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Modelling Private Wealth Accumulation and Spend-down in the Italian Microsimulation Model CAPP_DYN: A Life-Cycle Approach

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Abstract: In microsimulation literature a limited number of models are provided with a module aimed at analyzing and projecting the evolution of private wealth over time. However, this issue appears crucial in order to get a comprehensive evaluation of the likely distributional effects of institutional reforms adopted to cope with population ageing. In this work we describe the implementation in the Italian dynamic micro simulation model CAPP_DYN of a new module in which household's savings and asset allocation are modelled. In particular, our efforts are addressed at accounting for some possible behavioural responses to pension reforms in household savings. To this end, we rely on an approximate life cycle structural framework for estimating saving behaviour, while adopting the traditional stochastic micro simulation approach for assets allocation. In line with Ando and Nicoletti Altimari (2004), we emphasize the role of lifetime economic resources in households' consumption decisions, yet we further account for internal habit formation and subjective expectations on pension outcomes in the econometric stage. In addition, we model intergenerational transfers of private wealth in a probabilistic fashion.

Despite possible saving responses to pension reforms, simulated results for the period 2008-2050 suggest a rising dispersion in saving propensity and intergenerational transfers received are largely responsible for the predicted increase in disposable income inequality in the next decades which, differently from the recent past, will also affect the group of elderly.

Keywords: household consumption, habit formation, pension expectations, social security, intergenerational transfers, income and wealth distribution, microsimulation.

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1. Introduction

In microsimulation literature a limited number of models are provided with a module aimed at analyzing and projecting the evolution of private wealth over time[1]. Introducing a wealth module in a dynamic MSM indeed brings undoubted advantages yet it also entails some drawbacks. On the one hand the modelling of wealth permits researchers to draw a more complete picture of disposable income dynamics (*i.e.* labour plus capital income components) and therefore of households' well-being distribution, thus also allowing the future redistribution effects of reforms that will affect – as expected in Italy – both public and private pension pillars to be analyzed. In fact, private wealth becomes crucial both in analyzing overall wellbeing after retirement and, ex ante, in affecting saving/investing as well as retirement decisions.

On the other, however, it significantly increases the model's complexity, and explicitly raises the debated question of the choice between a mechanical and a behavioural approach.

In fact, the former one also called 'probabilistic', assumes relations estimated (through reduced forms) on data to be structurally stable over a period of about 50 years. To our knowledge, existing models – especially population based ones - including a wealth module have relied mainly on an arithmetical-probabilistic approach, providing a deterministic representation of transmission, accumulation and decumulation of financial and real wealth, while being added to with several stochastic processes in order to account for heterogeneity and uncertainty in the dynamic simulation of all variables.

Differently, the 'structural dynamic' approach models economic variables as a solution of a utility maximization problem subject to institutional framework constraints, and attempt to account for second round (behavioural) effects, which could either strengthen or offset the first order impact of reforms. In this second scheme, a value function characterised by uncertainty in one or more arguments is maximized and the solution is derived by *backward recursion* under dynamic programming.

We recognize the introduction of a module accounting for the role of private asset accumulation and spend down - beside the dynamics in social security wealth - as a crucial step in order to give a comprehensive evaluation of the likely distributional effects of institutional reforms adopted in order to face one of the most complex challenges of modern welfare states, namely population ageing. To this end, the present work aims at developing and endowing the dynamic micro simulation model CAPP_DYN[2] with a new module in which households' savings and asset allocation are modelled.

In particular, our efforts are addressed at accounting for some possible behavioural change in household savings. To this end, our strategy has been that of approximating a structural framework for simulating consumption behaviour, while adopting the traditional stochastic micro simulation approach for assets allocation (investments decisions). The introduction of some form of behavioural response is in fact extremely important in micro simulation models aimed at analyzing long run effects of radical reforms in the social protection system as long as these are expected to affect saving decisions.

On the one hand indeed, and in line with the nature of CAPP_DYN, the wealth accumulation and spend down module allows the representation of several processes characterized by a high degree of institutional details by means of a large set of empirical '*ad hoc'* solutions. On the other hand, since savings behaviour can be strongly affected by radical reforms, the traditional probabilistic approach based on reduced-form estimations on current data would fail to represent long run relations, especially when reforms have not yet been fully phased-in, due to a long transitional phase. In such cases, in order to account for changes in expectations and to give a proper account of household saving decisions, the empirical model needs to be "clasped" onto a theoretical framework.

Our framework has been inspired from a basic version of the life cycle-hypothesis as formulated in Ando and Nicoletti Altimari (2004) (henceforth AN) as most of the assumptions they made in order to obtain a computable algebraic expression for the household consumption rule as well as several of their enlightening 'heuristic' solutions, appeared reasonably compatible with the nature of our model. However, while AN aimed at making a forecast for the evolution of aggregated savings, we are mainly interested in a long-run distributional analysis of income, consumption and wealth, especially during individuals' retirement.

To better represent behaviours and catch heterogeneity in a micro framework, we also allow for *internal habit formation*, as this hypothesis is very helpful in reconciling the life-cycle theory with most of the empirical evidence on household inter-temporal decisions (see, among others, Meghir and Weber, 1996; Seckin, 2000; Angelini, 2009). Therefore, as in the original AN microsimulation analysis, we emphasize the role of life cycle economic resources in households' consumption decision, however we further modify their empirical model in order to account for habit persistence and subjective expectations on pension outcomes in the econometric stage. In addition, we allow for liquidity constraints on consumption expenditure in the simulation program.

The aim of this paper is to provide an overview of the new Wealth module we have developed, highlighting some specific focal points and presenting some illustrative results for the Italian case. In the next section we briefly outline the functioning of the Wealth Module by illustrating the sequencing of the main tasks. Following, in section 3, we describe the theoretical background for modelling the behaviour of households in distributing resources for consumption over the life cycle. In order to achieve this aim, we focus on the estimation of household lifetime human resources - and their specific components (section 3.1 and 3.2) - a key variable employed for the estimation of the consumption rule explained in section 4, which represents one of core processes of the dynamic simulation. In section 5 we discuss the empirical strategy for modelling intergenerational transfers and their mechanics in the simulation program. Finally, section 6 shows some selected results.

2. The Wealth Module Sequence

The Wealth Module of CAPP_DYN starts the simulation from the panel dataset provided by the pre-existing blocks of the model, where demographic events, labour incomes and a full range of social security benefits are simulated for the period 2008-2050[3]. In keeping with the previous part of the model, the base year population is represented by the 2002 wave of the Bank of Italy's Survey of Households Income and Wealth (SHIW). As the SHIW suffers from a heavy financial assets under-estimation due to under-reporting, we use the adjusted wealth data from D'Aurizio et al. (2006) on the same source[4].

The sequence of processes for the mechanisms of formation, transmission and spend down of household wealth are given in summary form in figure 1.

The module adopts the traditional recursive logics of dynamic MSMs , included CAPP_DYN. In addition, some of the simulated processes have a dynamic specification themselves and have been estimated on the panel component of SHIW using the lagged dependent[5] among the covariates. The decisional unit for the wealth processes is the household.

For simulation purposes, we adopt a re-coding of SHIW wealth variables into two macro-aggregates: (a) house equity (real wealth) (b) an enlarged financial wealth component, which includes all financial assets plus tangible goods other than real estate (which will be assimilated into non-risky assets). Net worth is obtained by subtracting financial debt (if any) from total gross wealth.

As mentioned above, the first simulated events are the intergenerational transfers of wealth between parents and children outside the family of origin (*inter vivos* and *mortis causa*). The *inter-vivos* transfers have been modelled by means of a probabilistic approach based on a Heckman two-step procedure in order to account for the selection bias. Bequests instead have a mechanical connotation. It is worth noticing that, due to insufficient information on financial transfers in the SHIW for our purposes, we have used a different micro data source that specifically focuses on this issue: the *Survey of Health, Ageing and Retirement in Europe* (SHARE). Details on the econometrics and the functioning of this sub-module are discussed in section 5.1.

Next, the model performs an updating of wealth stock by assigning a specific return to each assets in order to determine current wealth value (as a random walk with drift). Returns are derived from an iid draw from a specific normal (or Pearson) distribution with mean, variance (and kurtosis) derived from available time series for Italy. This step introduces the individual portfolio risk in private accumulation process. The current house equity value of household *h*, (AH^t) is obtained as: $AH^t = AH^{t-1}(1 + r_h^t)$ where $r_h^t \sim N(\mu_{AH,}\sigma^2_{AH})$[6].

For financial wealth, in order to account for differential returns on the share of risky (ϕ^t)[7] and non-risky[8] assets, we preliminarily estimate financial wealth allocation between these two components with a dynamic model accounting for persistence in attitude to risk[9] and for the role of other observables with a selection model à la Heckman. Since (in the baseline) we assume the non risky share of financial wealth accrues a null real return, the weighted rate of return on overall enlarged financial assets amounts to $\phi^t r_f{}^t$, where the latter rate is a specific return on financial risky assets obtained as an iid draw from a asset-return-specific distribution[10]. The updated value for the enlarged financial aggregate for the household (AF^t) is then determined as: $AF^t = (AF^{t-1})(1 + \varphi^t r_f^t) + S^{t-1}$ where $r_f^t \sim iid(\mu_{AF,}\sigma^2_{AF})$ and S is the flow of yearly household saving. The outstanding debt is, in the first instance, obtained by subtracting the capital component of the mortgage instalment paid in the previous period (R^{t-1}_{cap}) from its lagged value (B^{t-1}). Here we adopt the convention that all households repay their mortgage over 20 years[11] (*i.e.* roughly the average mortgage duration in Italy, according to Rossi, 2008).

We assume the borrowing rate – r_m – normally distributed with mean 3% and standard deviation equal to 0.5% to be fixed over time once the mortgage has been subscribed and the mortgage repayment to be constant. The net wealth is then given by the sum of real and financial wealth minus the outstanding debt (*i.e.* mortgages being the only form of borrowing we allow in the model).

In the following step the model simulates choices affecting the stock of real estate and the number of dwellings owned by the family.

The decisions to buy or sell a house work on a set of discrete choice models (logit, estimated on the pooling of 1989-2006 waves of SHIW-HA) combined, in simulation, with Monte Carlo techniques. The totals are then calibrated to match an official external source (ISTAT, 2005)[12]. First, the model distinguishes between households that already own at least one house, which are allowed to sell a property, and households that do not own a house equity, which are not allowed to sell.

Once the family is selected for the "sale" event, the value of house equity sold AH_s^t is "heuristically" assumed to be the current value of real wealth divided by the number of houses owned. The new value of household real wealth is the difference between the current real wealth and the value of the sold house.

