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The Political Economy of Intergenerational Cooperation

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Abstract

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1 Introduction

"Let us assume that men enter the labor market at about the age of twenty. They work for forty-…ve years or so and

¤Draft of a chapter in North-Holland's forthcoming Handbook of Giving, Reciprocity and Altruism, edited by S. Kolm and J. Mercier-Ythier (Handbooks in Economics Series, edited by K.J. Arrow and M.D. Intriligator). The author is grateful to Dan Anderberg, Michele Boldrin, Alex Kemnitz, Serge Kolm, Lex Meijdam and Jean Mercier-Ythier for valuable comments. Remaining errors and shortcomings are the author's responsibility.

> then live for …fteen years in retirement. Naturally, ... men will want to consume less than they produce in their working years so that they can consume something in the years when they produce nothing. ...
>
> If there were only Robinson Crusoe, he would hope to put by some durable goods which could be drawn on in his old age. He would, so to speak, want to trade with Mother Nature current consumption goods in return for future consumption goods. ...
>
> For the present purpose, I shall make the extreme assumption that nothing will keep at all. Thus no intertemporal trade with Nature is possible. If Crusoe were alone, he would obviously die at the beginning of his retirement years.
>
> But we live in a world where new generations are always coming along. ... [C]annot men during their productive years give up some of their product to bribe other men to support them in their retirement years?" (Samuelson, 1958)

The answer to Paul Samuelson's question is clearly yes, if there are ways of ensuring that the bribed person will deliver his side of the deal when the time comes. Samuelson's own solution to this enforcement problem is what he calls "social contrivances": contract law and its associated legal enforcement apparatus, money that "gives workers of one epoch a claim on workers of a later epoch" (Samuelson, 1958). But what about the very young? They need support too, indeed more than the old because, unlike them, they have not had an earlier phase of life in which to put by durable goods. Therefore, if anyone is willing to be "bribed", it is precisely them. The problem is that Samuelson's contrivances are not much help here. In most legal systems, the minors are not allowed to enter into binding commercial agreements (and babies could not anyway). Why is there no mention of them in Samuelson's analysis? As Martin Shubick perceptively put it,

> "... Samuelson's model is implicitly a three period model where he dropped the …rst period by the assumption that child support was to be purely instinctive and hence not in the analysis" (Shubick, 1981).

The same implicit assumption underlies much of the subsequent literature on the subject, including some of the articles referred to in this Chapter. The basis for making such an assumption, one may suppose, is that successful animal species are genetically programmed to care for their o¤spring. But is that enough? The existence of laws and social

norms deputed to ensure that children get adequate support suggests that it may not. This does not necessarily mean that parents do not care about their children, but it does imply that externalities, or some other kind of coordination failure, could be responsible for at least some of the parents giving their children less than is socially desirable. Even Gary Becker, the economist most closely identi…ed with the view that parental transfers to children are gifts, uses the argument that parents may underinvest in their children to explain public intervention.

> "State intervention in the provision of education and other human capital could raise investments in children to the e¢cient level. ... The compulsory schooling laws in the United States that began in the 1880s ... tended to have this e¤ect. A state usually set minimum requirements at a level that was already exceeded by all but the poorest families in the state. These laws raised the schooling of poor children but did not tend to a¤ect the schooling of other children" (Becker and Murphy, 1988).

The aim of this chapter is to examine the scope for mutually bene…cial intergenerational cooperation, and theoretically explain the emergence of certain norms and institutions (hence the political economy label) as a rational response to the coordination problems we have just outlined. The contributions on which we draw come from several branches of economics, as far apart as household economics and the constitutional department of political economy, and encompassing both the normative and the positive branch of public economics. Pooling the work of authors with very di¤erent intellectual traditions faces special di¢culties, in that each sub-literature approaches the point at issue from its own distinctive point of view, and makes the simplifying assumptions that appear most appropriate from that particular perspective. As mere juxtaposition would have served little purpose, what we have attempted is a systematic re-exposition of the entire subject area within a coherent framework.[1]

A cost of this expositional strategy is that the basic assumptions made have to be the lowest common denominator of those typical of the di¤erent modelling traditions. A good part of the formal analysis will be based on the hypothesis that individuals are not altruistic, and that utility depends only on the consumption of market goods (essentially

[1] Many of the authors cited will feel that some part or other of this Chapter "sounds like, but is not quite" what they wrote.

money); leisure is ignored.[2] The assumption that people derive utility also from the consumption or well-being of others, is common in household economics, but unusual in other branches of economics.[3] The same may be said of the hypothesis that utility depends also on the personal services of speci…ed individuals. We shall look …rst for the possibility of cooperation between generations of sel…sh individuals deriving utility from money only, then ask whether altruism, or the existence of personal services for which the market does not provide a perfect substitute, make things any easier.

Another cost of spreading the net so wide is that important contributions where the primary focus in not on intergenerational cooperation will have to be excluded. Except where intra-generational heterogeneity impinges very directly on inter-generational matters, we shall thus reason as if all persons born at the same date were the same. Perhaps less justi…ably, we deal only parenthetically with the implications of uncertainty, and do not go into the important issue of intergenerational risk sharing.[4]

A good part of the analysis refers to a small open economy. The motivation is not so much realism (that depends on whether one is inside the United States looking out, or outside looking in), as expositional convenience. In a small open economy without restrictions on international capital ‡ows, the rate of interest is in fact exogenous, and capital accumulation is independent of domestic saving. By uncoupling intergenerational cooperation from capital accumulation, the small open economy assumption allows us to reproduce the results of the greater part of the literature on private intergenerational transfers that takes factor prices as given. The closed economy assumption will be used only where factor price endogeneity is crucial to the argument.

Wherever practical,[5] we shall treat fertility as endogenous. The reason for this assumption is not just that the empirical evidence strongly supports it. There is also a theoretical motivation, namely that giving present adults the power to in‡uence the number of partners to any fu-

[2] This could be interpreted as literally meaning that free time is not a good, or that the utility function is weakly separable. If the second interpretation is followed, consumption includes the consumption-equivalent of the utility of leisure, costs include opportunity-costs, and income is to be interpreted as full income.

[3] Robertson (1956) warns economists that love or altruism is a scarce good, on which they should economize. Indeed, there is little empirical evidence that individual actions are systematically driven by such sentiments.

[4] Barro (1979), and Gordon and Varian (1988) show that public debt may permit risk sharing between generations; Gale (1991), Thogersen (1998) and Wagener (2003) show the same to be true of pay-as-you-go pension systems.

[5] When educational investment is brought into the picture, or in dealing with voting models, endogenous fertility makes things too complicated.

ture agreement makes it more likely that an agreement will be reached, and will be e¢cient: Except in section 7, where we deal with hidden actions, we shall reason as if parents could decide how many children to have. In reality, parents can only condition (by frequency of intercourse and contraceptive practice) the probability of an extra birth. Like most things in life, completed fertility is thus the result of a combination of chance and deliberate action. The cost of making the simplifying assumption that parents can actually choose fertility is that policy prescriptions take an unpleasant totalitarian tone ("thou shalt have n children, or else ..."), but that is only a theoretical artefact. When it is recognized that parents can only choose the fertility conditioning variable, not the actual outcome, the policy takes the more acceptable form of an incentive (or disincentive) to have children. Again for the sake of simplicity, we shall assume parthenogenesis (for coherence, rather than political correctness, we shall thus use the feminine gender). Allowing for sexual reproduction would complicate the analysis considerably without throwing any extra light on the points at issue.

Throughout the exposition, we take the life-cycle to consist of three periods, labelled $i = 0; 1; 2$. A person is said to be young in period 0, adult in period 1, old in period 2. Adults are able to produce income, and to reproduce; the young and the old can do neither. Each adult is endowed with a certain earning capacity, and with the potential to have children (up to an unspeci…ed physiological maximum, generally assumed to be inconsequential) by bearing a …xed cost for each child. This cost includes the child's subsistence consumption in period 0 (above-subsistence consumption is a choice variable), as well as all the expenditures and opportunity costs associated with childbearing. We adopt the convention of calling t the generation that enters period 1 of its life at date t. As individuals are active in that period only, this has the expositional advantage of making the date of the action coincide with the generational label of the actor.

2 A normative benchmark

Before embarking on an analysis of the institutions that might make it possible for members of a generation to cooperate with members of another generation, it is useful to establish a normative benchmark against which to measure the performance of any such arrangement. In this section, we approach the issue under the assumption that capital is the only durable good. (we shall introduce a second asset, human capital, and deal with the issue of educational investment, in Section 6).

Let the lifetime utility of each member of generation t be given by

$$U^t = u_0\left(c_0^t\right) + u_1\left(c_1^t\right) + u_2\left(c_2^t\right); \tag{1}$$

where c_i^t denote consumption in period i-th period of life ($i = 0; 1; 2$) of a member of generation t. The function $u_i(:)$ is assumed to be concave, with $u_i(0) = 0$, and $u_i'(0) = 1$.

Income is determined by

$$y^t = f\left(k^t\right); \tag{2}$$

where k^t, y^t and n^t denote, respectively, the capital, income and number of children of each member of generation t (or, equivalently, capital, income and fertility per adult at date t), and $f(:)$ is the per-adult production function. Assuming a small open economy, and perfect capital mobility, the interest rate, $r^t - 1$, is exogenously given. The capital stock is then determined implicitly by

$$r^t = 1 + f'\left(k^t\right); \tag{3}$$

Since income is net of capital depreciation, the resource constraint for any date t may be written as

$$k^t - r^t d^t + f\left(k^t\right) = \frac{c_2^{t-1}}{n^{t-1}} + c_1^t + \left(p + c_0^{t+1} + k^{t+1} - d^{t+1}\right) n^t; \tag{4}$$

where d^t is the foreign debt per member of generation t.[6] As already mentioned, p is a positive constant, representing the unavoidable part of the cost of having a child. Since this constant will include the subsistence part of a child's consumption, the variable c_0^{t+1} is to be interpreted as the above-subsistence consumption of a child born at date t.[7]

2.1 Consumption and fertility in the spirit of J. S. Mill

Suppose that society is interested in maximizing

$$W^0 = \sum_{t=0}^{1} (\pm)^t U^t; \; 0 < \pm \cdot 1; \tag{5}$$

[6] The way the constraint is written implies that k and d are measured at the beginning, and c_i at the end of the reference period.

[7] We could similarly introduce constants representing subsistence consumption in periods 1 and 2 of a person's life, and de…ne c_1^t as above-subsistence consumption in period 1 by a person born at $t - 1$, c_2^{t-1} as above-subsistence consumption in period 2 by a person born at $t - 2$, but that would serve no useful purpose. By contrast, p needs to be there anyway, because procreation has to have a …xed cost for the fertitility choice problem to be bounded.

with c_0^0 given, subject to (4) for each t.[8] The …rst-order conditions for a social optimum may be written as

$$\frac{u_1^0(c_1^t)}{u_2^0(c_2^t)} = r^{t+1}; \tag{6}$$

$$\frac{u_0^0(c_0^t)}{u_1^0(c_1^t)} = r^t = \frac{u_1^0\left(c_1^{t-1}\right)}{u_2^0\left(c_2^{t-1}\right)} \tag{7}$$

and

$$\frac{u_2^0(c_2^t)}{u_1^0(c_1^t)}\frac{c_2^t}{n^t} = p + c_0^{t+1} + k^{t+1} - d^{t+1}; \tag{8}$$

for each t.

The …rst two conditions, (6) and (7), tell us that the marginal rate of substitution of adult for old-age consumption must be equated to the current interest factor, and to the marginal rate of substitution of youthful for adult consumption of the next generation. The third condition, (8), tells us that the marginal social bene…t of an extra child must be equated to the marginal social cost. Since the goods produced by the new person when she becomes an adult will be consumed by the present adults when they become old, the marginal social bene…t is the adult consumption equivalent, for a member of generation t, of the contribution that an additional member of generation t+1 would make to her old age consumption, $\frac{u_2^0(c_2^t)}{u_1^0(c_1^t)}\frac{c_2^t}{n^t}$. The marginal social cost is the sum of two terms: the private cost of raising a child, $\left(p + c_0^{t+1}\right)$, and the social cost of equipping the future adult with k^{t+1} units of capital,.net of the foreign debt d^{t+1} that this person will inherit from the previous generation, $(k^{t+1} - d^{t+1})$.

Notice that (6)-(7) are the necessary conditions for a Pareto-optimal allocation of consumption across generations of given size.[9] If the population pro…le were exogenously given, Pareto and a social optima would then coincide. Since the population pro…le is not given, society favours the one that satis…es the additional condition (8) for each t. If $r^t = r$

[8] There is also the constraint that, for each t, n^t cannot be less than zero, or greater than a certain physiological maximum. In reality, these restrictions may well be binding for some women, but average fertility is always inside the limits. Since, in our analysis, all women are the same, we follow the common pratice of assuming that these restrictions are not binding at the optimum.

[9] The Pareto criterion does not apply across population pro…les.

for all t, the social optimum has a steady state ($c_i^t = c_i^{\alpha}$ for all t), characterized by

$$n = \pm r: \tag{9}$$

Therefore, in a comparison across steady states, the optimal rate of population growth will be no higher than the exogenously given interest rate.

In view of (3), (9) implies

$$\frac{n}{\pm} = 1 + f^{0}(k): \tag{10}$$

We note in passing that this is the discrete-time version of the "modi…ed golden rule" for the accumulation of capital in a closed economy with exogenous population. In our open economy, however, the interest rate is exogenous, and the stock of capital per adult is …xed by (3); what is endogenous is the population pro…le. Since the optimal rate of capital accumulation is trivially equal to the optimal rate of population growth, the rule is really about population growth. If society does not discount the utility of future generations ($\pm = 1$), the population pro…le is chosen so that the utility of the representative agent is at a maximum as John Stuart Mill bids us to do. Stretching things a bit, we shall dub (9) the "Millian criterion", and call the allocation which maximizes (5), subject to the constraints, the "Millian optimum".

2.2 Consumption and fertility in the spirit of J. Bentham

If society were interested in aggregate rather than average utility, it would maximize

$$W^0 = \sum_{t=0}^{\infty} (\pm)^t N^t U^t; \; 0 < \pm \cdot 1 \tag{11}$$

where

$$N^t \acute{} \prod_{j=0}^{t} n^{j\,i\,1} \tag{12}$$

is the number of persons in generation t, with c_0^0 and n^{i1} given. For $\pm = 1$, (11) is a Benthamite welfare function, the unweighted sum of the utilities of all members (actual and potential) of society. By extension, we shall call the allocation that maximizes (11), subject to the constraints, the "Benthamite optimum". Since the Pareto criterion applies only to comparisons of consumption streams relating to the same

population pro…le $(N^0, N^1, N^2, ...)$, the e¢ciency conditions are still (6)-(7), but the fertility condition is now

$$\frac{(\pm)^t W^{t+1}}{u_1^0(c_1^t)} + \frac{u_2^0(c_2^t)}{u_1^0(c_1^t)}\frac{c_2^t}{n^t} = p + c_0^{t+1} + k^{t+1} - d^{t+1} \tag{13}$$

for each t. Compared with (8), the social bene…t from adding a person to generation t has an extra term, $\frac{(\pm)^t W^{t+1}}{u_1^0(c_1^t)}$, representing the adult consumption equivalent, for a member of generation t, of the weighted sum of the lifetime utilities of the new member and of all her descendents.

Given (11), a steady state implies

$$\pm r = 1: \tag{14}$$

In other words, the exogenously determined rate of interest $(r - 1)$ must equal the given rate of social time preference $(\frac{1-\pm}{\pm})$; zero if $\pm = 1$. Since r and ± are both exogenous, these two numbers could be equal only by chance. For this reason, where fertility is treated as endogenous, we choose to be guided by John Stuart Mill rather than Jeremy Bentham. Where fertility is treated as exogenous, there is obviously no di¤erence between the two approaches. If we also assume a stationary environment, all individuals are the same irrespective of date of birth; Vilfredo Pareto is then all we need when it comes to comparing alternative allocations.

2.3 Normative implications of altruism

In a number of studies, for example Groezen, Leers and Meijdam (2003), individuals are assumed to derive utility not only from their own consumption, but also from the number of children they beget. Since this implies that parents are indi¤erent as to whether their o¤spring will live prosperous or miserable lives, we cannot call it altruism. All we can say, in such a case, is that people have a "taste for children" (or are biologically predisposed to reproduce themselves). We can talk of (descending) altruism if parents derive utility also from the children's consumption, as in Kollmann (1997), or lifetime utility, as in most of Gary Becker's contributions, in particular Becker and Barro (1988). Since all these approaches are special cases of the one mentioned last, we concentrate on that one.

Let the utility of generation t be given by

$$U^t = u_0\left(c_0^t\right) + u_1\left(c_1^t\right) + u_2\left(c_2^t\right) + u_3\left(n^t U^{t+1}\right); \tag{15}$$

where $u_3(:)$ is a concave function, with the same properties as $u_0(:)$, etc.[10] Since a similar expression applies also to generations t + 1, t + 2,

[10] Becker and Barro (1988) use a special form of (15).

..., this implies that the utility of each person ultimately depends on the consumption pro…le of all her descendents. Given (15), the …rst-order conditions for the maximization of (5), subject to (4), will still include (6) and (7), but fertility must now satisfy

$$\frac{u_3'(n^t U^{t+1})}{u_1'(c_1^t)} U^{t+1} + \frac{u_2'(c_2^t)}{u_1'(c_1^t)} \frac{c_2^t}{n^t} = p + c_0^{t+1} + k^{t+1} - d^{t+1}: \qquad (16)$$

Comparing this with (8), we can see that the marginal social bene…t of fertility now includes an extra term, $\frac{u_3'(n^t U^{t+1})}{u_1'(c_1^t)} U^{t+1}$, representing the current consumption equivalent of the pleasure that parents derive from having another child. In steady state, (9) must still hold. Therefore, population must still grow at a rate that is no greater than the rate of interest.

