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Permanent Income, Age and the Distribution of Wealth

André MASSON *

ABSTRACT. – Within a life cycle framework, this paper focuses first, on the relation, adjusted for age, between wealth and lifetime resources (comprising permanent (labor) income and inheritance) and second, on distributional issues, through the contribution to wealth inequality of age and permanent income combined. The theoretical analysis concentrates on the other factors of wealth inequality and shows that they are likely to induce non linearities between wealth and resources. Empirical French results reveal the crucial role played by inheritance in accumulation, the lifetime propensity to save out of capital receipts being much higher than the one out of permanent income. Moreover, the joint contribution to wealth inequality of age and permanent income may be quite important, although not dominant (26% in Canada, around 45% in France).

Revenu permanent, âge et répartition du patrimoine

RÉSUMÉ. – Dans le cadre de l'Hypothèse du Cycle de Vie, cette contribution traite de la relation, à âge donné, entre le patrimoine et les ressources vitales (revenu permanent et héritages) et de la contribution jointe à l'inégalité patrimoniale de l'âge et du revenu permanent. L'analyse théorique porte notamment sur les autres facteurs d'inégalité patrimoniale et sur les non proportionalités qu'ils engendrent entre le patrimoine et les ressources. Les résultats empiriques obtenus pour la France révèlent le rôle crucial de l'héritage dans l'accumulation patrimoniale, la propension intergénérationnelle à épargner les transferts étant bien supérieure à celle correspondant au revenu permanent. En outre, la contribution jointe à l'inégalité patrimoniale de l'âge et du revenu permanent apparaît importante bien que non majoritaire (26 % au Canada mais environ 45 % en France).

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* A. MASSON: CEREPI, 42, boulevard Raspail, 75007 Paris. I received helpful comments from Glenn HUBBARD at the Paris Conference and from Mervyn KING, Jonathan LEAPE and William BRAINARD at the Seminar on Capital Markets at the London School of Economics. I want also to thank Luc ARRONDEL and Philippe PLEUVRET for computational assistance..

1 Introduction

This paper tries both to draw theoretically and to test empirically the implications of the Life Cycle Hypothesis (referred to as LCH) relative to the distribution of households personal wealth: it concerns the major determinants of this distribution, their effect on wealth and, more specifically, their contribution to wealth inequality. The analysis focuses on the total amount of non human wealth (net worth) and the discussion of empirical evidence refers mainly to cross-sectional wealth survey data.

The crucial problem, which concerns the relevance of the LCH as a theory of wealth distribution, can be briefly stated as follows. Looking at intra-age wealth dispersion, ATKINSON [1971] has found that age explains very little of wealth inequality. This empirical result is however not evidence against the LCH, since one has also to control for the differences in total lifetime resources (including intergenerational capital receipts) or at least in "*permanent*" (non property) *income*. This control is indeed a dominant feature of the recent studies of individual saving within a LCH framework: BLINDER, GORDON and WISE [1983], KING and DICKS-MIREAUX [1982], DIAMOND and HAUSMAN [1984] – referred to respectively as BGW, KDM, DH – and HUBBARD [1986]. The question remains then to know if differences in permanent incomes can explain the widely dispersed distributions of wealth observed at given ages.

FRIEDMAN [1957, p. 210-214] was perhaps the first to tackle this problem and to see its connection with the *proportionality hypothesis* between wealth and resources. This hypothesis should hold, since, otherwise, one should observe a tendency for the rich to get richer and the poor to get poorer (this is clever but wrong reasoning); but if planned savings are proportional to permanent income, "does this not imply... that the distribution of wealth (at given ages) becomes similar to the distribution of income?". To resolve the apparent inconsistency – wealth appears much more concentrated than income – Friedman stressed the fact that actual savings were much more unequally distributed that planned savings, due to transitory income and its positive autocorrelation (other clever but sometimes wrong reasoning).

More specifically, this paper tries to answer two related types of questions:

(i) the first ones are primarily theoretical: does the LCH point out, besides age and lifetime resources, to other individual factors of wealth dispersion, that cannot be treated as stochastic noise in the specifications? What could be their likely effect on the wealth-resources relationship?

(ii) the second ones are empirical: how much of observed wealth inequality is not explained by the two reference variables, age and lifetime resources or permanent income (assuming one can get reliable estimates of these resources)? In other words, how does the dispersion of wealth within cells defined by age and permanent income compare with overall wealth inequality?

Most students of the LCH have a tendency to give a negative answer to the first questions: it is often implicit in their writings but sometimes also explicit as in DH: "the representative individual version of the life-cycle hypothesis... does expect savings to permanent income ratios, adjusted for age, to be quite similar". But this may simply reflect the fact that the theory was originally designed to deal with average or aggregate behaviour: another variant of the LCH is indeed needed to study the distribution of personal wealth, its intra-cell dispersion and its relation to permanent income.

Section 2 of the paper proposes such a modified approach of the theory which leans heavily on its recent developments. While remaining largely faithful to the original view expressed by MODIGLIANI and BRUMBERG [1954] (referred to in the following as MB), the "second generation" life cycle models introduce new wealth holding motives and lead to a dual, more elaborate conception of wealth. The distributional consequences of this extended LCH framework are then drawn through the analysis of the individual factors X of wealth dispersion within cells defined by age (a) and lifetime resources (W), assuming that net worth A satisfies a relation of the form: $A = f(a, W, X)$. Special emphasis is then given to the subset of variables X which can generate *non proportionality* between wealth and permanent income.

Section 3 presents then the properties of the "*wealth equation*", a refinement of the previous relation which plays for the LCH a similar role as the "earnings function" for the human capital theory. As it has been proposed by KDM, Hubbard or DH, this equation allows simultaneously different tests of the LCH, concerning the precise effect on wealth and the quantitative importance on wealth inequality of five types of determinants: (1) age, (2) permanent income YP, (3) public and private pensions, (4) inheritance, (5) other demographic, economic and socioeconomic factors.

Section 4 concentrates on the contribution to wealth inequality of "other factors" (5). Using an additively decomposable measure such as the Theil index, this contribution can be estimated by the value of $1-p(a, W)$ or $1-p(a, YP)$, where $p(a, W)$ and $p(a, YP)$ represent the contribution to wealth inequality of age and resources combined. It is then shown that $p(a, YP)$ will be high iff there is strong "*superproportionality*", which implies that wealth to permanent income ratios, adjusted for age, rise strongly with the level of permanent income. The question concerns then the nature of individual factors generating such superproportionality, either derived from the LCH framework or from alternative models.

Section 5 is devoted to empirical applications, first to Canadian data (1977) sent graciously to me by Mervyn King and Jonathan Leape (including KDM computations of permanent income), and second to French data (1975 and mainly 1980). The French survey on inheritance (1975) allows an original, if preliminary test of the specific effect of intergenerational capital receipts on wealth. The main results concern various Theil decompositions of wealth inequality for Canada and France (1980), the major problem in the latter case being the lack of a reliable estimate of permanent income.

2 Theoretical Framework

We shall first recall the basic principles and equations of the LCH which assumes that the rational, forward looking consumer accumulates assets for consumption smoothing over his lifetime, especially after retirement: for a standard non property income profile, wealth exhibits the famous *hump shaped pattern* with respect to age. We shall then try to summarize the contribution of 'second generation' models which envisage more realistic environments, allowing notably for uncertainty and capital market imperfections.

Besides age and lifetime resources, these models point out to a number of individual factors of wealth dispersion which are summed up in Table 1. Among them, those which can engender significant non proportionality between wealth and permanent income at a given age are reported in Table 2: their resulting effect is likely to be "superproportionality", that is an increasing ratio A/YP with the level of YP.

2.1. Individual Accumulation Behaviour: the Basic Model

The LCH rests on two main hypotheses: (i) utility is derived mainly from the consumption stream over the life cycle; (ii) the limit to the consumer's choice is essentially his lifetime budget constraint, about which he has a reasonable degree of knowledge. They correspond respectively to two sets of assumptions, A1 and A2. A1, relative to time and consumption preferences, is approximatively shared by *all* life cycle models; A2, concerning mainly the properties of the environment of the consumer, is specific to the basic LCH model envisaged in this paragraph.

ASSUMPTIONS A1: intertemporal utility is an autonomous, homothetic and time separable (specifically weakly separable and strongly recursive) function of the total amounts of consumption at each period of the life cycle.