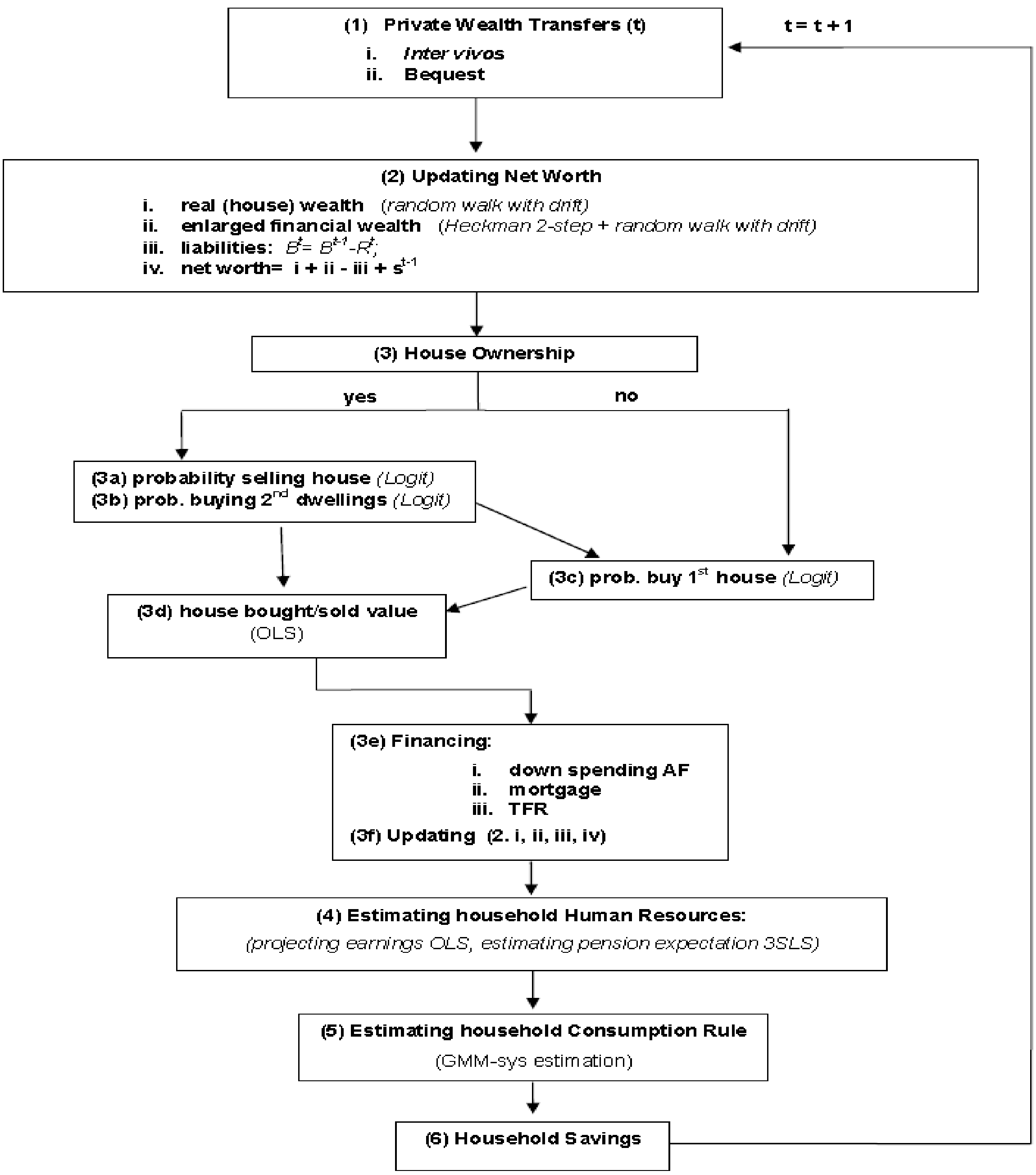

Figure 1: a stylized scheme of formation and transmission of wealth in the Wealth Module.

The financial wealth is assumed to increase by the value of equity that may exceed the existing debt $AF^t = AF^t + max\left\{0, AH_s^t - B^t\right\}$, while the latter (if exists) falls by the price of equity sold up to its outstanding value $B^t = max\left\{0, B^t - AH_s^t\right\}$; finally, the new mortgage (total and capital) instalment is computed on the new debt (if any) $R_{tot}^t = B^t(1+r_m)^{20}\left[r_m / ((1+r_m)^{20} - 1)\right]; R_{cap}^t = B^t / 20$.

When a household is selected – through a similar procedure – for buying, the value of the purchased dwelling (AH_b^t) is estimated using an OLS on a pooling of SHIW cross sections (1989-2006) using the ratio of house value to household net wealth as the dependent variable. The model distinguishes among three cases:

i. purchase with down-spending of up to 90% of the enlarged financial wealth; in this case financial wealth decumulates by the price of the house bought, real wealth increases by the same amount and any debt does not vary;

ii. if the price of the house exceeds the 90% threshold, the financial advance can be added to by creating new debt for the difference between the house value and the 90% of financial wealth: $\hat{B}^t = B^t + AH_b^t - 0.9AF^t$; real and financial wealth are updated accordingly;

iii. if at least one of the two spouses has an accrued end-of-service allowance (TFR)[13] and the purchase concerns the first house, a 70% redemption of it is allowed as a set-off of debt contracted in ii): $\hat{B}^t = B^t + max(0, AH_b^t - 0.7TFR_{acc}^t - 0.9AF^t)$, with any difference exceeding the debt being added to the financial wealth (decumulated by 90%): $A\hat{F}^t = AF^t - min(0, AH_b^t - 0.7TFR_{acc}^t - 0.9AF^t)$

Finally, since the issued debt may be excessively high due to low financial assets relative to the price of the house, we control mortgage sustainability by setting a ceiling to the (total) instalment, as the 40% of the current household net labour and pension income[14]. If the instalment exceeds the threshold, we force the instalment to the ceiling $R_{tot}^t = 0.4y^t$ and re-calculate the maximum sustainable debt given current resources: $B_{sust}^t = R_{tot}^t / \left[(1+r)^{20} r / ((1+r)^{20} - 1)\right]$

Subtracting the pre-existing debt from this amount, one obtains the maximum amount that can be loaned in the current period to buy the house: $diff = max(0,(B_{sust}^t - B^t))$. Finally, the maximum value of the house bought in keeping with the new stock of debt is re-calculated by adding the 90% of financial resources to the maximum amount that can be loaned for the current period ($AH_b^t = diff + 0.9AF^t$), plus the 70% of the TFR for households which are constrained despite its redemption.

In the last steps of the loop the model predicts household human lifetime resources, which are the present discounted value of labour incomes stream until retirement plus the pension income flows until household extinction (see section 3.1 and 3.2 for details). This aggregate is crucial for determining household consumption expenditure[15]. Finally, yearly household savings are obtained as the difference between disposable labour and pension incomes (net of mortgage instalment) and consumption: $S^t = y^t - R^t_{tot} - C^t$.

3. Households' Saving/Consumption Behaviour

In this section we illustrate the theoretical background of modelling households' behaviour in allocating resources for consumption over different periods of their life. Our aim is to estimate a general consumption rule in order to catch some possible behavioural reactions related to gradual changes in pension outcome expectations as a consequence of a radical social security reform which is characterized by a long transitional phase.

Assuming a homothetic - non-separable over time - utility function, a closed-form lifecycle consumption function from the optimization problem as elaborated in Modigliani and Brumberg (1954 and 1979) can be derived. Hence, our general formulation - in order to get an approximate optimizing model - is given by:

$$\underset{C^{t+i}}{Max}\ E_t \sum_{i=0}^{\infty} \phi^i \left[U_a^{t+i}(C_a^{t+i}, C_a^{t+i-1}; H^t) \right]$$

$$s.t.$$

$$A_a^t = (1 + r_a^t)\left[\frac{A_{a-1}^{t-1}}{1-\pi} + y_a^t - C_a^t\right]$$

Where:

a = age of household head

C_a^t = current consumption

C_a^{t-1} = last period consumption for the same household (internal habit)

A_a^t = non-human household wealth in year t when the age of the household head is a

y_a^t = current household disposable income (earnings and pensions) in year t when the age of household head is a

π = period constant probability of household extinction

H = household characteristics and type

r = real interest rate

Following Willman (2003) we can derive an algebraic expression for current consumption which in its implicit form is given by:

$$C_a^t(H) = f\left(C_a^{t-1}; a,\pi,H; A_{a-1}^{t-1}, y_a^t, HR^t(r,H,a)\right) \qquad (1)$$

where, in particular, *HR* represents the (expected) lifetime human resources (or human wealth) given by the discounted future labour and pension incomes stream. The "structural" element of the equation lies in the introduction of expectations about future income stream, through the role of human resources, as a determinant of household consumption. C_a^{t-1} represents the role of habit in consumption.

For the estimation we chose an empirical specification which well describes the consumption/saving behaviour of Italian households in our sample, and which is summarized in the formula:

$$\frac{C^t}{HR^t} = \rho\frac{C^{t-1}}{HR^{t-1}} + f(a) + \beta_1 A^t + \beta_2 y^t + \sum_k \beta_k D_k^t(H) \qquad (2)$$

[16]

The implications of such an empirical specification and the econometric estimation will be discussed in section 4.

In the dynamic simulation program, this equation provides us with a predicted value for the current level of consumption $\hat{C}^t$. To account for the role of liquidity constraints - which should not be neglected in a distributional analysis - we compute current simulated consumption as:

$$C^t = min\left\{\hat{C}^t, y^t + (1-\varphi^t)AF^t - R_{tot}{}^t\right\} \qquad (3)$$

i.e. current household consumption can never exceed the sum of current disposable income plus the liquid share of enlarged financial wealth (non-risky assets), net of the mortgage instalment (if any).

3.1 Household lifetime human resources (HR)

In this section we focus on the definition of total household expected human wealth, the estimation of which is preparatory to estimating the consumption rule. The expected value of human wealth is empirically obtained by aggregating spouses' individual projected (after tax) incomes (earnings and pensions), plus the stream of adult children's expected labour incomes up to the age of 30, plus one year of earnings contribution of active children over 30[17].

In algebraic terms:

$$HR^t(i,H,a) = \left(\underbrace{\sum_{k=1}^{2} \left\{ \underbrace{\sum_{i=1}^{p_k - a_k} E_i \frac{\left[w^t_{k,a_k+i} \right]}{(1+r)^i}}_{=0 \; if \; p_k \le a_k} + \sum_{i=1}^{T_k - a_k - p_k} E_t \frac{\left[P^t_{k,a+i} \right]}{(1+r)^i} I_k \right\}}_{Spouses' \; human \; resources} + \underbrace{\sum_{j=1}^{J} \left\{ \sum_{i=1}^{30-a_j} E_i \frac{\left[w^t_{j,a_j+i} \right]}{(1+r)^i} \right\}}_{active \; children's \; projected \; resources \; up \; to \; 30} \right) \quad (4)$$

where:

k = 1,2 adult members

j = active children up to 30 living in the household

w^t_{k,a_k+i} = net labour income of household member k (or j) expected in year t when he/she will be aged $a+i$

$P^t_{k,a+i}$ = net old-age pension benefit of household member k expected in year t when he/she will be aged $a+i$, or, if already retired, projection of current old age (or survivor) pension benefit in year t when he/she will be aged $a+i$

p_{k} = expected retirement age for spouse k

a_{k} = age of spouse k

T_{k} = expected death age for spouse k (according to ISTAT projections)

Therefore, in order to evaluate this (stock) variable we need to evaluate its three main components, that is the household lifetime labour income, the expected social security wealth for active individuals and the current (residual) social security wealth for the individuals who are already retired. It is worth noting that, in the simulation program, the predicted values of estimated equations used to build HR are re-computed – using the current simulated values of explanatory variables - every year so as to obtain the current value of HR which, in turn, is a determinant of the yearly simulated consumption.

3.1.1 Individual lifetime income profiles

Individual lifetime earnings are defined as the present discounted value of future expected labour income flows up to the planned age of retirement. The projection in t for income at time $t+i$ (where i is a generic period between t – current year – and the age of retirement (p_k - t)) for each individual k or j is obtained as the prediction of the following econometric models where age is a_{k+i}:

$$lny^t_{k,a+i} = \rho lny^t_{k,a+i-1} + \beta' x^t_{k,a+i} + \gamma' pa^t_{k,a+i} + u_k \quad if \quad wage > 0 \; in \; t \qquad u_k \sim N\left(0,\sigma^2{}_u\right) \quad (5a)$$

or

$$lny^t_{k,a+i} = \beta' x^t_{k,a+i} + \gamma' pa^t_{k,a+i} + v_k \qquad if \quad wage = 0 \; in \; t \qquad v_k \sim N\left(0,\sigma^2{}_v\right) \quad (5b)$$

where $\ln y^{t}_{k,a}$ is the log of individual labour income net of personal income tax and social security contribution, the *x* vector includes the set of observables such as educational level achieved, occupation, type of employer, full (part time), *pa* is a polynomial in age vector that interact with individual characteristics.