Instead of going down the Becker-Barro road, one may characterize altruistic preferences by writing the utility function of any member of society, irrespective of date of birth, as

$$U = \sum_{t=0}^{1} \left[u_0 \left(c_0^t \right) + u_1 \left(c_1^t \right) + u_2 \left(c_2^t \right) \right]: \qquad (17)$$

As this implies unanimity over which is the best population pro…le, and which is the best way of allocating consumption between generations, social welfare and individual utility obviously coincide. Since (17) is obtained substituting (1) into (5), and setting $\pm = 1$, the …rst-order conditions for a (Millian or Benthamite) social optimum are the same as in the basic model without altruism when society does not discount the utility of later generations.

3 The market

Are there institutions such that a decentralized economy will generate a socially optimal solution, or at least allocate consumption e¢ciently? The second question refers to a given population pro…le. The …rst presupposes a criterion (e.g., the Millian one) for choosing among di¤erent pro…les. In this section, we look for an answer to these questions under the assumptions that individual decisions are coordinated only by the market, taking it for granted that Samuelson's "social contrivances" are …rmly in place. We start by assuming that agents are interested only in their own lifetime consumption, then introduce altruism à la Becker-Barro.

3.1 A life-cycle model

Modigliani's life-cycle theory provides a useful starting point.[11] Here, everyone is out for oneself: children support themselves by borrowing, adults save for their own old age, the old live o¤ their own savings. The population pro…le is exogenous. Each member of generation t chooses her own consumption stream $(c_0^t; c_1^t; c_2^t)$ so as to maximize (1), subject to the lifetime budget constraint

$$\left(p + c_0^t\right)\left(r^{t-1} + 1\right) + c_1^t - w^t + \frac{c_2^t}{r^t} \leq 0; \tag{18}$$

where w^t is the wage rate (and, normalizing the time endowment to unity, the earnings) of an adult at date t. Assuming perfect competition, the wage rate is determined by

$$w^t = y^t - \left(r^t - 1\right)k^t; \tag{19}$$

y^t and k^t are still determined by (2) – (3), r^t is exogenous for the open economy assumption.

The solution to the individual optimization problem for a member of generation t satis…es (6), and the …rst equation in (7). Since the same is true for generation $t - 1$, the second equation in (7) is satis…ed too. Since the stock of capital per worker is determined by the exogenously given rate of interest, capital accumulation is e¤ectively exogenous (grows in proportion to the population, exogenous too), any gap between domestic saving and investment is …lled by changes in the foreign debt. Therefore, (6) – (7) is all that is needed for a Pareto optimum. Provided everyone can borrow or lend at will at the given rate of interest, as (18) implies, the intergenerational allocation brought about by the market is e¢cient.

In general, however, it may not be true that everyone is free to borrow any amount, subject only to (18). That is especially likely in period 0 of a person's life, for the well-known di¢culties the young face in borrowing against future earnings (Stiglitz and Weiss, 1981).[12] There is then an additional constraint,

$$p + c_0^t \leq b; \tag{20}$$

where b is the maximum anyone can borrow in period 0. If (20) is binding for some t,[13] the market equilibrium is ine¢cient.

[11] Since that author was not concerned with intergenerational issues, it also provides a convenient straw-man, all too easy to knock down; we apologize for that.

[12] Furthermore, all legal systems we know of debar minors, for their own protection, from entering into binding agreements.

[13] If b is lower than the subsistence consumption component of p, the agent will not live to be an adult.

What if fertility is endogenous? If that is the case, the size of generation t depends on individual decisions taken by members of generation $t-1$. There is nothing to ensure that such decisions will satisfy (8). Worse, there will be no generation t. Assuming that parents are not allowed (by law, or by some form of social control) to let their children starve, or to actually kill them,[14] a child does in fact cost her parent at least p, but yields no bene…t. Had there been a generation $t-1$, its members would have thus chosen $n^{t-1} = 0$. But, if there is no reason why generation $t-1$ should have produced a generation t, there is equally no reason why generation $t-2$ should have produced a generation $t-1$, and so on. Hence, the economy will vanish with generation 0. Put another way, fertility choice is not compatible with a Modigliani economy.

3.2 A dynastic model

One way to make fertility choice compatible with a Modigliani economy is to assume altruism from parents to children, as in Becker and Barro (1988), so that each agent gets direct utility from the consumption stream of her entire dynasty. Each dynasty may then be regarded as an in…nite-lived individual. The intertemporal decisions of these synthetic individuals are coordinated by the market just like those of ordinary mortals in Modigliani's model.

Given perfect markets, each member of generation 0 chooses, at date 0, her own consumption plan for what is left of her life, together with the size, and lifetime consumption plans, of all subsequent generations, to maximize

$$U(c_1^0; c_2^0; n^0; U^1) = \left(c_1^0\right)^{\theta} + u_2 \left(c_2^0\right)^{\theta} + u_3 \left(n^0 U^1\right)^{\theta}; \tag{21}$$

subject to two restrictions. One is the dynastic budget constraint,

$$\sum_{t=1}^{\infty} \left(p + c_0^t\right)^{\theta} r^{t-1} + c_1^t - w^t + \frac{c_2^t}{r^t}\left(\frac{N^t}{R^t}\right)^{\theta} \leq a^0 + w^0 - c_1^0 - \frac{c_2^0}{r^0}; \tag{22}$$

where

$$R^t \equiv \prod_{j=1}^{t} r^{j-1}; \tag{23}$$

is the capitalization factor from 0 to t. The other is a set of nonnegative bequest constraints, one for each $t > 0$,

$$a^t \equiv c_1^t - w^t + \frac{c_2^t}{r^t} + \left(p + c_0^{t+1} + \frac{a^{t+1}}{r^t}\right)^{\theta} n^t \geq 0 \tag{24}$$

[14] None of that should be taken for granted. We know that infanticide by starvation, or deliberate action (especially in the case of girls), is rife in certain parts of the world.

where a^t are the assets of (the amount inherited by) an adult member of generation t. The …rst restriction says that, so long as the dynasty as a whole is solvent, any member of the dynasty can lend to, or borrow from the market at will. The second says that nobody can be obliged to accept an onerous gift (to inherit her parent's debts).

If (24) were never binding, as Becker and Barro assume,[15] the …rst-order conditions would yield (6), (7) and

$$\frac{u_3'(n^t U^{t+1})}{u_1'(c_1^t)} U^{t+1} + \frac{u_2'(c_2^t)}{u_1'(c_1^t)} \frac{c_2^t}{n^t} = p + c_0^{t+1} + \frac{a^{t+1}}{r^t} \tag{25}$$

for each t. Since, at any date, the assets held by the representative adult equal the country's (per-adult) net credit position,

$$k^{t+1} - d^{t+1} = \frac{a^{t+1}}{r^t}; \tag{26}$$

(25) would then be equivalent to (16). The aggregate outcome of the myriad of individual fertility choices would consequently satisfy the modi…ed golden rule, and the laissez-faire equilibrium would coincide with the Millian optimum.[16]

But there is no reason to expect that the nonnegative bequest constraint will never be binding. Given convex preferences, parents will in fact wish they could make negative bequests if their children are su¢ciently richer than themselves. Any bequest is in fact on top of inter vivos transfers and direct payment for children's consumption. Furthermore, it comes at a time when the bene…ciaries are adults and, therefore, no longer subject to credit rationing. The purpose of a bequest cannot then be that of relaxing a temporary liquidity constraint, but only that of altering the distribution of wealth between the parent and children. If (24) is binding for some t, the allocation is ine¢cient.[17]

4 The family

In the real world, individuals interact not only through the market, but also through lower-level organizations such as families, clubs, and interest groups. In particular, decisions regarding fertility and the intergenerational allocation of resources tend to be coordinated by families. In

[15] The assumption that no parent will ever wish she could be subsidized by her own children is made explicit in a footnote of Becker and Barro (1988).

[16] Not, however, with the Benthamite optimum, because the social bene…t deriving from an additional birth would then contain an extra term, $\frac{(\pm)^t W^{t+1}}{u_1'(c_1^t)}$.

[17] The issue is discussed in Becker and Murphy (1988), where it is spelled out that "operative bequests" (or, more generally, positive transfers from parents to children) are required to achieve e¢ciency.

game-theoretical language, any such organization is a coalition, a subset of the population whose members are better o¤ re-distributing their endowments among themselves, than going to the market.

Intendedly, Becker and Barro (1988) is a model of the family. As the family they describe operates as if it consisted of just one in…nite-lived individual, however, there is no coordination problem. The model is rigged-up in such a way, that no member of the dynasty has any reason to dissent from the founder's decisions. The same may be said of much of Gary Becker's contributions to the subject, epitomized by his "rotten kid theorem" (Becker, 1974). In essence, there is always a member of the family who, by virtue of (a) having the well-being of other members at heart, and (b) controlling a su¢ciently large part of family resources to be in a position to make gifts (bequests in the model with Barro) to others, can e¤ectively decide how much each member will consume, subject only to the constraints imposed by the market.

An early attempt at giving the family a distinctive role, additional and in some sense alternative to that of the market, is Neher (1971). Elaborating on an idea of Leibenstein (1960), that the demand for children may be derived from that for old-age support (the so-called "pension motive"), Philip Neher imagines a situation were property rights are vested in families, not individuals, and family income is distributed according to a "... share alike ethic whereby all members of the family have equal claim to the product whether they work or not." Thus conceived, a family creates opportunities (of free riding!), and places restrictions on individual behaviour (nobody can individually own anything), that would not be there if individuals interacted only through the market. In such a situation, fertility turns out to be higher than it would be if adults could individually accumulate assets (in which case the pension motive for having children would disappear), and higher than the social optimum.

4.1 Political economy of the family

The rules governing Neher's family are arbitrarily given. Here, we look in some detail at a model where the rules are endogenously determined. A useful way of characterizing an organization is to describe its fundamental rules, its constitution. Economic theory tells us that it may be in everyone's interest to agree …rst on a constitution, allowing agents to safely renounce the dominant strategy in a prisoner's dilemma type of situation, and then optimize individually subject to that constitution (Buchanan, 1987). Although originally conceived with reference to city or nation states, the constitution concept can be applied also to smaller groupings, such as clubs, professional associations or, indeed, families.

Cigno (1993) puts forward the idea of a "family constitution", and establishes conditions under which this is self-enforcing in the sense that it is in the best interest of every family member to obey it, and to have it obeyed. Cigno (2000) identi…es circumstances in which a constitution is self-enforcing also in the stronger sense that, once established, it will never be amended. Empirical testing cannot reject the hypothesis that behaviour is constrained by such constitutions.[18]

4.1.1 Family constitutions

At any given date, a family consists of individuals at di¤erent points of the life-cycle. Age di¤erences are important, because they provide an opportunity for mutually bene…cial deals between members of the same family.[19] Following Cigno (1993), let a family constitution be de…ned as a set of (unwritten, typically unspoken) rules prescribing, for each date t, the minimum amount of income, z^t, that each adult must transfer to each of her children (if she has any), and the minimum amount of income, x^t, that she must transfer to her parent.[20] Such transfers are subject to the pro viso that nothing is due to a parent who did not herself obey the rules; this makes it in every adult's interest to punish transgressors. That is important, because only an adult can punish another adult; neither children nor old people have the means to do so. Supposing, for simplicity, that r (hence k and w) is constant over time, $x^t = x$, $z^t = z$ for all t.[21]

At this stage of the game, we shall assume that people are self-interested, so that the lifetime utility of each person is given by (1). In the next section we shall argue that, if a cooperative agreement will stick under such unpromising conditions, all the more it will if people love, or may learn to love, their parent and children. The existence of a family constitution gives each adult a choice of two strategies: comply with the constitution (cooperate), or go it alone in the market (defect). Since children cost their parents something (at least p), but will only bring a return if the constitution is complied with, it is clear that go-it-aloners will not have children. Being self-interested, compliers do not transfer

[18] See, for example, Cigno, Giannelli and Rosati (1998).

[19] Such opportunities arise also from di¤erences of sex and other personal characteristics, but we assume these di¤erences away to concentrate on intergenerational relations.

[20] Cigno and Rosati (2000) allow for transfers of personal services, as an alternative to income; more about it in subsection 4:4.

[21] That is a convenient simpli…cation, but there is no conceptual di¢culty in dealing with changing environments, hence with family constitutions that prescribe di¤erent payments to di¤erent generations (or, if the environment is uncertain, that prescribe environment-conditional payments). In Cigno (1993), $(z^t; x^t)$ varies with t.

more than the minimum required by the constitution. For reasons that will become clear in a moment, compliers have no interest in lending to the capital market, and are not allowed to borrow more than a certain quota (normalized to zero).

Denoting the amount lent to the market by s, the pay-o¤ to going it alone is

$$v(r;w) = \max_{s} u_1(w - s) + u_2(rs): \tag{27}$$

For any given $(r;w)$, the choice of s satis…es

$$\frac{u_1'}{u_2'} = r: \tag{28}$$

The e¤ects of changes in r or w on the pay-o¤ of this strategy are

$$v_w = u_1'(w - s);\ v_r = su_2'(rs): \tag{29}$$

The pay-o¤ to complying, provided that the agent's children also comply, is

$$v^{\text{¤}}(w;x;z) = \max_{n} u_1(w - x - (p+z)n) + u_2(xn): \tag{30}$$

For any given $(x;w;z)$, the choice of n satis…es

$$\frac{u_1'}{u_2'} = \frac{x}{p+z}: \tag{31}$$

The e¤ects of changes in x, y or z on the pay-o¤ of this strategy are

$$v_x^{\text{¤}} = -u_1'(w - x - (p+z)n) + nu_2'(xn); \tag{32}$$

$$v_w^{\text{¤}} = u_1'(w - x - (p+z)n); \tag{33}$$

$$v_z^{\text{¤}} = -nu_1'(w - x - (p+z)n): \tag{34}$$

If

$$v^{\text{¤}}(w;x;z) \geq v(r;w); \tag{35}$$

complying is the best response to everyone else doing the same. The set of "comply" strategies (one for each member of each generation) is thus a Nash equilibrium. Since complying implies threatening one's own parent of punishment if she does not comply too, and since the threat is credible, because carrying it out is in the interest of the person making it, the equilibrium is sub-game perfect. In equilibrium, the threat is never carried out because everybody complies.

For a complier, having a child is a form of investment, costing $p + z$ in the current period, and yielding, in equilibrium, x in the next. Since a complier must pay a …xed amount x to her parent, irrespective of how many children she has, a necessary condition for (35) to be true is that the return to having a child is strictly larger than the return to buying conventional assets from (lending to) the market,

$$\frac{x}{p + z} > r: \tag{36}$$

Were that not so, there is in fact no way that an agent could recover the …xed cost of complying. Given (36), a complier will not save.[22]

While making it disadvantageous for compliers to lend to the market, (36) makes it advantageous for them to borrow from the market in order to …nance additional births. But there are limits to this arbitrage operation. First, fertility cannot increase without bound because it will eventually hit its physiological ceiling. Second, there is no legal mechanism through which entitlements arising from an informal family arrangement can be transferred to another person. Since an entitlement that cannot be legally transferred cannot be used as collateral to obtain credit from the market, we assume that compliers cannot borrow from the market at all, but nothing of substance would change if we allowed them to borrow up to some positive amount, smaller than nz.

Figure 1 illustrates the properties of the set of constitutions that can be supported by a sub-game perfect Nash equilibrium. The set consists of all the $(z; x)$ pairs that satisfy (35). Since young children have no income, and cannot consequently make transfers to their parents, z cannot be negative. It can be zero, however, because agents are past childhood, and have already received z from their own parents. They would thus be happy to subscribe to a constitution that did not oblige them to make transfers to children (in addition to the paying for their subsistence consumption, included in p) in the current period. On the other hand, agents would not countenance a constitution that did not entitle them to receive transfers from their children in the next period. Therefore, all points of the set satisfy $z \geq 0$, and $x > 0$.

The boundary of this set is the locus of the $(z; x)$ pairs that make

[22] Strictly speaking, that is true only if the physiological ceiling on fertility is not binding. Were it binding, the agent could not procure as many children (acquire as many entitlements to future transfers) as she would like, and would then …nd it optimal to top-up her stock of domestic credits with market assets; in other words, save (Cigno, 2000). Allowing for this possibility complicates the analysis without bringing any additional insight.

(35) into an equation. The slope of the boundary is

$$\frac{dz}{dx} = \frac{(p+z)\,n - x}{nx}: \tag{37}$$

Since

$$\frac{d^2z}{d(x)^2} = -\frac{p+z}{(x)^2} \tag{38}$$

is negative, z is maximized at the point, shown in Figure 1 as $(z^{\alpha}; x^{\alpha})$, where

$$\frac{x}{p+z} = n: \tag{39}$$

As v_r is positive in view of (29), a rise in r will shift the boundary inwards. Intuitively, that is because the lowest rate of return to children that makes complying with the constitution at least as attractive as going it alone in the market increases with the market rate of interest. By contrast, a rise in w shifts the boundary outwards. In view of (29) and (33) v_w and v_w^{α} are in fact positive. In view of (36), however, the rate of return to children is higher than the rate of return to capital. As a consequence, compliers consume less than go-it-aloners in the current period, and the marginal utility of current income is thus higher for the former than for the latter. Therefore, v_w^{α} is higher than v_w. While an exogenous rise in the interest rate would make the set of sustainable constitutions smaller, an exogenous rise in the wage rate would thus make it larger. For $\frac{w}{r}$ sufficiently low, the set may be empty.

An interesting implication of the role of capital in providing an alternative to intra-family arrangements is that a sustained rise in the interest rate, or easier access to financial markets for wider strata of society, would result in lower aggregate fertility.[23] Neher, mentioned earlier, reached the same conclusion by a different route. This gives an analytical basis to Leibenstein's original intuition.

4.1.2 Picking a constitution

Given that an infinite number of (z; x) pairs may satisfy (35), and that an infinite number of constitutions might thus be sustained by a sub-game perfect Nash equilibrium, which will prevail? Cigno (1993) suggests that the family founder will choose the constitution which suits her best. Since the founder is a selfish adult, she will obviously favour the one that prescribes the largest sustainable transfer to the old, and zero transfers

[23] Cigno and Rosati (1992) find evidence of that in a developed country, Foster and Rosenzweig (2000) in a developinng one.