These properties make it possible to define a subutility function at each age a and imply that the time coefficient affected to this function, as well as its logarithmic age derivative [the rate of time preference $\delta(a)$] can only depend on age a. The "*horizon*" of a consumer aged a can therefore be fully represented by the *couple* $(T-a, \delta(t))$, with t varying from a to the end of lifetime T, and is thus *independent* of its environment or its other preferences or endowments.

ASSUMPTIONS A2: the consumer is placed in a world of certainty (or at least of certainty equivalence), with perfect capital markets and exogenous labor supply; moreover there is no motive for bequest: hence utility depends only upon consumption.

In this situation the only limit to choice is the budget constraint over remaining lifetime, which requires that the consumer dies with a non negative wealth: $A_T \geqslant 0$. This means that he cannot consume more than his initial resources W over total lifetime, or more than its current and future (expected) resources W^c over remaining lifetime.

Under perfect capital markets these resources are equal to:

$$(1) \qquad W = E + I; \qquad W^c = E^c + A + I^c$$

E is the present value of human capital, the lifetime discounted sum of non property income Y; I is the lifetime discounted sum of intergenerational capital receipts. With homothetic preferences, present (permanent component of) consumption of a consumer aged a will then be proportional to current lifetime resources W^c:

$$(2) \qquad C = k(r, T - a, \delta(t), u)\, W^c \; t \text{ from } a \text{ to } T$$

where the propensity to consume k depends upon the horizon, the real (after tax) rate of interest r and a parameter u characterizing consumption preferences.

The precise form of the utility function allows to determine the desired rate of consumption variation with age, $j(a)$. In the case of an isoelastic additive utility function, where instantaneous utility is equal to $C^{1-(1/s)}/1-(1/s)$, the parameter u corresponds to the constant intertemporal elasticity of substitution, s, and j equals (with $\dot{C}$ the time derivative of C):

$$(3) \qquad j(a) = \dot{C}(a)/C(a) = s \,.\, (r - \delta(a)).$$

From the consumption profile, one can infer the age-wealth profile with the help of the instantaneous budget constraint:

$$(4) \qquad \dot{A} = rA + Y - C + \dot{I} - \dot{B}; \qquad A_T \geqslant 0$$

which simply states that savings equals wealth variation, besides the contribution of intergenerational transfers received ($\dot{I}$) or bestowed (B) [1].

For a consumer aged a, net worth satisfies finally a relation of the form:

$$(5) \qquad A = d(a, r, X)\, W$$

with: $X = (T, \delta(t), u, Y(t), \dot{I}(t), \dot{B}(t))$, t from 0 to T.

Current wealth is proportional to total, *past*, present and future lifetime resources, W; besides age and resources, its level depends of a vector of

1. This central relation (4) implies very specific definitions of the variables measured in real terms. Consumption includes the services provided by durable goods, not their expenditures. Non property income Y is disposable income, net of taxes and social contributions. The rate of return r to wealth A includes both income yields and capital gains and is net of taxes and capital or durable goods depreciation. Finally, wealth is net worth including durable goods, debts being valued by the discounted sum of future total repayments.

personal characteristics, including life expectancy, time and consumption preferences and the timing of human and non human resources.

The basic life cycle model can finally be characterized by *nine properties*. Concerning the *status of resources*: (I) non property income Y can be considered exogenous to the consumption-saving choice; (II) human capital and non human wealth are perfect substitutes [relation (1)]. Concerning *consumption behaviour*: (III) this behaviour is purely forward looking and autonomous: the consumer is not ruled by habits nor influenced by the well being of others, but determines its consumption according to its horizon and its expectations of future income, needs and tastes [relation (2)]; (IV) the proportionality hypothesis holds between C and W^c, or between A and W; (V) there is separability of consumption and income profiles since consumption depends upon remaining lifetime resources and preferences [relations (2) and (3)], not directly upon current income $Y + rA$. Concerning the *function of wealth*: (VI) net worth A provides no direct present utility; (VII) given lifetime resources, it is purely endogenous to the consumer; (VIII) it should follow a hump shaped pattern over the life cycle, with normally peak value at retirement eve and nil value upon death.

Of special interest here is the last property (IX): if the LCH is relevant for the study of wealth inequality, age and lifetime resources $W(W^c)$ should be the major determinants of the amount of wealth (consumption).

2.2. The Contribution of Second Generation Life Cycle Models

What happens to this theoretical framework when more realistic situations are considered? While keeping assumptions A1, LCH models of the second generation have extended MB research program in a number of directions concerning the modelling of expectations (stochastic life cycle theory), the long term effect of future income (Y or *r*) or lifetime uncertainty, the incidence of capital market imperfections, the introduction of a bequest motive, the implications of an endogenous labor supply...

These extensions engender a number of modifications in former analysis. *First*, capital market imperfections, uncertainties and incomplete information make it necessary to distinguish between "desired" or rather *expected* wealth A* and *actual* wealth A.

For given lifetime resources, expected wealth may be approximatively defined as the amount the consumer would own under perfect capital markets and certainty—or at least when expectations are fulfilled [2]. Accumulated for deferred consumption or bequest, wealth A* is purely endogenous to the consumer.

2. Time consistency, implied by a strongly recursive utility function, assures that the initial accumulation plan is carried out successfully when expectations are fulfilled.

On the other hand, the gap A – A* cannot be assimilated to a "transitory" component and even less to a short term variable. Indeed, it may be accumulated for liquidity, for precautionary motives and for return to wealth and results more generally from a complex interaction between, on the one hand, information, opportunities and especially luck, and on the

TABLE 1

Individual Factors of Wealth Dispersion for Given Age and Resources

	Wealth A* Certainty Perfect markets (for endogenous variables)	Wealth A – A* Uncertainty (Capital) market imperfections
Endowments	1. Life duration or expectancy 2. Depreciation rate of human capital. Ability to produce and value human capital	9. Ability to search and process information
Resources	3. Timing of non-property income 4. Timing of intergen. capital receipts	10. Degree of uncertainty of non-property income 11. Degree of uncertainty of intergen. capital receipts
Preferences:		
Time	5. Time preference	12. Attitude towards the risk of life or longevity: precautionary bequest (BS)
Other	6. Consumption preference (intertemporal substituability) 7. Preference for bequest (BK) amount and timing 8. Relative preference for leisure (or for human capital)	13. Preferences towards risk in resources (non property income, rate of return to wealth, intergenerational capital receipts)
Opportunities		14. Opportunity to search and process information 15. Opportunities on capital markets 16. Opportunities on markets governing non property income
Luck		17. Luck relative to non property income at different stages (human capital formation, labor supply, wage rate...) 18. Luck concerning the rate of return to wealth

other, preferences, timing of resources and endowments (see above Table 1). Moreover, the wealth gap A – A* may be largely out of the consumer's control: a household with little wealth at the eve of retirement may have been lacking in foresight, but may also have been suffering from severe constraints or repeated bad luck.

Second, the introduction of a bequest motive leads to a division of net worth into "*life cycle wealth*", S, and "*transmission wealth*", K, which are assumed to follow separable and heterogenous processes of accumulation.

This dual conception of wealth is implicit in MODIGLIANI's [1986] recent work.

S-wealth provides no utility and appears primarily as a reserve for deferred consumption purposes, in agreement with LCH basic principles. There is no planned bequests of S-wealth but this form of wealth may give rise to "unintended" or "*precautionary*" *bequest*, BS, in order to cope with an uncertain lifetime under the absence of annuity markets and the resulting impossibility to hold negative amounts of net wealth (DAVIES [1981]). BS-bequests depend notably upon the timing of resources, increase with the probability of survival and the degree of risk aversion or an earlier dealth. As MODIGLIANI [1986] points out, their amount is a priori *proportional* to lifetime resources, owing to homothetic preferences for consumption.

By contrast, K-wealth is wealth earmarked for bequest and leads to "volontary" or *planned bequest* BK that provide direct utility. Since it is considered as residual saving, this type of wealth is very simply modelled in LCH models: the major requirement is that BK-bequest have an elasticity with respect to lifetime resources superior to one [3].

