On the impact of indexation and demographic ageing on inequality among pensioners

(Validating MIDAS Belgium using a stylized model)

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On the impact of indexation and demographic ageing on inequality among pensioners

Starting point

validation: “the comparison of the model’s results to counterpart values that are known or believed to be correct, or that are consistent with one’s assumptions, [or] other trustworthy models’ results” (Morrison, 2007, 5)

Theses

1. the long run development of inequality of pensions is driven by just a few factors
2. A very simple stylized model can therefore be used to validate the simulation results of a dynamic microsimulation model.

Overview of this presentation

1. A base stylized model for the inequality of pensions
2. Simulate a change of the indexation parameter, and the impact of the retirement age
3. Apply two ‘forms’ of demographic ageing
   - A ‘baby boom’ generation
   - Increasing longevity
4. Validation of the Belgian MIDAS model

The base model

Suppose

1. 100 individuals in time t≥0, each of a different age (so, age_t=[0,…, 100], t=[0, …, 100]).
2. everybody retires at 60 and dies at 100,
3. the pension benefit at 60 equals € 100.
4. The model is expressed relative to wage growth, and pensions lag behind the development of wages with a constant fraction Ψ.

Then

$p_{0,age} = 100(1-\Psi)^{age-60}$ when t=0

$$P_{t,age} = \begin{cases} p_0(1-\psi)^{(t)}, & if \quad age_0 > 60) \\ 100(1-\psi)^{(t)-(60-age_0)}, & if \quad age_0 < 60 \;\&\; age \geq 60) \end{cases} \qquad (1)$$

$$Gini_t = F\left\{P_{t,60}, \quad \ldots \quad, P_{t,age>60}, \quad \ldots \quad, P_{t,100}\right\} \qquad (3)$$

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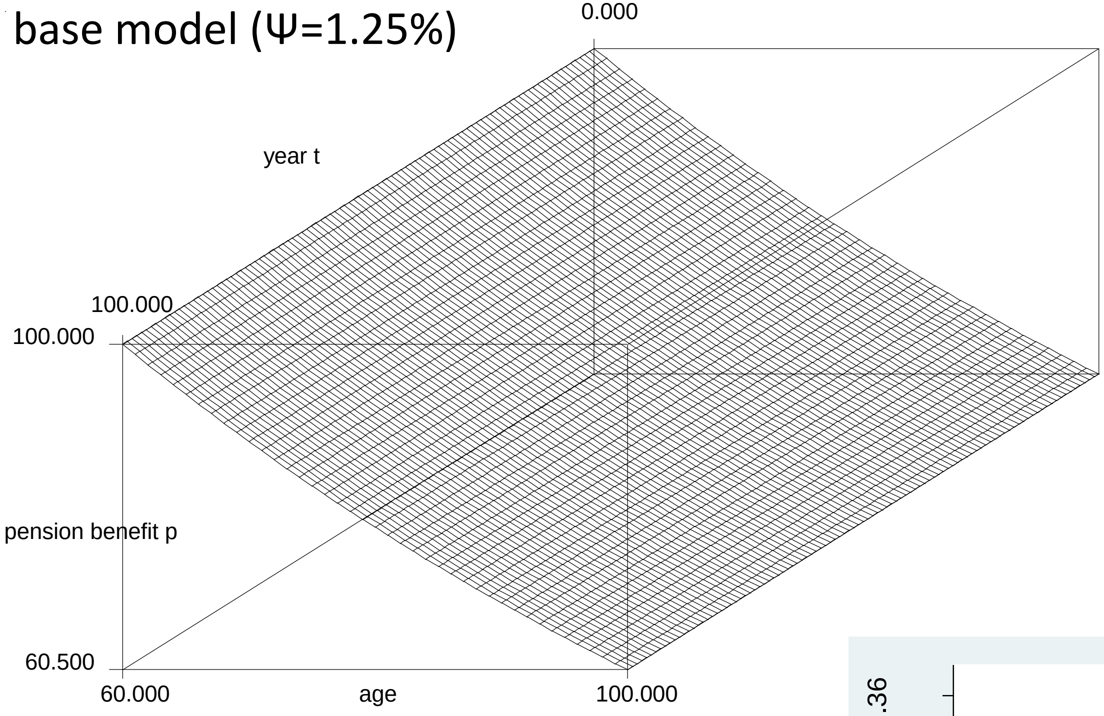
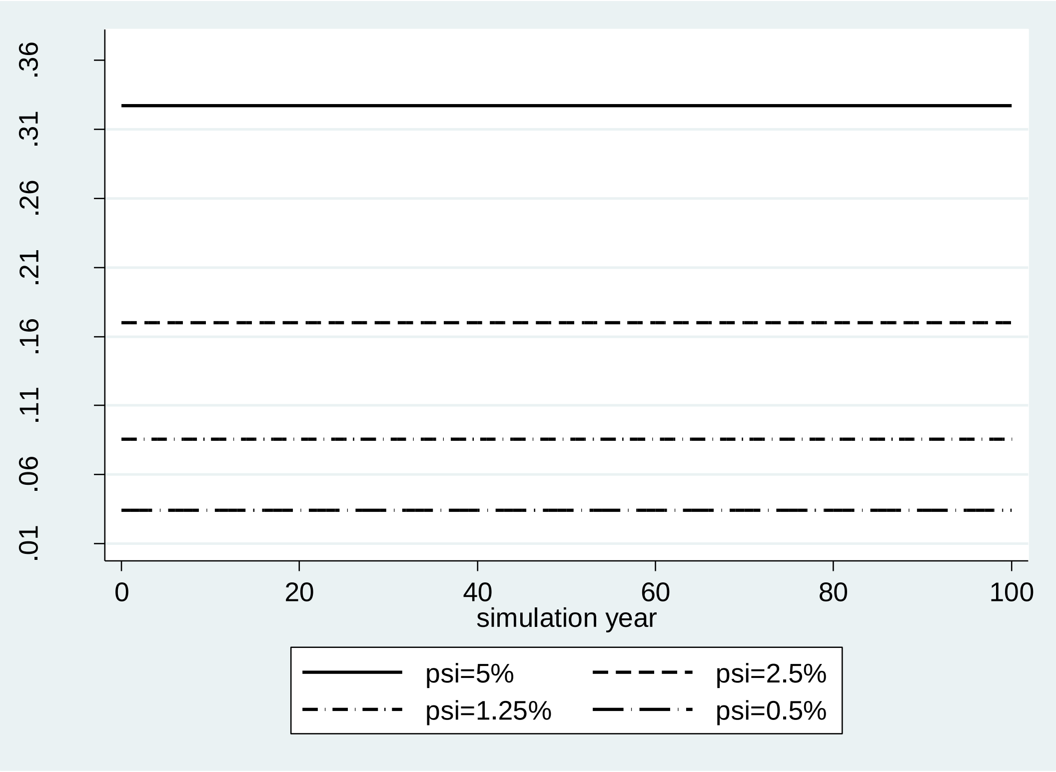
base model (Ψ=1.25%)