(on top of the subsistence level) to children. In Figure 1, this constitution is represented by point $(0; x^m)$.[24]

Cigno (2000) o¤ers an alternative selection criterion, akin to the renegotiation-proofness concept developed by Bernheim and Ray (1989), and Maskin and Farrell (1989).[25] At any date t, any member of generation t is at liberty to propose a new constitution. Will subsequent generations take any notice? Not if (i) the old constitution satis…es (35), and (ii) no other constitution satisfying (35) makes generations t, t + 1, t + 2, ... better-o¤. In other words, a constitution is renegotiation-proof if, in addition to being a sub-game perfect Nash equilibrium, it allocates consumption across generations in a Pareto-optimal way. The argument runs as follows.

If there are no free lunches to be dished out, the only way a person can o¤er her children a better deal than the existing constitution, and not loose in the bargain, is by paying her own parent less than the existing constitution requires. That, however, would mean defaulting on the existing constitution. Her children would then be better-o¤ upholding the existing constitution, which entitles them to pay nothing to their parent, than acquiescing to the proposed new one.[26] Once established, a constitution satisfying the double requirement of being a sub-game perfect Nash equilibrium and an intergenerational Pareto optimum is thus unamendable.

For any given n and w, a constitution prescribing $(z; x)$ is a Pareto optimum if it maximizes

$$u(n; z; x) \equiv u_0(z) + u_1(w - x - (p + z)n) + u_2(xn); \qquad (40)$$

and thus satis…es

$$\frac{u_0'}{u_1'} = n = \frac{u_1'}{u_2'}: \qquad (41)$$

Given such a constitution, parents have the number of children that equates their marginal rate of substitution of adult for old-age consump-

[24] Provided, of course, that the associated n does not violate the physiological ceiling on fertility. If it does, the founder will pick the constitution that makes it optimal for each family member to choose n just equal to that maximum.

[25] But those articles refer to a situation where the players are always the same, not to an overlapping generations model like the present one, where the players change at each round.

[26] Anderberg and Balestrino (2002) point out that this corresponds to the weak notion of renegotiation-proofness (internal consistency). The strong notion (external consistency) requires an equilibrium to be undominated by any weakly renegotiation-proof equilibrium.

tion to the rate of return to children implied in the constitution,

$$\frac{u_1'}{u_2'} = \frac{x}{p+z}: \tag{42}$$

Does any of the constitutions that can be sustained by a sub-game perfect Nash equilibrium satisfy (41) ¡ (42)? At any point in the set of sustainable constitutions, $\frac{u_1'}{u_2'}$ is equated to $\frac{x}{p+z}$ by choice of n. The constitution represented by point $(z^{\alpha}; x^{\alpha})$ of that set prescribes the largest enforceable transfer to each child. In view of (39), the number of children chosen in correspondence with that constitution is equal to $\frac{x}{p+z}$. Hence, $(z^{\alpha}; x^{\alpha})$ satis…es (41) ¡ (42). Of all the constitutions that can be sustained by a sub-game perfect Nash equilibrium, the one that prescribes the largest transfer to each child is thus renegotiation-proof. The constitution that the family founder would have found most advantageous, $(0; x^m)$, o¤ers a higher marginal return, $\frac{x^m}{p} > n$, but is not renegotiation proof.[27]

We have thus found that the winning constitution allocates consumption e¢ciently across generations, and over the life-cycle of each generation. In view of (36), however, it induces parents to choose n greater than r. Recalling that the socially optimal n is no greater than r, this means that fertility will be too high.[28] Therefore, spontaneous intra-family arrangements yield an e¢cient allocation of consumption given the population pro…le, but the population pro…le is not the social optimum.

4.2 Altruism within the family

The hypothesis that parents derive direct utility from the well-being of their children, but not the other way round, is central to the Becker-Barro model examined in subsection 3:2. As far as we are aware, this idea has not been pursued in connection with a family constitution, but it is not di¢cult to see what di¤erence it would make. The …rst thing to be noted is that, if the utility function is (15), a constitution is still needed to get adults to support their parents. The second is that not only compliers, but also go-it-aloners, may now have children. Since go-it-aloners get only direct utility from children, however, while

[27] The founder's children would thus ignore it, and set themselves up as generation 0.

[28] The same is true in Neher (1971), examined at the beginning of this subsection. There too, fertility is too high because the return to investing in children is higher than the return to investing in conventional assets. There, however, the rules that cause this to happen are taken as given.

compliers get also indirect utility (via transfers), the latter will still have more children than the former as in the basic model. The third is that compliers will still have more children than is socially optimal. Loving parents might in fact be willing to support their children even if they expected nothing in return, but would still require some inducement to comply with a constitution that obliges them to support their own parents.

The case of bilateral altruism is less straightforward. The most optimistic assumption one can make is that all members of the same dynasty unanimously maximize the same utility function (17), subject to the same dynastic budget constraint (22). There are no nonnegative bequest constraints, in this case, because children would be happy to subsidize their parents if need be. As every member of the same dynasty solves the same optimization problem, there is then no call for a family constitution to coordinate individual decisions. Since the …rst-order conditions for an individual optimum coincide with those for a Millian optimum, the individual fertility decisions generate a socially optimal population pro…le; given that pro…le, the intergenerational allocation of consumption is a Pareto optimum.

A less optimistic assumption is that the utility functions of di¤erent generations are symmetrical, rather identical. To keep things simple, suppose that, at date 0, there is one adult with an exogenously given number of children, n. Suppose that this person will have no grandchildren, so the story ends with generation 1. The parent would like to maximize

$$U^0 = u_1\left(c_1^0\right) + u_2\left(c_2^0\right) + \delta n\left[u_0\left(c_0^1\right) + u_1\left(c_1^1\right) + u_2\left(c_2^1\right)\right];\ 0 < \delta \leq 1; \tag{43}$$

subject only to the dynastic budget constraint,

$$c_1^0 + \left(p + c_0^1\right)n + \frac{c_2^0 + c_1^1 n}{r^0} + \frac{c_2^1 n}{r^0 r^1} \leq w^0 + \frac{w^1 n}{r^0}. \tag{44}$$

Each of her children would like to maximize

$$U^1 = u_0\left(c_0^1\right) + u_1\left(c_1^1\right) + u_2\left(c_2^1\right) + \frac{\delta}{n}\left[u_1\left(c_1^0\right) + u_2\left(c_2^0\right)\right];\ 0 < \delta \leq 1. \tag{45}$$

subject to the same budget constraint. If $\delta = 1$, we are back to the unanimity case. If $\delta < 1$, however, there is a con‡ict of interest between the two generations (and, since there are no rotten kids,[29] the eponymous

[29] Since children love their parent, albeit less than they love themselves, the utility of the former is not entirely contained in that of the latter.

theorem does not apply). Assuming n = 1, Stark (1993) suggests that the intergenerational allocation will be the solution to a non-cooperative game between the parent and the child, and …nds that this is generally ine¢cient. If the story literally ends at date 1, there is no alternative to such an unsatisfactory outcome. If the story goes on, however, a self-enforcing family constitution may exist, and the best any family member can do is then to comply with it.

Which of the assumptions that we have considered in this subsection is the right one? Arguably none. Love for one's parent or children (the Latin pietas, not to be confused with amor, sexual love) is not something that one is born with, but something that develops with acquaintance. Psychologists talk of "bonding", ethologists of "imprinting". In Becker and Murphy (1988) and elsewhere in Gary Becker's writings, the process of getting to love a parent or a child is compared with becoming addicted to the consumption of a certain good.[30] Making somebody's utility or consumption an argument in someone else's ex-ante utility function does not capture this. Let us then consider the following alternative.

A childless adult cannot love her children because she does not have any, but may love her parent. She looks for the best way of providing for her own old age. If a self-enforcing constitution exists, the best she can do is comply with it. She will then …nd it advantageous to have children. If she loves her own parent, she may give her more than the minimum prescribed by the constitution. Once her children are born, she may get to love them, and give them too more than the constitution prescribes. In turn, her children may get to love her, and give her more than the constitution prescribes. If the same happens at every step, each member of the dynasty will consume more than z when she is young, and more than nx when she is old, but not necessarily. It may in fact happen that some member of some generation, a black sheep (or, if you prefer, a rotten kid), will not get to love her parent or children. In the absence of a self-enforcing constitution, this black sheep would give her parent or children nothing. Given that there is one, she will pay them the minimum that the constitution prescribes. In the same way as legal sanctions and a police apparatus are needed to deter possible malfeasance even in a generally law abiding society, so a self-enforcing constitution is needed as a defence against the possible appearance of a black sheep even in a mostly loving family.

Since complying is the dominant strategy, the argument goes through irrespective of whether the agent attaches some positive probability to

[30] Something similar happens also outside the family. Experimental economists report that players behave di¤erently in arti…cial game situations if they have had the opportunity to become acquainted beforehand, than if they go in cold.

the event that she will get to love her children when she has them, or is taken entirely by surprise. Therefore, what we are proposing is not a veil-of-ignorance argument (Rawls, 1971). According to the latter, the agent favours a redistributive policy because she is not sure whether she will be among the benefactors or the bene…ciaries. Here, by contrast, the agent knows full well that the constitution will make her a benefactor in the current period, and a bene…ciary in the next. The uncertainty is only about whether any agent, herself included, will give more than is strictly required.

4.3 Heterogeneity, uncertainty, and the demand for attention

We have reasoned, so far, as if all persons with the same birthday were exactly the same. In the present context, this implies that either all families have the same self-enforcing constitution, or none does. Starting from an equilibrium where r is so low relative to w that everyone complies and nobody saves (capital accumulation is entirely …nanced by foreigners), the economy would then jump suddenly to an equilibrium where everyone goes it alone and nobody has children (aggregate fertility is zero, and the economy ends there) if r rises su¢ciently relative to w. This unrealistic bang-bang feature is eliminated if we allow members of the same generation to di¤er in their ability to produce income, or cost of raising children. It is then possible that some families will have a self-enforcing constitution, and others will not (or, if we identify the family with its constitution, that some individuals will have a family, and others will not). Given heterogeneity, the e¤ect of a factor price change would be to shift the margin between complying and going it alone, rather than cause everyone to jump from one camp to the other (Cigno, 2000).[31]

We have also reasoned as if future states of the world were known with certainty. Let us drop this assumption. It may the happen that, for reasons beyond their control (lack of ability, ill health, premature death), today's young will not be in position, tomorrow, to pay their parents a …xed x. It is also possible that a radical change of government, or a sharp rise in the internationally determined interest rate, will alter the economic environment in such a way, that a constitution prescribing a …xed payment to the old becomes unenforceable. One way to deal with that is to make constitutional prescriptions conditional on the state of the world. The constitution will then allow the risk to be shared

[31] With a continuum of agents, that would generate a functional relationship between aggregate household saving and factor prices. In a closed economy, the interest rate would be endogenously determined by this relationship.

between generations as in Di Tella and MacCullogh (2002).[32] Such a constitution may not be self-enforcing, possibly because of the high cost of working out a sequence of z and x for each conceivable sequence of exogenous events. Whether it exists or not, it may be worthwhile for a risk-averse complier to do some precautionary saving, in addition to having children, as in Rosati (1996). That remains true if not only the return to children, but also the return to capital is uncertain (provided that risks are uncorrelated, or negatively correlated).

Another assumption we have been making is that market goods are the only source of utility. We now allow for the possibility that the market does not provide a perfect substitute for the personal services ("attention") of the agent's own parent or children. Cox (1987), and Cox and Jakubson (1995) hypothesize intra-family exchanges of money for attention. The idea of commerce sits somewhat uncomfortably next to that of imperfect substitutability, because the latter implies that the person giving the attention is somehow "special" to the one receiving it. One way to reconcile the two propositions is to say that, instead of getting to love a child or a parent, a person may (in Becker's analogy) become "addicted" to the child's or the parent's services.[33] If that is the case, however, commerce may lead to exploitation.

Suppose, for example, that an elderly parent does not regard the assistance of a professional helper as a perfect substitute for the attention of her own children, but her children are indi¤erent between hiring themselves out to the market or to their own parent. The children can then exploit this asymmetry by colluding to raise the price of attention to such a point, that the parent is indi¤erent between buying from them or from the market. The entire surplus produced by the exchange is then appropriated by the children.

An example of opposite sign is provided by Bernheim, Schleifer and Summers (1984), who argue that parents make bequests in order to get cut-price attention from their children.[34] The idea is that the parent can o¤er her children (there must be more than one) a contract, - in e¤ects, write a conditional testament - whereby she pre-commits to leaving her entire estate to the child who gives her most attention. Since the parent has the outside option of buying from the market, the testament will

[32] A constitution then does for a family what a pay-as-you-go pension system may do, under certain conditions, for society as a whole; see, for example, Thorgersen (1998) and Wagener (2003).

[33] That is not be as far-fetched as it sounds. In certain symbiotic partnerships (between an elderly parent ad an adult child, for example, or between elderly spouses), the parties do not appear to like each other very much, yet cannot do without the other.

[34] The argument is further developed in Cremer et al. (1992); see Section 6.

have a clause stating that the money will go to someone other than the children if the attention provided by them falls below a speci…ed minimum. By dangling this all-or-nothing o¤er, so the argument goes, the parent can extract from the children the entire surplus generated by the exchange. To this it may be objected,[35] however, that children could counter the parent's move by drawing up a perfectly legal contract among themselves, whereby they agree that (a) only one of them will give the parent any attention (the minimum stated in the testament), and (b) the child receiving the estate will keep back just enough of it to compensate her for the attention given to the parent, and share the rest equally with her siblings.

Exploitation on either side can be avoided if attention giving is incorporated into the family constitution. Cigno and Rosati (2000) reformulate the constitution story to the e¤ect that each adult is required to transfer a certain level of utility, rather than income, to her elderly parent and young children. Permitting agents to choose the combination of money and personal services with which to discharge their family duties minimizes the cost of complying. Since attention substitutes for money at a diminishing marginal rate, it also raises the maximum level of utility that a self-enforcing constitution can require agents to give their parent and children. Extending the model in this way makes it more likely that an intra-family scheme can o¤er a higher return (in utility, rather than in money terms) than the market, and thus that a self-enforcing family constitution exists. It also explains why, in developed countries, voluntary monetary transfers to the young by far exceed voluntary money transfers to the old. Having relatively large pensions or accumulated savings, the old will in fact value personal services without perfect market substitutes more than money.

5 Public transfers and population policy

We have seen that the laissez faire equilibrium is generally not a social optimum. We now look for ways in which this can be remedied by policy, under the assumption that the government (i) can observe parental actions, and (ii) does not have to account to an electorate for its policies. The problem of hidden parental actions will be dealt with in Section 7, that of political acceptability in Section 8.

5.1 The state and the market

Suppose that the market is the only spontaneous coordination mechanism available. Groezen, Leers and Meijdam (2003) show that a Millian

[35] The point was originally made in Cigno (1991).

social optimum can be implemented by the introduction of a pay-as-you-go pension scheme, side by side with a system of child bene…ts …nanced by a lump-sum tax on adults. Analogous results were obtained by Peters (1995), and Kolmar (1997). Groezen et al. assume that people derive utility from their own consumption and number of children, but not from their children's consumption or utility.[36] The argument, however, has more general validity. We adapt the analysis for the case where, as in our basic model, people derive utility from their own lifetime consumption only.

Suppose that the interest rate is constant over time. Let ´ be a lump-sum bene…t payable to each old person, and μ a lump-sum contribution payable by each adult. Assuming that the scheme must break even for each generation,

$$´ = \mu r; \tag{46}$$

the policy imposes a life-cycle reallocation, but not an intergenerational transfer. Similarly, let ' be the bene…t payable to adults for each child they have, and ¿ a lump-sum tax, payable by each adult. Assuming that it, too, must break even,

$$'n = ¿; \tag{47}$$

this scheme does not impose an intergenerational transfer, but does re-distribute in favour of adults with children. Having assumed that parental actions are observable, the government can make sure that parents spend the subsidy ' for their children.[37]

Let $c_i^¤$ denote the socially optimal value of c_i, and $n^¤$ the socially optimal value of n. Suppose that the young cannot borrow. Given r, the government can implement a social optimum by setting $´ = c_2^¤$, $\mu = \frac{c_2^¤}{r}$, $' = p + c_0^¤$, and o¤ering tax payers the following "forcing contract":[38]

$$\begin{array}{ll} ¿ = (p + c_0^¤)\, n^¤ & \text{if } n = n^¤;\ c_0 = c_0^¤. \\ ¿ = ¿^0 > (p + c_0^¤)\, n^¤ & \text{otherwise} \end{array} \tag{48}$$

[36] They also use a special functional form of $u_i(:)$, and assume zero social time preference ($± = 1$).

[37] Alternatively, we could suppose that the government can pay the subsidy directly to the child (e.g., in the form of free and compulsory education, school meals, etc.). Were neither of these propositions true, there would be an agency problem; see the next section.

[38] The expression comes from the principal-agent literature, and applies to any situation where the agent's actions are observable by the principal. As pointed out in the Introduction, a forcing contract applied to the number of childen as an unpleasant ring about it, but this is purely a consequence of the simplifying assumption that parents control the number of births, and that the action of procuring a certain number of children thus coincides with its visible outcome; more about this in section 8.

An agent has then only two relevant alternatives: either beget n^{α} children, spend $p + c_0^{\alpha}$ for each child, and save nothing; or have no children, and save some positive amount, s. Given (1), the pay-o¤ to the …rst course of action is

$$u_1(w - \mu) + u_2(\acute{}) : \tag{49}$$

The pay-o¤ to the second is

$$\max_s u_1(w - \mu - \grave{}^0 - s) + u_2(\acute{} + sr) : \tag{50}$$

By setting $\grave{}^0$ su¢ciently large, the government can induce the agent to choose the …rst alternative. Then, $n = n^{\alpha}$, and $c_i = c_i^{\alpha}$ $(i = 0; 1; 2)$.

