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Fiscal Incidence when both Individual Welfare and Family Structure Matter: The Case of Subsidization of Home-Care for the Elderly

Abstract

How should we construct incidence indexes for children and parents in the case of public subsidies for home-care of the elderly? What is the nature of a fiscal incidence index on a budgetary basis versus a theoretically more satisfactory index that is welfare-based? Can we find budgetary based measures that will serve as a proxy for incidence in welfare terms? Does the structure of the family including the altruism of children affect incidence indexes? How should fiscal shifting of the subsidy for home care paid to the parents be defined, in budgetary or in welfare terms, and what does simulation tell us about the distribution of benefits between the generations?

We address these issues analytically and with simulation (using data from the Medical Expenditure Panel Survey) in this contribution to the study of fiscal incidence. The definition of welfare incidence, the comparison of welfare-based incidence with budgetary incidence for non-cooperative and cooperative families, and the calculation of the shifting of program benefits between family members, some of whom may be altruistic, are key issues in the analysis. The integration of individual welfare, family structure and benefit shifting provides a new perspective on the fiscal incidence of home care programs.

JEL-Code: H220, I180, D130.

Keywords: home care of the elderly, price-subsidy, fiscal incidence index, non-cooperative family, cooperative family, income pooling, altruism, benefit shifting, Medical Expenditure Panel Survey, Medicaid, simulation.

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1. Introduction

Ageing of the population in developed countries has increased the pressure on children of elderly parents to provide more home care as an alternative to costly institutionalization.[1] And because personal contributions - in both time and money - by family caregivers only ameliorates a difficult situation, it is not surprising that governments in many countries are also finding themselves under pressure to increase public support for home care of the elderly.[2] Subsidizing home care rather than institutional capacity allows them to maintain expenditures in other important policy areas while responding to the demands of increasingly burdened (adult) children.

In this paper, we investigate analytically and with simulation the fiscal incidence among children and parents of a program that subsidizes the cost of home care for elderly parents. Although there is an extensive literature on the family and its relation to public policy, aspects of which we review and selectively rely upon, to the best of our knowledge there has been no work so far on the *fiscal incidence* of programs designed to subsidize the care of seniors who remain at home.

To analyze the fiscal incidence across parents and children of a public subsidy for home care, it is necessary to deal with several related issues that have not yet been combined in this context: (i) At the most general level is the longstanding problem in incidence analysis with the common use of budgetary amounts rather than individual welfare as a metric for the attribution of net benefits across program recipients and tax payers; (ii) The structure of the family - whether children and parents act non-cooperatively or cooperatively, as well as the nature and consequences of altruism among family members – is a second set of issues that must be integrated into an assessment of the incidence of a family-related program; (iii) And finally there is the related matter of the definition and calculation of the shifting of the subsidy between the two generations. The resulting integration of a concern with welfare as well as with budgetary incidences, family structure, and benefit shifting between parents and children provides a new perspective on the study of the fiscal incidence of home-care programs.

It is useful to briefly address previous research related to each of these three key issues.

Work on welfare-based incidence of public expenditure has been sparse since the seminal contribution of Aaron and McGuire (1970). Early incidence studies, as well as most contemporary work, conveniently uses budgetary amounts as a metric, as for example in the work of Gillespie (1964, 1980), Okner and Pechman(1974), Suits (1977), Pechman (1985), Vermaeten et al. (1995), and many others. This is so despite the work of Aaron and McGuire, Maital (1973), and Martinez-Vazquez (1982) that showed how the translation of budgetary incidence into welfare terms substantially affects incidence calculations for public goods.[3] One should note that even though the price-subsidy program we analyze does not involve the provision of a public good, budgetary changes are not in principle identical to welfare changes.[4]

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[1] On the financial cost of home care versus institutional care, see for example Weissert et al. 1997, Hux et al. 1998, and Hollander and Chappell 2002.

[2] OECD (2005) provides many examples of home-care subsidies drawn from OECD countries.

[3] Welfare is used as a metric in some computable equilibrium studies such as Piggot and Whalley (1987). But to the best of our knowledge, there remains a striking absence of analytical work on incidence when welfare matters.