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A change of the indexation parameter ψ in the period cht

$P_{t,age}$=

$$
\begin{cases}
p_0(1-\psi_1)^{(t)}, \quad if \quad (age_0 > 60)\,\&\,(t < cht) \\
p_0(1-\psi_1)^{(cht)}(1-\psi_2)^{(t-cht)}, \quad if \quad (age_0 > 60)\,\&\,(t \geq cht) \\
100(1-\psi_1)^{(t)-(60-age_0)}, \quad if \quad (age_0 < 60)\,\&\,(age \geq 60)\,\&\,((60-age_0) < cht)\,\&\,(t < cht) \\
\dfrac{100(1-\psi_1)^{(cht)}(1-\psi_2)^{(t-cht)}}{(1-\psi_1)^{(60-age_0)}}, \quad if \quad age_0 < 60\,\&\,age \geq 60)\,\&\,((60-age_0) < cht)\,\&\,(t \geq ch \\
100(1-\psi_2)^{(t)-(60-age_0)}, \quad if \quad (age_0 < 60)\,\&\,(age \geq 60)\,\&\,((60-age_0) \geq cht)\,\&\,(t \geq cht)
\end{cases}
$$

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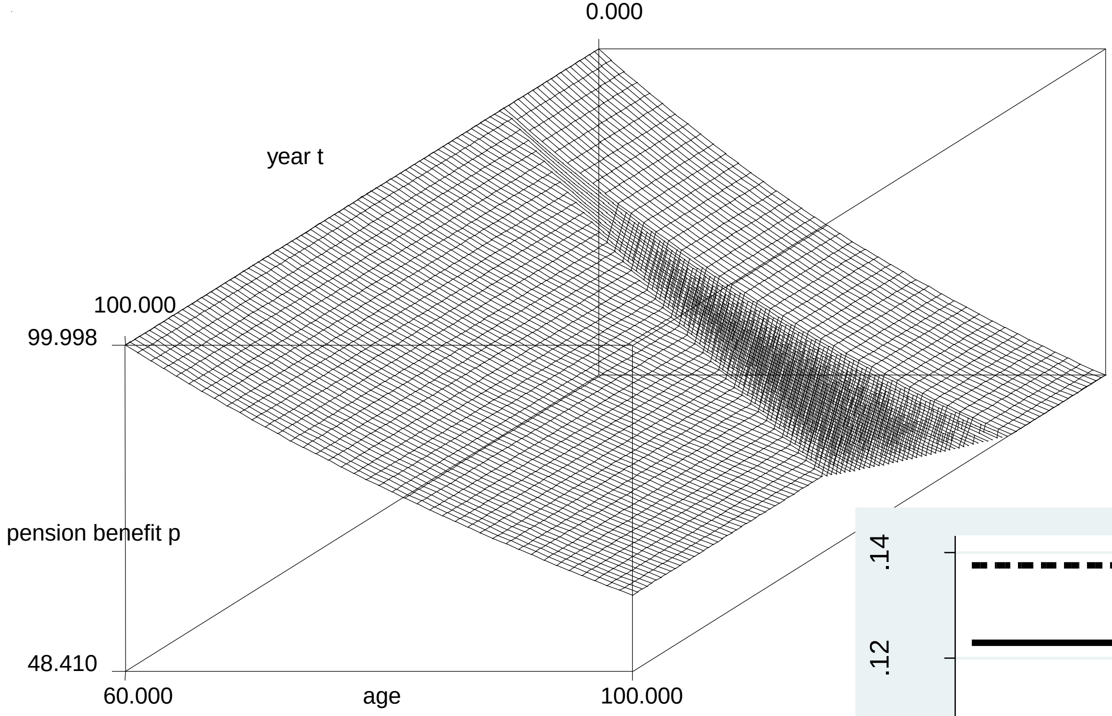
Ψ decreases from 1.8% to 1.25% in t=20



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Demographic ageing I: a ‘baby boom generation’

Write the base model as

$$F\{\Pi_t\}\text{ with } \Pi_t = \begin{vmatrix} P_{t,60} & \dots & P_{t,age>60} & \dots & P_{t,100} \end{vmatrix} \text{ or}$$

$$\Pi_t = \begin{vmatrix} P_{t,60} & \dots & P_{t,age>60} & \dots & P_{t,100} \end{vmatrix} \begin{vmatrix} 1 & . & 0 & . & 0 \\ . & . & . & . & . \\ 0 & . & 1 & . & 0 \\ . & . & . & . & . \\ 0 & . & 0 & . & 1 \end{vmatrix}$$

A special case is

$$Gini_t^W = F\{\Pi_t^W\}$$

And

$$\Pi_t^W = \begin{vmatrix} P_{t,60} & \dots & P_{t,age>60} & \dots & P_{t,100} \end{vmatrix} \begin{vmatrix} w_{t,60} & . & 0 & . & 0 \\ . & . & . & . & . \\ 0 & . & w_{t,age>60} & . & 0 \\ . & . & . & . & . \\ 0 & . & 0 & . & w_{t,100} \end{vmatrix}$$