For $\pm = 1$, the socially optimal value of n is r. In view of (46), the pension scheme can then be …nanced on a pay-as-you-go[39] basis. There is a problem if $\pm < 1$, for in that case the optimal n is less than r. If the scheme is to be pay-as-you-go, (46) must then be replaced by $\acute{} = \mu n$, implying that the return to participating in the scheme will be less than the market rate of interest (Aaron, 1966). Alternatively, participants might be remunerated at the market rate, but (46) must then be dropped, implying that the pension fund de…cit will be covered by general taxation, or by the issue of public debt. Either solution raises questions of long-term political viability (we shall look into that when we come to section 8).

Notice that the pension system on its own creates a positive population externality, because atomistic agents have no reason to take into account that an extra birth increases social welfare by relaxing (46). As a child costs p, but brings no private bene…t in the absence of policy, agents will then have no children. The per-child transfer ' has the nature of a Pigovian subsidy.

Continuing to assume that all agents are the same, a Millian social optimum is thus obtained by introducing a combination of public pensions (not necessarily pay-as-you-go) and child bene…ts, backed up by penalties for parents who do not have the socially optimal number of children,[40] or spend less than is socially optimal for each child. The resulting system of public transfers looks remarkably like a family constitution, with $\acute{}$ in place of x, and ' in place of z, but there is an important di¤erence. Since the government, unlike the family, has the power to coerce, it does not need to pay over the odds to get agents to

[39] In a pay-as-you-go pension system, the taxes paid by generation t are used to …nance the bene…ts for generation $t - 1$, rather than invested at the interest rate $(r - 1)$ to …nance the bene…ts for generation t.

[40] But see the penultimate footnote.

participate in its scheme. That is what permits the government to reach a …rst best.

In real life, however, agents may di¤er in a number of characteristics (earning capacity, cost of raising children, etc.). Personalized transfers would thus be needed to achieve a …rst best. If some personal characteristics are private information, a …rst best may then be out of the question, but the government may have statistical information on the distribution of these characteristics (in other words, the government may know how many persons have a certain characteristic, but not who is who), which must be used to reach a second best.

A route the government can follow in the search for a second best is to induce agents to reveal their characteristics by o¤ering them a menu of …scal treatments, one for each type of agent (combination of personal characteristics). This approach, originally devised by James Mirrlees and further developed by Joseph Stiglitz, involves distorting the decisions of the type more benignly treated by the …sc, in order to deter mimicking (i.e., to make it unpro…table for the less benignly treated type to imitate the behaviour of the more benignly treated one in order to qualify for its …scal treatment). Since children are visible, mimicking is more di¢cult in an endogenous than in exogenous fertility context, because the mimicker must procure the same number of children as the mimicked. Balestrino, Cigno and Pettini (2002) take fertility as endogenous, and assume that agents are di¤erentiated by two characteristics, earning ability and cost of raising children. Cremer, Dellis and Pestieau (2003) take fertility as exogenous, and treat the number of children as a di¤erentiating personal characteristic, along with the agent's earning ability. Both papers assume descending altruism.

If the self-revelation game is too costly to administrate, the government may give up the idea of discovering who is who, and pursue the alternative route of linear taxation. Since the number of children is easily observable, however, the information conveyed by this variable should be exploited in the design of the second-best policy. Cigno and Pettini (2002) take this line under the assumption that (i) fertility is endogenous, (ii) agents are di¤erentiated by their earning capacity only, (iii) parents love their children, and (iv) it is possible to distinguish, hence tax di¤erentially, goods consumed prevalently by adults, from goods consumed prevalently by the young. The last assumption gets over the problem that goods are bought anonymously by adults, and that it is thus not possible to know how the family budget is allocated between parents and children. The second-best policy is to subsidize child-speci…c commodities, and to tax adult-speci…c commodities and the number of children, if household expenditure for child-speci…c goods is decreasing

in the wage rate; to tax all goods, and subsidize the number of children, if the opposite is true. The optimal policy choice depends, therefore, on the relative wage elasticities of fertility and expenditure per child.

Cremer et al., already mentioned, also look for an optimal combination of linear income taxes and child subsidies as an alternative to getting agents to reveal their characteristics, but they do not distinguish between child and adult-speci…c goods. Since they take fertility as exogenous, the number of children is a distinguishing household characteristic. The second-best policy is to make the income tax rate a decreasing function of the number of children. The optimal relationship between the child bene…t rate and the number of children cannot be established analytically, but the simulation experiments carried out by the authors seem to indicate that the rate should increase with the number.

5.2 The state, the market and the family

Now suppose that self-enforcing family constitutions exist. Since constitutions allocate consumption e¢ciently given the population pro…le, and all that is wrong is the fertility rate, one might then be tempted to conclude that a punitive tax on agents who depart from the socially optimal fertility would give us a social optimum. But things are not so simple. As we saw in the last section, compliers choose how many children to have subject to the family constitution. If the threat of a punitive tax deters agents from having the number of children that would maximize their lifetime utility, they may no longer …nd it advantageous to comply with the constitutional requirements.

Suppose the government introduced a pension scheme of the type outlined in the last subsection. Since go-it-aloners have no children, and the pension scheme yields the same return as the market in view of (46), the policy has no e¤ect on them. The e¤ect on a complier's fertility is given by

$$\frac{dn}{d\mu} = - \frac{(p + z) u_1^{0} + rxu_2^{0}}{(p + z)^2 u_1^{00} + x^2 u_2^{00}}; \tag{51}$$

clearly negative. The e¤ect on her utility,

$$\frac{dv^{\alpha}}{d\mu} = - u_1^{0} + ru_2^{0}; \tag{52}$$

is also negative in view of (31) and (36).

Continuing to assume that all agents are the same, and that they are compliers (otherwise, we are back to the case of the last subsection), the policy then leaves the current generation worse-o¤. On the other hand, the size of the pension system can be so chosen that the population

pro…le, and the related consumption allocation, are optimal from the next generation on. If the second e¤ect is larger than the …rst, the policy raises social welfare, but the outcome is obviously not a …rst best.

Let us now drop the assumption that agents are the same,[41] and suppose that there is a large number of di¤erent agent types. In the absence of policy, certain types comply (with di¤erent constitutions), and others go it alone. Since the policy reduces the pay-o¤ to complying, but has no e¤ect on the pay-o¤ to going it alone, a number of family constitutions will cease to be self-enforcing if the government introduces a pension scheme. A number of agents, who otherwise would have complied, will now go it alone. The e¤ect of the policy is qualitatively the same as if all agents were the same.

Could there be an advantage in introducing a child bene…t system, of the type outlined in the last subsection, alongside the pension scheme? If all agents are the same, they have the same number of children, and the policy has no re-distributive e¤ects. If agents are di¤erent, however, the policy re-distributes from go-it-aloners to compliers (and from compliers with fewer children, to compliers with more). It may thus be used to moderate the initial welfare loss caused by the introduction of a (funded) pension system.[42]

However, child bene…ts a¤ect fertility. Let n_j denote the number of children of, and $(z_j; x_j)$ the constitutional requirements applicable to, agent j (if j is a go-it-aloner, $z_j = x_j = 0$). In view of (47),

$$\frac{dn_j}{d\epsilon} = -\frac{u_1'}{nH} + \frac{n_j - n}{n}\frac{\left[p + z_j - \frac{\epsilon}{n}\right]u_1''}{H}; \tag{53}$$

where

$$H \equiv \left[p + z_j - \frac{\epsilon}{n}\right]^2 u_1'' + (x_j)^2 u_2'' < 0:$$

The …rst term on the right-hand side of (53) is the negative of the substitution e¤ect, clearly positive for all agents, including go-it-aloners. The second is the income e¤ect, proportional to $(n_j - n)$. Assuming that, for any complier, the child bene…t rate is no greater than the cost of raising a child (otherwise, we would have a corner solution, with n_j at

[41] The U^t that …gures in the Millian social welfare function (see section 2) must then be re-interpreted as the mean (and that which …gures in the Benthamite social welfare funtion as the sum) of the utilities of the individual members of generation t.

[42] Using n to denote the fertility rate, and n^i to denote the number of children of agent j, the e¤ect of (a small) ϵ on the utility of agent i is equal to $\frac{n^i - n}{n}$ times the marginal utility of current consumption for agent j. Given diminishing marginal utility, the utility loss of agents with less than n children will then be more than compensated by the utility gain of those with more than n children.

the physiological maximum), the income e¤ect is positive for agents with above-average fertility, negative for agents with below-average fertility (including all go-it-aloners), and zero for those with average fertility. Child bene…ts thus raise n. A larger pension scheme would then be needed to achieve the same fertility reduction.

Using the two policy instruments together may be better than using just the pension system. To achieve a …rst best, however, the government would have to eradicate family constitutions entirely, and replace them with its own schemes in the way indicated in the last subsection. There are several reasons why this may not be possible. One, mentioned in the last subsection, is that some personal characteristics may not be observable by the government. Another is that the public sector may not be able to provide perfect substitutes for the attention of the agent's own parent and children any more than the market can (see the discussion in subsection 5:2.). Yet another is that informational asymmetries may not allow the public sector to fully replace the family in its mutual insurance role.[43] All of this helps explain why, in reality, public transfer do not appear to fully crowd out intra-family transfers,[44] and family arrangements survive in the folds of the welfare state.

6 Education

Re‡ecting a growing interest in human capital as the mainspring of economic growth, numerous papers on intergenerational transfers, including Cremer, Kessler and Pestieau (1992), Docquier and Michel (1999), Kaganovich and Zilcha (1999), Pecchenino and Utendorf (1999), Kemnitz (2000), Boldrin and Montes (2002), and Anderberg and Balestrino (2003), focus on the e¢ciency of private provision for children's education, rather than consumption. The basic questions asked in this subliterature are analogous to those posed in earlier sections. If the young are rationed in the capital market, what is the socially optimal level of transfers from parents to young children, and from grown-up children to elderly parents? Is laissez faire e¢cient? What can be done if it is not?

Education, however, is a factor in the production of human capital. In turn, human capital is an input, alongside ordinary capital, into the production of income. There is thus a portfolio choice problem. To compensate for this complication, the authors make a number of simplifying assumptions. A common one is to treat fertility as exogenous. This might be justi…ed by saying that parents decide …rst how many children to have, and then how much to invest in their children's education. In

[43] See Di Tella and MacCulloch (2002).

[44] Evidence of that is reported by Cox and Jakubson (1995), and Cigno, Giannelli and Rosati (1998), among many others.

a static analysis of education decisions, it is thus legitimate to take the number of children as given. Not so in a dynamic analysis, where fertility choice and educational decisions are linked by backward induction.

Further simpli…cations include a disregard for the above-subsistence consumption of the young ($c_0 = 0$), and the assumption that the only e¤ect of education is to increase future earning capacity. With the exception of Pecchenino and Utendorf, all the authors mentioned assume that agents are moved by self-interest; with the exception of Cremer et al., who introduce …lial attention in the utility function of parents, they also assume that utility depends only on goods bought from the market.

6.1 Market equilibrium and education policy

Taking the lowest common denominator of the various contributions, we write the life objective of each member of generation t as

$$U^t = u_1 \left(c_1^t\right) + u_2 \left(c_2^t\right): \tag{54}$$

The income produced by an adult at date t is given by

$$y^t = f \left(h^t; k^t\right); \tag{55}$$

where f (:) is a constant-returns-to-scale production function with the usual properties, h^t is the stock of human capital, and k^t the stock of capital, all in per-adult terms. The stock of human capital is similarly determined by

$$h^t = g \left(e^t; »\right); \tag{56}$$

where g (:) is another production function, with properties analogous to those of f (:). Here, e^t denotes the (cost of the) education that a member of generation t received at date t ¡ 1, and » is a parameter, representing the endowment of human capital that a person receives at birth ("native talent").

The interest rate is still exogenous, but this does not pin down the capital/labour ratio as in the one-asset model of earlier sections, because it is now possible to substitute capital with human capital in the production of income. Given constant returns to scale, however, the asset mix and the price of human capital are determined by the rate of interest. The resource constraint is now

$$f \left(g \left(e^t; »\right); k^t\right) ¡ r^t d^t = \frac{c_2^{t¡1}}{n^{t¡1}} + c_1^t + \left(p + e^{t+1} + k^{t+1} ¡ d^{t+1}\right) n^t: \tag{57}$$

The …rst-order conditions for maximizing social welfare,[45] subject to (57), include (6) and the second of the equations in (7).[46] In place of (3), we now have

$$f_h\left(h^t;k^t\right)g_e\left(e^t;\varepsilon\right)=r^t-1=f_k\left(h^t;k^t\right). \tag{58}$$

This is a portfolio condition, stating that the rate of return to education must equal the rate of return to saving.[47] Since fertility is exogenous, the …rst-order conditions for a social optimum coincide with those for a Pareto optimum.

Is market equilibrium e¢cient? Boldrin and Montes (2002) address the question under the assumption that people can take their own lifetime decisions right from the word go, and that there are no parents (loving or otherwise) willing to buy goods for their children.[48] The only di¤erence between this and the Modigliani-like model of section 3:1 is that any above-subsistence expenditure taking place in period-0 is now supposed to buy education, rather than consumption.[49]

In the absence of credit rationing, a person born at date $t-1$ chooses $(e^t;c_1^t;c_2^t)$ to maximize (54), subject only to the lifetime budget constraint

$$\left(p+e^t\right)^{\phi}r^t+c_1^t+\frac{c_2^t}{r^t}=h^tw^t; \tag{59}$$

where w^t is now the price of human capital at date t (rather than the wage rate as in earlier sections); the wage rate is now h^tw^t. Given (56), this person borrows from the capital market, in period 0, to the point where the marginal bene…t of education equals the marginal cost,

$$w^tg_e\left(e^t;\varepsilon\right)=r^t-1. \tag{60}$$

[45] With exogenous fertility, it does not matter whether the social welfare function is of the Benthamite, or the Millian variety. Since the only di¤erence between the two is that the generational weighting factor is $\pm n$ in the former, $\pm$ in the latter, using one or the other makes no qualitative di¤erence when n is given.

[46] The …rst equation has disappeared because there is no consumption in period 0.

[47] Like Boldrin and Montes, we are implicitly assuming that the young cannot save, and adults cannot be educated. Without this simpli…cation, the timing of investment would have to be endogenously determined.

[48] They also assume a closed economy. As this complicates matters, but makes no di¤erence to the points of concern here, we stay with our small-open-economy assumption.

[49] Actually, Boldrin and Montes assume that p, too, is equal to zero (the young live on air). We retain the positive value of p.

In period 1, the same person lends to the capital market (saves $s^t \equiv h^t w^t - c_1^t$) to the point where her marginal valuation of current consumption equals her marginal valuation of future consumption; (6) is thus satisfied.

Employers[50] equate the marginal product of capital to the interest rate,

$$f_k\left(h^t; k^t\right) = r^t - 1. \tag{61}$$

and the marginal product of human capital to its price,

$$f_h\left(h^t; k^t\right) = w^t. \tag{62}$$

In view of (60), the portfolio condition (58) is then satisfied. As in the simple life-cycle model of subsection 3:1, if everyone is free to borrow or lend any amount at the given interest rate, market coordination is thus enough to ensure that individual decisions allocate consumption efficiently.

As in subsection 3:1, however, we must allow for the possibility that the young cannot borrow from the market enough to finance the efficient level of educational investment. The economy will then produce too little human capital. The policy remedy offered by Boldrin and Montes is analogous to that discussed in section 5, a lump-sum transfer τ to every young person, and a lump-sum transfer σ to every old person, each financed by a specific lump-sum tax (respectively, $\lambda = \tau n$ and $\mu = \sigma n$) payable by every current adult. The only difference between this and the scheme of section 5 is that τ is now to be interpreted as an educational grant. If σ is set equal to the optimal c_2, and τ equal to the optimal e,[51] individual choice will yield the social optimum.[52]

If parents are altruistic as in Pecchenino and Utendorf (1999), however, public transfers may crowd out voluntary provision for education. We shall see in the next subsection that the same is true if parental choice is conditioned by the existence of self-enforcing family constitutions.

6.2 Families again

Instead of going straight for corrective policy, Anderberg and Balestrino (2003) look first for the possibility of an intra-family solution to the rationing problem faced by the young. As in the model of subsection

[50] The introduction of a second asset makes it necessary to bring firms explicitly into the analysis, albeit in a highly stylized form.

[51] Recall that, by assumption, the government can make sure that parents use τ for their children's education, and not for their own consumption.

[52] As fertility is now exogenous, there is no need for a forcing contract to get parents to deliver the right number of children.

4:1, they start by asking whether a family constitution (they call it a "family norm") involving transfers to children and to the old could be self-enforcing, then check that it is e¢cient. Adults are again faced with the alternative of either complying with a family constitution, or going it alone in the market. As in the model of subsection 4:1, the constitution prescribes the amount x that each adult must pay to her elderly parent, and the amount z that she must pay to each of her young children (in addition to bearing the per-child cost p). The di¤erence is that z now pays for the child's education, rather than consumption ($c_0 = 0$), and that n is assumed to be exogenous.

The …rst step is again to characterize the set of constitutions that can be sustained by a sub-game perfect Nash equilibrium. The pay-o¤ to going it alone in the market is now

$$v(r; wh) = \max_s u_1(hw - s) + u_2(rs): \tag{63}$$

The pay-o¤ to complying is simply[53]

$$v^{\alpha}(wh; x; z) = u_1(hw - x - nz) + u_2(nx): \tag{64}$$

Since go-it-aloners choose s to satisfy (28), a constitution is a sub-game perfect Nash equilibrium if and only if

$$v^{\alpha}(wh; x; z) \geq v(r; wh): \tag{65}$$

The boundary of the set of sustainable constitutions has again the shape depicted in Figure 1, with z reaching a maximum at the point where the marginal return to investing in children is equal to n.[54] Since parents cannot choose their fertility to satisfy (31), however, there is nothing to ensure that $\frac{u_1'}{u_2'} = n$ at the point where z is at a maximum (as in the model of subsection 4:1), or anywhere else in the set of sustainable constitutions.