[4] On the importance of price changes for incidence analysis, albeit in different contexts to that considered here, see Brennan (1976) and Browning (1978).

In the paper we pay special attention to the comparison of analyses that alternatively use welfare or budgetary amounts as a metric. While welfare is theoretically superior as a metric, it would be much simpler to accumulate appropriate evidence and to translate it into practical policy advice if budgetary amounts rather than welfare could serve as a basis for assessing distributional impacts.

The nature of family structure has been well considered in the economics literature, and provides useful modeling ideas for our own work. This includes Becker (1981) on the altruistic family, Lundberg and Pollak (1994), Konrad and Lommerud (2000) and Chen and Woolley (2001) on the non-cooperative family, Manser and Brown (1980) and McElroy and Horney (1981) on cooperative family bargaining, and Chiappori (1992), Browning and Chiappori (1998) and Apps and Rees (1997, 2007) on the collective household, among other contributions. In addition, there is some research on the impact of public programs on the living arrangements of the elderly and on the extent of informal care giving of the children, including Hoerger et al. (1996), Pezzin and Schone (1997, 1999), Bittman and Folbre (2004), Stabile et al. (2006), Viitanen (2007), Byrne et al. (2009), and Orsini (2010). There is also a useful literature on the optimal structure and consequences of public support for the family (where incidence is not, however, considered) including, for example, Cigno (1993, 2006), Balestrino (2004), and Pestieau and Sato (2008).[5] We will return to aspects of this body of research at various points.

The last of the three major elements that we incorporate into the incidence analysis is shifting. Unlike tax shifting, which is a classic topic in public finance - for a recent survey, see Zodrow (2005) - the shifting of benefits, whether of services or of subsidies, remains largely un-researched (Shoup 1988 is a rare exception). In assessing the distributional impact of home care subsidies, where family structure is obviously involved, it is necessary to deal with the possibility that program benefits may be shifted between the two generations. The literature on how families internalize transfers is also helpful here. For example, Altonji et al. (1997), Cox et al. (2004) and Juarez (2007) consider whether a change in the income distribution among family members induces the family to modify existing internal transfer arrangements. Cox and Jakubson (1995) and Gueth et al. (2002) investigate the mechanism through which private transfers adjust to public transfers, and the consequent distribution of income. However, while this work also informs our research, it is conceptually distinct from fiscal incidence analysis because an incidence study must distinguish shorter from longer run behavioral adjustments and consider the overall welfare consequences for all types of individuals.

The paper proceeds in the following manner. We first construct a model of individual behaviour for parents and children in the presence of a tax-financed (price) subsidy for home care for elderly parents, when the children may be altruistic and families are non-cooperative. In this analysis, after summarizing the key conceptual steps required for any incidence study, we explicitly carry out these steps for the home-care subsidy. Both welfare-based and budgetary-based incidence indexes are developed. Using simulations because of the complexity of the resulting models, we next explore the importance of assumptions about family structure for the calculation of incidence and benefit shifting. Here the model is calibrated to Medicaid data from the Medical Expenditure Panel Survey for 2007. A final section concludes. Ancillary calculations are provided in an Appendix.

Before turning to the analysis, it may be helpful to set our contribution in a broader context. We focus on the incidence of subsidies for home care because the increasing burden of the elderly on their children is in our view a major stimulus for many current policy reforms. Our contribution is

[5] See also the many references in the recent collection of papers edited by Cigno et al. (2011).

primarily methodological in nature. We address one part of a bigger picture that must be dealt with by policy makers considering care of the elderly. Our framework does not deal with questions of whether the government should use home care subsidies in a world where there are some people with adult parents and some without, and where there are various alternative policies available to deal with the old. All of these matters would have to be part of any comprehensive assessment of elderly care. Despite this narrowing of our focus, however, there remain many challenging issues to deal with in the pursuit of the fiscal incidence of a price-subsidy for elderly home care, an analysis which is also a key part of the more comprehensive picture.