It follows that the two components of wealth are hierarchized: S-assets, held mainly for future consumption, liquidity, precaution and transaction purposes appear as "necessities", whereas K-assets, held for bequest or income or accumulated for its own sake (for power or for social prestige...), appear as "luxury goods", insofar as the wealth elasticities of the former are inferior or equal to one and the elasticities of the latter superior to one [4].

Third, the problem is then to decide what should be kept of the nine properties of the basic LCH model [5]? These properties fully apply to expected life cycle wealth S*. When unintended bequests BS are added to

3. The S-K division raises obviously a number of questions (see MASSON and ARRONDEL, [1987], chapter 3). The separability hypothesis between the two accumulation processes is especially opened to criticism and MODIGLIANI himself [1986] suggests that the precautionary motive in BS and the bequest motive in BK may interact, since the same asset can fulfill different saving motives. The decomposition of total bequest (B = BS + BK) is therefore not straightforward.

   One may also argue that this division is not exhaustive since it does not encompass some important wealth holding motives. Some assets may be held mainly for economic power or for social prestige and hence provide direct utility, whether they are earmarked for bequest or not: for an operational decomposition of wealth, such assets must indeed be included in K-wealth. In empirical work a crude division will finally be made between S-assets, assimilated to consumption wealth and including life annuities and pensions, liquid saving, durable goods and residential housing and K-wealth, assimilated to capital investment and comprising stocks and shares, investment in real estate, business equities...

4. French estimates of wealth elasticities of assets do largely confirm predictions (MASSON and ARRONDEL [1987], chapter 4). They are around .7 for liquid saving, around .9 for owner-occupied housing or housing savings arrangements, generally above 1.2 for K-assets; some S-assets, such as secondary residence and some bonds, appear however as "luxury" goods.

5. The instantaneous budget constraint (4) continues to hold whenever the borrowing rate equals the rate of return *r*; other equations must be considered only as approximations, sometimes very rough approximations indeed.

this to form "hump plus precautionary" saving (MODIGLIANI [1986]), the proportionality hypothesis (IV) still holds and the hump shaped pattern for wealth (VIII) remains with appropriate modifications: there is only limited decumulation after retirement and the size of BS-bequest may be important.

But when it comes to total net worth A, it is easy to see that *each* of the nine properties can be significantly violated [6]: much depends here on two factors [7]: (i) the importance of bequest and K-wealth; (ii) the influence of uncertainty and capital markets imperfections generating the gap $A - A^*$. A strong bequest motive for instance can anihilate the hump saving pattern and make wealth a "luxury good". The central predictions of the (extended) LCH do indeed suppose that K-wealth is generally of residual importance and that the gap $A - A^*$ is limited for most households.

Among these predictions, we shall mainly focus on the wealth effects of age and lifetime resources or permanent income and the contribution of these variables to wealth inequality. Their importance depends upon the influence of other LCH individual factors on wealth accumulation and distribution.

2.3. Individual Factors of Wealth Dispersion for Given Age and Resources

The LCH models of the second generation point out a number of individual characteristics that may influence wealth. Table 1 lists the main X-factors, besides age and the level of lifetime resources: $A = f(a, W, X)$, that may influence expected wealth A^* or the gap $A - A^*$. Note that Table 1 is derived under specific conditions. The analysis takes thus place in a steady state, intragenerational framework. Tastes and needs are supposed certain and exogenous. More importantly, the family dimensions of accumulation behaviour are overlooked in several respects, since households are considered as single entities [8].

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6. Even the basic property (III) of a forward looking and autonomous consumption behaviour may not anymore hold. For instance, certain investment decisions concerning durables or dwellings may be partly irreversible owing to adjustment costs. Also, MODIGLIANI [1986] assumes that the share of lifetime resources earmarked for bequest depends on the household's *relative* position in the distribution of resources of its age cohort, which makes indirectly consumption a function of this position.
7. A third factor is here largely neglected, namely the incidence of income related choices on the accumulation process. The retirement decision process (see DH) and the participation choice of wives may however significantly influence the amount of wealth. More generally, the quantitative importance of income formation on wealth accumulation is a crucial issue for the validity of the LCH: in the limit case where he had total command over his resources, the consumer could directly adapt his income profile to the desired consumption pattern, without any need for saving.
8. Nothing is said about the effects of demographic factors, such as marital status or family size. Admittedly, no satisfactory analysis of the effect of the number of children on wealth accumulation is yet available. This effect is indeed not easy to assess: rearing costs can be partially financed by family allowances; on the other hand, the positive effect on planned bequest can be compensated by the negative effect on precautionary bequest if the family serves as a proxy to an annuity market (KOTLIKOFF and SPIVAK [1981]).

A detailed study of these factors of wealth dispersion may be found in KESSLER and MASSON [1988] and MASSON [1986 *b*]. I will only present its conclusions.

Most X-factors are unobservable (such as preferences and certain endowments), others are difficult to evaluate (the effects of market imperfections for instance), and only a few are *a priori* observable: life expectancy, timing of income..., although accurate estimations are here also uneasy to obtain.

Indeed the distributions and correlations (or even the mean) of some crucial parameters of preferences are not known. Time preference estimates are not consistent in the litterature (the difference $r-\delta$ being sometimes assumed positive, sometimes negative). The evaluation of relative risk aversion varies, according to the authors, from .75 to 4 or 5. There is no agreement concerning the substituability or complementarity between leisure and consumption: HECKMAN [1974] assumes substitutability; BLINDER [1976 *b*] argues for complementarity. Such variations are all the more unfortunate as they correspond to a large variety of age-wealth profiles in the LCH. Furthermore, the interaction effects between personal characteristics and properties of the environment are potentially strong and too complex to be controlled even through extensive simulation procedures.

The degree of wealth dispersion generated by X-factors appears therefore very difficult to assess on a theoretical basis, although observable factors let fall a hint that the dispersion could be important. But is it possible to get a more precise idea of their resulting effect on the relation between wealth and life resources or permanent income?

2.4. The Relation between Wealth and Permanent Income at a Given Age

The reference relation of proportionality concerns net worth and total lifetime resources W. It appears however preferable to consider the effect on wealth A of non-property permanent income YP, while setting aside capital receipts, I, which are seldomly available in surveys and anyway quite specific. When income Y is exogenous, YP can be defined as the constant flow which, if cumulated over the life cycle, has a present value equal to expected lifetime discounted non-property income E; more generally, it is an indicator of earning capacity.

The wealth-permanent income relation is considered here cross-sectionally, while controlling for age but not for other individual, often unobservable differences: the benchmark is therefore rather "*average proportionality*", holding only age constant, than strict proportionality, ceteris paribus.

Table 2 lists the principal x-factors of super- or sub-proportionality within the LCH framework, that is notably for a utility function which is homothetic in consumption (assumption A1). A more detailed analysis of these factors can be found in MASSON [1986 *b*]. They can be conveniently divided into two categories: factors 1 to 3 and 7 imply non homothetic

TABLE 2

Main LCH Factors of Non (Average) Proportionality Between Wealth (A) and Permanent Income (YP)

	Non homothetic behaviour	Heterogeneity of consumers
Factors generating *super-proportionality* between wealth and permanent income...........	1. Bequest motive (the elasticity of bequest is superior to one) 2. Capital market imperfections (constraints and non homogeneities) Imperfect information 3. Degree of uncertainty of non property income (higher for self-employed)	4. Life expectancy (there is a positive correlation between life expectancy and permanent income) 5. Correlations between permanent income and individual characteristics (endowments, preferences, timing of income, opportunities) 6. Positive correlation between permanent income and intergenerational receipts
Factors generating *sub-proportionality* between wealth and permanent income...........	7. Labor-leisure substitution effect and the definition of permanent income (whether derived from human capital considerations or current income averaging)	8. Substitution effect between property income and non-property income and the definition of permanent income (aged widows, people living on their private means) 9. Distribution of public and private pensions and the definition of wealth (whether including pension value or not)

Explanatory notes about factors 5 to 9:

Factor 5 means that more thrifty people have a tendency to choose professional activities yielding higher incomes (entrepreneurship for instance). Inversely, some capacities and preferences (concerning notably risk), which lead to higher permanent incomes, do also favour a larger accumulation.

Factor 6 results from the fact that permanent income YP does not account for differences in intergenerational receipts I. The correlation between I and YP is found in all studies to be significantly positive (between .12 and .20 according to the survey in Becker and Tomes, 1986) with I almost nil for low YP. If net worth A is proportional to total life resources W, the wealth to permanent income ratio will then increase with the level of permanent income.