We use two models estimated on the panel component of SHIW using 1989-2006 waves to obtain a projection of labour income until retirement.

In particular, we use a dynamic specification to estimate the process to be simulated when the individual has a positive wage in the current period (which represents the lagged variable for predicting the expected wage for the following year) (5a), while we use a static specification to estimate the process for active individuals with zero wage, e.g. in the case of unemployment (5b), which is fitted on both employed and unemployed individuals.

Hence, the present value of the expected labour income at a generic age *a+i*, y^{t}_{k,a_j+i} is given by the predicted value of the earnings model when age=*a+i*:

$$y^{t}_{k,a_k+i} = \left(\frac{1}{1+\delta}\right)^{i} e^{(\rho \ln y^{t}_{k,a_k+i-1} + \beta' x^{t}_{k} + \gamma' pa^{t}_{k,a_k+i})}(1+g)^{i} \tag{5c}$$

where the *(1+g)* factor allows the wage level to be linked to the medium-long run productivity growth which is calibrated through the “Scenario” block of the pre-existing CAPP_DYN[18] modules. For simplicity, we assume δ (the inter-temporal discount rate) to be equal to g.

Finally, in order to obtain individual lifetime income, we need to sum the present value of the projected labour incomes for every t from the current period up to the expected retirement age p_k. However, p_k is not known *a priori* either.

Indeed, p_k, along with the expected replacement rate ω^{t}_{k,p_j}, plays a key role in determining both lifetime income as well as the expected social security wealth. In the following section, a method based on subjective expectations declared in SHIW coupled with conjectures about their evolution is illustrated in order to estimate these two variables.

3.1.2 Planned retirement age and (related) expected replacement rate

Reforms implemented in Italy from 1992 to 2007 have significantly affected the institutional social security framework, introducing a tight actuarial link between contributions paid and pension received back, sharply reducing the expected replacement ratio for future pensioners but assuring the long term financial sustainability of the social security system.

These new computational rules will affect incentives to retire. While for those whose pension is calculated with the old defined benefit (DB) formula the expected retirement age can be reasonably expected to match the legal provision (or the age at which individuals accrue the seniority requirements), for workers instead falling under the mixed and, especially, under the notional defined contribution (NDC) regime, the expected retirement age presents troublesome elements. In fact, we need to model the behaviour of individuals who will have to face very different scenarios and will therefore not be able to draw from the experience of previous generations.

For this purpose, since we consider subjective expectations to matter in economic decisions, we use the expected replacement rate and the planned retirement age information reported in the SHIW[19] survey and we build an econometric model for imputing *out-of-sample* values. Data support the hypothesis of an increase in the expected retirement age and a decrease in the expectations on future replacement rates if we consider recent survey waves, suggesting a partial internalization of the effect of pension reforms in the process of expectations-formation.

Since the planned retirement age (plan_ret_age) and the expected replacement rate (exp_repratio) are slightly negatively correlated (ρ=-.14) but part of their variability may be jointly determined, there is a strong likelihood that there will be a correlation between plan_ret_age and the error term in the model of expected replacement rate[20]. In order to better account for this kind of endogeneity we then choose to fit a three-stage estimation for systems of simultaneous equations, since plan_ret_age is simultaneously the dependent of the first equation and an explanatory variable in the second equation (exp_repratio) of the system.

With regard to the first equation of the system (table 1), *i.e.* the planned age of retirement, we can notice the contributive seniority (and its square) has a negative coefficient while in order to account for the effect of age and its strong collinearity we interact the latter with the former. Then, we can interpret its positive and significant coefficient as a counter-effect of age (perhaps due to an adjustment of individuals' planning when they approach to retirement), given the expected negative impact of seniority. Time dummies catch the slight extension in planned retirement in the more recent waves, while cohort dummies do not suggest a clear cut pattern apart from the fact that individuals who were born after 1953 plan to retire later than older individuals.

Looking at the second equation, the expected replacement rate, we can see how the simultaneous estimation corrects the endogeneity of planned retirement age as a regressor by estimating a positive, significant, coefficient; the contributive seniority, as expected, has a positive impact while its interaction with age has a low significance, small, negative effect. Individuals which fall under the NDC pension scheme expect, on average, 6 points less in their future replacement rate. Also in this equation, but with a more clear pattern, time dummies catch the recent (downward) revision in pension outcome expectations, while cohort dummies surprisingly show, other things being equal, that the younger the cohort the higher the expectation about future replacement rate. This evidence provides us with a further clue about the incomplete internalization of pension reforms, especially by younger individuals, who are expected to bear the heaviest burden of the reform itself.

Table 1: Three-stage least-squares regression of planned age of retirement and the expected replacement rate

Equation	Obs	Parms	RMSE	R-sq	chi2	P
1.Plan_ret_age	27194	21	3.435451	0.257	9408.45	0.000
2.exp_repratio	27194	21	0.163388	0.149	5034.9	0.000

Planned Age of Retirement				***Expected Replacement Rate***			
	B		Se		B		Se
Year_contrib	-0.5005	***	0.0117	Plan_ret_age	0.0026	**	0.0008
Year_contrib^2	-0.0094	***	0.0003	Year_contrib	0.0065	***	0.0007
Age*contrib.	0.0146	***	0.0003	Age*contrib	-0.00003	*	0.00001
Female	-2.085	***	0.0445	NDC	-0.0602	**	0.0205
NDC	0.6392		0.4316	Single	0.0095	*	0.004
upper_secondary	0.2882	***	0.0473	Upper secondary	0.0147	***	0.0022
degree_or_more	0.9429	***	0.0722	Degree or more	0.018	***	0.0035
self_employed	1.2191	***	0.0548	Self emplolyed	-0.1161	***	0.0028
Public	-0.2453	***	0.0541	Public	0.0404	***	0.0026
home_owner	-0.113	*	0.0473	Partime	-0.0395	***	0.0041
South	0.6049	***	0.0496	Centre	0.0349	***	0.0025
Single	0.6131	***	0.085	South	0.0424	***	0.0026
tau2002	0.2049	***	0.0594	tau2002	-0.0339	***	0.0028
tau2004	0.4154	***	0.0618	tau2004	-0.0506	***	0.003
tau2006	0.1333	*	0.0651	tau2006	-0.0789	***	0.003
coor_53	1.2315	***	0.0881	coor_53	0.0119	**	0.0041
coor_58	2.1149	***	0.1063	coor_58	0.0221	***	0.005
coor_63	2.3574	***	0.1239	coor_63	0.0334	***	0.0056
coor_68	2.3954	***	0.1403	coor_68	0.0449	***	0.0061
coor_73	2.2184	***	0.1547	coor_73	0.0607	***	0.0064
coor_78	1.9241	***	0.1718	coor_78	0.0704	***	0.0069
Intercept	61.2566	***	0.1635	Intercept	0.4337	***	0.0539

Endogenous variables: plan_ret_age, exp_repratio

Source: Author's computations on SHIW 2000-2006

In the light of this empirical analysis, since the expectations-adjustment process of has not been fully completed, it would be unreasonable to assume that pension expectations will remain unchanged into the future. On the opposite, we guess these expectations to become increasingly accurate over time.

Therefore, the projected values for these two variables p_k and ω^t_{k,p_j} (both generically called y) are computed as a weighted average between the values predicted by the econometric model above (ŷ) and the values simulated by the "Pension module" (y*) of CAPP_DYN for individuals retiring during the simulation period (within 2050). For the younger individuals not retiring in the simulation period, we assume the predicted value of the model to converge linearly towards a long run mean value estimated (by a regression on the 2045-2050 simulated data) for population subgroups. Therefore:

$$y = \gamma \hat{y} + (1-\gamma)\, y^* \tag{6}$$

The weight of this average $\gamma \in (0,1)$ becomes closer to zero the closer the year of simulation is to 2050 (*i.e.* the more the pension outcomes of the new NDC regime become observable) and the more the worker is close to his/her retirement age (the closer one is to her retirement age, the more one is aware about the exact moment of retirement and about pension amount).

$$\begin{aligned} &\gamma = [1 - \frac{1}{2050 - 2003} * (t - 2003)] * (l^{0.5} - 1) / l^{0.5} \\ &l = year\ of\ retirement - t \end{aligned} \tag{7}$$

Although actual simulated future values are exogenous to the Wealth module (at the state of the art feedbacks from this latter to the former modules are not yet allowed) nevertheless, the social security module of CAPP_DYN - following a rule of exit essentially playing along with the increase in the legal provision - provides an evaluation of the pension benefit that is consistent with a given seniority and with the computational rules related to the particular pension scheme an individual falls under. In other words, we assume that, given a simulated labour market exit-age which only partially adjusts to offset the future decreasing pension coverage, the expectation about the implied replacement rate should converge towards this actual value.

3.2 Social Security Wealth

In order to estimate the expected value of future pension benefits, the model computes the expected value of the first annuity by multiplying the estimated expected replacement rate ω^t_{k,p_j} by the projection of last labour income (in $p_{k\text{-}1}$) :

$$P^t_{k,p_k} = \omega^t_{k,p_{kj}} y^t_{k,p_k} \tag{8}$$

The expected present value of future pension flows is obtained as the sum of present values of pension annuities from retirement to the expected time of death (T_k) (calibrated according to ISTAT projections):

$$SSW_k^{p_k} = \sum_{i=p_k}^{T_k} \left(\frac{1}{1+r} \right)^i P_{k,i} \tag{9}$$

Finally, *SSW* values are discounted back to the current period and are aggregated for the spouses. By aggregating the life-time labour incomes component plus the pension component the model produces an estimate of the expected value of household human resources (*HR*).

4. Estimation of the Consumption Rule

In this section we discuss the specification and the estimation of the consumption rule, the parameters of which we use in the simulation program. As mentioned in the introduction, the idea driving our approach is that the likely impact of radical social security reforms on the consumption/savings age profile of Italian households asks for a step beyond the estimation of a traditional reduced form Keynesian equation. In fact, if we look at the recent past (*i.e.* our 1991-2006 panel dataset, figure 2) through a set of kernel regressions, we notice that the (equivalent) savings profile of Italian Households is characterized by a nearly flat pattern from about 35 years on, with pensioners having, on average, a positive propensity to save even at older ages.

A broad literature has investigated the so called "retirement consumption puzzle" in several countries (Lunberg et al. 2001, Fernandez and Krueger, 2003 and 2004). For Italy, some authors have explained - at least partially - the high (private) savings propensity of the elderly with the generosity of the social security system (Miniaci et. Al, 2003) which, so far, provided pensioners with rather high rate of returns on contributions and high replacement rates. Once the social security wealth is included in the total wealth, the savings profile of Italian Households turns to be more consistent with the lifecycle hypothesis, with a positive propensity until retirement and a spend-down phase in the ensuing period.[21]

We believe that thinking of this pattern as given and projecting it into the forthcoming decades - when social security reforms will be fully operational and the generosity of public pensions will be much reduced - would miss an important part of the distributional story. In fact, reforms especially affect current young and future workers whose lifecycle consumption is not (or only partially) observed and whose expectations have only partially embodied the long-run effects of the reforms themselves. We therefore believe that linking consumption behaviour to a lifecycle theoretical framework, while searching for a specification that fits our data more closely, is an appropriate strategy for accounting for such issues.