2. A behavioural model of a non-cooperative family when children are altruistic

We begin by setting out a simple behavioural model of a non-cooperative family in the presence of altruism. By non-cooperative, we mean that incomes of family members are not explicitly pooled, and that the decisions of the parent and the child are made simultaneously in a non-cooperative Nash game.

The non-cooperative case may be particularly relevant in the present context because at some point, it is reasonable to expect that children would rather give money instead of spending more time with their parents, while parents continue to prefer the children's attention to a money transfer. We think that this disagreement may be widespread among families in developed countries and, in such a situation, use of a non-cooperative model of the family is appropriate. However, we do not have independent empirical evidence on this matter. Moreover, because the literature on the basic (non-cooperative vs. cooperative nature of the family) is not definitive and since, as we will show, the cooperative model of the family carries with it strong implications for the nature of fiscal incidence analysis, we will also consider the incidence of the home care program when the family is cooperative in a later section.[6]

There are several well-discussed motivations for income transfers within any type of extended family, including altruism, exchange, mutual insurance and emotions among others (Cox and Fafchamps, 2008). We shall adopt altruism as the motivation for intra-family transfers in both non-cooperative and cooperative family models, represented as usual by interdependence of the utilities of the donor and recipient. Here this altruism is assumed to be one-sided – the child cares about the parent – an assumption to which we shall return below.

We assume that all families are identical and that every family is composed of an elderly parent and one child. Equivalently, we may think of the model as applying to a family of two parents and two or more children where there is no disagreement between the parents, or among the children. To make it

[6] Anderberg and Balestrino (2011) offer two reasons to believe that families are more likely to be non-cooperative: (i) Families are usually not as efficient as is implied by a cooperative approach because many family decisions are irreversible and these decisions, once made, affect the distribution of future bargaining powers (see also Lundberg and Pollak 2003); and (ii) empirical evidence appears to reject the hypothesis of income pooling among family members (Altonji et al. 1997; Lundberg et al. 1997, 2007). In choosing between models of the family, one may also note that cooperative bargaining models suffer from two unrealistic assumptions: the Nash bargained agreement is binding costlessly, and the threat point of the cooperative bargaining is a costly dissolving of the family (Xu 2007). In response, non-cooperative models are proposed to solve the enforcement problem and serve as a more realistic threat point for cooperative bargaining, as discussed further by Woolley (1988) and Lundberg and Pollak (1993, 1996). Nonetheless, for reasons stated in the text, we also consider the cooperative family case.

clear that we do not consider strategic interaction among children, or between parents, we proceed from this point on as if there were one male parent and one female child.[7]

The parent is infirm and requires home care, perhaps as a substitute for institutionalization, which consists of both formal and informal components. The parent buys formal services from the market, a portion of the cost of which is subsidized by the government. The child is altruistic to some extent and, in general, spends time taking care of the parent and also buys some formal home care for the parent from the market. The supply of formal care services is assumed to be at a fixed price for all members of the family.

The formal care purchased by the child and by the parent are considered to be perfect substitutes in consumption. But purchases of formal care by the child are not eligible for the public subsidy.[8] We also assume that the parent prefers the company of the child, and so the formal care purchased by the child is not considered by the parent to be a perfect substitute for the child's personal attention.

Assuming that utility is Cobb-Douglas, so that the subsidy and the consequent change in the price of home care affect all components of agent choices, the utility of the parent (p) is:

$$U(x_p, m, s, h) = a \log(x_p) + b \log(m+s) + c \log(h), \quad (1)$$

where x_p is the numéraire consumption of the parent, $m+s$ is the total hours of formal care received by the parent, of which m hours of formal care is purchased by the parent and the other s hours of formal care is purchased by the child, and h is the total hours that the child spends to take care of the parent. As usual we let $a+b+c=1$, and because the parent prefers the child's attention to purchased care, we assume that the Cobb-Douglas coefficient of formal care $m+s$ is smaller than that of informal care h; i.e. $b < c$.