Factor 7, due to non homothetic behaviour in case of endogenous labor supply, has been underlined by HECKMAN [1974] and BLINDER [1976*a*]. Leisure being a normal good, a rise in earning capacity or in the wage rate H leads to a less than proportional increase in non property incomes or in their discounted sum E. This substitution effect between leisure and work makes the ratio A/YP a decreasing function of YP if permanent income is estimated by human capital variables (YP is an estimator of H) as it is partly the case in KDM or Hubbard, but has no influence if permanent income is obtained as in DH by real earnings averaging over a number of years (YP is an estimator of E).

Factor 8 comes from the possibility to substitute material wealth to human capital in the production of income: some people with low permanent income may live on rents derived from large estates. There is some evidence of this phenomenon in LOLLIVIER's French study [1985], which shows that high property incomes are located at the two tails of the distribution of current earnings. However, Lollivier found that people with high wealth and low non-property income comprise a majority of aged widows, whose permanent income, based upon the lifetime earnings of their deceased husband, is likely to be much higher than current income. So, with appropriate corrections, the effect of factor 8 should be quite limited.

Factor 9 results from mismeasurement of wealth. KDM point out that the LCH proportionality hypothesis should concern an enlarged concept of wealth, including part of the provisions of public and private pensions, according to the degree of substitutability between the two forms of wealth. Since there is a positive correlation between pensions rights (relative to permanent income) and permanent income (a fact corroborated by BGW), the ratio of fungible wealth to permanent income should have a tendency to decline when permanent income increases.

behaviour and violate therefore the strict proportionality relation, "everything being equal"; the other factors result only from consumers' heterogeneities besides age and permanent income.

Factors of non homothetic behaviour, which generate *superproportionality* (a rising ratio A/YP with YP) include notably planned bequest (factor 1). Capital market non homogeneities, such as the existence of tax gimmicks offered by certain assets, or a rising rate of return with the amount invested, make also the rich richer. A similar conclusion is to be generally expected with imperfect information and with capital market constraints [9] (factor 2). Also, a more uncertain income leads to a higher accumulation among self-employed through precautionary savings, risk aversion being usually strong and superior to one (factor 3).

The most important factor of superproportionality among those created by consumers heterogeneities is likely to be social mortality differentials (factor 4), wealthy people expecting a longer retirement period. Factors 5 and 6 (see notes of Table 2) should have only a small impact.

I have found three noticeable factors that can engender *subproportionality* between wealth and permanent income (a decreasing ratio A/YP with YP). They all arise because of definition or mismeasurement problems concerning wealth (factor 9) or permanent income (factors 7 and 8); they derive from substitution effects either between work and leisure (factor 7) or between human and non human wealth (factors 8 and 9). Their resulting effect is however likely to be limited (see notes of Table 2).

If the main sources of non proportionality have thus be identified, it is clear that the dominant effects are those of bequest, capital market imperfections and mortality differentials: the LCH should then lead to *appreciable* (average or strict) *superproportionality*, especially when mismeasurement and definition problems are properly dealt with. This conclusion departs strikingly from the traditional view that interprets non proportionality as contradictory evidence to the LCH.

3. The Wealth Equation

The wealth equation, proposed notably by KDM, DH and Hubbard, is an econometric specification and an extension of relation (5) which takes the general form:

$$\text{(6)} \qquad \text{Log}\, A/YP = f(a, YP, I, V, V'_t, e) = f_1\,(a, YP', SSW, I, V, V'_t, e_1)$$

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9. For instance, BLINDER [1976 *b*] points out that consumers with higher incomes are more likely to follow steeply rising age-earnings profiles and therefore to be "reactors", forced by borrowing constraints to save more than desired in their earlier part of life (although human capital can be partly used as a collateral). Also HUBBARD [1984] shows that the earnings ceiling in Social Security benefits and the scarcity of private annuities force high-income rationed households to accumulate by their own...

with SSW social security wealth, YP′ permanent *earnings* (excluding transfer income), V (resp. V_t') permanent (resp. life cycle or transitory) demographic and socioeconomic variables, and e or e_1 error terms [10].

Through the use of a comprehensive set of variables, this relation allows to test simultaneously, "everything being equal", the predictions of the LCH concerning the effects on wealth of five variables: (1) age, (2) permanent income, (3) pension wealth, (4) inheritance, and (5) "other factors". Applied to cross-sectional data it raises however numerous problems, created by the presence of time effects or reverse causation phenomena, and, especially in the case of a stock variable, the lack of retrospective information on the household and its past wealth profile (which could also be used to control for unobservable individual differences: see DH) [11].

3.1. Age Effects

For a test of hump saving and of the length of the horizon assumed by the LCH (neither too short: myopic behaviour, nor too long: strong bequest motive), the estimation of age effects must satisfy to certain conditions:

(1) age effects must be controlled for differences in permanent incomes as it is the case with the wealth equation (6);

(2) the predicted humped shape is highly non linear and depends on a variety of factors (uncertainties, constraints...): the tested form should therefore be non linear and not too restricted (KDM, Hubbard, DH);

(3) age may not be a precise indicator of the position in the life cycle: being retired or not, or the length of retirement may be more appropriate: this is only done in longitudinal studies (DH, BERNHEIM [1984]; HURD [1986]); one may also use demographic variables (marital status, number of children...), which may however as well represent permanent (lifetime) differences;

10. As far as the specification of the dependent variable is concerned, the use of the logarithm of the ratio of wealth to permanent income has a number of advantages. It allows an interpretation of regression coefficients in terms of rates of accumulation; it leads to a direct test of proportionality; it eliminates the bias created by mortality differentials (the rich living longer). The logging procedure and the division by permanent income remove also part of the outliers' problem (the rich leading to strong heteroscedasticity of residuals). Another problem concerns the treatment of the poorer households that are often removed from the sample (with the use of a probit model to correct for the bias thus created).

11. One way to take into account the influence on wealth accumulation of uncertainty and capital market imperfections could be to separate in equation (6) the effects of *already received* and *expected* permanent income and inheritance.

(4) to get "pure" age effects one must still eliminate time effects (whether cohort or period specific), indeed not an easy task [12].

Most estimations, cross-sectional or longitudinal, lead to comparable conclusions: there is evidence of a hump-shaped pattern for saving but decumulation rates at old ages are limited, due perhaps to precautionary bequest. Moreover, average age profiles do not appear very representative of the variety of individual accumulation profiles, which depend notably on the level of permanent income. BURBIDGE and ROBB [1985] and MASSON [1986 *a*] thus find a hump-shaped pattern for intermediate occupational groups but no significant decumulation at old age for the higher groups, where the bequest motive seems important. On the other hand, a significant part of the population appears not to accumulate enough assets to finance old age consumption (see below Table 4).

3.2. Permanent Income Effect

We have seen that the LCH is likely to lead to superproportionality, that is to a positive effect of permanent income YP on the wealth-income ratio A/YP. When permanent earnings YP′ is used, the relevant wealth variable concerns the sum of net worth A and (part of) pension wealth (see KDM, p. 264).

The best recent evidence comes here from the three studies of KDM, DH and Hubbard, which use similar econometric wealth equations, regressing log A/YP′ on YP′ (or log YP′), age, a number of personal characteristics and two indicators of social security and private pension wealth.

The conclusions obtained in the three studies are however very contradictory, KDM find a significant negative correlation between log A/YP′ and log YP′ which vanishes, however, when pension rights are taken into account in wealth. Using a piecewise non linear function to approximate the relation between log A/YP′ and YP′, DH and Hubbard find, on the contrary, strong superproportionality.

The explanation of such divergences regarding a key relation appears to be a difficult task, although there are obvious differences in the three studies. For instance DH are the only ones to include inheritance variables and to use longitudinal data to estimate permanent income; however (as Mervyn King pointed out to me), they use current pension receipts instead of the present value of pension benefits. On the other hand, Hubbard's and KDM studies are much more comparable and lead nevertheless to opposite results.

12. It is shown in MASSON [1986 *a*] that there is no direct way to get rid of non neutral time effects on wealth cross-sections. Longitudinal studies may get rid of cohort effects but not of period effects: Bernheim's results concerning the rates of wealth decumulation of retirees vary indeed a lot from one period (1969 to 1975) to another (1975 to 1979). I have tried to get "pure" age profiles while using the steady state properties of a simulation accounting model, generating synthetic cohort wealth profiles for different French occupational groups.