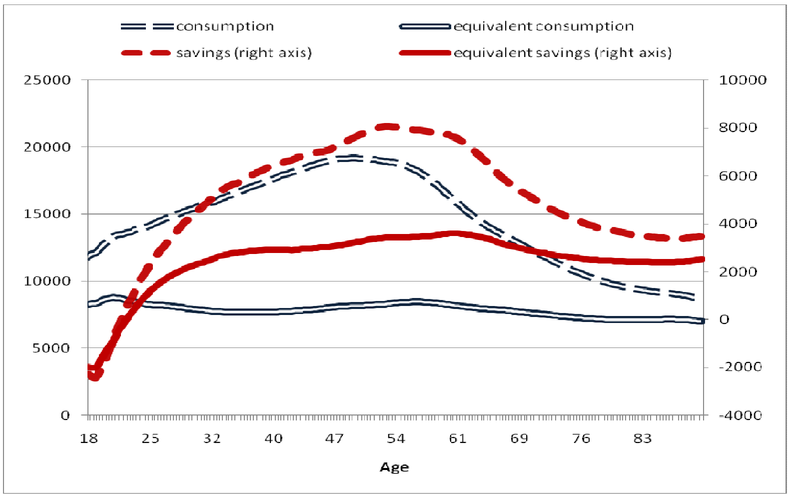

Figure 2: Consumption and saving age profiles in the estimation dataset
Source: Author's computations on SHIW 1991-2006, Nadaraya-Watson nonparametric regression, Euros 2002

As mentioned in section 3, the empirical specification is the following:

$$\frac{C_h^t}{HR^t} = \rho \underbrace{\frac{C_h^{t-1}}{HR^{t-1}}}_{\substack{\text{lagged}\\ \text{dependent}}} + \underbrace{\delta' pa_h^t}_{\substack{\text{Polynomial}\\ \text{in age of the hh}\\ \text{and relative}\\ \text{interactions}}} + \sum_m \beta_m \underbrace{D_{m,h}^t(H)}_{\substack{\text{Households'}\\ \text{and hh}\\ \text{Characteristics}\\ \text{Dummies}}} + \psi \underbrace{lny_h^t}_{\substack{\text{Current}\\ \text{Disposable}\\ \text{Incomes}}} + k \underbrace{lnAF_h^t}_{\substack{\text{Financial}\\ \text{Assets}}} + \varsigma \underbrace{lnAH_h^t}_{\substack{\text{House}\\ \text{Equity}}} + \vartheta \underbrace{lnPF_h^t}_{\substack{\text{Financial}\\ \text{Debt}}} + u_h + \varepsilon_h^t \quad (10)$$

Such a functional form, where the dependent is (log of the) consumption to HR ratio, proves to better fit our household consumption data across the distribution while considering the role of habit persistence[22] and the effects of future expectations about incomes and pensions outcomes as a crucial determinants of current consumption. Moreover, by estimating a propensity rather than a level, in the simulation program we can avoid having to make arbitrary assumptions due to the non-stationary nature of consumption that would have implied a moving average and therefore a dynamics in the intercept of the equation.

In order to estimate the dynamic consumption function (10) we use a GMM system estimator (Arellano, Bover, 1995; Blundell, Bond, 1998) with robust standard errors so as to purge the estimations from the bias induced by the endogeneity due to the individual fixed effect.

It has to be noticed that the periodicity of the survey means that the reference consumption propensity is the two-year lag causing a weaker estimated persistence parameter (0.115) when implemented in the discrete yearly simulation program.

Both the enlarged financial wealth and financial debt have positive elasticities on the propensity to consume out of human resources while house equity shows a negative elasticity which, however, is to be evaluated in the light of the interaction with the number of owned dwellings. The positive sign of the interaction probably indicates a non-linear effect of real wealth on the dependent as owners of more than one property often enjoy actual rents (besides imputed rents for owner-occupied dwellings) that constitute an extra-source of (capital) income that can be allocated to consumption. It is worth noting the negative effect of household head being retired, which confirms the well-known one-off drop in consumption at the time of retirement. Finally, the effects of household types suggests that nuclear families - the reference (omitted) category- are characterized by a lower propensity to consume out of the human life-time resources[5]

Table 2: Dynamic panel-data estimation of the consumption rule, two-step system GMM[23]

ln{C/HR}	B		se	t	Ci95	
Lag.ln{C/HR}	0.1152	***	0.0259	4.4556	0.0645	0.1659
ln_af_en	0.0128	***	0.0026	4.8835	0.0077	0.0179
ln_ar_h	-0.0244	***	0.0052	-4.7274	-0.0345	-0.0143
ln_ar_h*n_houses	0.0069	***	0.0018	3.8106	0.0034	0.0105
ln_pf	0.0135	***	0.0019	7.1701	0.0098	0.0172
Q2_income	-0.1185	***	0.0197	-6.0043	-0.1571	-0.0798
Q3_income	-0.1589	***	0.0222	-7.1707	-0.2024	-0.1155
Q4_income	-0.2282	***	0.0249	-9.1813	-0.2769	-0.1795
Q5_income	-0.2908	***	0.0289	10.0710	-0.3474	-0.2342
Age	0.1892	***	0.0507	3.7288	0.0898	0.2887
age^2	-0.0061	***	0.0014	-4.4608	-0.0088	-0.0034
age^3	0.0001	***	0.0000	6.0067	0.0001	0.0001
age^4	0.0000	***	0.0000	-7.4470	0.0000	0.0000
age_self	0.0010	*	0.0004	2.4646	0.0002	0.0019
age_upsec	-0.0011	***	0.0003	-4.1302	-0.0017	-0.0006
age_degree	-0.0034	***	0.0004	-8.1461	-0.0042	-0.0025
Retired	-0.0704	**	0.0233	-3.0183	-0.1162	-0.0247
earners_ratio	-0.2705	***	0.0283	-9.5756	-0.3259	-0.2152
South	-0.0505	***	0.0119	-4.2364	-0.0739	-0.0271
Single	0.0171		0.0198	0.8618	-0.0218	0.0560
Nusihehh	0.1080	**	0.0355	3.0388	0.0383	0.1777
non_nusihehh	0.3959	***	0.0376	10.5271	0.3222	0.4696
non_nuclfam	0.1787	***	0.0163	10.9877	0.1468	0.2106
tau1991	-0.0204		0.0167	-1.2196	-0.0532	0.0124
tau1993	0.0500	**	0.0159	3.1525	0.0189	0.0811
tau1995	0.0890	***	0.0148	6.0144	0.0600	0.1180
tau1998	0.0379	*	0.0161	2.3605	0.0064	0.0694
tau2006	0.0232		0.0131	1.7736	-0.0024	0.0488
Intercept	-5.7109	***	0.7040	-8.1118	-7.0908	-4.3311

Source: Author's computations on SHIW data, Historical Archive, panel component, waves 1991-2006

5. The Intergenerational Transfers Sub-Module

[5] It is worth stressing once more that our definition of non-nuclear household does not include proper "composite structure" families with more than two adult members (except children) living in. Actually, if we allowed for this group in the analysis, it would probably represent the highest savers group.

This section describes the functioning of another important block of the Wealth module. Indeed, this part of the model proves to be of fundamental importance in modelling private wealth within a dynamic microsimulation framework that aims at explicitly accounting - in a probabilistic fashion - for inter-generational links[24] and therefore at evaluating the between-generations/cohorts role of private wealth transmission at the same time as a demographic and institutional transitions. From a micro perspective, intergenerational transfers may reduce inequality across generations but may conversely also increase economic disparities within cohorts and are thus an important channel for transmitting economic inequalities.

The analysis of such phenomenon plays an important role in our study for at least two reasons:

i) on the one hand, since the empirical evidence shows that the size of the wealth transfers is not negligible (although some uncertainty surrounds its exact magnitude) and that they are very concentrated, assessing the main statistical determinants of such choices is important as they significantly impact on the overall wealth distribution;

ii) on the other hand, intergenerational transfers may support or even substitute social security transfers, especially whenever the latter will play a decreasing role in the future. The question is even more crucial when considering three main features of Italy's demography and economy: the secular decline in fertility, which is greater than in other European countries, the high saving rate of the elderly and the mortgage market imperfections which, by causing big borrowing constraints for the young, would even further reduce their consumption capabilities as well as the decision and the possibility to buy a home without substantial private wealth transmission.

Concerning the quantitative evaluation of such a phenomenon, data available for Italy are still narrow. The only two sources are the Bank of Italy's *Survey on Household Income and Wealth* (SHIW, 1992 and 2002 waves) and the *Survey of Health, Ageing and Retirement in Europe* (SHARE), which collects information on a representative sample of a cross country of populations for individuals over 50. According to Cannari and D'Alessio (2007) who use the former source, intergenerational transfers make up a sizeable share of Italian households' net wealth: direct estimates referring to 2002 range from 30 to 55 percent, depending on whether the income stream produced by transferred assets is included. Moreover, transfers would be concentrated on the top tail of the distribution and would therefore be an important factor in explaining wealth inequality persistence in Italy.

Similar results have been found in works based on SHARE data. This survey, collects more rich and detailed information compared with SHIW on wealth (and time in the form of reciprocal care) intergenerational transfers and provides the possibility to carry out cross country comparisons. To this end, Albertini, Kohli and Vogel (2008) show that the share of Italian households making a financial transfer in a year is smaller compared with northern countries' families. However, the share of transferred wealth is higher compared with the European average.

5.1 Implementation of the transfers sub-module in CAPP_DYN

In this section we describe the structure of the intergenerational transfer sub-module of CAPP_DYN. This module includes the set of procedures which allow the transmission of financial and real (this latter only in bequest processes) wealth among the family units in every year of simulation.

In the simulation program, wealth transfers may occur *inter vivos* or *mortis causa*. The former involves redistribution of wealth from donor to recipient family units which are linked by ties of blood during their all life cycle. The latter occurs when a household extinguishes in the model (because all of their member died), through the distribution of net wealth (whether positive) among heirs.

In the current release of the model we assume that the *inter vivos* transfer decisions depend on socio-economic characteristics of the observational unit. In other words, first the model determines such characteristics within the original blocks then, conditional to these observables, wealth transfers are simulated. Therefore feedbacks from wealth decisions to demographic, occupational and pension choices are not allowed yet. The methodology we adopt in the *inter vivos* estimates is based on a traditional two part approach (where the first equation estimates the probability and the second the amount) and, in order to control for possible selection biases, draws on the micro-econometric literature of estimation using a control function. Therefore, we introduce a Heckman correction in the OLS estimation of the amount, whether it is needed.

We model separately the two sides of the transfer (donor and recipient). Therefore, for the estimation, we also had to construct a child level dataset where the unit of analysis is the child's family (which is more likely to be recipient), rather than his/her parents, by means of an "inversion" of the original dataset. We end up with two datasets. The original one, which we call "potential donors" and the derived one, which we call "potential recipients"[25]. We then estimate the two sides of the exchange separately on the two datasets using, however, some mutual characteristics (*i.e.* recipients characteristic in the donor equation and *vice versa*). The inclusion of such characteristics in the equations (especially, controlling for parents financial wealth in the recipient regression) allows to explain a quite similar share of the variance of the dependent variables in the two outcome equations (*i.e.* transfers given and received), thus providing predicted values characterized by a quite similar variability. This property will prove to be important in the simulation stage in order to avoid an excessive under-estimation of the intergenerational transmission of inequality through an unrealistic *within* cohort redistributive effect of private wealth inter-generational transfers.

Finally, since we are interested in the simulation of transfers of non-negligible amounts, we restrict the estimation to transfers greater than 1,500 euros.

The submodule is structured as follows: among households with a head aged over 50 and with a positive wealth in the previous period, the model selects those with the highest transfer probability. This selection follows a pseudo-random lottery, that is the model computes the deterministic prediction by means of a discrete choice model. Such a conditional probability (score) coupled with a Monte Carlo process allows us to select the actual donor households among those with the highest score. The model endogenously determine the donors' share, depending on the interaction of the econometric model and the Monte Carlo stochastic ranking. The second step determines the transferred wealth as a share of household enlarged financial wealth.