The parent's utility is maximized by choice of numéraire consumption, x_p, and formal care consumption, m, subject to the budget constraint

$$y(1-t) = x_p + q(1-t_s)m, \quad (2)$$

where y is the amount of the fixed pension income of the parent, the price of numéraire consumption is normalized to 1, the price of formal care is q per hour, and t_s is the rate of non-taxable subsidy that the government gives to the parent. t is the uniform income tax rate applied to both the parent and the child. Here taxes are levied only to pay for the home care subsidy. With the government subsidy, the effective price of the formal care purchased by the parent is $q(1-t_s)$ per hour.

Following Becker and many others, we assume the utility of the child (c) depends on that of the parent:

$$U(x_c, l, x_p, m, h, s) = [(1-d)\log(x_c) + d\log(l)] + rU_p(x_p, m, s, h), \quad (3)$$

[7] Interested readers may wish to see Knoef et al. (2007) or Pezzin et al. (2007) for analyses of the strategic interactions among children in arranging home care for their parents.

[8] We set aside the possibility that, since the parents who are subsidized are old, it is possible that the child is involved with her parent's finances in some way and, via this route, with the parent's response to the home care subsidy.

where, x_c is the numéraire consumption of the child, l is the leisure enjoyed by the child, U_p is the utility of the parent, and r is the degree of altruism towards the parent. The elements in the square bracket represent the utility of the child in the absence of altruism.[9]

The child maximizes (3) by choice of (x_c, h, s) subject to her budget constraint,

$$w(T-h-l)(1-t)=x_c+qs, \tag{4}$$

where $T = L + h + l$, with T the child's total available time in a day, L the child's working hours, h the number of hours that the child provides informal home care to the parent, l the hours of leisure enjoyed by the child, and w the child's wage rate.

One might also include parent's altruism towards the child in the model, that is, a model with two-sided altruism, where the parent's altruism to the child may be represented by the leaving of a lump-sum bequest to the child. Such a bequest will not affect the net benefit from a government subsidy program in budgetary terms, nor does it induce any behavioral interaction in the above model in which case, as we show later, differences between a budgetary-based and welfare-based incidence analysis are muted. One may argue that in a longer run context than we consider in this paper, the degree of altruism of the child may depend upon the expectation of such bequests. We leave this very long run analysis for future research, as one-sided altruism introduces by itself considerable complexity into the analysis.[10]

Given the structure above, the indirect utilities of the parent and the child when the subsidy is in place and fully adjusted to, V_p and V_c, are[11]:

$$V_p = \log[wT(1-t)+\frac{y(1-t)}{(1-t_s)}] + a\log(1-t_s) + Z_p \text{, where } Z_p \text{ is a constant and } Z_p = -\log(1+r) + a\log(ra) + b\log(rb) + c\log(rc) - b\log(q) - c\log[w(1-t)], \tag{5}$$

and

$$V_c = (1+r)\log[wT(1-t)+\frac{y(1-t)}{(1-t_s)}] + ra\log(1-t_s) + Z_c \text{, where } Z_c \text{ is a constant, and } Z_c = -(1+r)\log(1+r) + (1-d)\log(1-d) + d\log(d) - (d+rc)\log[w(1-t)] + rZ_p . \tag{6}$$

In the language of incidence analysis, expressions (5) and (6) represent post-fisc welfare in the long run (of this model) for the parent and the child respectively.

Note that because of the form of the parent's utility (1), the child at an interior solution (6) will always provide some *informal* home care (h>0). But *formal* care purchased by the parent or the child,

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[9] One may note that the model differs from that of Lundberg and Pollak (1993)'s separate sphere model in that here the child cares about her parent's entire utility instead of only about the quantity of home care, and the formal care purchased by the parent and the child are not separable in the utility function. The incidence analysis based on a separate sphere model is simpler, but still similar to, that presented later.

[10] Readers interested in models of optimal fiscal policy when parents and children exchange care and inheritances may refer to Pestieau and Sato (2008).

[11] Further details are provided in the Appendix.

m or *s*, could be zero (as shown in the simulation later). The situation when the child lives away so that she cannot provide any *informal* care will be addressed later on.