3.3. Public and Private Pensions Effects

The relation between net worth and social security wealth SSW or pension present value PPW [13] allows a test of the forward looking behaviour but also of the length of the horizon. The replacement effect through which pensions substitute for non-pension wealth in the financing of retirement consumption should lead to negative coefficient for SSW and PPW.

The substitution to assets may however be only partial owing to a variety of effects including the induced retirement effect, the restricted access of social security annuities to rich people...; on the other hand the annuity insurance effect, reducing the need for precautionary saving and the size of unintended bequest, may lead to degrees of substitution that are superior to one among the rich who are not subject to capital market constraints (HUBBARD [1986]). The degree of substitution is therefore likely to vary both along the income scale and the wealth scale.

Empirical studies (BGW, DH, KDM, Hubbard) tend to confirm LCH predictions: however, the degree of substitution for SSW is limited on average (below half) [14]. Such micro studies of the relation between traditional wealth and (public) pensions are unfortunately not available in France.

3.4. The Effect of Capital Receipts

Capital receipts have not been given much attention in the literature. They exert in fact two different effects on wealth:

– *a timing effect* that plays an important role under strongly imperfect capital markets in favour of young inheritors [15].

– a *size effect,* as a component of lifetime resources W; the magnitude of this effect should be commensurate to the generally small share of transfers I in resources W: everything being equal and apart from timing effects, the composition of W in human and non human resources should have no bearing on wealth accumulation [16].

Empirical findings of a strong size effect of capital receipts can receive various interpretations. It may result from a limited substitutability

13. SSW and PPW are gross measures (since disposable income is net of social contributions) and are generally introduced in ratios to permanent income in the wealth equation.
14. The degree of substitutability is even weaker for private pensions, owing first to the greater uncertainty of private benefits and second to a reverse causation or selection effect (private pensions being chosen mainly by rich people).
15. The position in the cycle of wealth receptions may be measured by the ratio between transfers already received and inheritance expectations; KESSLER and MASSON [1979 *a*] have found in the CREP survey [1975] (see Table 6) that this ratio shows great dispersion at given age and occupational group and that receptions are more evenly distributed over the life cycle of the beneficiary in younger cohorts.
16. Note that inheritance may have a small impact on the total amount of wealth but, at the same time, a strong influence on the composition of wealth (existence of "biens de famille"...).

between human capital and inheritance owing to capital market constraints. But it may also reveal that consumers consider differently their inheritance from their self-accumulated wealth, a non LCH behaviour that may be explained by the specific role played by family intergenerational links [17]. A third reason is simply that inheritors are all together a different group from the rest of the population, with specific tastes and endowments.

3.5. Other Factors Influencing Wealth

Other variables introduced in the wealth equation include demoeconomic factors (marital status, number and spacing of children, number of children having left home, labor force status of the wife...) and socioeconomic ones (race, education, health, unemployed, occupational status, self-employed...).

Especially with cross-section data, most of the effects of such variables on wealth may be given quite different interpretations, depending on the term considered. Being unemployed may correspond to a transitory accident or reveal income lasting instability. The number of children, the marital status, may define the position in the life cycle or indicate the length of the horizon or the degree of altruism (see HURD [1986]).

In the LCH perspective, the central issue is however not so much the nature of those effects as their relative magnitude: if their contribution to wealth inequality is high, the age of the consumer and the level of its life resources or permanent income explain little of the distribution of wealth and the relevance of the LCH as a theory of wealth distribution is seriously in question.

4 Decomposition of Wealth Inequality

The analysis of the contribution to wealth inequality, $p(a, \mathrm{YP})$, of age and permanent income combined, will reveal the key role played by non proportionality factors, either compatible with the LCH (x-factors) or not

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17. The test of the size effect of (lifetime) inheritance may thus have important theoretical implications: indeed most intra- or inter-generational models of wealth (BECKER and TOMES [1986]; BERNHEIM *et al.* [1985]) take for granted that bequest depend on total life resources, without considering the possibility of a specific relation between the amount of wealth received and the amount of wealth bequeathed.

(z-factors). An alternative model of wealth is then proposed to investigate the possible nature of z-factors and hence allow to disentangle their effects from those of x-factors in empirical testing.

4.1. The Contribution of Age and Permanent Income to Wealth Inequality

For the decomposition of wealth inequality we may refer to the crude specification of the wealth equation: $A = f(a, YP, h, X, Z)$, where h is a criterion of inheritance or gifts already received (this specification imposed by the data), X is the set of LCH individual factors of wealth dispersion within ($a=t$, $YP=y$) cells, and Z represents factors of intra-cell wealth dispersion which are alien to the LCH (such as myopic behaviour, class differentials in wealth holding motives...).

The objective is to assess the relative contributions to wealth inequalities of the different factors. For that matter, the decomposition of the R^2 coefficient derived in wealth equation regressions is not really appropriate, for a number of reasons[18]. It is highly preferable to use additively decomposable measures of inequality belonging to the "*generalised entropy*" *class*, which satisfy the mean independence and population replication conditions and the Pigou-Dalton principle of transfers (see BOURGUIGNON [1979]; SHORROCKS [1980]). We choose the Theil index, defined by:

$$(7) \qquad T = (1/N) \sum_i (A_i/m) \operatorname{Log}(A_i/m)$$

with N the population size, m the mean value of wealth and A_i the amount of assets owned by household i. For a partition of the population engendered by the values v from 1 to n of a given variable V, with N_v, m_v and T_v for the sub-group $\{V=v\}$ representing resp. the size, the mean value of net worth and the intra-group wealth inequality, the relation of additive decomposability is:

$$(8) \qquad T = \Sigma_v (N_v m_v/N m) \operatorname{Log}(m_v/m) + \Sigma_v (N_v m_v/N m) T_v = T^\theta + T^u$$

where T^θ is the measure of inter-group wealth inequality—the part of inequality "explained" by variable V—and T^u is a weighted mean of intra-group wealth inequalities. The contribution of variable V, $p(V)$, is then equal to the ratio T^θ/T.

The contribution to wealth inequality of age and permanent income combined, $p(a, YP)$, is thus the ratio of inter-cells ($a=t$, $YP=y$) inequality to overall inequality; the complementary contribution $1-p(a, YP)$ results from the joint action of other variables but also from their interaction effect with age and permanent income.

18. The decomposition of the R^2 is based on specific forms of age and income effects; it uses the variance or the variance of the logarithm which do not satisfy the Pigou-Dalton principle of transfers; a bias results from the interactions between observable and unobserved characteristics (see BOURGUIGNON and MORRISSON [1985]).

The combined contribution of two variables is indeed not equal to the sum of their contributions. Applying relation (8) to the decomposition of total population by age and permanent income and to the decomposition of each age group according to the level of permanent income leads thus to (see MASSON [1986 *b*]):

$$(9) \qquad p(a, \mathrm{YP}) = p(a) + (1 - p(a))\bar{p}(\mathrm{YP}/a)$$

with:

$$\bar{p}(\mathrm{YP}/a) = \Sigma_t (\mathrm{N}_t m_t/\mathrm{N}\, m)\, \mathrm{T}_t\, p(\mathrm{YP}/a=t)/\Sigma_t (\mathrm{N}_t m_t/\mathrm{N}\, m)\, \mathrm{T}_t$$

where $p(\mathrm{YP}/a=t)$ is the contribution of permanent income to wealth inequality T_t among households aged *t*. $\bar{p}(\mathrm{YP}/a)$ is then a weighted average of these contributions for various ages and can therefore be interpreted as the *conditional* contribution of permanent income to wealth inequality, given the value of age [19].

Since the contribution of age $p(a)$ to wealth inequality is typically small, relation (9) shows that $p(a, \mathrm{YP})$ will be high if and only if $\bar{p}(\mathrm{YP}/a)$ is itself high. Thus, the study of the determinants of the combined contribution $p(a, \mathrm{YP})$ becomes that of the determinants of the conditional contributions $\bar{p}(\mathrm{YP}/a)$ or $p(\mathrm{YP}/a=t)$.