In the selection equation we employ a binary variable that is equal to 1 if the interviewed household has made at least one transfer towards children or grandchildren in the 12 months preceding the interview, otherwise it is 0. For the outcome equation the dependent is built as the logarithm of the transferred amount on donor financial wealth[26] (gross of transfer) ratio.

Once donor households have been identified and the wealth to be transferred has been determined, the model updates the stock of household financial assets. The down spending of donors' wealth is deterministically simulated by subtracting the amount transferred by the pre-transfer held stocks. The following step starts from the identification of the potential recipients of a wealth transfer.

For the recipient model, the dependent variable is a binary that is equal to 1 if the observed child' household received a transfer in the 12 months preceding the interview, while in the outcome equation the dependent is the logarithm of the transfer received[27].

Among the covariates of the recipient model, besides a polynomial in age we use some occupational and household structure controls plus the existence of children (which in turn are grandchildren for the donors) and, as a cross-explanatory variable, the (pre-transfer) financial wealth of the family of origin.

In the tables 3 and 4 we report estimated coefficients for the two separate models. For the donors model, the evidence shows a lower probability joint to a larger share of transferred wealth for Italian households; in fact, in the selection equation, estimated by means of a *logit* model, ITA dummy coefficient is negative and significant, while in the outcome equation is positive and significant.

Belonging to higher net wealth quintiles still has a positive sign in the *logit*, but has a negative sign in the outcome equation. Therefore, the better-off households show a higher transfer probability but, as a share of their financial wealth, they transfer less compared to less-affluent families. Moving on to the recipients' characteristics, the determinant role of some specific events in the recipients' lives (such as unemployment, marriage, child birth) is confirmed and increases both the probability to be donors and the amount. In particular, we use the latter variable, *i.e.* wed_or_birth - which is strongly significant and very powerful (coefficient 3.2) in predicting the financial giving event[28].

Table 3: Two-step estimation for intergenerational giving with Heckman correction

Donor side							
Logit Probability of being Donor				**OLS ln{Ratio }**			
	B		Se		B		Se
Age	0.0807	***	0.0243	Age	-0.7785	**	0.2404
age2	-0.0007	***	0.0002	age2	0.0113	**	0.0036
in work	0.3522	***	0.052	age3	-0.0001	**	0.000
Q3_wealth	0.4146	***	0.0543	in work	-0.4384	***	0.0866
Q4_wealth	0.6046	***	0.0531	Retired	-0.2449	**	0.0849
Q5_wealth	0.6989	***	0.0531	Unemp	-0.4619	**	0.1649
child_unemp	0.2835	***	0.0625	ch_unemp	0.3006	***	0.0817
wed_or_birth	3.2668	***	0.1205	Q3_wealth	-0.5422	***	0.0752
upper_secondary	0.5074	***	0.0463	Q4_wealth	-0.8931	***	0.0736
degree_or_more	0.742	***	0.0502	Q5_wealth	-1.4278	***	0.0733
Ita	-0.2737	***	0.0747	Ita	0.7029	***	0.0951
_intercept	-4.4368	***	0.8158	***mills_ratio***	0.2653	***	0.0414
				_intercept	15.5409	**	5.3305

Source: Author's computations on SHARE data, wave 2004

Turning to the recipient equations (table 4), due to the derived nature of the dataset, we can estimate only a model with a reduced number of covariates and no valid exclusion restrictions[29]. Italian recipients show both a higher average probability and a greater average amount compared to the other European homologues. This evidence seems at odds with the lower giving probability in the table 3. Nevertheless, Italian households tend to transfer more often to all of their children when they do that and have, on average, a slightly few number of children compared to the overall sample. Finally, a powerful determinant of transfer receiving is, as expected, the financial wealth of the family of origin.

Table 4: Two-step estimation for intergenerational receiving without Heckman correction

Recipient side							
Logit Probability of being Recipient				**OLS ln{Amount}**			
	b		t		B		se
ln(af parents)	0.169	***	0.0061	ln(af parents)	0.0892	***	0.0079
Age	-0.0883	***	0.0105	Age	0.0253	*	0.0147
age^2	0.0007	***	0.0001	age^2	-0.0004	*	0.0002
Married	0.3004	**	0.1119	Grandchildren	-0.1051	*	0.0567
Single	0.6497	***	0.1125	Married	0.1911	***	0.0494
Divorced	0.6462	***	0.1288	Ita	0.2481	**	0.0944
in work	-0.2689	***	0.0403	_Intercept	7.028	***	0.2699
Degree	0.3421	***	0.0414				
Grandchildren	0.2863	***	0.0442				
Ita	0.1984	**	0.0709				
_Intercept	-1.3815	***	0.2094				

Source: Author's computations on SHARE data, wave 2004

The (log) value of parents' financial assets for family units without a potential donor in the sample in a period t is obtained as a draw from a normal distribution with mean and variance equal to the actual first and second moments of the financial wealth distribution among over 50 families in period t[30]. This procedure implicitly assumes that the future distribution of financial wealth will change in its mean and variance only (not a very strong assumption) and that such a draw is independently distributed over time[31] and across families. We follow this approach rather than simply exclude this variable from the set of recipient equations regressors, in order to warrant a acceptably good matching between the variances of given and received simulated transfers[32]. In practice, we introduce an important explanatory factor in the recipient equations that, whenever unobservable, is substituted by a random-component whose first two moments are however not fixed over the simulation period but are time-varying according to the distributional evolution of the enlarged financial wealth among over 50 households.

Next, the model verifies the consistency between the total (out-and-in) flows and, every year, imposes the following condition to hold:

$$\sum_{i=1}^{J} af_i^G = \sum_{i=1}^{K} af_i^R \tag{11}$$

Where J and K are the households giving (G) and receiving (R) a transfer, respectively, while *af* is the amount of transferred financial wealth. Condition (11) ensures an accounting consistency in the process of *inter vivos* transmission.

Should a family unit extinguish due to the death of the last remaining member, the model simulates the (proportional) transmission of the whole wealth endowment to the heirs. To this end, we try to account for the main family relationships in order to define the heir stall of bequests. Currently CAPP_DYN allows the considering of relationships among individuals who, during the survey (2002), shared the same house, plus individuals who lived outside the family of origin at that time but whose existence was still reported by the survey's respondents[33]. We consider therefore as potential heirs all the children, grandchildren and common-law spouses in the initial population plus the children living outside (*i.e.* those not included in the sample) plus children and grandchildren born during the simulation period.

Once the number of heir family units is defined, bequests are deterministically simulated with the stock of wealth being proportionally distributed among them in the form of financial wealth. Then, in order to ensure the accounting consistency of the wealth stocks in the economy, every year the model imposes the following identity to hold:

$$\sum_{i=1}^{J} nw_t^G = \sum_{i=1}^{K} nw_t^R + Res \tag{12}$$

Where J is the number of extinguishing family units in each year that pass on their wealth (G) *mortis causa*, K is the number of in-sample heirs that receive a bequest (R), *nw* is the net wealth transferred amount (in the form of financial wealth) and Res is the residual amount consisting of the net wealth of households that is extinguished without heirs plus the wealth shares received by out-of-sample heirs.

At this stage we decided to impute such a residual through calibration, where Res is distributed as a proportion of net worth already held by the household, in order not to alter the sample wealth distribution.

6. Simulation Results

In this section we present some selected simulation results provided by the extended version of CAPP_DYN including the new Wealth module. Our aim is to assess some possible outcomes on disposable income and wealth distribution as well as on the saving patterns of Italian households in the coming decades (2010-2050). The next future will be characterized by two significant transitions - in the demographic structure (particularly pronounced in Italy) and in the public pension system, which will slowly shift from quite a generous (although horizontally unfair) defined benefit system (DB) to an actuarially neutral notional defined contribution regime (NDC). The gradual social security reforms are expected to place most of the burden on current young (and future) workers through a significant cut in their expected returns on social security contributions.

Demographic changes will bring a large increase in the population share of elderly on the one hand, while on the other, the replacement of older cohorts – that have been characterized by a large number of individuals (baby-boom generations), a high net saving rate (despite the generous pension system) and a low number of descendants - with the later cohorts, less numerous and not enjoying the same social security arrangement. Nevertheless, on average, they would be able to benefit from a larger intergenerational transfers of private wealth.

We consider dynamic micro simulation as an appropriate tool for shedding light on the future saving pattern of Italian households and on the likely distributional consequences of transitions.

In the following sections we present some simulation results for the period (2008-2050)[34] starting from a look to the general trends of household propensity to save for different groups in order to check their consistency with model hypotheses. We then focus on the evolution of private intergenerational transfers (*inter vivos* and bequests) and discuss how they could partially crowd-out - together with the role of demography - the average pro-saving effect of pension reforms. Next, we carry out distributional analyses on wealth and incomes in order to interpret general patterns in inequality in the light of some key driving factors. We finally provide some decompositions of inequality trends by age group and by pension regime in three key years (2008-2025-2050).

6.1 Aggregate trends

In order to get a macroeconomic picture of the saving patterns simulated by the model, figure 3 displays aggregate results in terms of propensity to save out of base income (Y0). In particular, two definitions of savings are adopted: s0, the liquid savings (*i.e.* base income minus consumption minus the mortgage installment, if any), and s1, obtained by considering the capital share of mortgage installment as a form of savings (*i.e.* base income minus consumption minus annual mortgage interest, if any). As it can be noticed, in a first period, up to 2022, the saving propensity increases substantially, followed by a long period of moderation (more dramatic for the s0 propensity).

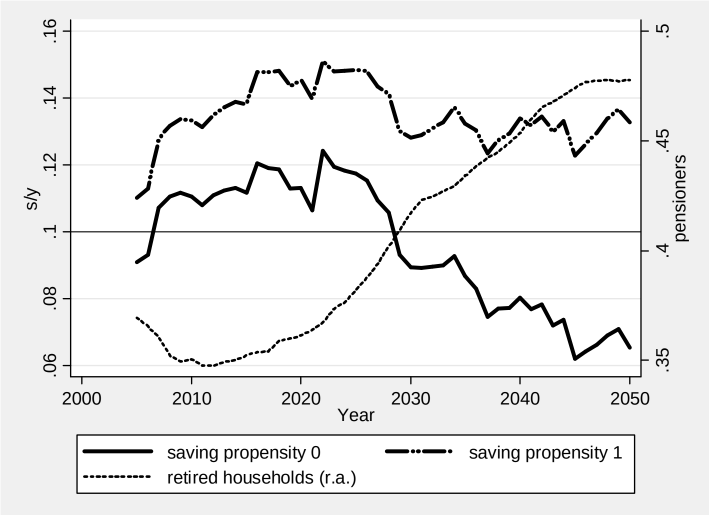

Figure 3: General propensity to save

Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

We can identify some forces driving such pattern. Figure 3 also plots the share of households whose head is retired. A sharp increase is recorded in this value, which increases from 35% of the population in 2012 to about 47% in 2045. This is a first macro-level clue of the moving back of savings in the second spell. Nevertheless, this evidence would be consistent in a life cycle perspective if we think of retired people in the future decades behaving differently from current Italian pensioners (who are still net savers at the older ages, see fig.2). Indeed, households' life cycle savings pattern is expected to change, becoming increasingly more consistent with the life cycle theory, which is characterized by greater saving just before retirement and more dissaving after retirement. This is a consequence of the behavioural hypotheses at the basis of estimating the consumption rule.