[53] With the number of children given, a person diciding to comply has nothing left to choose. Anderberg and Balestrino introduce an extra dimension to the choice probem by putting leisure in the utility function, so that the supply of labour becomes endogenous. As the utility function is assumed to be separable in consumption and leisure, however, this has no implications for the rest of the analysis; see also footnote 2.

[54] Since the number of children is now given, p is irrelevant to the comply decision because an agent will have to spend np anyway. The marginal return to investing in children (i.e., to spending z for each child on top of p) is thus $\frac{x}{z}$ rather than $\frac{x}{p+z}$. The necessary condition for (65) to hold is $\frac{x}{z} > r$ rather than (36), as in the endogenous fertility model of subsection 4:1.

Once again, a constitution is renegotiation-proof if (i) it is a subgame-perfect Nash equilibrium, and (ii) it is not dominated by any other sustainable constitution. As there is no guarantee that as In the model of subsection 4:1, any constitution satisfying the …rst of these requirements is a Pareto optimum. As this is not true here, one must then look for the $(z; x)$ pair that maximizes the utility of the representative agent,

$$U(n; x; z; \cdot) = u_1(wh \; ¡ \; x \; ¡ \; (p + z)n) + u_2(nx); \tag{66}$$

where h is given by (56), subject to (65). If the constraint is not binding, the renegotiation-proof constitution satis…es

$$\frac{u_1'}{u_2'} = n = wg_e: \tag{67}$$

The renegotiation-proof constitution is then e¢cient (it is a Pareto optimum),[55] but this can happen only by chance. If the constraint is binding, the allocation is not e¢cient (it is a constrained Pareto optimum). This contrasts with the result of subsection 4:1, that a renegotiation-proof constitution is always e¢cient. Intuitively, the reason for the di¤erence is that, if fertility is endogenous as in subsection 4:1, the constitutional design problem has an extra degree of freedom in comparison with a situation like the present one, where fertility is exogenous.

In the present context, ine¢ciency implies that parents underinvest in their children's education. In other words, if parents invested more, the reduction in period-1 consumption would be more than compensated by the increase in period-2 consumption. An education policy may thus be justi…ed even if self-enforcing family constitutions are in place. The situation is similar to that examined in subsection 5:2, in that the government has to take into account the e¤ect of its policies on the continued existence of self-enforcing family constitutions. The di¤erence is that, in the present model, family constitutions do not deliver an e¢cient intergenerational allocation of consumption as in subsection 5:2. The aim of policy is thus to improve the allocation of consumption to the given population pro…le, rather than to improve the population pro…le at the price of an e¢ciency loss. Anderberg and Balestrino characterize second-best policy under the assumption that only distortionary policy instruments are at hand.

A very di¤erent kind of family is described in Cremer, Kessler and Pestieau (1992). As in Bernheim et al., discussed in subsection 4:3, it

[55] Since childhood consumption (included in p) is exogenous, we do not need to worry about its marginal rate of substitution for adult consumption equalling that of adult for old-age consumption as in the model of subsection 4:1.

is assumed that parents use the promise of a bequest to extract attention from their children at rock-bottom price. But the question is now whether investing in children's education will raise the return in …lial attention su¢ciently to induce parents to invest the e¢cient amount. In the absence of corrective policy, the answer is no. Under certain assumptions about the form of the utility function, and about the rate of population growth, Cremer et al. show that an e¢cient equilibrium can again be induced by a judicious combination of public education and public pensions.

7 Uncertainty and hidden actions

We shall drop some of the more unrealistic assumptions made so far. Suppose that a child's chances of success in life depend in some way on actions taken by their parents, as we assumed in the last section, but that some these actions are not observable by the government. In the context of Section 6, for example, we could re-interpret e as the vector of, broadly educational, activities carried out by the child's parents. While school fees, and some domestic expenditures, are easily observable, some other expenditures, and the time that parents spend with their children, may be impossible (or too costly) for the government to monitor.

That would not make a di¤erence if the unobservable actions could be inferred from the observation of h. It does make a di¤erence, however, if we realistically assume that h depends not also on e, but also on a random factor ("luck"), for in that case the government cannot infer e from the realization of h. The same may be said about fertility decisions, if we realistically recognize that n depends not only on unobservable action (frequency of intercourse, contraceptive practice), denoted by b, but also on some random factor. An implication is that the policy optimization takes the form of an agency problem, with the government in the role of principal, and parents in that of agents. Another, and more fundamental implication is that the normative benchmark developed in section 2 can no longer be applied.

In that section, we assumed that the government's objective ought to be that of maximizing social welfare, de…ned as the mean (or the sum) of the utilities of present and future individuals. That did not con‡ict with the "methodological individualism" principle, that welfare assessments must be based on judgements made by a given set of individuals, because we were assuming that (i) the personal characteristics of future persons are known, and (ii) the number of future persons is either exogenously given, or deterministically chosen by existing persons. The equivalent, in our present context, would be to maximize the expectation of social welfare over all possible states of the world. But that would contradict the

methodological individualism principle, on which normative economic propositions are based, because the individuals that exist in a state of the world are di¤erent from those that exist in another. Maximizing expected social welfare would thus involve averaging judgements made by alternative sets of individuals.

Having assumed that the size and composition of the next generation are uncertain, policy can then be judged only by its e¤ects on the well-being of existing individuals. This does not mean that future generations may be exploited, but it does imply that the well-being of potential persons will be taken in consideration only insofar as it contributes to the well-being of actual persons. Like so many economic propositions, this may be hard to swallow for many decent people, who regard it as their moral duty to do what they think is good for future generations. But that is precisely the point: moral individuals can only do what they think is good for people yet to come. [56] There is thus no con‡ict between the proposition that people, or some of them, are concerned with the well-being of potential persons, and the proposition that welfare judgements can only be based on the preferences of actual persons.

Cigno, Luporini and Pettini (2003) assume that adults can directly choose n, but treat h as a random variable, with given density conditional on e. In a follow-up paper, Cigno and Luporini (2003), n is treated as a random variable too, with given density conditional on b. Relaxing the assumption that children can be produced by …at has the advantage of substituting a …nancial inducement to have children for the unrealistic (and morally unacceptable) threat to punish parents who have the wrong number of children. Both the policy optimization, and the decision problem of each agent, have a dynamic programming structure, and are solved by backward induction. We draw on both papers to characterize the second-best policy under the simplifying assumption that existing adults are ex-ante identical.[57]

7.1 Parents as government agents

Given the tax system, and the rate of interest, the present value of a person's lifetime tax payments is a monotone function of earnings, hence as good a measure as any of a person's human capital at the start of adulthood. Let us then measure the stock of human capital that a child born at date t will have at date $t + 1$, h^{t+1}, as the present value

[56] Doing that requires people to guess what future people will be like. Especially where their own children are concerned, many tend to see these potential persons as projections of themselves, and to impute them their own preferences and values.

[57] The second of the papers cited allows for di¤erences in parental ability to in‡uence their children's future earning ability, but we shall not go into that here.

(at date t) of the taxes that the future adult will pay at t + 1. Adults living at date t derive utility from the present value, denoted by c^t, of their own consumption over what is left of their life-cycle. Possibly, they derive utility also from n^t and h^{t+1}, either for altruistic reasons, or because there is a self-enforcing family constitution that entitles them to receive transfers from their grown-up children conditionally on h^{t+1} (see subsections 4:1 and 6:2).

We continue to assume that human capital is determined by (56) as in section 6. Now, however, » is a random variable, with given density. We may interpret this variable again as native talent or, more generally, as luck. Then h itself is a random variable, with probability density Á(h; e) derived via (56) from that of ». As e is interpreted as educational investment, the higher this variable, the better the chances that the future adult will have a high h.[58]

Although identical ex ante, agents are di¤erent ex post because of the random nature of n and x. The utility of agent j may then be written as

$$u_j = u(c_j + v(h_j)n_j); \tag{68}$$

where u(:) is the utility function, assumed increasing and concave. We may interpret $v(h_j)$ as the consumption-equivalent of the pleasure that j derives from her child's success, or as the transfers that she is entitled to receive, in old age, from a child with human capital h_j. The function v(:) is assumed increasing and concave.

The household budget constraint is written as

$$c_j = w + Y(n_j) + [y(h_j; n_j) - !(e_j) - p]n_j; \tag{69}$$

where w represents the agent's income (net of taxes, but exclusive of transfers), Y is a government transfer payable to parents as soon as n_j is known (and possibly conditional on it), y is a per-child government transfer, payable to parents only when h_j is known (and possibly conditional on it), $!(e_j)$ is the per-child cost of the action e_j, and p has the usual interpretation. The function ! (:) is obviously increasing in its argument; since $!(e_j)$ includes the opportunity-cost of the …xed household resources used by the action e_j, ! (:) is also convex (increasing marginal cost of e_j).[59]

[58] In more technical language, for any $e_2 > e_1$, the cumulative dstribution corresponding to $Á(:; e_2)$ …rst-order stochastically dominates the one corresponding to $Á(:; e_1)$.

[59] If the resources used by this action include the agent's own time, w is to be interpreted as full income. If $v(h_j)$ is interpreted as future transfers from j's child,

Agent j decides …rst how much to invest in each child she might have, taking into account the way in which this will a¤ect the probability distribution of h_j. Dispensing with time superscripts, because we are looking at the decisions of just one generation, agent j chooses e_j so as to maximize her expectation of utility over all possible realizations of h_j,

$$U_j = \int u_j Á(h_j; e_j) dh_j; \tag{70}$$

where u_j is determined by (68) ¡ (69), taking n_j as a parameter. Assuming that agents are too many (coordination costs are too high) to collude, j takes government policy, represented by ' and $y(:; n_j)$, as given. The …rst-order condition,

$$¡ ! {}^{0} n_j \int u_j^{0} Á dh_j + \int u_j Á_{e_j} dh_j = 0; \tag{71}$$

tells us that j will increase e_j to the point where the expected marginal cost equals the expected marginal bene…t. Notice that, if j gets neither pleasure nor money from h_j, $v(h_j) ´ 0$, the bene…t of e_j can come only through y. She will then choose e_j positive only if y is increasing in h_j, and at least as large as p.

The decision we have just examined associates a value of e_j with each possible realization of n_j. Armed with that information, j will then choose her reproductive behaviour, b, taking into account the e¤ect that this will have on the probability distribution of n_j. Since w does not vary with j, all agents choose the same b. In recognition of the fact that n_j can only take values 0, 1, 2, ..., we write its density in the discrete form $¼(n_j; b)$: We de…ne b so that the higher the value of this variable, the greater the chances of having many children. The agent then chooses b so as to maximize her expectation of U_j over all possible realizations of n_j and h_j,

$$E(U_j) = \sum_{n_j} ¼(n_j; b) \int u_j Á(h_j; e_j) dh_j: \tag{72}$$

Since b has no direct cost (but it has an expected indirect cost, via its expected e¤ect on n_j), the …rst-order condition is

$$\sum_{n_j} ¼_b(n_j; b) \int u_j Á(h_j; e_j) dh_j = 0; \tag{73}$$

but this informal credit cannot be borrowed against (see subsection 4:1), the budget constraint remains (69), but w is then to be interpreted as net of any transfers due to j's parent, and $!(e_j)$ as net of any transfers due to j's child.

meaning that the agent will increase b until its expected marginal utility is equal to zero.

7.2 The government as principal

Since the number of agents (hence the number of future tax payers) is "large", the government does not face uncertainty over its current transfer expenditure, and future tax revenue. We may then write the government budget constraint in expected value terms.

At the stage where n_j is known, and $Y(n_j)$ consequently given, for every j, the constraint is

$$\sum_j n_j \int (h_j - y(h_j; n_j)) \acute{A}(h_j; e_j) dh_j = \sum_j Y(n_j); \qquad (74)$$

implying that the government can …nance its transfers to current adults with the taxes paid by future adults.[60] How can this be justi…ed? A comparison of (74) with (69) makes it clear that j has no reason to take into account the e¤ect of her own choice of e_j on the government budget constraint. A justi…cation for the policy is then that, by promising to pay j at least part of h_j, the government is in e¤ect reducing an externality. Another justi…cation is that, since the government does not face risk, it can raise social welfare by o¤ering parents insurance.

At this stage of the game, the government chooses the function $y(:;:)$ so as maximize the sum of the objective functions of its agents at that same stage,[61]

$$W = \sum_j U_j; \qquad (75)$$

subject to the budget constraint (74), and to the incentive-compatibility constraints (71), taking the fertility vector (n_j); and the per-adult transfer vector $(Y(n_j))$ as parameters. The …rst-order conditions tell us that, for each possible realization of h_j, y must satisfy

$$\left[u_j' - \lambda\right]\acute{A} + \mu_j\left[-n_j w' u_j'' \acute{A} + u_j' \acute{A}_{e_j}\right] = 0; \qquad (76)$$

where λ is the Lagrange multiplier of (74) (the marginal social utility of tax revenue), and μ_j the Lagrange multiplier of (71) (the marginal social utility of relaxing the jth incentive-compatibility constraint).

[60] The taxes paid by current adults were used to …nance transfers to their parents.

[61] Since the number of agents is given, it makes no di¤erence whether we average or add-up.

If the government could observe educational investments, the incentive compatibility constraints would not be binding ($\mu_j = 0$ for all j), and (76) would reduce to $u_j^0 = \lambda$ for all j: A first best[62] could then be implemented by choosing $y(\cdot; n_j)$ so that

$$y(h_j; n_j) + v(h_j) = \text{const.} \tag{77}$$

This means that the principal should assure the same level of utility to all parents who have the same number of children, independent of the realization of h_j.[63] If parents have no interest in their children's achievements ($v' = 0$), (77) implies $y_h = 0$.[64] If they have an interest in their children's achievements ($v' > 0$), (77) tells us that the government must fully insure parents against the risk that their children will meet with bad luck. If that is the case, the less a child achieves, the more the parent must be subsidized, $y_h < 0$.

Since educational investments are not fully observable, however, there is a moral hazard problem. The guarantee of full compensation would in fact encourage parents to underinvest in their children's education. The government must then use part of the future tax revenue to give parents the incentive to invest more, and the outcome will consequently be a second best. Let us see what we can say about the shape of the second-best $y(\cdot;\cdot)$. Since μ_j is now positive, (76) may be re-written as

$$\frac{\lambda}{u_j^0} = 1 + \mu_j (\rho n_j \theta^{\rho} + \bar{\alpha}); \tag{78}$$

where $\rho = -\frac{u_j''}{u_j^0}$ is the Arrow-Pratt measure of absolute risk aversion, assumed constant. The term $\bar{\alpha} = \frac{\partial e_j}{\partial}$ is a close relative of the likelihood ratio, assumed increasing in h_j.[65]

It is clear from (78) that utilities will not be equalized as in first best. It is also clear that the optimal transfer payable to j depends on n_j: Since u_j^0 is decreasing, and μ_j increasing in n_j,[66] agents with more children should be offered a larger per-child transfer for the same amount of human capital, $y_n > 0$.

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[62] If e_j is observable, j can be forced to invest the optimal amount. There is thus no externality.

[63] We shall see in a moment that Y is designed to compensate parents for having too many, or too few, children. In first best, agents then get the same utility come what may.

[64] There is then no real need to use y, Y is enough .

[65] That is a standard assumption.

[66] An increase in the number of children increases the marginal utility of income, and tightens the incentive-compatibility constraint.

Using standard arguments, it can also be shown that

$$\frac{dy}{dh_j} = \frac{-'}{\frac{\partial}{\partial 1_j}\frac{\partial n_j}{u'_j}} \; i \; v':\tag{79}$$

If parents had no direct interest in their children's achievements ($v' = 0$), (79) would be telling us that the amount transferred should increase with the quantity of human capital. In other words, parents should be rewarded for having clever children, even though that is only partly their doing. That may not be the optimal policy, however, if parents have a direct interest in their children's future. Since v' is decreasing in h_j, the transfer schedule is likely to be U-shaped as in Figure 2: decreasing in the child's human capital at low levels of h_j, where insurance considerations are paramount, increasing at high levels of h_j, where incentive considerations will tend to predominate. That provides a rationale for the common practice of compensating the parents of handicapped or educationally subnormal children, and subsidizing those of highly talented ones.

Let us now take a step back to the stage where n_j is still a random variable, conditional on j's choice of reproductive behaviour. Having associated a function $y(:;:)$ with each possible pair of the fertility vector (n_j), and transfer vector $Y(n_j)$, the government can now choose the function $Y(:)$. Since the logical structure of this stage of the policy optimization is analogous to the one just examined, we shall just simply summarize the procedure, and enunciate the main results. The government's objective is now to maximize the expectation of (75) over all possible realizations of n_j. The government budget constraint differs from (74) in that n_j is now a random variable with discrete density conditional on b. The incentive-compatibility constraint is now (73), the same for all j. The first-order condition may be written as

$$\frac{\partial}{u'\partial dh} = 1 + °Ã;\tag{80}$$

where $À$ is the Lagrange multiplier of the government budget constraint, and $°$ the Lagrange multiplier of the incentive-compatibility constraint, for this stage of the decision process; the analogue of $-$, $Ã = \frac{¼_b}{¼}$, is an increasing function of n_j.

If b were observable, the solution would be a first best. As the incentive-compatibility constraint would not be binding ($° = 0$), (80) would reduce to $U' = À$. Every agent would then be assured a given

level of expected utility, independent of how many children they will eventually have. Therefore, the …rst-best policy fully insures parents against the eventuality of getting too many, or too few children.

Since b is not observable, however, we have again a moral hazard problem. With (73) binding, $\circ$ is positive: Since $\tilde{A}$ depends only on n, and increases with it (and given that, for any j, y_j is not large enough to hold c_j constant as n_j increases), the same must be true of Y. It can also be shown that the second-best b is larger than any agent would have chosen in the absence of policy. There is thus a positive population externality, that the government will attempt to cure using the Pigovian subsidy Y. The second-best policy equates the expected net external bene…t of b to the cost for the government of providing each agent with the right incentive.