It can then be shown (see appendix) that the more the wealth-permanent income ratio A/YP rises (at given age) with YP, the higher are these conditional contributions. Since wealth is much more concentrated than (permanent) income, it follows that the joint contribution $p(a, \mathrm{YP})$ will be high *if and only if there is strong (average) superproportionality between wealth and permanent income.* Intuitively, if YP is to be a good predictor of wealth, and especially of the upper tail of its distribution, A/YP ratios must be very high among the top permanent income households.

We have already seen (see 2.4) that superproportionality is likely to be implied by the LCH; we find now that it is necessary for the theory to have a high explanatory power of wealth dispersion.

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19. It is proved in MASSON [1986 *b*] that relation (9) (with appropriate weight of $p(\mathrm{YP}/a=t)$ in $\bar{p}(\mathrm{YP}/a)$) and the conclusions of 4.1 apply to any inequality index of the "generalised entropy" class. The choice of the Theil index instead of the mean logarithmic deviation (or of an alternative measure of contributions, see SHORROCKS [1980]) is justified by the little relevance of wealth inequality at young age, when amounts are low.

4.2. An Alternative Model of Wealth Accumulation?

To assess the role of age and permanent income in wealth inequality we have then to study the individual factors that may generate non proportionality and determine their likely outcome. These factors are of two types: LCH x-factors (Table 2) which lead on balance to superproportionality and z-factors which are a subset of the Z-factors alien to the LCH.

To investigate the nature of the main potential z-factors, the best approach is to oppose to the LCH a simple alternative model of wealth distribution, denoted SA model. We have then to find ways to disentangle the effects of x-factors and z-factors: in case of a strong superproportionality for instance, we have to decide if the effect of permanent income on wealth is mainly the result of x-factors or the consequences of some z-factors, such as class differentials, for which differences in permanent income are a proxy.

It is true that a coherent alternative framework to the LCH is not available (see King [1983]); but all that is needed for our purpose is a general sketch of this competing approach. The SA model should be inspired by a neo-Pasinetti framework, with a *three class* division into (1) poor and myopic individuals, (2) lifecyclers and (3) K-wealth owners who often adopt a dynastic behaviour and hold wealth for specific motives such as power, prestige, return to wealth and transmission. Savings should generally be considered, according to a long tradition (Keynes, Duesenberry...), as a luxury good. Time preference for the present should decrease with the level of resources and be quite high for poorer households (Fisher). The lifetime propensity to save out of capital receipts should be higher than the one out of human resources. Moreover, the SA model is likely to emphasize the role of intergenerational family links, the heritability of endowments and preferences... and to view inheritance as a priviledged vector of social class reproduction.

Elements of this class approach can be found in different forms in the literature. Moreover, it has the further advantage not to completely disqualify the LCH: in its perspective, Modigliani's approach could still be an acceptable approximation for a part of the population (the middle class or the non-inheritors) or for a part of wealth (S-assets).

It is clear that the SA model points out a series of z-factors that should on the average lead to strong superproportionality. The test relative to the permanent income effect on wealth does not therefore give a way to discriminate between the LCH and the SA models; but it can refute both models if a strong subproportionality is empirically found.

A battery of tests should be proposed in this spirit: find ways to discriminate between the LCH and SA models and also try to assess their relevance to accumulation behaviour. For this purpose we may consider as well the effects on wealth or the contributions to wealth inequality of different variables, use different types of wealth (S, K or A) and refer to various populations (inheritors, non inheritors. . .).

All the cases are a priori possible. The most favourable one deals with situations where the LCH passes the test and the SA model does not (for instance if hump saving appears the law along the entire income or wealth scale). The worst case is when both models are refuted (see Table 4): it means that the major determinants of wealth are neither in the LCH nor in the SA model. Among the intermediate situations one finds a test which is favorable to the SA model but not to the LCH (for instance a strong positive size effect of inheritance on wealth): this case calls for an extension of the LCH but is not necessary dramatic for the theory.

5 Empirical Results

We shall first present wealth inequality decomposition results for Canadian cross-sectional wealth data (1977): they are obtained with the Theil index, using KDM computations of permanent income. Other applications concern next French recall data (1975) on inheritance and wealth and cross-sectional wealth data (1980): these data are used for a rough test of proportionality, a test of the "size" effect of inheritance on wealth, and also for Theil decompositions of wealth inequality.

5.1. Canadian Results (1977)

KDM study is based upon data collected for 12,734 Canadian families in 1977 by Statistics Canada. Deleting households headed by a woman (especially widows) and other special cases reduces the sample considered to 10,118 units. The definition of net wealth A "includes the market value of cash, deposits, bonds, stocks and shares, registered savings plans, other financial assets, vehicles, owner-occupied houses and other real estate, equity in a business or a farm, less debts of various kinds" (KDM, p. 248). To that wealth A1 adds pension wealth and A2 pension wealth and social security wealth (see Table 3).

The main advantages of this survey come from its large size and the detailed information available on households' characteristics which enabled

TABLE 3

Theil Decomposition of Wealth Inequality: Canadian Results (1977)

(*a*) Theil

Variable	No. of observation in (1)	Theil (1)	Theil (2)	Theil (3)	Theil (4)
A..............	9307	0.810	0.760	0.453	0.401
A1..............	9581	0.587	0.541	0.373	0.321
A2..............	10115	0.223	0.199	0.116	0.092

(*b*) Contributions (%)

Variable	Criterion	Cont. (1)	Cont. (2)	Cont. (3)	Cont. (4)
A..............		12.5	11.7	*14.8*	*14.2*
A1..............	Age	5.8	5.0	5.4	4.2
A2..............		11.4	8.2	*14.1*	9.8
A..............	Permanent income	2.0	1.8	0.9	0.7
A1..............		14.1	13.9	11.0	10.7
A2..............		14.6	13.2	14.1	11.8
A..............	Age × permanent income	26.2	25.4	22.3	20.9
A1..............		32.4	31.2	26.8	24.7
A2..............		38.7	35.4	*40.2*	34.8

Notes:
– non negative wealth amount; A = net worth; A1 = A + private pensions value; A2 = A1 + social security wealth
– Age in twelve brackets (of five years length); permanent income in deciles
– Sample weights are used in the calculations
(1) households with non negative (A, A1, A2) wealth amounts
(2), (3) and (4) concern different subsets of populations (1): (2) excludes the lower five percent of the wealth (A, A1, A2) distribution, (3) excludes the upper five percent, (4) excludes the lower and the upper five percent.
Sources: Statistics Canada and calculations of KING and DICKS-MIREAUX [1982].

KDM to compute elaborate estimates per household of permanent income [20] and public and private pension wealth. However there is no information concerning inheritance; moreover I have not ventured to make a S-K division of Canadian assets.

20. KDM permanent income model on cross-sectional data is based upon two equations at the individual level. The first one makes permanent income a function of human capital variables (level of education, social origin, occupational group, race, labor market conditions...), an exogenously imposed cohort effect due to economic growth and a fixed unobservable individual effect. The second equation: Y = YP + YAGE + YT, derives permanent income from (observable) current earnings Y, an estimated typical deterministic age component YAGE (derived cross-sectionaly and assumed identical for everybody) and a "transitory" component YT. For each individual, permanent income can be estimated from the resulting earnings equation if the fixed individual effect and the transitory income component can be separated in the residuals of the earnings equation: for this, exogenous information drawn from income panel data must be used. Finally, household's permanent income is the sum of those of its members.

Table 3 shows that the contribution of age to A-wealth inequality is, as expected, quite moderate but significant (12.5%) whereas that of permanent income is very low (2.0%). Indeed the more relevant conditional contribution $\bar{p}(\mathrm{YP}'/a)$ is only 15.7%. It follows that the combined contribution $p(a, \mathrm{YP}')$ is only 26.2% (note however that figures for A1- or A2-wealth are already higher). Of course, this unfavourable result is due to the negative correlation of A/YP′ with YP′, showing subproportionality (see 4.1).

Another surprising result is that truncations of the sample by elimination of the rich and/or the poor have a tendency to *decrease* the values of the contributions of age and permanent income, in sharp contrast to the predictions of either the LCH or the SA model. The interpretation of this decline is not easy: it corresponds notably to the fact that the highest permanent incomes do generally correspond to very wealthy households.