When the government budget is balanced, total tax revenue equals total expenditure: $t(Y_p + Y_c) = t_s qm$,[12] where Y_p and Y_c are the taxable gross income of the parent and the child. Using this government budget constraint and the solutions to the optimization problem of the parent and the child given in part 1 of the Appendix, we can derive for later use the equilibrium tax rate in the post-fisc situation with full behavioral adjustment of the parent and the child in the long run, t^{LR}:

$$t^{LR} = \frac{\frac{y}{(1-t_s)} - \frac{ra}{(1+r)}\left[wT + \frac{y}{(1-t_s)}\right]}{\frac{y}{(1-t_s)} - \frac{ra[wT + y/(1-t_s)]}{(1+r)} + \frac{(1+r-d-rc)(y+wT)}{t_s(1+r)}}. \qquad (7)$$

3. The net incidence of a price subsidy for home care

Having outlined the underlying behavioral model, we can proceed with the incidence analysis. Fiscal incidence analysis can be boiled down into five key steps, a summary of which is not easy to find despite the vastness of the literature. These five steps are: (i) the choice of a counterfactual experiment; (ii) the treatment of the government budget in the counterfactual; (iii) the choice of a metric for incidence calculations; (iv) the choice of a benchmark income for the purpose of defining an incidence index; and, finally (v) allowance for shifting. In conducting the incidence analysis, we compute both a welfare-based incidence measure along with the traditional budgetary-based index. We proceed deliberately, and as quickly as possible, through each step, some of which are more complicated in the present context than others.

3.1 Choice of the counterfactual

The first step is to choose a counterfactual experiment which effectively defines the policy to be analyzed. We may consider replacing the existing subsidy program with another policy in a *differential incidence analysis*. Or we may analyze the implications of an existing home-care subsidy by comparing it to a pre-fisc situation in the absence of the subsidy and of the revenue required to finance it in a *balanced budget analysis*.[13]

In this paper, we pursue a differential expenditure analysis by comparing the situation when the subsidy is in place to a counterfactual in which the price subsidy is replaced by an equal-cost set of lump-sum transfers. This choice focuses our attention on the consequences of changing the relative price of home care, and is motivated by observing changes in existing public budgets which are being reoriented towards the elderly and their needs (rather than simply increased) as the population ages. It is convenient to regard the situation with the subsidy in place as the initial situation '0'. In the counterfactual situation '1', we hypothetically replace the price subsidy with the alternative lump-sum transfer program. The structure of the tax system remains unchanged.

[12] Because all the families are assumed to be identical, the number of them is omitted in the government budget.

[13] A classic example of the differential approach is Pechman (1985). Gillespie (1964) provides the seminal balanced-budget analysis.

3.2 Defining the government budget in the counterfactual

The second step is to define precisely the nature of the government budget in the counterfactual. The change in revenue or expenditure as a result of the application of the counterfactual must be exactly allocated across citizens.

Let the equal-cost set of lump sum transfers in the counterfactual be denoted by R_i. We let R_i be proportional to taxable income in the presence of the price subsidy, so that $R_p = f \cdot Y_p$ for the parent and $R_c = f \cdot Y_c$ for the child. To maintain the government budget when the subsidy program is replaced with the transfer program, we must have $R_p + R_c = f(Y_p+Y_c) = t_s qm$ in the counterfactual situation, while also observing government budget balance: $t^{LR}(Y_p + Y_c) = t_s qm$. Therefore, in this case, $f = t^{LR}$, $R_p = t^{LR}Y_p$ and $R_c = t^{LR}Y_c$, so that the transfer in the counterfactual is equal to the tax payment. This conveniently eliminates changes in income distribution as a result of the application of the counterfactual.[14]

3.3 Choosing a metric: budgetary amounts versus welfare changes

The third step in incidence analysis is to choose a metric for the measurement of net benefits. Most fiscal incidence studies used budgetary amounts as a metric - see for example, Browning (1978) or Vermaetan et al. (1995). Only a few studies have used welfare as a metric, following the seminal work of Aaron and McGuire (1970). Here, we use both welfare and budgetary amounts in order to compare the resulting incidence calculations. As we noted earlier, it would be convenient if a budgetary incidence could be used as a proxy for welfare based incidence. The analysis below is designed to allow consideration of this possibility.