7.3 Child bene…ts, scholarships and pensions

We have found that the second-best policy uses two instruments, a per-adult transfer Y, conditional on number of children, and a per-child transfer y, conditional on children's number and future tax paying capacity. It comes natural to interpret the …rst of these transfers as child bene…ts, so that $'n = Y$. The second transfer lends itself to alternative interpretations. To the extent that scholastic performance is a predictor of future tax paying capacity, we may interpret y as a scholarship, conditional on "merit" (scholastic performance), and adjusted for "need" (family size). Since tax paying capacity can be gaged with any accuracy only when a person is well into middle age, and her parent on the point of retirement, however, it seems more natural to interpret $y(h)n$ as the parent's pension.

Imagine, then, a scheme that entitles each agent j to a pension $´_j = y(h_j; n_j)n_j$. Although the money paid to j will come out of her children's taxes, this is not a conventional pay-as-you-go scheme. In the latter, the taxes paid by current adults go into a common pool, and the pension to which an old person is entitled may or may not be related to her own tax payments, but bears no relation to the taxes payed by her children. Therefore, in a conventional pay-as-you-go scheme, there is no incentive for adults to produce good tax payers. Indeed, if pension entitlements are earnings related, there is an incentive to have fewer children, and to spend as little time as possible with each child. Here, by contrast, there is an incentive to have children, and to invest in their education. Elements of that exist in several real-life pension systems (e.g., in France and Germany).

If we relax the assumption that adults have the same earning capacity (which, incidentally, contrasts with the assumption that their children

will enter adult life with di¤erent earning capacities), there is a clear advantage in giving people a choice of qualifying for the pension either by producing income and paying taxes, or by producing children who will in turn pay taxes. Running the two schemes side by side would induce an e¢cient allocation of people's time between income and child raising activities.[67]

8 Political acceptability

We now address the question whether a system of public transfers can be implemented in a democratic society. Browning (1975) makes the fundamental point that, since children do not vote, direct democracy produces a pension system that is larger than the one which would maximize the lifetime utility of the representative agent. This argument is further developed in a long series of public choice papers, including Boadway and Wildasin (1989), Hansson and Stuart (1989), Tabellini (1991), Verbon (1993), Peters (1995), Meijdam and Verbon (1996), Kolmar (1997), Grossman and Helpman (1998), Boldrin and Rustichini (2000), Conde-Ruiz and Galasso (2000), and Kemnitz (2000) among others.[68]

A somewhat smaller number of contributions, beginning with Shubick (1981), and including among others Kotliko¤, Persson and Svensson (1986), Kotliko¤ (1988), Esteban and Sakovics (1993) and Caillaud and Cohen (2000), attempt to explain the existence of public institutions that make intergenerational transfers as the outcome of some kind of constitutional arrangement. These constitutional political economy papers pose, at the level of society, the same sort of questions that the papers examined in subsections 4:1 and 6:2 pose at the level of the family. Although the idea of a constitution comes from politics, however, the kind of unspoken agreement these authors are looking for is closer in spirit to a family constitution, than to a political constitution in the usual sense. The latter does in fact contain only broad statements of principle, and lays down the rules of the political game. It cannot thus be used to explain why current tax payers do not refuse to …nance the pensions of currently retired people, or to honour the public debt. We thus refer to any such society-wide arrangement a "social compact", rather than constitution.

The public choice and the constitutional political economy branches of this sub-literature share a number of common assumptions. The …rst

[67] Cigno and Luporini (2003) assume that adults di¤er in their endowments of social capital. If these endowments are uncorrelated (or negatively correlated) with earning capacity, that will further strengthen the argument for giving people the opportunity to specialize in accordance with comparative advantage.

[68] See Breyer (1994) for an early survey.

is that fertility is exogenous; as we found to be the case at the level of the family, this reduces the scope for agreement between adjoining generations. The second is that (with rare exceptions such as Hansson and Stuart, who postulate ascending altruism, from adults to the old) agents are self-interested. The third is that, again with the notable exception of Shubick's pioneering work, people are either born adult,[69] or do not eat when they are young. Transfers to the young come into the picture only insofar as they serve to pay for education, and inasmuch as education raises future productivity. That is somewhat surprising.

Even if the old do not require material or personal assistance from their own children, they still need adults around to man the capital stock (transform it into consumption goods). Therefore, current adults could be expected to have a keen interest in the survival, hence in the consumption, of those who are currently young; future productivity should be only a second-order consideration. Why are the young ignored then? As Martin Shubick noted with reference to Samuelson (1958),[70] there is an implicit assumption, underlying these theoretical contributions, that parents will instinctively provide for the survival of their o¤spring. Either that, one might add, or political agreement on legislation obliging parents to provide for their own children is reached as a matter of course. But neither of these assumptions is su¢cient, particularly if parents cannot in‡uence the size of their progeny, to ensure that the young will receive the e¢cient level of support.

8.1 A social compact?

We now look for the possibility that intergenerational cooperation might be the result of some kind of constitution-like social agreement. Esteban and Sakovics (1993) examine a number of stylized institutions that redistribute intergenerationally, and explain their emergence as the outcome of some kind of either cooperative or non cooperative game between generations. Rather than looking for a self-enforcing mechanism, these authors rely on the build-up of trust to make the agreement stick. By contrast, Caillaud and Cohen (2000) search for the society-wide equivalent of a self-enforcing family constitution.

The framework is highly simpli…ed. Adults produce but do not consume,[71] and the old consume but do not produce, a perishable consump-

[69] Signi…cantly, working-age individuals are in fact referred to as "the young". For coherence with the terminlogical conventions of this Chapter, we promote them to the rank of adults:

[70] The actual quotation is in Section 1.

[71] A more palatable way of putting this would be to say that, in period 1 (as in period 0), consumption is a constant, normalized to zero.

tion good. Production per adult at date t is determined by

$$y^t = k^t l^t; \tag{81}$$

where l^t is the labour supplied by an adult at date t, and k^t is now interpreted as the state of knowledge (but could just as well be the stock of capital) at that same date. The time-path of k is exogenous (but nothing of substance changes if it is endogenized). Population is also exogenous, and taken to be constant. The lifetime utility of a member of generation t is determined by

$$U^t = -v\left(k^t; l^t\right) + c_2^t; \tag{82}$$

where $v(k^t;:)$ is a convex loss function, measuring the disutility (given the current state of knowledge, k^t) of supplying l^t units of labour in period 1 for a member of generation t.

A Pareto-optimal l^t maximizes (82), subject to (81). The market alone will not yield such an outcome. Since people care only about their own consumption, generation t will in fact produce goods only if this induces generation t + 1 to do the same. In the absence of a mechanism ensuring that, nobody produces anything;[72] consequently, nobody grows to be old. We are back to Samuelson (1958).

The way out proposed by Caillaud and Cohen is analogous to Cigno (1993, 2000), examined in subsection 4:1. They look for a "standard of behaviour" thus conceived, that any "generation should not be in a position such that it would prefer to erase the past, name itself generation [0] and reinitialize the strategy pro…le that was followed up to this date, rather than continue to abide by the current strategy pro…le" (Caillaud and Cohen, 2000). As in subsection 4:1, an arrangement that yields an intergenerationally Pareto-optimal allocation of consumption meets this criterion, and is thus renegotiation-proof. Alternative approaches, such as the one proposed by Kotliko¤ et al. (1986), who view the constitution as an asset that the old would like to sell to the adult generation, do not pin down a unique standard of behaviour.

A problem with this transposition of the constitution idea from the family level to society at large is that a single defector cannot be punished without also punishing the whole generation to which the defector belongs. While a family constitution entitles an adult to punish her own parent (not the entire category) if the latter misbehaved, the standard of behaviour proposed by Caillaud and Cohen does in fact entitle a generation to collectively punish all members of the previous generation (e.g.,

[72] Had we not put period-1 consumption to zero, we could have said that adults deploy the amount of labour, and produce the amount of goods, that just meets their own immediate consumption requirements.

by stopping pension payments) if just one of them misbehaved. That makes the threat less than credible. Furthermore, for the argument to go through, it is required that each adult know not only how her own parent, but also how every other member of her parent's generation behaved. This imposes an unrealistically heavy informational requirement on the scheme.

All these problems go away if adults are altruistically inclined towards the old, as assumed in an earlier contribution by Veall (1986). Altruism, however, is a stronger assumption to make at the level of whole society, than in a family context. If we think of altruistic behaviour as a product of acquaintance (see subsection 4:3), and society is not just the population of a little village, a lifetime will not be enough for anyone to get to know and love everyone else.

8.2 Direct democracy

Browning's seminal contribution assumes direct democracy. Taken literally, this means that citizens are able to vote on every single policy. That is unusual in real life, but some political constitutions do contemplate referenda on a range of speci…ed issues. Others allow only consultative referenda, but the outcome of these consultations heavily conditions the decisions of parliament. Direct democracy gives current voters the power to condition future voting because it creates vested interests. Suppose, for example, that a pay-as-you-go pension system is voted in at date t: At date t + 1, part of the electorate (the old of the day) will have a vested interest in keeping the system going. The same may be said about a vote, at date t + 1, on whether to honour the public debt issued on the strength of a vote at date t.

We now examine a number of contributions that exploit the dynamic interdependence of single-issue political consultations under the assumption of rational expectations. As these papers look for conditions such that a decision is not overturned (at least not immediately) by a subsequent vote, the research agenda is not very di¤erent from that of the "constitutional" models looked at in subsection 8:1. The crucial di¤erence is that the generation or generations who introduce the policy have now a …rst-mover advantage on subsequent generations. Constitutions are designed to prevent exactly that!

An equilibrium is de…ned as a sequence of policy decisions and market prices such that, at each date, (i) markets clear, (ii) the utility of each agent is at a maximum given the policy and the prices, and (iii) the policy is weakly preferred to any other by a majority of current voters. The last restriction plays a role analogous to that of renegotiation-proofness in a constitutional model. The rational expectations assumption bites more

deeply here than in an ordinary market equilibrium model, because it implies an understanding on the part of all voters not only of the general equilibrium e¤ects of the policy they are called to vote upon, but also of the way in which the policy will condition future voting behaviour.

8.2.1 Voting over pensions

Boldrin and Rustichini (2000) are interested in the possibility that a pay-as-you-go pension system brought in by referendum at a certain date will never be revoked, or will at least survive the generations that voted it in. The set-up is similar to that of section 3, except that fertility is now exogenous, and the economy is assumed to be closed. The latter is essential, because the argument now rests crucially on the general-equilibrium e¤ects that the policy is expected to have on factor prices. At each date t, adult and old citizens are called to vote on a policy that taxes each adult $\mu^t = ¿^t w^t$ ($0 \cdot ¿^t < 1$), and pays each old person $´^{t¡1} = n^{t¡1}\mu^t$.[73] The vote is essentially about the value of $¿^t$ ($¿^t = 0$ means that the policy is rejected). Clearly, the old will favour as large a $¿^t$ as possible. Adults may face a trade-o¤. On the one hand, any $¿^t$ greater than zero reduces their current consumption; on the other, the policy could o¤er a higher return than the market ($\frac{´^t}{\mu^t} > r^t$).

Given k^t and $¿^t$, and the expectations held by current adults about $´^t$ (the actual one will depend on n^t and $¿^{t+1}$), market competition determines factor prices, and the amount saved by each adult, at date t. A vote at date t in favour of introducing, or maintaining, a pay-as-you-go pension system would in‡uence the amount collectively saved by generation t, hence the capital stock, and factor prices, at date t + 1. Therefore, the outcome of the vote taken at t creates facts on the ground, that will condition future voting behaviour. Under particular functional assumptions (not dissimilar from those of Caillaud and Cohen, examined in the last subsection), Boldrin and Rustichini establish conditions on technology and individual preferences, such that a sequence of tax rates ($¿^0, ¿^1, ¿^2, ...$) is a subgame-perfect Nash equilibrium.

Boldrin and Rustichini …nd that there may be equilibria where the pension system is not brought in until a certain date, but it is then kept forever. The opposite case, where the system is abandoned after a certain date, is not admissible in a growing economy. If n is always greater than 1, there are always more adult than old voters. Were it known in advance that generation t would vote against the system at date t, generation t ¡ 1 would vote against it at t ¡ 1, otherwise it would …nd itself …nancing the pensions of generation t ¡ 2 for no good reason. Since the same applies

[73] Recall that $n^{t¡1}$ is the fertility rate of generation t ¡ 1, an thus the ratio of tax payers to pensioners at date t.

to generations t ¡ 2, t ¡ 3, ..., a pay-as-you-go pension system can exist only if everyone believes that it will go on forever.[74] Suppose, however, that a sudden drop in the population growth rate will some day make the pay-as-you-go pension system unsustainable as a sub-game perfect Nash equilibrium. If the agents know that this will happen, but are not sure when, they may take the risk of voting for the maintenance of the pay-as-you-go system one period more.[75]

It is interesting to compare this way of dealing with the issue with that of Caillaud and Cohen, examined in the last subsection. There, many alternative standards of behaviour could be sustained as sub-game perfect Nash equilibria, but only one was renegotiation-proof. Here, if an economic-political equilibrium exists, it may be unique (in the examples provided by Boldrin and Rustichini, there is only one stable equilibrium). In contrast with a renegotiation-proof standard of behaviour, however, the economic-political equilibrium brought about by a sequence of plebiscites need not be e¢cient.

8.2.2 Voting over the public debt

At various stages of this Chapter, we have come across the result that allowing for either altruism or intragenerational heterogeneity facilitates intergenerational cooperation. Tabellini (1991) assumes both intragenerational heterogeneity, and (bilateral) altruism, but the result is an increase in the …rst-mover advantage of earlier generations. It would thus appear that, in the absence of a constitution at some level, altruism or intragenerational heterogeneity bring about exploitation of future generations, rather than mutually bene…cial cooperation.

The policy under consideration is now government debt, rather than a pay-as-you-go pension system as in Boldrin and Rustichini, just examined. The latter also implies a public debt, because it commits a generation to make a net transfer to the previous one; it, too, can be repudiated just like and explicit debt. But the creditors of a pension system are the old of the land, not just those of them who chose to buy government bonds. Tabellini looks for conditions such that the public debt issued at a certain date will not be repudiated at the next. The amount of debt to be issued, and the subsequent decision whether or not to honour it, are the subject of referendum. As usual, only adults and the old can vote.

At date 0, there is a certain number of adults, each of whom begets

[74] The same is of course of the family constitutions examined in sections 4 and 6, and of the standard of behaviour discussed earlier in this section.

[75] Boldrin and Rustichini show this to be the case under certain functional assumptions.

an exogenously given number of children, n. At date 1, those children will be adults, and their parents will be old. In order to end the story there, it is assumed that generation 1 does not have children, and will not live to be old. Apart from this (and from the common assumption that the young live on air), the utility functions of parents and children are, respectively, (43) and (45) as in the bilateral altruism model of subsection 3:2. Therefore, parents may choose to make gifts to their children, and children to their parents (but things are so arranged that, in equilibrium, neither of them will).

Intragenerational heterogeneity is introduced by assuming that, in periods 1 and 2 of her life, each agent j receives a_i^j $(i = 1; 2)$ units of a perishable good. The cumulative distribution of this endowment is common knowledge, but the actual a^j is known only to j. In other words, individual wealth is not observable. Each member of generation t $(t = 0; 1)$ produces w^t units of the good in period 1 of her life. Unlike initial endowments, w^t is the same for all j (but may vary endogenously with t). This assumption is intended to capture the empirical regularity that income is generally less unequally distributed than wealth.

Let us now describe the political process. At date 0, the government submits to referendum a policy proposal that would pay every current adult a lump sum $g \geq 0$, and …nance these transfers by issuing bonds. The vote is about the value of g ($g = 0$ means that no debt is issued, and no public transfer is consequently made). Since there are no old people yet, only adults vote. Once the vote is taken, each adult decides how much to save; adult j saves s^j. assuming that there is no store of value other public debt, saving means buying government bonds. Notice that, as adults have di¤erent wealth endowments, they may save di¤erent amounts.

At date 1, the electorate is called upon to decide whether to honour or repudiate the debt. If it is decided that the debt should be honoured, the government will have to recover the cost by taxing current incomes and bond holdings (remember that inherited wealth is not observable, hence not taxable). Supposing that bond holdings are anonymous, they can be taxed only at a ‡at rate, denoted by μ. Since w is the same for all adults, the income tax rate, τ, is also the same for everybody. If it is decided that the debt should be repudiated, there is no need to raise taxes, but bonds will become worthless ($\mu = 1$, $\tau = 0$). The vote is about the values of μ and τ $(0 \leq \mu \leq 1, 0 \leq \tau < 1)$. Whichever policy emerges from the polls, it will redistribute not only between, but also within generations.

On the assumption that $n > 1$, at date 1, there are more adult than old voters. Therefore, the old alone could not push through a resolution

in favour of honouring the debt. Furthermore, it is not in the interest of all the old that the debt should be honoured, because some of them do not hold bonds, but all have children. If the debt is honoured, any bonds held by the former will in fact have a positive redemption value, but the latter will have to pay tax on their incomes. If the debt is repudiated, by contrast, incomes will not be taxed, but bonds will become worthless. Therefore, families without savings are unambiguously in favour of repudiating the debt (i.e., of expropriating the rich), but families with savings face a trade-o¤. Assuming single-peaked preferences, the outcome of the vote is determined by the "median voter" who, in the present context, is a kind of synthetic family, consisting of an old person m, holding a share $\frac{s^m}{g}$ of the outstanding debt, and an adult (not m's own child) whose parent holds a share $\frac{s^m}{\circ 2g}$; $\frac{s^m}{g}$ is so determined that, in the economic-political equilibrium, the two members of this synthetic family vote in exactly the same way.

Under certain functional and other restrictions, Tabellini shows that a majority comprised of both adult and old voters may favour honouring the debt ($\mu; ¿ > 0$). A necessary condition for this to happen is that

$$\frac{s^m}{g} \quad , \quad \circ u_1^0 \; \mathbf{i} \; c_1^1 \mathbf{¢}; \tag{83}$$

where adult consumption, c_1^1, is the same for every member of generation 1 because of the functional and distributional assumptions made. In equilibrium,

$$c_1^1 = w^1 \; ¡ \; (r \; ¡ \; 1)\frac{g}{n}; \tag{84}$$

where r is the net redemption value of a government bond ($r ¡ 1$ is the implicit rate of return on a bond after paying the tax μ).