Finally, KDM notice that 37.2% of the households in the age range 60-64 have wealth to permanent income ratios below 2. Arguing that lifecyclers should have wealth-income ratios between 2 and 6 around retirement age (for standard pension coverage), they conclude that these households do not seem therefore to follow an accumulation behaviour which is in agreement with the LCH. Moreover, the comparison of the distributions of permanent income for this low-wealth group and for the entire population in the same age band 60 to 64 shows only limited differences (Table 4). These figures are not very favourable to the LCH but do also contradict the predictions of the SA model.

5.2. French Results (1975, 1980)

The French data come notably from a sample survey conducted in 1980 by the CREP [1981] for 3,000 households. The definition of wealth is comparable to that of KDM except only that durables, including cars, have not been recorded. Moreover, rich households have been greatly oversampled so that results considered below concern population weights, not sample weights.

We also know for certain assets if they have been (totally or partly) received through gifts or inheritance: these assets include (*i*) housing and real estate (*ii*) land and equity in a business or a farm (*iii*) securities and stocks and shares. We have used two criteria for the presence of capital receipts: *h* (two modalities) tells only if the household has received anything whereas criterion *h′* (five modalities) divides inheritors according to the nature of their receipts.

As 14 types of equities are distinguished, it is possible to divide A-wealth in S-assets and K-assets (see Kessler and Masson [1987]). S-wealth includes liquidities, quasi-liquidities (time and savings deposits including bonds) and residential housing. K-wealth includes investment in real estate, land, equity in a farm or in a business, stocks, shares and obligations, and represents roughly 45% of total A-wealth.

TABLE 4

Permanent Income of Households with Low Wealth-Permanent Income Ratios: Canada 1977
(households aged 60-64 years old, A/YP inferior to 2)

	Pourcentage in each permanent income decile										No. of obser-vations
	1	2	3	4	5	6	7	8	9	10	
All population aged 60-64	19.6	17.3	18.7	14.6	11.4	8.2	3.7	2.4	2.5	1.5	669
(cumulated %)		(36.9)	(55.6)	(70.3)	(81.6)	(89.8)	(93.6)	(96)	(98.5)	(100)	
Subpopulation aged 60-64 with: A/YP<2	21.3	20.1	22.1	12.4	11.6	5.6	2.8	1.6	1.2	1.2	249
(cumulated %)		(41.4)	(63.5)	(75.9)	(87.6)	(93.2)	(96)	(97.6)	(98.8)	(100)	

Source: Statistics Canada and calculations of King and Dicks Mireaux (1982).

TABLE 5

Wealth-Current Income Ratio by Income Decile: France (1980)
(households aged 55-64 years old)

	Average ratios by income decile: * above average; ˙: almost average										
Income decile	1	2	3	4	5	6	7	8	9	10	Total
A	7.40*	3.61	5.42˙	6.47*	4.67	7.75*	3.91	4.71	6.02*	5.35˙	5.46
S	5.79*	2.58	4.13*	3.20*	3.55*	2.32	1.85	1.81	3.48*	2.57	3.00
K	1.61	1.02	1.28	3.27*	1.11	5.43*	2.06	2.90*	2.54*	2.78*	2.46

Source: Panel CREP 1980.

The CREP survey has however a number of deficiencies. The information required to compute public or private pensions present value is not available. More importantly, the level of education was not recorded, which precludes any reliable estimation of permanent income. Hence I have used non-property current income Y (in deciles) or occupational group, denoted CSP (in 10 modalities, retired people being reclassified in their group of origin), as crude proxies for permanent income. (Note that current income Y is already a better proxy of YP within age brackets).

Such shortcomings of the data make only possible an indirect, rough test of the "average" proportionality hypothesis in France, by looking, at a given age, at the ratio of wealth to *current* non-property income Y (Table 5). If average proportionality holds, this ratio should be a declining function of Y, since the transitory income component is on the average positive for incomes above the mean and negative otherwise (MAYER [1972]). The results do not conform to this scenario and agree with Hubbard's or DH findings of significant superproportionality, which appears moreover, as expected, stronger for K-wealth than for A-wealth and S-wealth.

Table 6, concerning the size effect of inheritance on wealth (at old age, including assets already transmitted), is drawn from recall data on inheritance and wealth collected by the CREP in 1975. The effect of inheritance appears highly significant in both the linear and the logarithmic models. Moreover, the high values of the coefficients constitute preliminary evidence of a *specific size effect of inheritance*, against the LCH but in favour of the SA model: the lifetime marginal propensity to save out of inheritance is markedly higher than out of human resources [21].

Tables 7 to 9 concern again the wealth data of 1980. Table 7 shows the contributions to wealth inequality of various factors. Age has a similar explanatory power to the one found for Canada: moreover its contribution is higher for S-wealth as should be expected. Demographic variables (number of children under 17, marriage status) make a minor contribution to wealth inequality which is however also higher for S-wealth [22].

But the most favourable results for the LCH come from the relatively high value of the combined contribution $p(a, Y)$ to A-wealth inequality, which is near 45% (unless current income Y is at a given age a much better

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21. The logarithmic model for instance finds an elasticity of wealth at old age with respect to inheritance of the order of .6. Since the ratio I/W of inheritance to lifetime resources is below 10% in 1975 in France (see KESSLER and MASSON [1979 *b*]), the hypothesis of a perfect substitutability between human resources and capital receipts implies that wealth at old age or bequest have an elasticity with respect to lifetime resources superior to 6. In that matter, the most reliable reference is MENCHIK and DAVID [1983] who find for the US a markedly lower elasticity of bequest, in the order of 1.8, and at least below 3 (with R^2 coefficients similar to those of Table 6 for the linear and logarithmic models). If French values are comparable, this means indeed a higher elasticity of bequest with respect to inheritance than with respect to human resources.
22. Note however that the number of children for instance has a higher additional contribution to wealth inequality when combined with age; the limited size of the sample does not allow us however to go far enough in this "stepwise" like decomposition of contributions to wealth inequality.

TABLE 6

Regression (OLS) Model of Wealth on Lifetime Inheritance: France (1975)
(Households aged 60 or over, inheritors, with no more inheritance expectations)
t-statistics in parentheses

Variable	Linear model A + PV*	Logarithmic model Log (A + PV)*
Constant	−479.3	3.32
	(0.009)	(1.311)
Lifetime Inheritance (I)	*0.658****	
	(2.983)	
Log I		*0.585****
		(3.717)
*Age Dummies***		
65-69 years old	8 426.1	0.573
	(0.725)	(1.411)
70-74 years old	2 522.8	0.510
	(0.210)	(1.218)
⩾75 years old	4 484.4	0.010
	(0.321)	(0.020)
*Educational Dummies***		
Some secondary schooling	6 208.5	0.228
	(0.490)	(0.519)
"Baccalauréat" and Post secondary diploma (or level)	1 591.7	−0.669
	(0.122)	(1.441)
University degree (or level)	37 123.0	−0.047
	(2.537)	(0.093)
*Income Dummies*** (1975) (thousand French Francs)		
30-50	19 811.4	0.775
	(1.652)	(1.844)
50-100	26 828.7	0.316
	(1.863)	(0.622)
Above 100	61 030.1	1.081
	(2.732)	(1.382)
Mariage dummy	−13 163.3	0.103
	(1.284)	(0.290)
*Occupational Dummies*** (retired reclassified)		
Self employed	−2 674.7	−0.306
	(0.183)	(0.586)
Professionals and executives	−9 804.8	−0.320
	(0.486)	(0.444)
Middle management	−18 227.1	−0.407
	(1.133)	(0.707)
Blue collar and white collar workers	−9 072.2	−0.443
	(0.586)	(0.800)
Number of kids	6 277.6	0.133
	(2.523)	(1.530)
R^2	0.381	0.307
$\bar{R}^2$	0.291	0.198
Number of observations	127	127

Notes:
*A + PV = wealth owned (A) and *already transmitted* (PV).
** The dummy defaults are: age: 60 to 64; education: primary schooling; income: below thirty thousand francs; occupation: never occupied.
*** Inheritance coefficients and R-squares remain remarkedly stable in the two models under alternate specifications of education, income, number of children and especially occupation (retired not reclassified or additional dummy for retirement).
Source: CREP inheritance survey, 1975.