These remarks are further corroborated by figure 4 which, in the left panel, depicts the evolution of saving propensities for households whose head is working while, in the right panel, for households whose head has retired. A clearly diverging pattern can be seen between the two groups that currently do not have a significantly different average saving rate. The inactive-head group, around 2020, would even start to dis-save its private assets in order to keep its living standard that is comparable with their pre-retirement one, despite the reduced generosity of social security system.

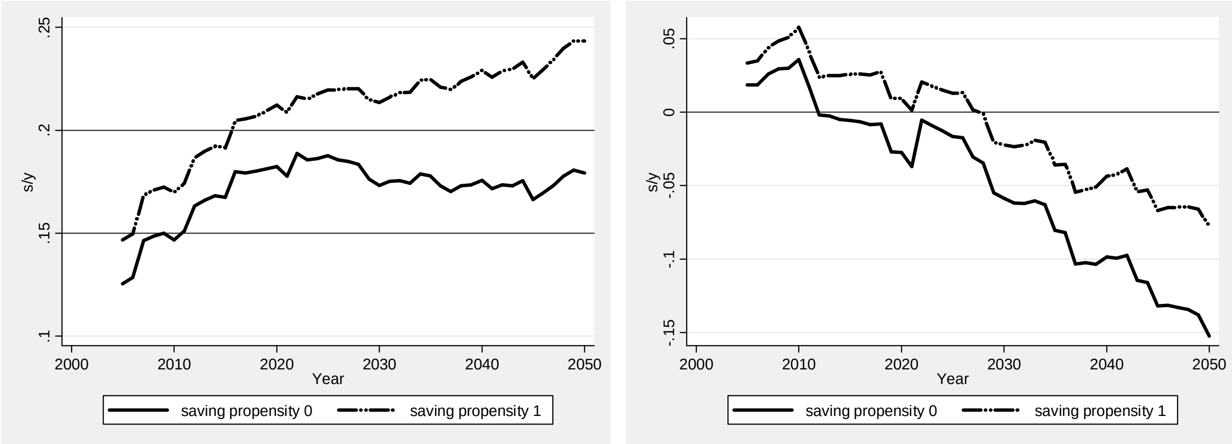

Figure 4: Propensity to save for active households (left) for retired households (right) (2008-2050)

Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

Pension expectations are an important parameter of the consumption rule and their evolution determine the initial upward trend in the propensity to save of active households. Later cohorts (fig.5) are indeed expected to progressively reduce their expectations about after-retirement replacement rate provided by the social security system and this, in turn, (*via* the internalization of reduced returns on contributions) is mirrored by a progressive fall in permanent income as a share of current income.

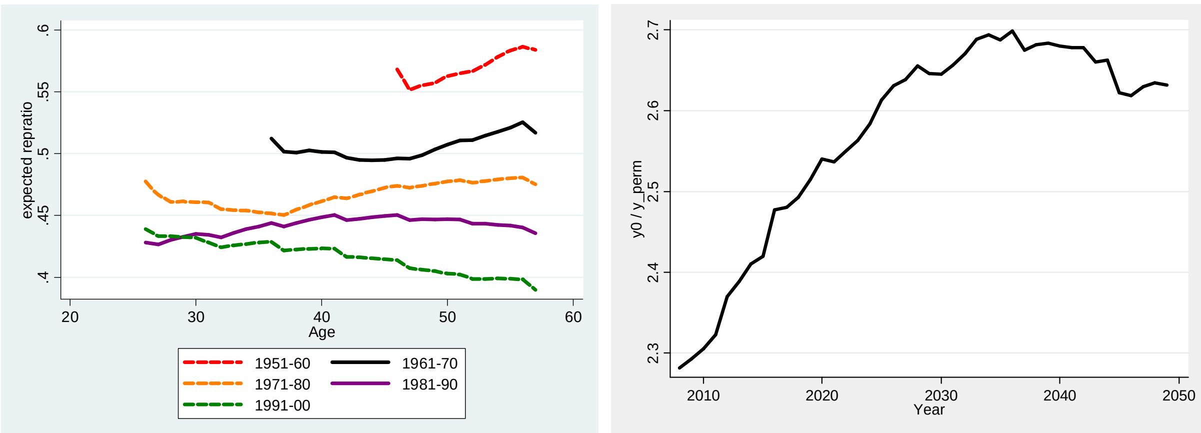

Figure 5: Expected replacement rate by age for different cohort (left) and the mean evolution of the current to permanent income ratio (2008-2050) (right).

Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

Therefore, so far, we have identified two opposite forces that could lead savings in the next years. One is a pro-saving effect due to the internalization in expectations of pension reforms by active people; the other is a counter effect – due to the interaction of future pension outcomes with the life-cycle consumption rule - on the behavior of future pensioners, who are expected to become more dis-savers.

We then isolate the saving propensity and the net worth to income age-profiles for five ten-years cohorts with at least 35 years of adult life in the simulation period. Figure 6 (left) displays the saving propensity according to the restricted definition (s0).

In short, for later cohorts, the general pattern is connoted by a more intense saving before retirement, followed by a significantly more pronounced dis-saving later. Moreover, moving toward younger cohorts, especially for the very youngest, the more intense savings effort start from 55.

In terms of net worth to disposable income age profile (right), it is worth noting that the two oldest cohorts, for most of their life, have a significantly higher ratio compared to the youngest three cohorts, which in turn seem to fill the gap with the former group at a more advanced age (also considering the longer life expectancy).

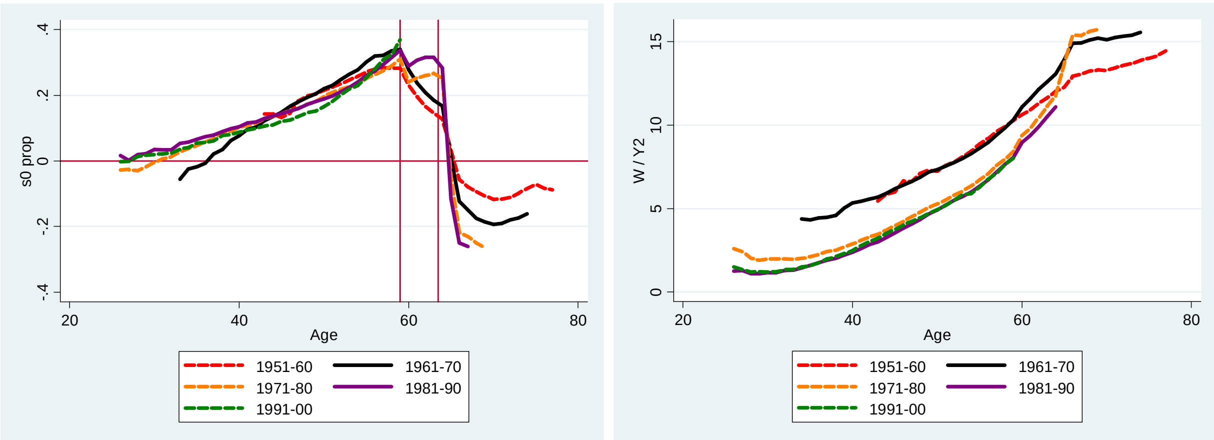

Figure 6: Propensity to save (s0) (left) and net worth to disposable income (right) age profile for different cohorts.
Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

Next, we investigate the specific role of private wealth received as a gift or bequest. Figure 7 displays the evolution of the share of recipient/donor families of *inter vivos* (left) and *mortis causa* (right) transfers and of the average amount transferred. A steady increase can be observed in both dimensions; the share of recipient households raises from 5.3% in 2008 to 9% in 2050 while the average transfers increases from 26,600 euros in 2008 to 47,700 in 2050 (euros at 2002 prices), equivalent to a compound annual growth rate of 1.4%, a bit less than the average general growth in wage (exogenously assumed at about 1.7%). However, considering the product of the two dimensions, the mass transferred *inter vivos* is expected to more than triple in real terms over the next 42 years while the mean wage is expected to double in the same period.

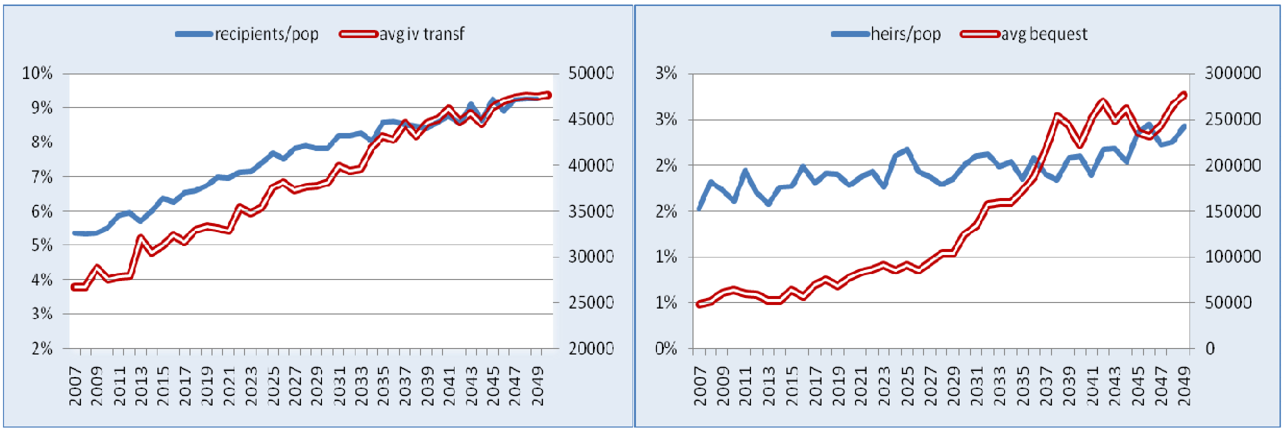

Figure 7: Evolution of the share of iv and mc transfers recipient households and of the avg amount transferred
Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

Concerning the private wealth transferred *mortis causa*, the share of heirs' families in the population is expected to increase steadily from 1.5% in 2008 to 2.4% in 2050, while the evolution of the average bequest received can be divided into three sub-periods: a steady and consistent growth from 2008 to 2029, an explosion from 2029 to 2042 and, finally, a third period up to 2050, when the amount remains flat.

In terms of average growth throughout the simulation period, the model predicts a noteworthy compound annual growth rate of 4.3% (with an acceleration in the central period, *i.e.* the time when the baby-boom generation is expected to pass away), well above the general growth in wages.
Multiplying the average amount by the share of population we get a mass of wealth bequeathed in 2050 equal to 9 times that of 2008.

This evidence points out a non-negligible role which the intergenerational transmission of private wealth would play in the coming decades, both in the dynamics of household accumulation and in wealth distribution.

6.2 Distributional results

This section aims at exploring the distributional implications of results provided by our simulation. Figure 8 below depicts the overall evolution in the Gini of net worth among Italian households in the coming decades as well as of the equivalent base income (*i.e.* net labour and pension incomes) and equivalent disposable income (Y2) obtained by summing the base household income (Y0, *i.e.* the sum of net labour and pension incomes) with annual rents provided by house equity (net of interests on mortgage, if any) and income from enlarged financial wealth[35]. Net wealth inequality is expected to stay fairly stable until about 2022, after when the model predicts a sharp increase in the Gini which would reach 0.655 in 2050. A similar path (though on a lower level) is recorded in equivalent base income inequality. Indeed, the Gini lies between 0.33 and 0.34 until 2025 and would steadily increase afterwards, exceeding 0.36 in 2050. Inequality in equivalent overall disposable income (which includes both base and capital incomes) is expected to progressively increase all over the simulation period starting from 0.34 in 2008 getting to 0.37 in 2050.

A regression of the simulated values of wealth Gini on some explanatory variables (Tab.5, left) can disclose the underlying correlations at work in the model. As expected, a crucial role in explaining wealth inequality is played by the dispersion in net labor and pension incomes (0.6 the coefficient). An additional variable correlated with wealth dispersion is the Gini in intergenerational (*inter vivos*) transfers (0.1 the coefficient). Finally, a strong powerful and significant regressor is the across-households standard deviation of saving propensity.