The properties of the politically viable set are illustrated in Figure 3. The abscissa measures the size of the outstanding debt. The ordinate shows the values of the left and right-hand sides of (83). The graph of $\circ u_1^0(c_1^1)$ is upward-sloping and convex, because the income tax rate must obviously increase with the size of the debt (hence, c_1^1 decreases, and u_1^0 increases, as g goes up). Since the number of bonds held by the median voter increases with the overall size of the debt, but not necessarily in the same proportion, the graph of $\frac{s^m}{g}$ may slope up or do. A plausible hypothesis is that the curve will be upward-sloping at low levels of g, downward-sloping at high ones.[76] The politically viable set

[76] Tabellini shows this to be the case under certain special assumptions, including a uniform distribution of wealth endowments.

is represented by the segment g^0g^{00}.

If the politically viable set is non-empty as illustrated, generation 0 will vote, at date 0; in favour of a public transfer to themselves, con…dent in the knowledge that the resulting debt will fall partly on generation 1. Clearly, these voters will favour the largest sustainable debt, g^{00}. Such a policy would not have been passed if generation 1 could have voted at date 0. In the absence of a constitution preventing generation 0 from exploiting their …rst-mover advantage, however, generation 0 will vote to change the economic environment in such a way, that it is then in the interest of a su¢cient number of members of generation 1 to vote, at the next referendum, for honouring the debt. This underlines the di¤erence between a sequential voting model, such as this, or the one of the last sub-subsection, and a "constitutional" model where the ground rules are laid down before anyone has a chance to change things to her advantage.

In contrast with the model of the last sub-subsection, a pay-as-you-go pension system is not politically viable context. Since generation 1 does not have children, and knows that it will not live to be old, its members would in fact oppose being taxed to give generation 0 a pension (being altruistic towards their parents, however, the may give them gifts);[77] but this result is contrived. If generation 1 did not die prematurely, and were followed by a generation 2, a generation 3, etc., a pay-as-you-go pension system might be sustainable.[78] It is more interesting to note that, in the Tabellini model, generation 0 can change the landscape for generation 1 not only via factor price changes as in Boldrin and Montes, but also via changes in the personal distribution of wealth. That is possible because Tabellini allows for the initial distribution of wealth to be unequal, and assumes bilateral altruism. The …rst assumption uncouples the fate of individual agents from that of the rest of their generation, the second ties it to that of their ascendants and descendents. Without these two assumptions, debt-…nancing would not be politically viable either.

8.3 Representative democracy

We have already noted that, in real life, "government by the people" usually means representative democracy. In such a system, policies are decided upon by the government, or by the parliamentary majority that supports it. Since governments are voted-in on the basis of broad, often vaguely worded, electoral programmes, that gives them a certain latitude over which measures actually to implement. It also leaves them open to pressure by interest groups (which, in our context, coincide with age groups, or generations). While direct democracy models predict the

[77] Being altruistic towards their parents, however, the may give them gifts.

[78] Conde-Ruiz and Galasso (2000) …nd precisely that.

behaviour of voters, representative democracy models predict essentially the behaviour of politicians.

There are two ways, respectively inspired by Becker (1983) and Coughlin (1986), of modelling the political process in a representative democracy. Becker makes the relative political weight of each interest group a function of its relative expenditure on lobbying. Coughlin shows that maximizing the probability of re-election in a two-party system tantamounts to maximizing the sum of the objective functions of the voters.[79] The public choice literature on intergenerational transfers draws on both these considerations by expressing the government's objective (some authors call it "target", others "political support") function, at any date t, as a weighted sum of the utilities of generations t and t ¡ 1. The di¤ers with a conventional social welfare function in that the relative weight of each generation depends on its ability to exert political in‡uence, rather than on ethical considerations. As only electors count, the young have zero political weight. Their consumption or utility would enter the objective function of the government if it were an argument in the utility function of their respective parents, but it is assumed that it is not.

With the exception of Hansson and Stuart (1989), who implicitly assume the existence of a constitution by imposing that each generation has the right to block any new legislation that would leave it worse-o¤, the assumption commonly made in representative democracy models is that any decision taken by a parliament can be reversed by the next. Again with the exception of Hansson and Stuart, who postulate ascending altruism, another common assumption is that individuals, and the governments they elect, are self-interested. In the models we shall examine in some detail, adult individuals maximize the utility they get from their own consumption over what is left of their life cycle. The government maximizes the probability of its own re-election. At any given date, adults decide how much to save, taking current and future taxes and bene…ts as given.

As in the last subsection, the economic-political equilibrium is modelled as a sequence of non-cooperative games. At each date, the government chooses current taxes and bene…ts, taking current saving decisions, and future taxes and bene…ts as given (in comparison with the direct democracy models, the sequence of economic and political decisions is thus reversed). Since future taxes and bene…ts will be decided by the future governments, the current Nash equilibrium is conditioned by political expectations. Boadway and Wildasin (1989) assume arbitrary ex-

[79] Coughlin et al. (1990) nuance this by introducing ideological bias in favour of one or the other party, and show that more ideologically homogeneous groups are more successful in in‡uencing government policy than less homogeneous ones.

pectations about future political decisions; the papers examined below impose rational ones.

8.3.1 Lobbying for pensions

Meijdam and Verbon (1996) postulate a closed economy, such that the interest rate is endogenous. Their motivation for making this assumption is to rule out corner solutions with either zero private saving, or zero public pensions.[80] At any date t, adults choose $(c_1^t; c_2^t; s^t)$ so as to maximize (54), subject to

$$c_1^t = w^t - \mu^t - s^t \tag{85}$$

and

$$c_2^t = s^t r^t + \tau^{t+1}; \tag{86}$$

taking the current pension contribution, μ^t, and the future pension benefit, τ^{t+1}, as given. As usual, the first-order condition yields (6). Having conveniently assumed that the young live on air, this ensures that consumption is efficiently allocated over the life-cycle of each generation. The old have no allocative decision to take. Given the current pension benefit, τ^t, their consumption at date t is determined by past saving decisions,

$$c_2^{t-1} = s^{t-1} r^{t-1} + \tau^t. \tag{87}$$

Since k^t is pre-determined by s^{t-1}, the private sector of the economy is closed using (2), (3) and (19).

Taking s^t and τ^{t+1} as given, today's government chooses μ^t and τ^t so as to maximize its objective function,

$$W^t = n^{t-1}\left[u_1\left(c_1^t\right) + u_2\left(c_2^t\right)\right] + \theta^t u_2\left(c_2^{t-1}\right); \tag{88a}$$

where θ^t denotes the relative political weight of the old, subject to (85)-(87), and to the pay-as-you-go constraint,

$$\tau^t = \mu^t n^{t-1}. \tag{89}$$

Political weight could simply reflect numerical strength, in which case $\theta^t = 1$ for all t. More generally, however, it may reflect ability to coordinate, and thus to exert political influence by lobbying.

[80] As noted in section 5, that could have also been taken care of by allowing for intragenerational heterogeneity, or introducing uncertainty.

As the authors themselves point out, the larger a group, the more costly it is for its members to coordinate their lobbying activities. From the argument that political weight may differ from numerical strength as a result of lobbying, it then follows that the political weight of the old could increase with the relative numerical strength of adults.[81] Casual observation does indeed suggest that an increase in the dependency ratio (the number of old people per adult) raises public concern for the welfare of the working generations, not of the retired. Nonetheless, Meijdam and Verbon assume that the relative political weight of the old increases with their numbers, $\varphi^t = \varphi(n^{t-1})$, $\varphi'(\cdot) < 0$.

The first-order conditions yield

$$\frac{u_1'\left[y^t - \mu^t - s^t\right]}{u_2'\left[s^{t-1}r^{t-1} + n^{t-1}\mu^t\right]} = \varphi^t. \tag{90}$$

If a Nash equilibrium exists, the value of μ^t that solves (90) maximizes the government's chances of re-election. Therefore, a sequence of voting equilibria may support transfers to the old. Will it allocate consumption efficiently?[82] In general it will not, because there is nothing to ensure that public transfers satisfy (7). In view of (6), however, (90) implies $r^t = \varphi(n^{t-1})$ for all t. If the exogenously given rate of population growth is constant over time ($n^t = n$ for all t), the political process then yields a steady state characterized by

$$r = \varphi(n). \tag{91}$$

If it so happens, but it would only be chance, that $\varphi(n) = \frac{n}{\pm}$, (9) is satisfied, and consumption is then efficiently allocated across generations.

8.3.2 Lobbying for pensions and education subsidies

Finding that, if pensions are the only item on the agenda, the political process may not deliver a system of intergenerational transfers should not have come as a surprise. Given a capital market, or the possibility of directly accumulating a durable good, adults can in fact do without a public pension system, because they can save for old age. Intergenerational transfers are strictly needed only by the young, who cannot support themselves. We also know since Section 5 that, if the young are allowed in the picture, a pension system on its own is not enough to allocate consumption efficiently.

[81] This line of reasoning is followed in Kemnitz (2000), to be considered next.

[82] Such a question is not in the public choice spirit. Indeed, it is not addressed in Meijdam and Verbon (1996); we have a stab at it exploiting the analogies with Meijdam and Verbon (1997).

Konrad (1995) argues that the old have an interest in paying for public education, because this will shift the La¤er curve. A similar line is taken by Kemnitz (2000). Since education increases future per-capita income, educational grants make it possible to increase pension bene…ts (of interest to adults, as well as to the old) without increasing taxes. Mutatis mutandis, these two papers present similarities with the Cremer et al. (1992) model, reviewed in subsection 6:2, where parents strategically choose how much to spend for their children's education with an eye to how this will raise their pay-o¤ in the subsequent bequests-for-attention game. There, however, the game is restricted to members of the same family. Here, it involves the entire polity.

Let ' be again the amount that the government pays to parents for each of their children, and ¿ the lump-sum tax imposed on each adult to …nance the scheme. As in Section 6, we interpret ' as an educational grant (again, children eat nothing), and assume that parents can be forced to choose $e = '$.[83] A pension system paying ´ to every old person, and charging µ to every adult, is also in place. Of course, either of these schemes could be inactive (µ or ¿ could be zero). Human capital is still determined by (56). Following Kemnitz, however, we now assume that $»^t = h^{t-1}$ stands for the parent's stock of human capital , rather than for the child's own native talent. Therefore, parents have a tutorial role.

Beside putting education on the political agenda, Kemnitz introduces uncertainty about survival into old age. Assuming a perfect annuity market,[84] and denoting by ¼ the probability that an adult will live to be old, a unit of money saved by an adult at date t is now worth $\frac{r^t}{¼}$, rather than simply r^t, a period later. Since uncertainty leaves scope for an equilibrium with both saving and public transfers even if the interest rate is exogenous, there is no need to assume a closed economy just to get that result. A small open economy assumption is thus assumed.

In contrast with Meijdam and Verbon, the political weight of each age group explicitly depends, à la Becker, on how much the group spends to in‡uence government policy. Therefore, political weight is now truly endogenous. As all persons of the same age look the same, there is not a problem of preference aggregation, decisions are unanimous. Since political weight bene…ts all members of the group equally, however, there is still a free-riding problem (political weight is a kind of local public good). To get round this, Kemnitz assumes that "in‡uence expenditure" serves to pay not only for lobbying, but also for maintaining group

[83] What to do when e is not observable was discussed in Section 7.

[84] Without it, there would be precautionary saving (to guard against the risk of having to support oneself in old age), and involuntary bequests à la Modigliani.

discipline. As the cost of maintaining discipline increases with numbers (like Coase's transaction costs), the amount of political influence bought by a unit of money decreases as the size of the group increases.

Being uncertain whether they will still be alive at $t+1$, adults at date t choose $(c_1^t; c_2^t; s^t; x_1^t; x_2^t)$ so as to maximize the expectation of (54),[85]

$$E\left(U^t\right) = u_1\left(c_1^t\right) + \gamma u_2\left(c_2^t\right); \tag{92}$$

subject to

$$c_1^t = w^t - \mu^t - \phi^t h^t - x_1^t - s^t \tag{93}$$

and

$$c_2^t = \frac{s^t r^t}{\gamma} + \varphi^{t+1} - x_2^t; \tag{94}$$

where x_i^t is "influence" expenditure in period i $(i = 1; 2)$. As in Section 6, w^t is interpreted as the rate of return to human capital at date t. The wage rate is again given $h^t w^t$, but h^t is now entirely determined by past education policies, rather than private decisions. The private sector of the economy is closed by the factor pricing equations, (61) and (62).

The government's objective is

$$W^t = n^{t-1} E\left(U^t\right) + \gamma\theta^t u_2\left(s^{t-1} r^{t-1} + \varphi^t - x_2^{t-1}\right); \tag{95}$$

where $E(U^t)$ is given by (92) - (94). This differs from (88a), not only because survival into old age is now uncertain, but also because the relative political weight of the old is now a function of "influence" expenditures, as well as of numbers,

$$\theta^t = \theta\left(\frac{x_2^{t-1}}{x_1^t}; \frac{n^{t-1}}{\gamma}\right): \tag{96}$$

The temporary economic-political equilibrium is again the solution of a non-cooperative game, where voters choose saving and expenditures, and the government chooses the policy. Under certain functional restrictions, Kemnitz demonstrates that a sub-game perfect Nash equilibrium exists. There is again no guarantee that the intergenerational transfers resulting from a sequence of such equilibria is efficient.

[85] Kemnitz uses a log-linear utility function to get explicit results.

9 Conclusion

We begun this chapter by asking whether intergenerational cooperation (i) is socially desirable, (ii) will be realized by spontaneous agreement at some level. The answer to (i) is yes, the answer to (ii) is problematic. Individual optimization coordinated only by the market is unlikely to allocate consumption e¢ciently if individuals are self-interested. Indeed, the market does not provide self-interested individuals with the incentive to have children; it may deliver an optimal population pro…le (but the assumptions required are rather strong), and allocate consumption e¢ciently given that pro…le, if individuals are altruistic towards their own children (descending altruism). One of the strong assumptions required for this optimistic outcome is that all parents make positive net transfers to their children. An even stronger assumption, unanimity, is required if individuals are altruistic also towards their parents (bilateral altruism).

In the absence of altruism (but its presence does no harm), cooperative behaviour may be generated by a self-enforcing constitution, such that it is in the interest of every individual to comply with it, and punish anyone who does not. For it to be credible, such an arrangement must be renegotiation-proof, otherwise any generation could set itself up as a constitutional assembly, and modify the arrangement to its own advantage. Under plausible conditions, it may be shown that self-enforcing constitutions exist at the level of the family, and that the renegotiation-proof constitution is unique given the personal characteristics of the family members. A renegotiation-proof constitution can be relied upon to deliver an e¢cient allocation of resources to any given population pro…le if fertility is endogenous, but not otherwise. If fertility is endogenous, however, the population will grow faster than is socially optimal. A distinctive feature of these family arrangements is that they guarantee intergenerational transfers to both the old and the young. The existence of a similar arrangement at the level of society (a "social compact") can be demonstrated under drastically simplifying assumptions, but the enforcing mechanism becomes less and less credible as the society gets larger.

We also asked whether, in the absence of a social compact capable of delivering a social optimum, there are policies that could do this in conjunction with, or in alternative to, the market and the family. Assuming that the government is driven by ethical considerations and does not have to answer for its policies to any constituency (the "benevolent dictator" paradigm), we get the usual result that a …rst best can be implemented if (i) the relevant individual actions are observable by the government, and (ii) the government can use personalized lump-sum

taxes and subsidies. Failing either of these conditions we have to be content with second best. The optimal (…rst or second best) policy includes public transfers to the old (pensions) and to the young (child bene…ts or educational subsidies), …nanced by taxes on the adults; it thus reproduces, at societal level, the working of a family constitution.

It is interesting to note that, if a …rst-best policy were practicable, it would entirely replace family transfer systems (family constitutions would cease to be self-enforcing). If a …rst best is out of reach, however, family arrangements may survive in the folds of second-best policy. If the government cannot make transfers directly to the young, and is thus obliged to use their parents as its agents, unconditional payments intended for children could end up as consumption for parents (given convex preferences, that remains true even if the latter are altruistic). To get round moral hazard problems, second-best policy will then make payments to parents conditional on children's success in adult life. Since these transfers are conditional on information available only when the children are well into middle age, and the parents are old, they may be interpreted as pensions.

In the absence of a benevolent dictator, intergenerational redistribution requires some kind of political equilibrium. Economic-political models are of two kinds. They assume either direct democracy, in which case they predict the behaviour of voters (essentially of the median one), or representative democracy, in which case they predict the behaviour of politicians. Under direct democracy, a durable equilibrium supporting a system of mandatory intergenerational transfers (such as an unfunded pension system, or the public debt) can come about only if it creates vested interests. Any such system will inevitably favour the generation or generations that voted it in the …rst instance, at the expense of the generations that come later. Rather than of intergenerational cooperation, we should thus be talking of fait accompli. There is no reason to expect that the intergenerational allocation of consumption resulting from these equilibria will be e¢cient.

Representative democracy weakens the link between policy and the electorate, and lets in the lobbies. In such circumstances, policies affecting the intergenerational distribution of resources re‡ect the relative political weight of di¤erent age groups, rather than any ethical consideration. As in a direct democracy, the young do not count. Their interests are taken into account by policy only insofar as they coincide with those of their own parents, or with those of the generation to which their parents belong. If education enhances a person's future tax paying capacity, a policy involving transfers to the young in the form of educational subsidies may be favoured by adult voters, because it will help pay for their

pensions. Without a society-wide constitutional arrangement governing transfers between generations, however, intergenerational e¢ciency and social optimality are again unlikely.

10 References

Aaron, H. (1966), The Social Insurance Paradox, Canadian Journal of Economics and Political Science 32, 371-374

Anderberg, D. and A. Balestrino (2003), Self-Enforcing Transfers and the Provision of Education, Economica (forth.)