with $w_{0,age0}$~N(43,23) and $w_{t,age}=w_{0,(age-t)}$

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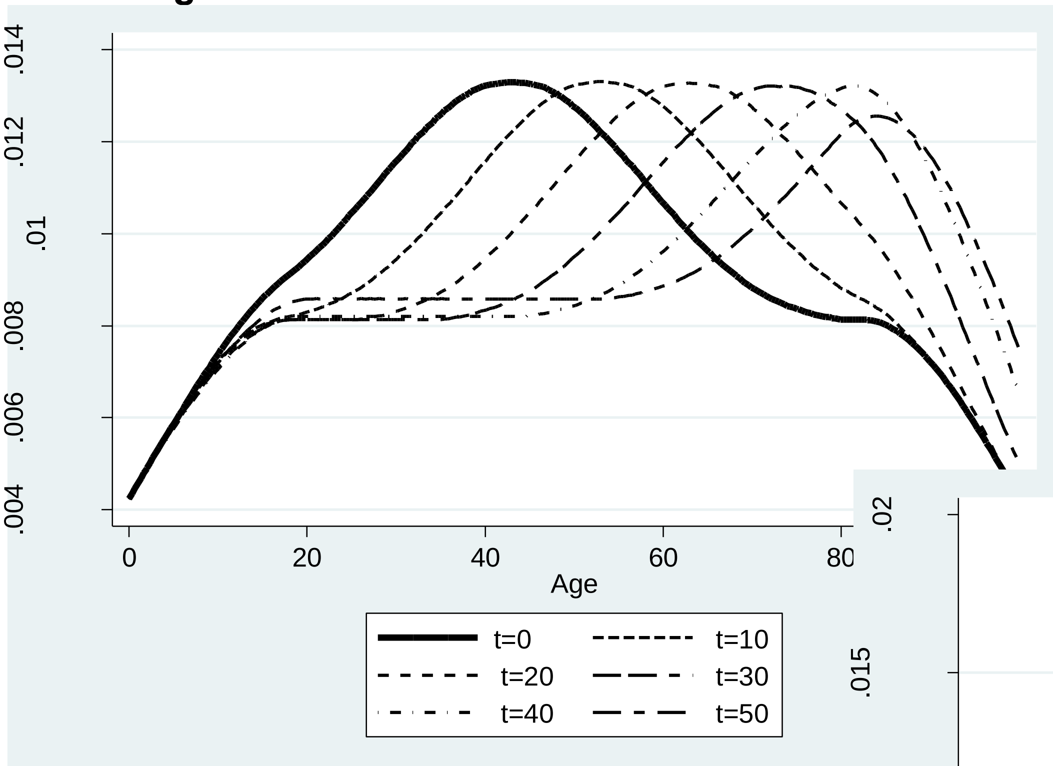
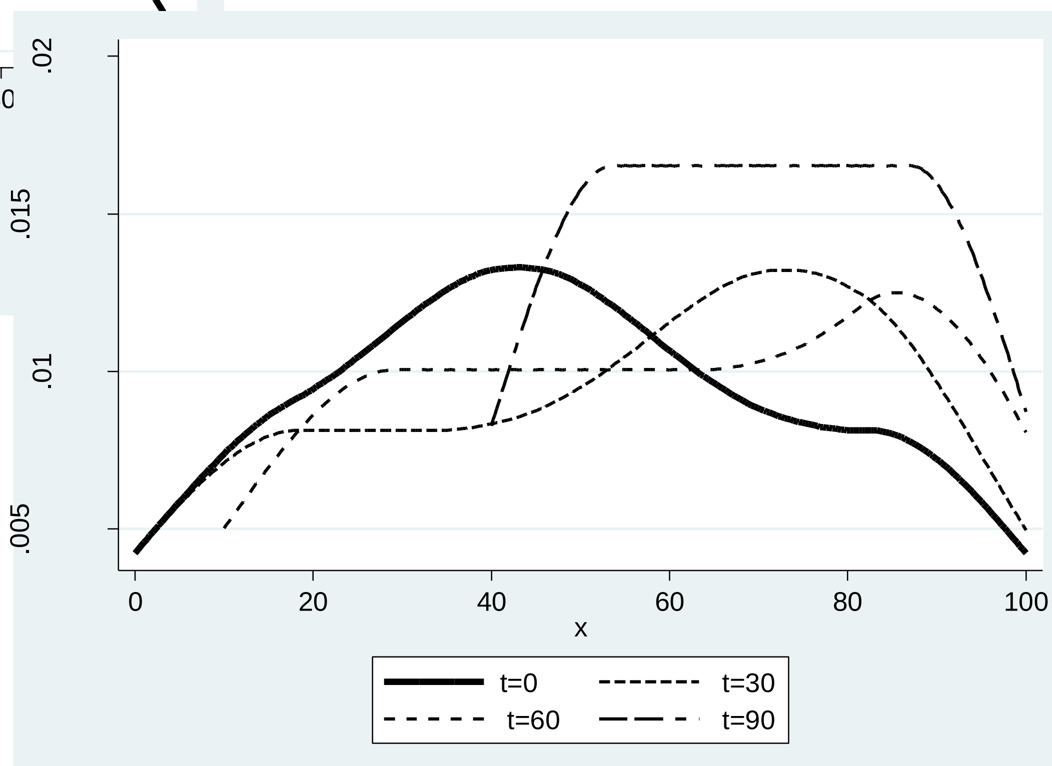
Demographic ageing I: a 'baby boom generation'