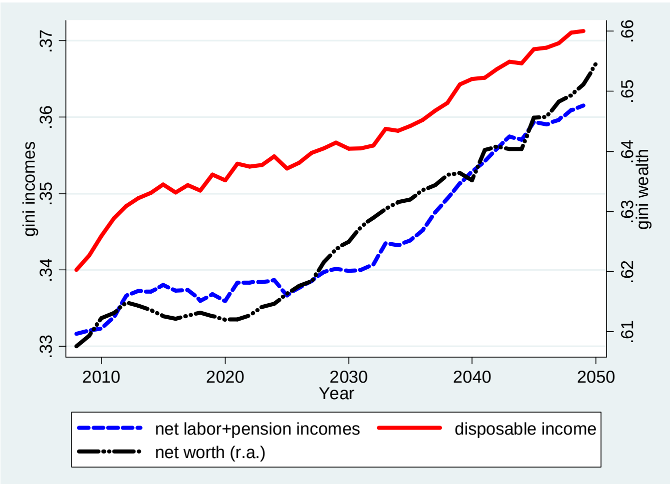

Figure 8: Evolution in the Gini of net worth and income (2008-2050)
Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

The analysis of the role of savings in shaping inequality is a specific task of our Wealth module as (following AN, 2004) we explicitly model household consumption behaviour in a life-cycle framework. A regression in differences (Tab.5, right panel) allows a better disentangling of the role of differences in household saving rates. To this end, we fit a linear model of the variation (*i.e.* the first difference) in Gini of wealth on variation in Gini of *inter vivos* transfers, contemporaneous and lagged values in standard deviation of the propensity to save. In this setting, it is worth noting that an acceleration (slow down) in intergenerational transfer dispersion is moderately yet significantly associated to an acceleration (slow down) in wealth inequality. Moreover, while the contemporaneous dispersion in saving rates is negatively correlated, with low significance, to the variation in wealth inequality, the two-year lag of the same explanatory variable is positively and significantly associated with the acceleration of inequality.

Table 5: Regression of Gini coefficient (left panel) and its variation (right panel) on simulated data

gini wealth				***D.gini wealth***			
	Coef.	Std. Err.	P>t		Coef.	Rob. Std. Err.	P>t
gini base income	0.597	0.119	0.000	D1. gini i.v. transfs	0.032	0.016	0.045
gini i.v. transfers	0.107	0.036	0.005	sd save propensity	-0.127	0.064	0.054
sd save propensity	0.363	0.047	0.000	l2.sd save propensity	0.158	0.067	0.024
Intercept	0.26	0.021	0.000	Intercept	-0.008	0.004	0.082

Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

The evolution of household base income inequality, simulated by the pre-existing labour and pension modules of CAPP_DYN, is mainly driven by a marked increase in earnings inequality in the coming decades interacting with an inverse U-shaped trend in public pension income inequality.

With respect to the evolution in the intergenerational transfers, the Gini of *inter vivos* components (giving and receiving) are both found to follow a rising trend for the whole simulation period. On the other hand, the bequests inequality displays a decreasing trend on a level which is, however, extremely high. The Gini, in fact, starts from 0.76 in 2008 and converges towards 0.6 in 2050. In sum, a *within* cohort pro-inequality effect of intergenerational private wealth transmission is at least partially counterbalanced by a *within* recipients (due to primary accumulation for new born families) and an obvious *between* generations redistributive effect. However, this *within groups* evidence does not imply, for household population as a whole, intergenerational transfers reduce inequality, rather, on the opposite, the decreased inequality within the group of recipients (or recipient plus donors) is more than offset by an increased inequality between recipients and non-recipients.

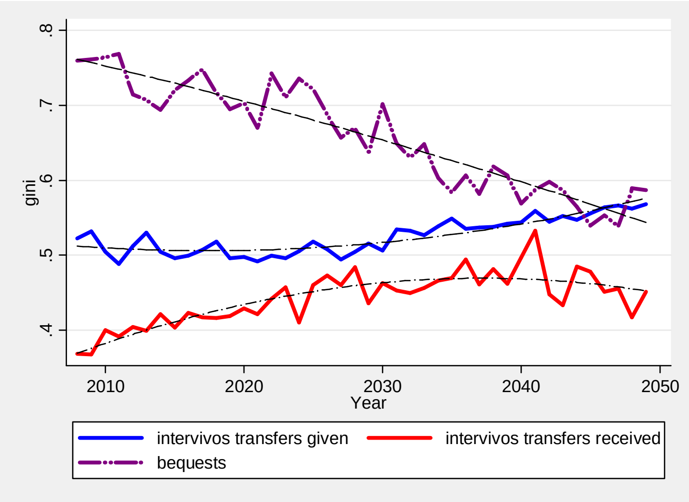

Figure 9: Gini intergenerational transfers (2008-2050)
Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

Concerning the dispersion in household saving rates, figure 10 shows the predicted evolution in the across-households standard deviation of the base propensity to save (s0) in the period 2008-2050.

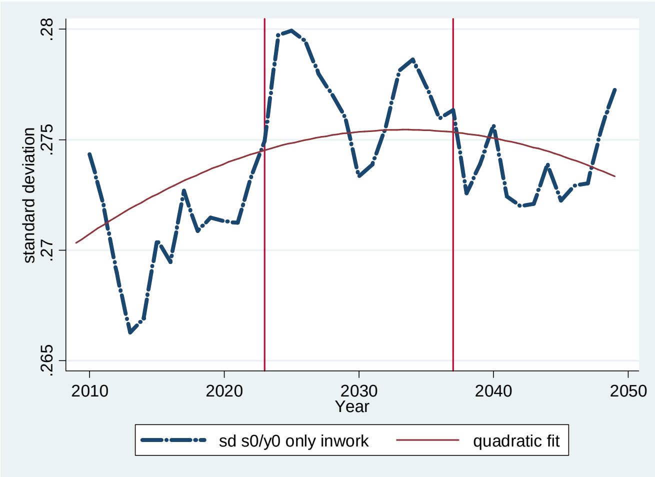

Figure 10: Across household standard deviation in the saving rates
Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

In particular, it depicts an erratic but growing pattern with a particular high and over-the-trend dispersion period between 2023 and 2037. Indeed, this spell coincides with the initial acceleration and then marked increase in wealth inequality. Therefore, the model points out a noticeable heterogeneous capacity and attitude to save and invest among Italian households in the central period of the simulation, which shows an important demographic transition coupled with the phasing-in of the social security system toward the NDC regime. This increased distance in capital accumulation among high-saving and low-saving households would even boost the steady-state inequality.

Summing up, the model suggests the likely role of three possible channels through which inequality will increase in the coming decades: firstly, an increased dispersion in earnings and public pensions; secondly, a rising (or very high) dispersion in intergenerational transfers of private wealth, coupled with a significant increase in their amount; and thirdly, a widening - sharp in the central period - gap between high-saving and low-saving households.

6.2.1 *Some inequality and poverty decompositions*

To further investigate worrying distributional trends in the coming decades, we perform some additional inequality and poverty[36] analyses, at some selected points in time.

First, by focusing on the household head's age distribution in the first quintile of the equivalent disposable income (fig.11), it is interesting to note that, while in 2008 this is mostly composed of young household heads, in 2050 the distribution would become bimodal with the first mode at ages around 25 and the second mode after 70. The model seems therefore suggesting an emerging income inequality polarization at the extreme ages in the coming decades.

A further confirmation can be drawn from the decomposition of inequality by age classes (tab.6). While currently the highest *within* inequality connotes the group of the youngest (under 35), in 2025 and, even more in 2050, it could also increasingly apply to the oldest group (over 65). This pattern in inequality would be coupled with stable high poverty incidence among the young and an upward poverty incidence among elderly.

Figure 11: Kernel density household head's age in the first quintile
Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

This evidence is the result of the ceasing re-distributional role of public pensions as well as a very heterogeneous pattern in private accumulation among households. This trend could radically change the distributional picture of Italy which, currently, is connoted by a lower income inequality and poverty incidence among elderly compared to other age groups. Moreover, it suggests the *between* age classes massive redistribution in favor of elderly (not showed here) could be associated with an impressive *within* elderly inequality in living standards.

Table 6: Gini (left panel) and poverty incidence (right panel) of equivalent disposable income by age classes

	GINI			***Poverty incidence*** (FGT$_0$)		
Age	***2008***	***2025***	***2050***	***2008***	***2025***	***2050***
<=35	*0.447*	*0.445*	*0.454*	0.444	0.462	*0.471*
36-45	0.333	0.323	0.322	0.249	0.253	*0.223*
46-55	0.309	0.331	0.317	0.176	0.199	0.144
56-65	0.303	0.329	0.339	0.140	0.176	0.148
>65	*0.274*	*0.311*	*0.361*	0.095	0.130	*0.185*
All				0.221	0.226	0.224
Between Ineq GE(0)	0.022	0.023	0.025			
Within ineq GE(0)	0.582	0.537	0.585			

Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

A final decomposition concerns the public pension schemes (tab.7). This analysis (carried out for 2025 and 2050 only because in 2008 we are still unable to observe NDC pensioners) points out the threat of a transition phase in around 2025, during which new NDC pensioners, representing nearly one third of all retired individuals, would face a particular severe inequality (0.38 the Gini against 0.28 among other pensioners) and a particular harsh poverty incidence (34% against 8%). This trend would characterize also the ensuing decades (in 2050, 7 pensioners out of 10 are expected to fall under the NDC regime) though to a less dramatic extent.

Table 7: Gini and poverty incidence of equivalent disposable income by pension regime

Equivalent Disposable Income	***2025***			***2050***		
PAYGO SCHEME	*Ineq (Gini)*	*Poverty (headcount)*	*Pop. share*	*Ineq (Gini)*	*Poverty (headcount)*	*Pop. Share*
DB/MIXED	0.280	0.079	73%	0.330	0.095	30%

NDC	*0.383*	*0.337*	27%	0.368	0.240	70%
All pensioners	0.317	0.149	100%	0.364	0.196	100%

Source: Authors' elaboration on CAPP_DYN simulation results (2008-2050).

The above analysis provides some useful insights to policy makers especially about the worrying initial phasing in of the new social security regime, when some individuals, retiring with a public coverage that is considerably smaller than the one enjoyed by previous generations, might not be endowed with private savings, with possible serious troubles in getting an adequate level of consumption after retirement. These results raise also questions concerning the provision of appropriate labour market policies that will able to encourage the elderly to keep working and compensatory schemes for individuals falling under the new NDC system with discontinuous careers and an insufficient level of contributions that will in turn affect their pensions. Moreover, since the magnitude of household savings response to social security reforms also depends on how fast and accurately young workers will revise their expectations in the direction suggested by the reforms themselves, policies aimed at improving workers' awareness about their pension wealth would encourage adjustments in private accumulation, which could soften perverse distributional consequences related to the demographic and pension transitions.

7. Concluding Remarks

The long run distributional effects of demographic transitions and structural reforms in social security, adopted to cope with them, are largely unknown and not easy to predict. In such new scenario, private wealth becomes crucial both in determining overall wellbeing after retirement and, ex ante, in affecting saving/investing as well as retirement decisions. Despite its growing importance, this issue has not yet been analysed in depth, especially in its distributional implications. The present work aims at filling this gap by endowing the Italian dynamic micro simulation model CAPP_DYN with a module accounting for the role of private asset accumulation and spend down. The joint analysis of private wealth accumulation and social security wealth is particularly important in order to get a reliable evaluation of household disposable incomes and standard of living in the coming decades.