TABLE 7

Theil Decomposition of Wealth Inequality: French Results (1980)

(*a*) single criterion

		Contribution to wealth inequality (in %) of						
Wealth variable	Theil index	Age *a*	Income Y	CSP	Criterion *h*	Criterion *h′*	MD	NC
A...........	0.907	10.9	28.3	32.4	21.8	24.6	4.2	0.1
S...........	0.727	12.0	28.2	19.4	11.1	11.6	6.9	0.5
K...........	1.773	7.3	19.2	37.5	22.8	26.9	1.6	0.1
K′..........	0.606	5.3	8.3	25.0	6.9	9.0		

(*b*) multiple criteria:

	Contribution (in %)								
Wealth variable	$a \times Y$	$a \times CSP$	$a \times h'$	$a \times h$	$Y \times h'$	$a \times Y \times h$	$a \times MD$	$a \times NC$	$NC \times MD$
A.......	44.3	45.8	32.5	29.3	49.2	57.9	15.2	14.8	5.3
S.......	42.6	34.3	22.9	21.2	37.5	50.1	17.6	15.8	8.0
K.......	35.2	49.7	31.5	27.4	45.4	52.5	9.8	10.7	2.6
K′......	29.0	43.2	12.9			39.4			

Notes:

– Non negative wealth amount. A = S + K; S = life cycle wealth; K = Capital investment; K′ concerns the contributions to K-wealth inequality among K-wealth holders only (1,406 of 2,992 households).

– Age *a* in twelve brackets (of five years length); current non-property income Y in deciles; CSP (retired being reclassified) = occupational group (ten groups); MD = mariage dummy; NC = number of children under 17; *h* = inheritance dummy; *h′* = inheritance criterion (five values).

Source: Panel CREP 1980.

TABLE 8

Theil Decomposition of Wealth (A) Inequality for Truncated Samples: France (1980)

Populations	Theil index	Contributions to wealth inequality (in %) of: Age *a*	Income Y	Criterion *h*	$a \times Y$	$a \times Y \times h$
Total population (see Table 7)............	0.907	10.9	28.3	21.8	44.3	57.9
Excluding lower 5%......	0.859	10.3	27.1	21.1	43.0	56.8
Excluding upper 5%......	0.704	9.8	20.6	14.8	38.6	52.0
Excluding upper and lower 5%...............	0.655	9.2	19.3	14.3	37.1	50.7

predictor of wealth than permanent one !). The comparison for S- and K-wealth of the combined contributions $p(a, Y)$, $p(a, h)$, $p(a, Y, h)$... is however less revealing.

TABLE 9

The Role of Capital Receipts in Wealth Inequality: France (1980)

(*a*) Contributions to wealth inequality within the inheritors' and non inheritors' groups

	Theil index		Contributions of age and current income (%)	
Wealth variable	Inheritors	Non inheritors	Inheritors	Non inheritors
A.	0.427	0.944	46.1	45.6
S..	0.416	0.771	47.0	42.9
K.	0.747	2.240	37.8	38.2

(*b*) Conditional contribution of inheritance dummy *h* within age brackets (%)

Wealth	<25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	>75	$\bar{p}(h/a)$
A.	38.3	12.6	11.9	14.9	12.6	30.2	21.6	24.1	34.3	11.5	15.9	23.8	20.7
S.	27.0	5.4	4.4	7.9	2.5	14.0	9.9	19.7	33.7	9.8	9.3	14.0	10.5
K.	31.4	15.7	14.7	14.5	17.3	31.9	23.7	20.7	47.7	8.3	14.4	24.4	21.7

$\bar{p}(h/a)=(p(a,h)-p(a))/(1-p(a))$.
Notes: see Table 7.
Source: Panel CREP 1980.

Table 8 shows that the elimination of the two tails of the wealth distribution leads, as in the Canadian case, to *lower* contributions to wealth inequality, contrarily to what was expected. Regarding A-wealth or K-wealth inequality, Table 9 shows that contributions among inheritors and non-inheritors are similar; moreover, the contributions to S-wealth inequality are higher among inheritors (for however a comparatively lower degree of wealth inequality). These results are again not too favourable to the LCH.

Finally the high contribution of the inheritance dummy *h* to A-wealth inequality (21.8%) and the fact that the conditional contributions of *h*, $p(h/a=t)$ at age *t*, remain quite important at old age (when the "timing" effect of inheritance is small) are supplementary evidence of a strong size effect of inheritance in favour of the SA model.

These conclusions for France are on the whole more favourable to the LCH than the ones derived for Canada. It should be nevertheless emphasized that the French results are not fully reliable, since current income is used instead of permanent income. An important issue concerns in particular the level of permanent income among low-wealth holders near retirement (see Table 4).

6 Conclusion

Most studies of life cycle models of wealth accumulation have focused on the relevance and the importance of hump saving or substitution effects of (public or private) pensions. This paper concentrates rather on the relation, adjusted for age, between wealth and the LCH concept of lifetime resources. It concerns mainly first, the influence on net worth of inheritance (or gifts) and permanent (non property) income and second, the contribution to wealth inequality of age and permanent income combined.

The theoretical analysis shows that the LCH (with homothetic preferences in consumption) may indeed lead in realistic environments to significant "superproportionality", that is an increasing wealth to permanent income ratio with the level of permanent income. Moreover, strong superproportionality appears a necessary and sufficient condition for a high contribution of age and permanent income.

Empirical results reveal that the role played by inheritance is much more important than predicted by the theory: notably, the lifetime propensity to save out of capital receipts is higher than the one out of permanent income. The joint contribution to wealth inequality of age and permanent income appears quite important, at least in the French case, although the results obtained here need further qualification and depend crucially on reliable estimates of permanent income. It appears however, at least for France, Canada and the US, that the major part of wealth dispersion (between say half and three quarters) is not explained by these two variables, whether it is due to inheritance or other individual differences.

The Life Cycle Hypothesis appears nowadays the reference framework for any intra-generational approach to wealth accumulation and distribution. This does not mean however that the theory can accurately reproduce the diversity of individual savings patterns, nor even that it always predicts correctly "average" accumulation behaviour.

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APPENDIX

"Average" Proportionality and the Conditional Contribution of Permanent Income

The conditional contributions $p(\mathrm{YP}/a=t)$ and $\bar{p}(\mathrm{YP}/a)$ of permanent income with respect to age are defined in relation (9). For their analysis it is useful to introduce the conditional means of the ratio of wealth to permanent income: $\mathrm{E}(\mathrm{A}/\mathrm{YP};\ a=t,\ \mathrm{YP}=y)=g_t(y)$. Average proportionality means that $g_t(y)$ is constant in y.

With the mean of wealth for an age t and a permanent income y, m_{ty}, equal to $y.g_t(y)$, the conditional contribution $p(\mathrm{YP}/a=t)$, is finally given by:

$$p(\mathrm{YP}/a=t)=\mathrm{T}(\{m_{ty}\})/\mathrm{T}(\mathrm{A}_t)=\mathrm{T}(\{y.g_t(y)\})/\mathrm{T}(\mathrm{A}_t)$$

where A_t is the distribution of wealth at age t and the weight of m_{ty} in the distribution $\{m_{ty}\}$ is equal to the share of households with permanent income y among those aged t.

Since the Theil index T is mean independant, average proportionality leads to a conditional contribution $p(\mathrm{YP}/a=t)$ equal to $\mathrm{T}(\mathrm{YP}_t)/\mathrm{T}(\mathrm{A}_t)$, the *ratio of permanent income and wealth inequalities at a given age.* This ratio is indeed small. It follows that average proportionality leads to small contributions $p(\mathrm{YP}/a=t)$ and consequently to small $\bar{p}(\mathrm{YP}/a)$ and $p(a, \mathrm{YP})$.

Now, since the inequality index T satisfies the Pigou-Dalton principle of transfers, it is clear that an everywhere positive function g_t' (the income derivative of g_t) will generate a higher contribution $p(\mathrm{YP}/\mathrm{a}=\mathrm{t})$, which is also an increasing function of the positive level of its income derivative g_t''. Conversely a negative g_t' will lead to an even smaller contribution $p(\mathrm{YP}/a=t)$ than the one obtained under average proportionality.

To sum up, the contributions $\bar{p}(\mathrm{YP}/a)$ and hence $p(a, \mathrm{YP})$ rise with the (positive) level of the correlations at given ages between A/YP and YP; they will be important if and only if the functions g_t' and moreover g_t'' are generally highly positive, that is in case of strong (average) superproportionality.