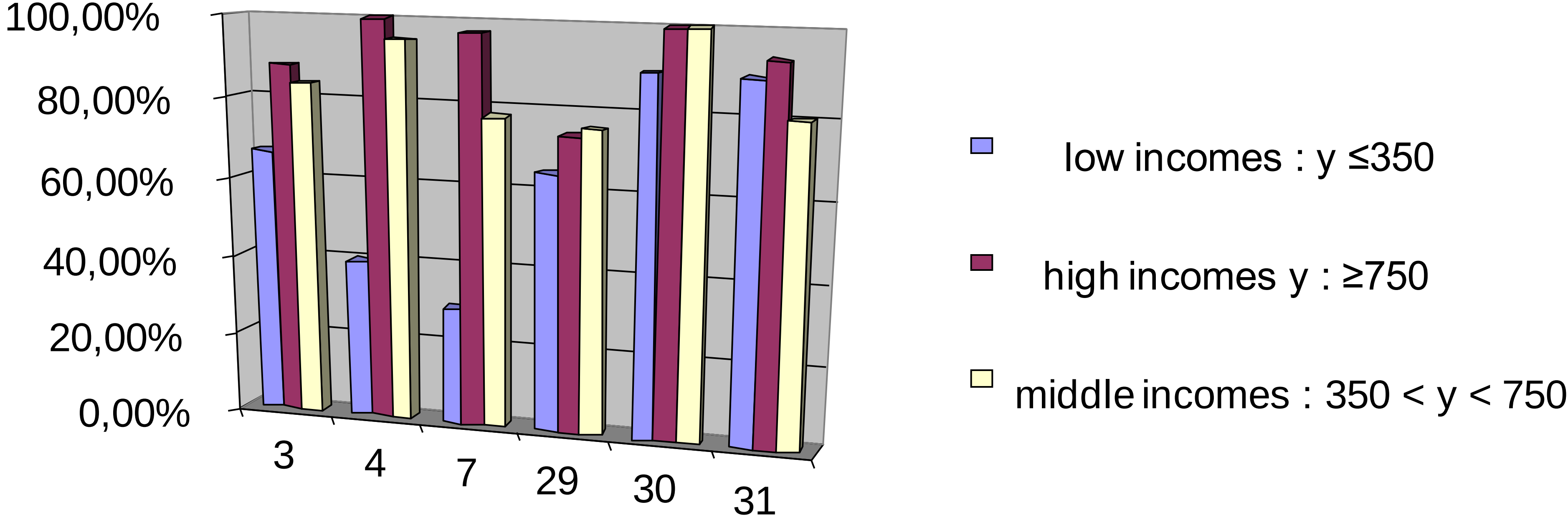
   Group 2 : No fraud (almost always)

3. Cheating more frequently as income increases (27%)

   Fraud if income is high in both groups

Predicted strategy
(low audit)

ID	Group 1	Group 2
3	80,00	0,00
4	75,74	0,00
7	72,03	8,41
29	72,60	5,45
30	96,36	0,00
31	86,79	5,08

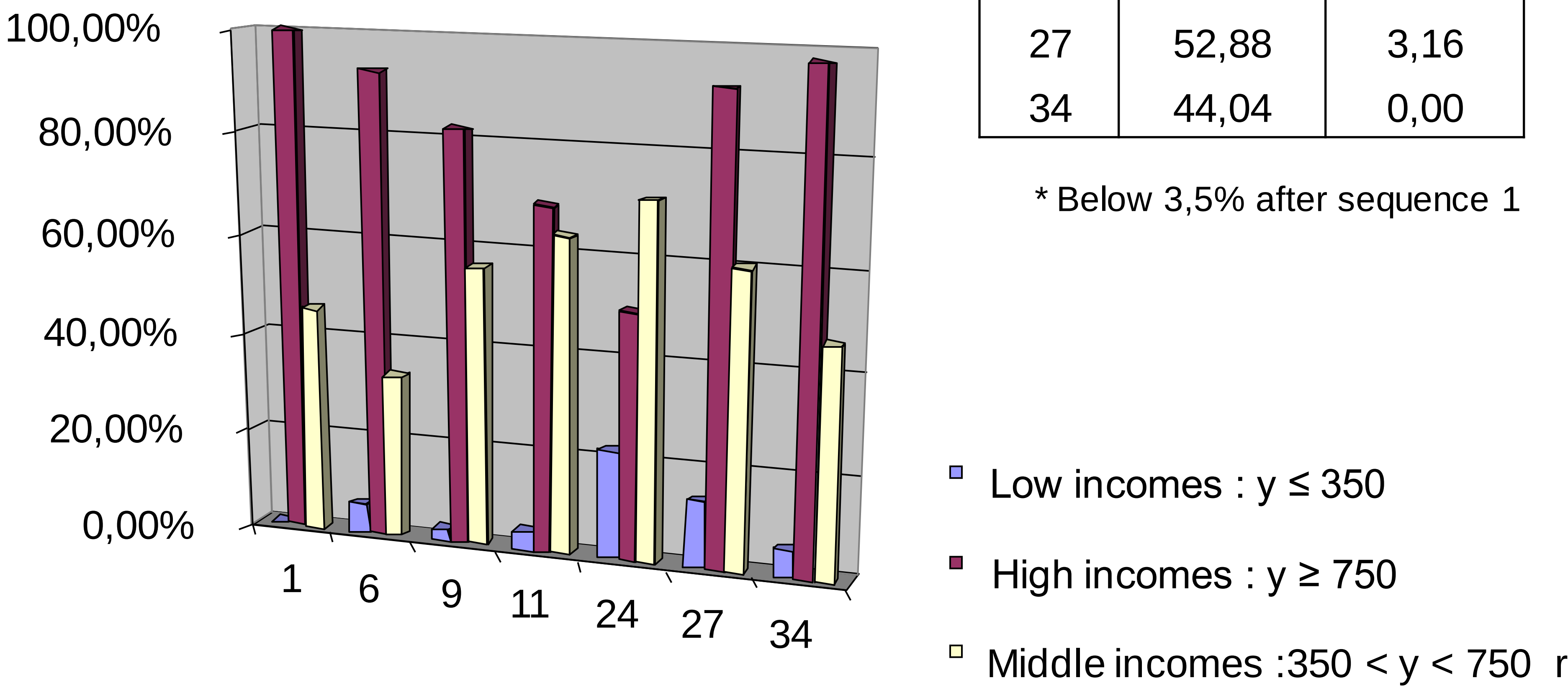


Predicted strategy for high income

(Low audit)

ID	Group 1	Group 2
1	47,03	2,15
6	41,30	5,88
9	48,48	3,95
11	46,24	10,81*
24	48,61	16,67*
27	52,88	3,16
34	44,04	0,00

* Below 3,5% after sequence 1



Summary

- Mechanism to minimize fraud based on random auditing and segregation
- Group 1 :subjects fraud less frequently than predicted, and fraud only a part of their income
- Group 2 : subjects fraud too frequently
- In both groups fraud is more frequent as income increases

Feasibility

$$p_1 \alpha + p_2 (1 - \alpha) \le r$$

$$\boxed{\rho\alpha < r}$$

Group 1

Group 2

Group 3

$p_1 = \frac{\rho}{2}$

$p_2 = \frac{\alpha}{1-\alpha} \times \frac{\rho}{2}$

$p_3 = 1$

$$\frac{\rho}{2}\alpha$$

$$\frac{\alpha}{(1-\alpha)} \frac{\rho}{2} (1-\alpha)$$