Since reforms are likely to affect households' accumulation patterns, we attempt to account for possible savings reactions by clasping the consumption rule onto a life cycle framework. In particular, policy parameters enter into the saving decision by means of subjective expectations about pensions outcomes. Moreover, we consider the modeling of private wealth transmission among generations as a fundamental task in getting a more accurate picture of the future distribution of economic resources. To this end, we provide the Wealth module with a probabilistic intergenerational transfers sub-module. We conceive the endogenization of savings and wealth transfers as well as their relationships with inequality as an original contribution of our model to the existing microsimulation literature.

Simulated results for the period 2008-2050 predict a marked rise in household disposable income inequality in the future. The analysis highlights the likely role of three possible channels through which inequality will increase in the coming decades: firstly, an increased dispersion in earnings and public pensions; secondly, a rising dispersion in intergenerational transfers of private wealth; and thirdly, a widening gap - sharp in the central period - between high-saving and low-saving households. Moreover, a polarization at the extreme ages in income inequality and poverty would emerge in the next decades, with an increasing share of future pensioners facing serious troubles in keeping their living standard at an adequate level.

Appendix A: SHIW Data

The Bank of Italy's Survey of Households Income and Wealth (SHIW http://www.bancaditalia.it/statistiche/indcamp/bilfait;internal&action=_setlanguage.action?LANGUAGE=en) collects information on economic situation - income and wealth - savings and consumption behaviour - and social features of a sample of families in the period 1977-2006. Since 1989, a panel section composed of households already interviewed in the previous wave is provided for. We exploited this component in our estimates of the consumption rule.

Concerning wealth, analyses based on the comparison between micro and macro data showed the amounts recorded in the SHIW under-estimate both real and financial components of wealth (Brandolini et al., 2004). In 2002 the total financial assets estimates derived from the survey is about one third of the corresponding value from Financial Accounts (Bonci et al., 2005). To this end, concerning misreporting, no comparable data are available for real wealth in the official National Accounts, therefore we do not make any adjustment for the level of reported real wealth. Finally, concerning financial wealth, we employ the adjusted values provided by D'Aurizio et al. (2006)[37] which matched the 2002 SHIW wave with anonymous data from a sample survey of customers of the Unicredit group on the assets actually owned by the customers.

By using advanced econometric techniques, this procedure determines a substantial correction for private bonds and mutual funds, particularly significant for single household and increasing with age. We do not employ the adjusted data in the econometric stage (except for the estimation of the risk propensity, reported in appendix B), but we replace them in the initial population (SHIW 2002) in order to simulate more realistic distributions.

The 2002 distribution of net worth in Italy is pretty unequal and right skewed with a mean of 212,000 euros, a median of 133,000 and the Gini is equal to 0.56. Financial assets aggregate, as expected, is the most unequally and skewed distributed (Gini is 0.63 with a skewness of 11.58) and its mean value is about 58,000 euros. Finally, real estate (without corrections) is the most important wealth component with a mean of 162,000 euros and Gini of 0.59.

Appedix B: SHARE data and sample selection

We base our econometric analysis on the first wave (2004) of *SHARE* (http://www.share-project.org/) – composed of about 32,000 individuals whereof 3,100 Italians – focusing on *inter vivos* monetary transfers towards children (and grandchildren) living out of the family of origin.

This micro data source has the unusual feature - not found in other surveys - of collecting detailed information on respondents' children living out of the family of origin and allows the reconstruction of a correspondence between parents' and children characteristics (influencing transfers) and a donor-recipient matching which is hardly obtainable by using other sources.

In order to evaluate the determinants of transfers we further restrict the sample by considering households with children living out of the family of origin. Such a selection reduces the sample size to 16,871 households whereof 1,533 are Italian. Such a size does not allow to focus the analysis on Italian families only, but we will control for systematic differences from other countries by means of dummy variables.

In SHARE, i*nter vivos* financial transfers are defined as "gifts, financial or material support (other than food or shared house) of at least 250 euros from/to someone within or outside the household". For our purposes we isolate transfers towards children or grandchildren living outside the respondent household.

For Italy, the share of donor households is around 21.6%, slightly below the European average, and is substantially above the information emerging from SHIW (2002): according to this latter source, households making *at least a gift over their whole life* are about 5%, while those who declare receiving a transfer in the same year are 0.18% only.

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[1] PENSIM2 in Great Britain, MINT3 in the United States or SESIM III in Sweden are some of the most relevant examples.

[2] For a description of the pre-existing structure of CAPP_DYN, see Mazzaferro and Morciano (2009).

[3] The main implication is that feedbacks from wealth to demographic and occupational decision are not allowed for. A further development of the research will be the sequential integration of the Wealth Module with the pre-existing modules.

[4] See Appendix A for details on SHIW and adjustment of financial wealth.

[5] CAPP_DYN is a discrete-time annual model, while our main estimation dataset (the *Bank of Italy Survey of Household Income and Wealth*) has a two-years frequency. This fact causes an underestimation of persistence in the simulated dynamic models. We are aware of this problem, but, at the state of the art a yearly panel data source containing the needed information is not available for Italy so. We thus believe the advantages of fitting a better overall model (especially for the consumption rule) outweigh the drawback of an underestimated persistence.

[6] In the benchmark scenario, we have adjusted the average return from Muzzicato et al. (2002) - amounting to about 2.5% over the 1970-2007 period - by imputing a lower (very long run) rate of 2%. At the same time we adopt a moderate 8% standard deviation, close to that estimated by Cannari et al. (2008) for houses prices in Italy.

[7] This aggregate is composed of stocks, mutual funds, private bonds, foreign government bonds, shares of limited liability companies.

[8] Non-risky assets include bank and postal deposits CDs, PCTs, BFPs and government securities. We also added real (tangible) goods other than real estate.

[9] A static model determines initial conditions for newborn households.

[10] In the benchmark simulation, we assume real returns of 3% with a standard deviation of 18% and an excess of kurtosis of 2.4% for risky assets. These values amount to a weighted average of short, medium and very long run returns for Italy computed by Dimson *et al.* (2006). Figures for a wide set of countries are available in the DMS Global Returns database. Future improvements aim at introducing the role of systemic risk in private accumulation and use of alternative, more realistic, methods for projecting equity returns.

[11] If a household extinguishes before the debt has been repaid, it simply transmits its overall net worth to its heirs according to the rule defined in section 5.

[12] Since SHIW data seems to severely under-report the official trade flows in the housing market, we still fit the econometric models in order to model systematic differences in house equity decisions according to some observable characteristics, aligning the totals to match external aggregate data. According to ISTAT between 2002 and 2008 in Italy about a 4.5 percent of households per year were involved in house equity purchasing/building. We assume this frequency to be stable over the simulation.

[13] In Italy, private sector employees receive an additional, and sizeable, severance indemnity at retirement called TFR (*Trattamento di Fine Rapporto, i.e.* end-of-service allowance). In practice, the TFR is a deferred share of wage, which can also be partially redeemed in some special cases, and in particular for the purchase of the 1st house or can be fully or partially transferred to complementary pension funds.

It is computed as 6.91% of the yearly gross wage and can be reasonably approximated with one gross monthly wage. It accrues at an yearly rate equal to 1.5% plus 75% the inflation.

[14] The average incidence of mortgage repayment on household income is around 30% in Italy (Rossi, 2008).
[15] Actual consumption cannot exceed the sum of all disposable households income and the "liquid" financial wealth [(1-ϕ)AF] net of any mortgage installment.
[16] For new born households the initial condition is estimated by means of a static FE model.
[17] The assumptions are that under 30 active children will leave the family of origin at 30, while over 30 active children will exit within one year.
[18] The annual real general increase in wage is assumed to be 1.20% up to 2016, 1.60% from 2016 to 2020, 1.90% from 2021 to 2030 and 2.00% from 2031 to 2050.
[19] For an analysis of retirement expectations and pension reforms on SHIW, see Bottazzi et. al, 2006.
[20] This correlation would violate one of the basic assumptions of independence in OLS regression. Therefore, as a check, we carry out a Hausman test to verify if differences between an OLS estimates of exp_repratio with plan_ret_age among the regressors and a 2SLS estimates are big enough to suggest OLS estimates are not consistent. Actually, we find a significant difference between OLS and 2SLS estimates (chi-square = 26.54, df =1, p = 0.0000) and the reason for the inconsistency of OLS is endogeneity of plan_ret_age.
[21] A drop in consumption after retirement still remains to be clarified. Several theoretical and empirical works propose different explanations for this stylized fact (Hurd and Rohwedder, 2008; Laitner and Silverman 2005; Fernandèz-Villaverde and Krueger, 2005. For Italy, Miniaci et al., 2009)
[22] We also estimate a static version of the model for newborn households with no lagged value of consumption to set the initial condition.
[23] Following Ando and Nicoletti Altimari (2004), we divided the household population in five categories: singles, nuclear families (two spouses plus children, if any), non-nuclear families (households with spouses and active children only, not properly composite non-nuclear families[23]), nuclear single headed and non-nuclear single headed.
[24] For instance, as far as we understand in SESIM III the transmission of private wealth is not explicitly modeled, that is a proper link across following generations is not allowed for, meaning that at an accumulation (for gifts and bequests) in a group in the sample does not correspond an equal and opposite de-cumulation in another group.
[25] Of course the latter dataset, given its derived nature, contains only a limited number of information that is directly related to the new observational units (i.e. the children of the original observational units).
[26] Financial wealth includes bank accounts, government and corporate bonds, stocks, mutual funds, individual retirement accounts, contractual savings for housing and life insurance policies.
[27] The dependent variable in the outcome equation is the level amount of received transfer, rather than the ratio to financial wealth, information on children's household wealth being not available in the data.
[28] We employ it in the selection equation only, in order to satisfy the exclusion restriction for the Heckman correction. Such augmentation proves to be opportune in controlling for the selection bias, as Mills ratio coefficient is extremely significant and positive.
[29] Therefore, we do not control for selectivity that however, in the case of recipients, is likely to be less severe than for donors.
[30] This strategy stems from the empirical evidence that the current over 50s' financial wealth distribution approximates to a log-normal distribution.
[31] This is a stronger, less realistic assumption. Nevertheless, only few households are selected for receiving an inter vivos transfer more that once or twice in a life cycle so this implicit assumption proves to be quite innocuous in distributional terms.
[32]On the opposite, the exclusion of such a covariate (which explains much of the selection/outcome equations) in the recipient equation would have implied a much lower variability in the predicted amount of the received transfers (inflows) compared to the variance in the predicted amount of the given transfers (outflows). This fact would have ended up making the transfer sub-module work as a progressive tax-benefit module, with obvious distorting rebounds on the transmission of inequality among generations.
[33] For these individuals the assumption is that they die after their parents with probability equal to 1.
[34] In the present work we show results according to assumptions on returns of the benchmark scenario only. An extended version of this section, containing more detailed results and alternative exogenous scenarios is provided in http://www.capp.unimo.it/pubbl/cappapers.
[35] Although in the simulation program we do not explicitly account for the role of capital incomes (interests, dividends, rents) on the household consumption behaviour, that instead depends on stocks, in order to give an evaluation of the overall disposable household income, in the post-simulation analyses, we assume house equity to provide a 3.50% annual rent (imputed for first, owner occupied dwellings and actual for other houses), the non risky component of the enlarged financial wealth to provide 1% real interest rate and the risky component 3% (interests and dividends).
[36] We set the threshold at 60% the median equivalent disposable income. OECD equivalence scale.

[37] We are grateful to Leandro D'Aurizio, Ivan Faiella, Stefano Iezzi and Andrea Neri for providing us with data adjusted for under-reporting resulting from their work "L'under-reporting della ricchezza finanziaria nell'Indagine sui Bilanci delle Famiglie Italiane".