KDE of age at t≤50



KDE of age at t≤90



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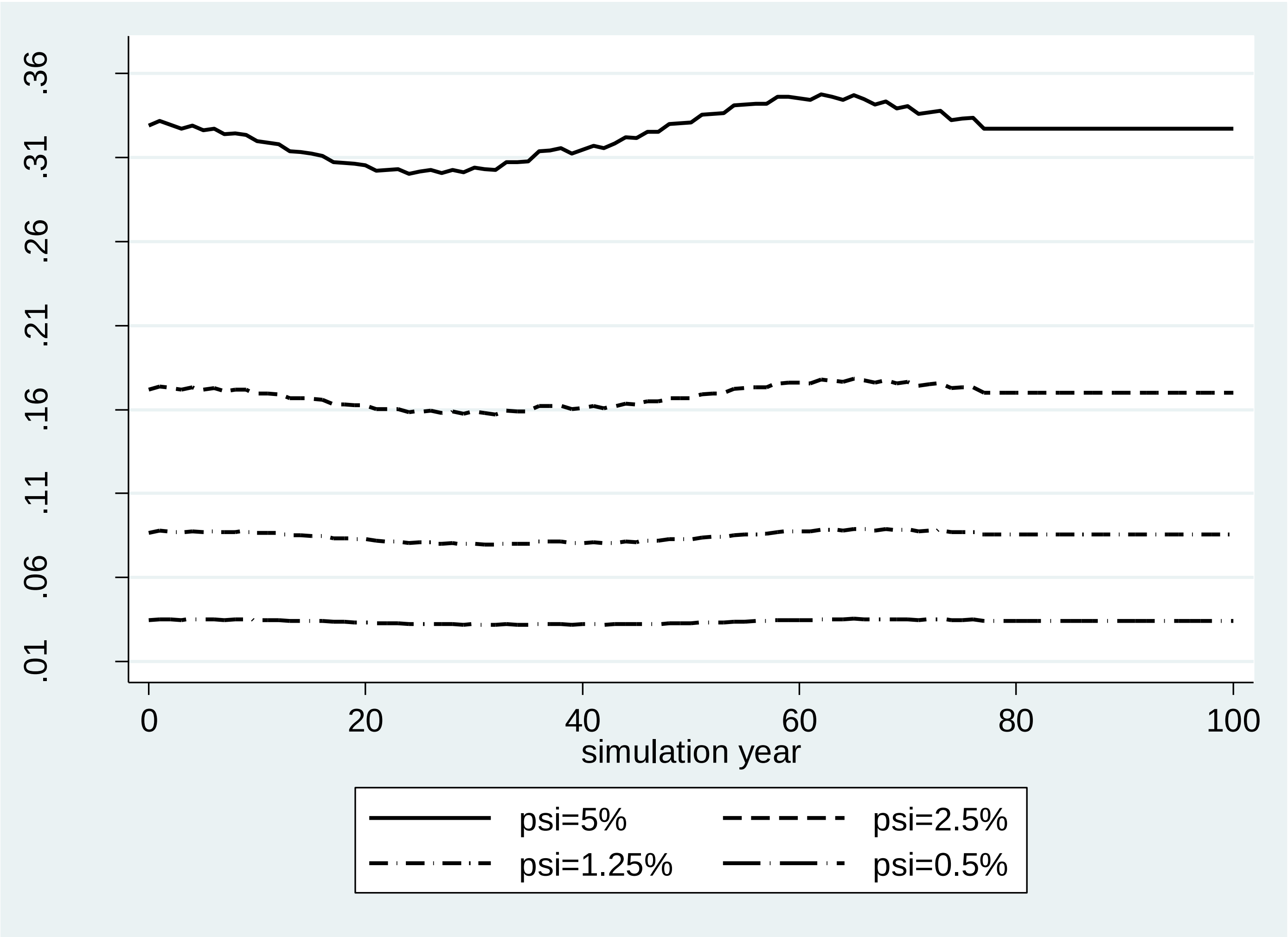
Source: PSBH, MIDAS starting dataset in 2002, and own calculations.

Demographic ageing I: a 'baby boom generation'