Balestrino, A., Cigno, A. and A. Pettini (2002), Endogenous Fertility and the Design of Family Taxation, International Tax and Public Finance 9, 175-193

Barro, R. (1979), On the Determination of the Public Debt, Journal of Political Economy 87, 940-971

Becker, G.S. (1974), A Theory of Social Interactions, Journal of Political Economy 82, 1063-1093

——————— (1983), A Theory of Competition among Pressure Groups for Political In‡uence, Quarterly Journal of Economics 98, 371-400

——————— and R.J. Barro (1988), A Reformulation of the Economic Theory of Fertility, Quarterly Journal of Economics 103, 1-25

——————— and K.M. Murphy (1988), The Family and the State, Journal of Law and Economics 31, 1-18

Bernheim, B.D. and D. Ray (1989), Collective Dynamic Consistency in Repeated Games, Games and Economic Behavior 1, 295-326

———————, Schleifer, A. and L.H. Summers ((1985), The Strategic Bequest Motive, Journal of Political Economy 93, 1045-1076

Boadway, R.W. and D. Wildasin (1989), A Median Voter Model of Social Security, International Economic Review 30, 307-328

Boldrin, M. and A. Montes (2002), The Intergenerational State: Education and Pensions, CEPR W.P. 3275

———— and A. Rustichini (2000), Equilibria with Social Security, Review of Economic Dynamics 4, 41-78

Breyer, F. (1994), The Political Economy of Intergenerational Redistribution, European Journal of Political Economy 10, 61-84

Browning, E.K. (1975), Why the Social Security Budget is Too Large in a Democratic Society, Economic Enquiry 13, 373-388

Buchanan, J. (1987), Constitutional Economics, in The New Palgrave: A Dictionary of Economics. London: MacMillan

Caillaud, B. and D. Cohen (2000), Intergenerational Transfers and Common Values in a Society, European Economic Review 44, 1091-1103

Cigno, A. (1991), Economics of the Family, Oxford and New York: Clarendon Press and Oxford University Press

——— (1993), Intergenerational Transfers without Altruism: Family, Market and State, European Journal of Political Economy 9, 505-518

——— (2000), Self-Enforcing Family Constitutions, in A. Mason and G. Tapinos (eds.), Sharing the Wealth: Intergenerational Economic Relations and Demographic Change, New York and Oxford: Oxford University Press

———, Casolaro, L. and F.C. Rosati (2003), The Impact of Social Security on Saving and Fertility in Germany, FinanzArchiv 59

———, Giannelli, G.C. and F.C. Rosati (1998), Voluntary Transfers among Italian Households, Structural Change and Economic Dynamics 9, 435-451

———- and A. Luporini (2003), Optimal Policy Towards Families with Di¤erent Amounts of Social Capital, in the Presence of Asymmetric Information and Stochastic Fertility, paper to the 2003 Venice Summer Institute

———-, Luporini, A. and A. Pettini (2003), Transfers to Families with Children as a Principal-Agent Problem, Journal of Public Economics 85

———- and A. Pettini (2003), Taxing Family Size and Subsidizing Child-Speci…c Commodities? Journal of Public Economics 87, 75-90

——— and F.C. Rosati (1992), The E¤ects of Financial Markets and Social Security on Saving and Fertility Behaviour in Italy, Journal of Population Economics 5, 319-341

——— and F.C. Rosati (1996), Jointly Determined Saving and Fertility Behaviour: Theory, and Estimates for Germany, Italy, UK, and USA", European Economic Review 40, 1561-1589

——— and F.C. Rosati (1997), Rise and Fall of the Japanese Saving Rate: The Role of Social Security and Intra-Family Transfers, Japan and the World Economy 9, 81-92

——— and F.C. Rosati (2000), Mutual Interest, Self-Enforcing Constitutions and Apparent Generosity, in L.A. Gérard-Varet, S.C. Kolm and J. Mercier Ythier (eds.), The Economics of Reciprocity, Giving and Altruism, London and New York: MacMillan and St Martin's Press

Coughlin, P. (1986), Elections and Income Redistribution, Public Choice 50, 27-91

———, Mueller, D. and P. Murrell (1990), Electoral Politics, Interest Groups, and the Size of Government, Economic Enquiry 28, 682-705

Conde-Ruiz, J.I. and V. Galasso (2000), Positive Arithmetic of the Welfare State, mimeo.

Cox, D. (1987), Motives for Private Income Transfers, Journal of Political Economy 95, 508-546

———- and G. Jakubson (1995), The Connection Between Public Transfers and Private Interfamily Transfers", Journal of Public Economics 36, 1-16

Cremer, H., Dellis, A. and P. Pestieau (2003), Family Size and Optimal Income Taxation, Journal of Population Economics 16, 37-54

———-, Kessler, D. and P. Pestieau (1992), Intergenerational Transfers within the Family, European Economic Review 36, 1-16

Di Tella, R. and R. MacCullogh (2002), Informal Family Insurance and the Design of the Welfare State, Economic Journal 112, 481-503

Docquier, F. and P. Michel (1999), Education Subsidies, Social Security and Growth: the Implications of a Demographic Shock, Scandinavian Journal of Economics 101, 425-440

Esteban, J.M. and J. Sakovics (1993), Intertemporal Transfer Institutions, Journal of Economic Theory 61, 189-205

Foster, A.D. and M.R. Rosenzweig (2000), Financial Intermediation, Transfers, and Commitment: Do Banks Crowd Out Private Insurance Arrangements in Low-Income Rural Areas? in A. Mason and G. Tapinos (eds.), Sharing the Wealth: Intergenerational Economic Relations and Demographic Change. New York and Oxford: Oxford University Press

Gale, D. (1991), The E¢cient Design of Public Debt, in R. Dornbusch and M. Draghi (eds.) Public Debt Management: Theory and History, Cambridge, Ma.: Cambridge University Press

Gordon, R. and H. Varian (1988), Intergenerational Risk Sharing, Journal of Public Economics 37, 185-202

Groezen, B. van, Leers, T. and L. Meijdam (2003), Social Security and Endogenous Fertility: Pensions and Child Allowances as Siamese Twins, Journal of Public Economics 87, 233-251

Grossman and Helpman (1998), Intergenerational Redistribution with Short-Lived Governments, Economic Journal 108

Hansson, I. and C. Stuart (1989), Social Security as Trade among Living Generations, American Economic Review 79, 1182-1195

Kaganovich, M. and M. Zilcha (1999), Education, Social Security and Growth, Journal of Public Economics 71, 289-309

Kemnitz, A. (2000), Social Security, Public Education and Growth in a Representative Democracy, Journal of Population Economics 13, 443-462

Kollmann, R. (1997), Endogenous Fertility in a Model with Non-Dynastic Parental Altruism, Journal of Population Economics 10, 87-95

Kolmar, M. (1997), Intergenerational Redistribution in a Small Open Economy with Endogenous Fertility, Journal of Population Economics 10, 335-356

Konrad, K.A. (1995), Social Capital and Strategic Inter-Vivos Transfers of Social Capital, Journal of Population Economics 8, 315-326

Kotliko¤, L.J. (1988), Intergenerational Transfers and Saving, Journal of Economic Perspectives 2, 41-58

————, Persson, T. and L. Svensson (1986), Social Contracts as Assets: A Possible Solution to the Time-Consistency Problem, American Economic Review 78, 662-677

Leibenstein, H. (1960), Economic Backwardness and Economic Growth, New York: Wiley

Maskin, E. and J. Farrell (1989), Renegotiation in Repeated Games, Games and Economic Behavior 1, 327-360

Meijdam, L. and H.A.A. Verbon (1996), Aging and Political Decision Making on Public Pensions, Journal of Population Economics 9, 141-158

———— (1997), Aging and Public Pensions in an Overlapping Generations Model, Oxford Economic Papers 49, 29-42

Modigliani, F. (1986), Life Cycle, Individual Thrift and the Wealth of Nations, American Economic Review 76, 297-313

Neher, P.A. (1971), Peasants, Procreation and Pensions, American Economic Review 61, 380-389

Pecchenino, R.A. and K.R. Utendorf (1999), Social Security, Social Welfare and the Aging Population, Journal of Population Economics 12, 607-623

Peters, W. (1995), Public Pensions, Family Allowances and Endogenous Demographic Change, Journal of Population Economics 8, 161-183

Rawls, J. (1971), A Theory of Justice, Cambridge, Ma.: Belknap

Robertson, D.H. (1956), What Does the Economist Maximize? in D.H. Robertson, Economic Commentaries. London: Staples

Rosati, F.C. (1996), Social Security in a Non-Altruistic Model with Uncertainty and Endogenous Fertility, Journal of Public Economics 60, 283-294

Samuelson, P.A. (1958), An Exact Consumption-Loan Model with or without the Social Contrivance of Money, Journal of Political Economy 66, 467-482

Shubick, M. (1981), Society, Land, Love or Money, Journal of Economic Behavior and Organization 6, 359-385

Stiglitz, J.E. and A. Weiss (1981), Credit Rationing in Markets with Imperfect Information, American Economic Review 71, 393-410

Stark, O. (1993), Nonmarket Transfers and Altruism, European Economic Review 37, 1413-1424

Tabellini, G. (1991), The Politics of Intergenerational Redistribution, Journal of Political Economy 99, 335-357

Thogersen, O. (1998), A Note on Intergenerational Risk Sharing and

the Design of Pay-as-You-Go Pension Programs, Journal of Population Economics 11, 373-378

Veall, M.R. (1986), Public Pensions as Optimal Social Contracts, Journal of Public Economics 31, 237-251

Verbon, H.A.A. (1993), Public Pensions: The Role of Public Choice and Expectations, Journal of Population Economics 6, 123-135

Wagener, A. (2003), Pensions as a Portfolio Problem: Fixed Contribution Rates vs. Fixed Replacement Rates Reconsidered, Journal of Population Economics 16, 111-134

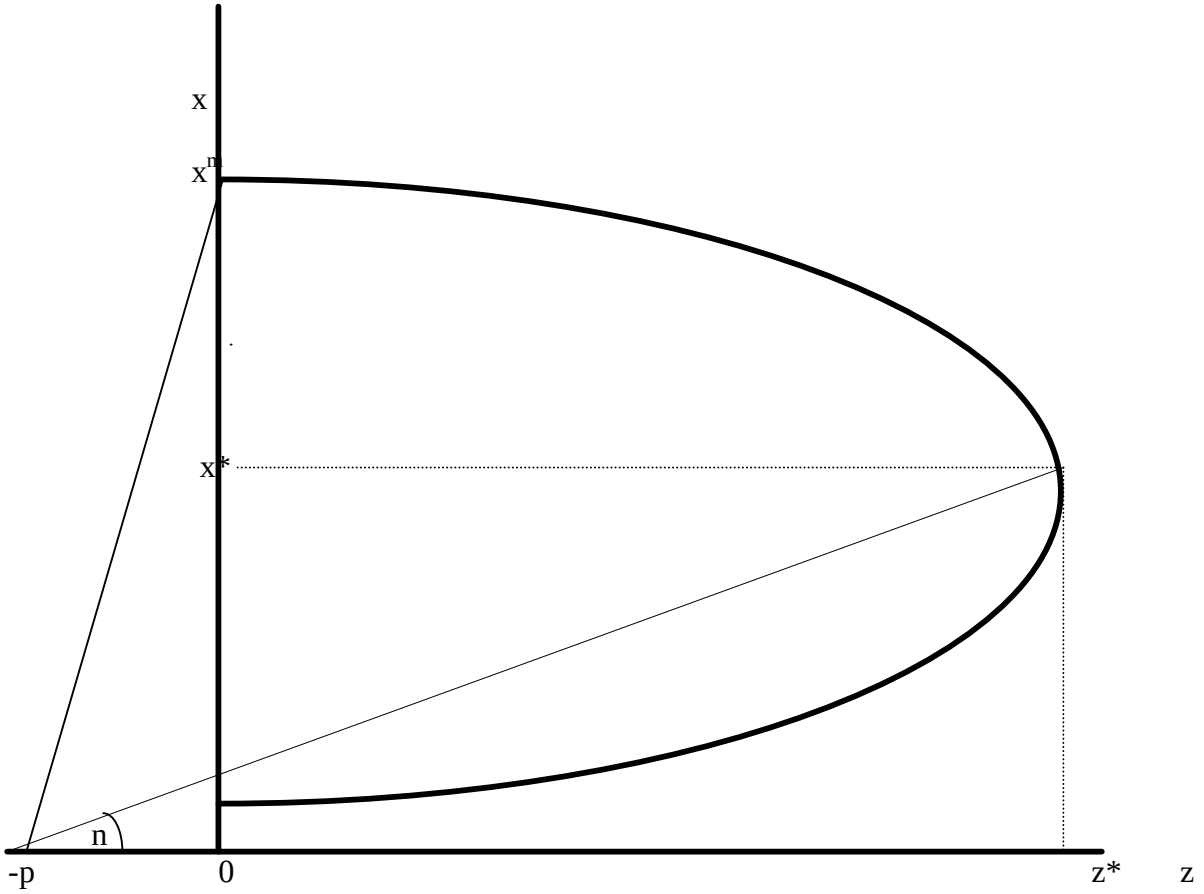

Figure 1: The set of sub-game perfect Nash equilibria and the self-enforcing constitution

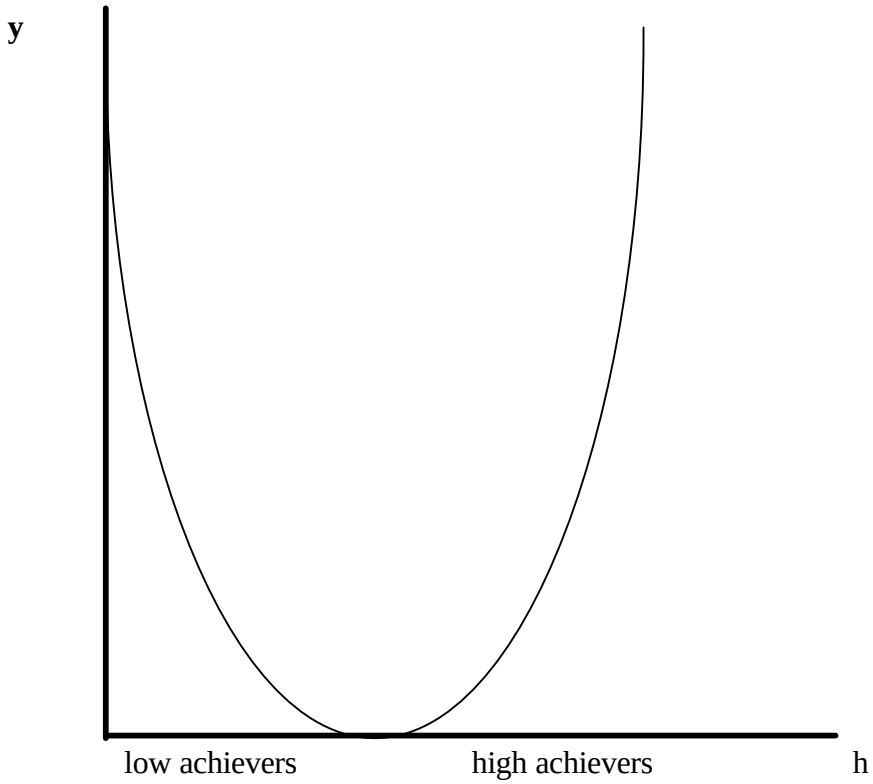

Figure 2. Second-best transfers per child, conditional on the child's achievements

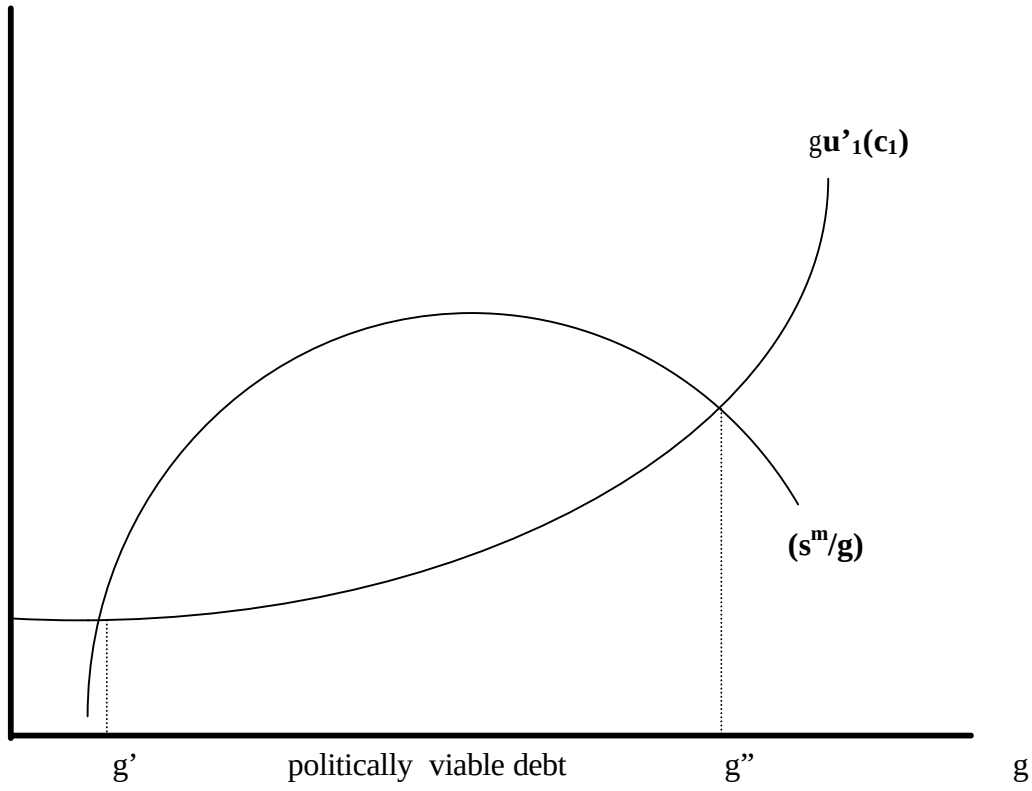

Figure 3. The set of politically viable public debt levels