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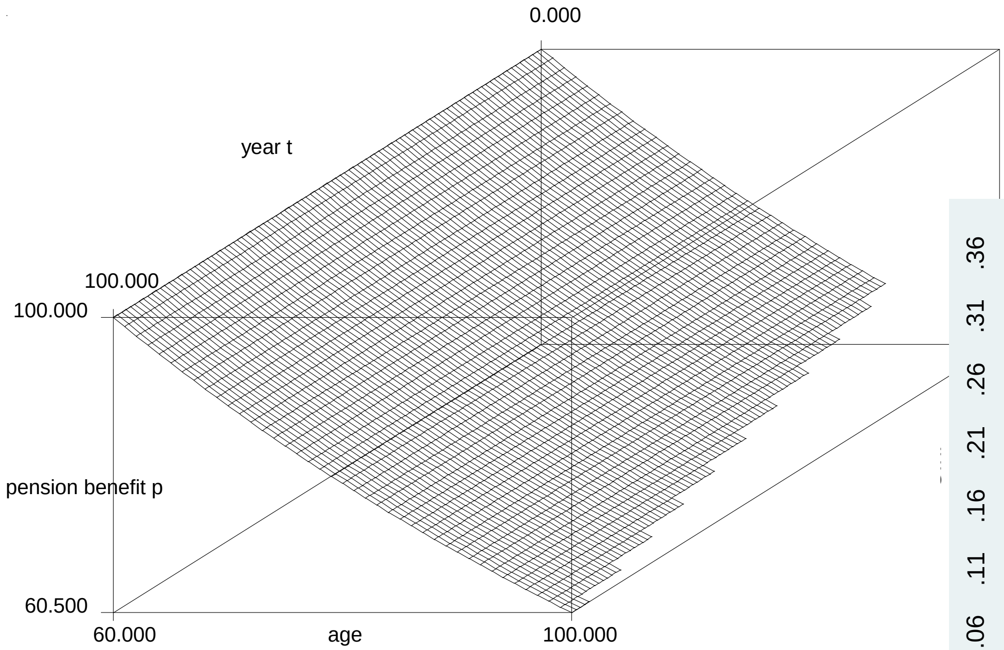
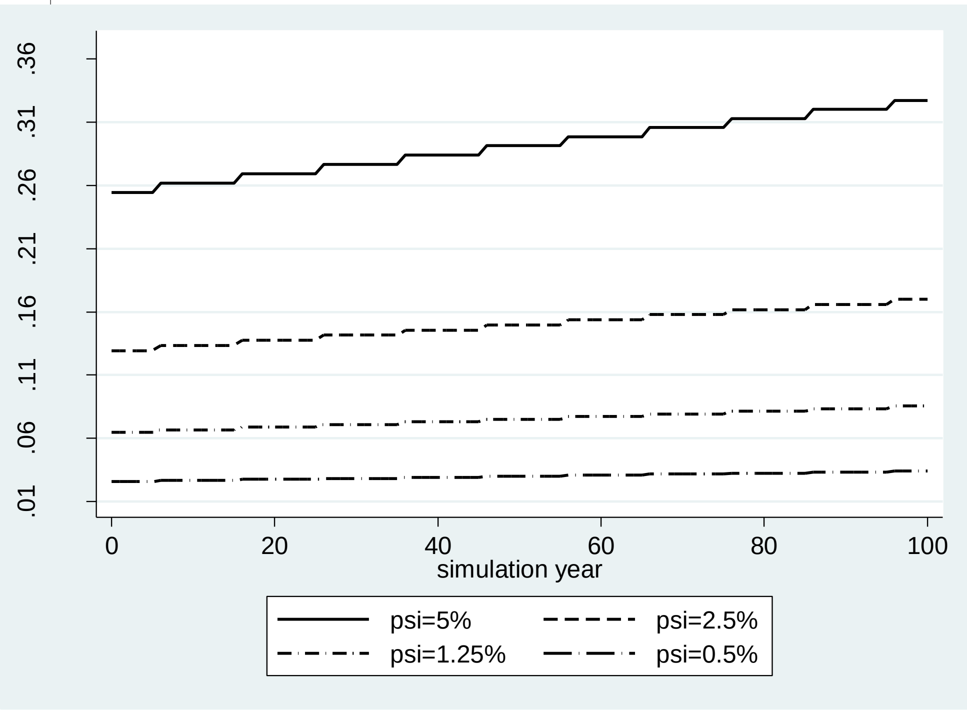
Demographic ageing II: increasing longevity

$$Gini_t = F\{P_{t,60}, \quad \dots \quad ,P_{t,age>60}, \quad \dots \quad ,P_{t,x}\} \qquad (5)$$

With $x=g(t) \ \forall \ t=[0, \dots, 100]$.

age of death *x* increases by 10 years , from 90 in period 0 to 100 in period 100.





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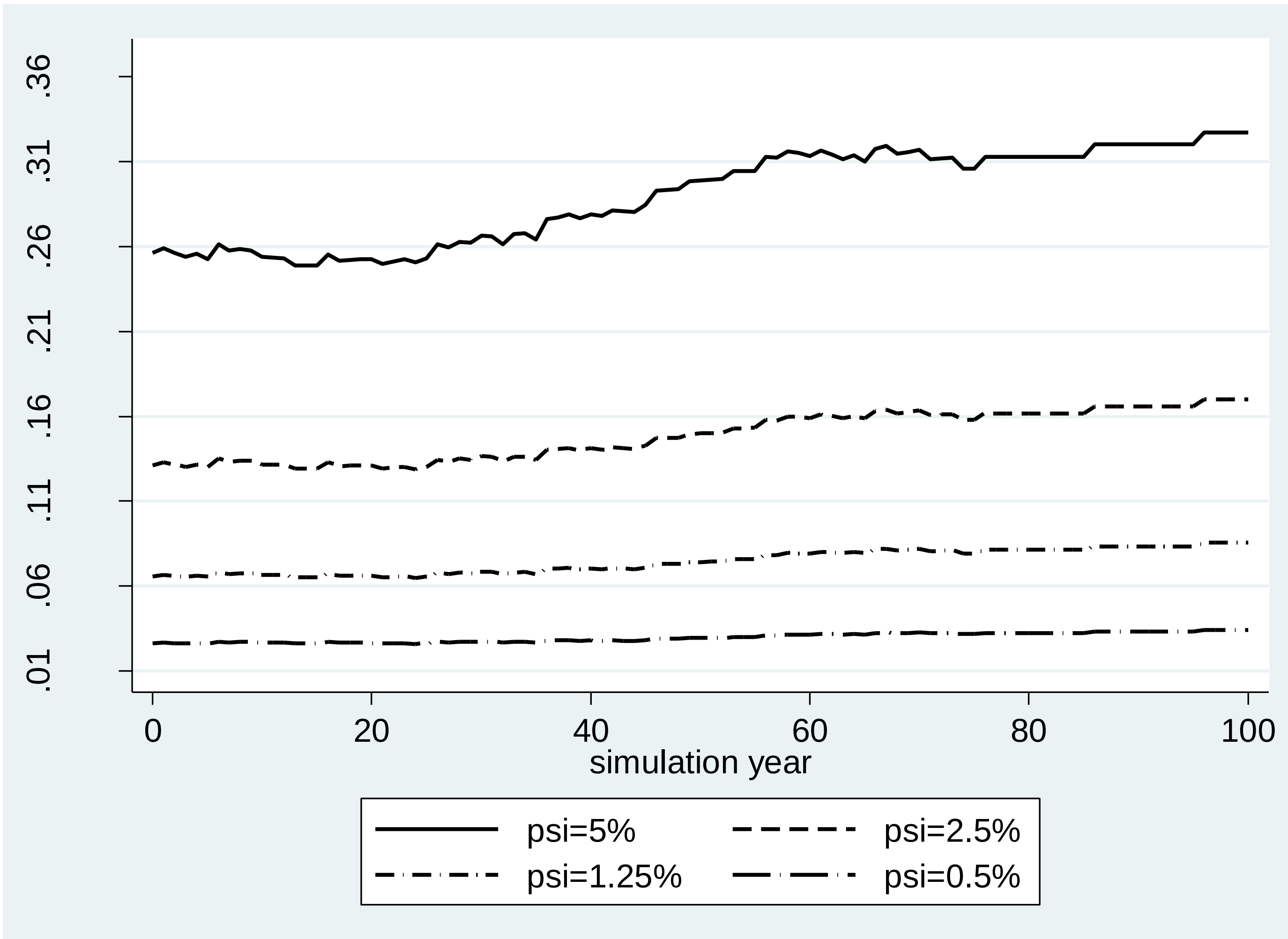
Demographic ageing: impact of ageing on pension inequality: the compound effect of fertility shock and increasing life expectancy



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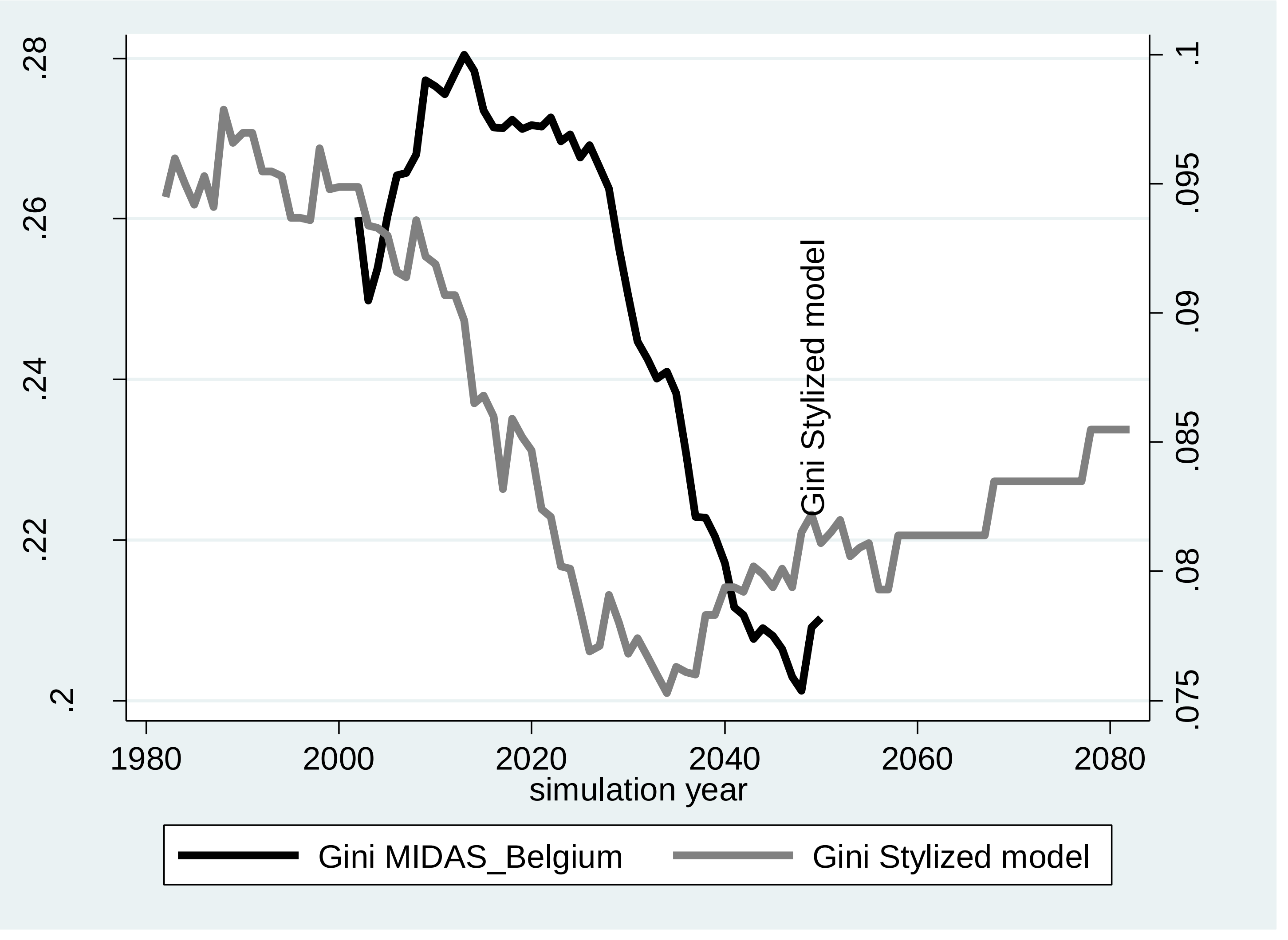
MIDAS Belgium

• An acronym for 'Microsimulation for the Development of Adequacy and Sustainability'
• A dynamic microsimulation model with cross-sectional ageing
• Developed in the FP6 project AIM
•The aim is to simulate the consequences of the assumptions and projections of the AWG on the adequacy of pensions.
• MIDAS was simultaneously developed for Belgium, Germany and Italy, by teams from the FPB, DIW and ISAE.
• The starting dataset of MIDAS_BE is the PSBH cross-sectional dataset representing a population of all ages in 2002 (8,488 individuals)
• MIDAS simulates
  • demographics: fertility, mortality, education
  • labour market: work, unemployment, disability, retirement, private & public sector, ...
  • pension module, 1st pillar: employees' pensions, civil servants' pensions, self-employed minimum pensions, CELS, IGO

Validation of the results of MIDAS_Belgium



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Conclusions

• the more pensions lag with the development of wages, the higher inequality of pensions at any point in time.

•the higher the retirement age, the lower the inequality of pensions.

•the higher the retirement age, the faster inequality of pensions reacts to changes of the lag parameter.

•The two underlying causes of demographic ageing each have a different impact on the inequality of pensions.

•Besides a difference in base levels and a sluggish reaction of inequality to a change in the indexation parameter , the results of the simulation results of the stylized model seem to validate the results of MIDAS_BE.