We first consider the use of budgetary amounts as a metric for calculating net benefits and then turn to welfare-based measures. A standard budgetary formula for the net benefit (NB) incident on group i in a particular situation is[15]

$$NB_i = G_i + TR_i - T_i \,, \tag{8}$$

where G_i is the monetary value of the service received by group i, TR_i is the amount of the government direct subsidy or transfer to group i, and T_i is the total tax that the group pays. This budgetary balance must in principle be measured in both the initial and the counterfactual situation with the overall net benefit from the program being given by the difference between the two:

$$NB_i = NB_i^0 - NB_i^1. \tag{9}$$

In the present context, the total benefit from the government to the parent in the long run is $TR_p = t_s qm$, and the total benefit to the child in the long run is $TR_c = 0$.

Alternatively, one might assume that in the long run, a part of the budgetary benefit from the subsidy is shifted from the parent to the child in proportion to the latter's purchase of formal care when the

[14] This differential analysis is still distinct from a balanced-budget analysis at least because income in the counterfactual of a differential analysis takes taxes paid into account, while in the balanced budget case, income in the counterfactual is defined in the absence of the effect of taxes required to pay for services received.

[15] Another definition of the net benefit in budgetary terms is the difference between the pre-government total income and post-government total income (See, for example, Meerman 1980). The difference between these two approaches depends on the general equilibrium effects on income of the policy under consideration.

subsidy is in place. However, we do not so, since this prejudges the outcome of the simulation analysis of shifting to be conducted later (where it turns out that this sharing rule is wrong).

The tax paid by the parent is $t^{LR}Y_p$ and the tax paid by the child is $t^{LR}Y_c$. So the net benefits received by the parent and the child in the post-fisc situation after all behavioral adjustments are:

$$NB_p^0 = TR_p - T_p = t_s qm - t^{LR}Y_p, \tag{10}$$

and

$$NB_c^0 = TR_c - T_c = 0 - t^{LR}Y_c. \tag{11}$$

In the counterfactual, neither the parent nor the child receives a subsidy. They both pay tax, and receive a lump-sum transfer equal to their tax payment. The net budgetary benefits in the counterfactual state (denoted by superscript 1) for both the parent and the child are zero,

$$NB_i^1 = R_i - T_i = t_i^{LR}Y_i - t_i^{LR}Y_i = 0. \tag{12}$$

Thus the overall net benefits of the parent and the child in the long run are:

$$NB_p^0 - NB_p^1 = (t_s qm - t^{LR}Y_p) - 0, \tag{13}$$

and

$$NB_c^0 - NB_c^1 = (- t^{LR}Y_c) - 0. \tag{14}$$

We now turn to the calculation of welfare-based incidence using the equivalent variation (EV) measure of welfare change.[16] We note again that although there is no public good in the model, this does not eliminate the problem of using budgetary based incidence as a proxy for a welfare-based measure.

The EV can be defined implicitly using the indirect utility function V. It is the amount of income that must be taken away from an individual in the initial state 0 in the presence of the subsidy in order to leave the individual just as well off as in the counterfactual state 1 where the subsidy is replaced by the lump-sum transfers. That is:

$$V_i^0[q(1-t_s), Y_i(1-t^{LR}) - EV_i] = V_i^1[q, Y_i(1-t^{LR}) + R_i], \tag{15}$$

where i represents p, parents, or c, children. A positive (negative) EV implies a net welfare gain (loss) from the subsidy in the benchmark state relative to the lump-sum transfer in the counterfactual state.

The EV from the subsidy for the parent in the long run is therefore

$$EV_p = [wT(1-t^{LR})(1-t_s) + y(1-t^{LR})] - (1-t_s)^{(b+c)}[y(1-t^{LR}) + t^{LR}y + wT(1-t^{LR})]. \tag{16}$$

Similarly, the child's' EV from the subsidy in the long run is:

[16] In computable equilibrium work on incidence such as that of Piggot and Whalley (1987), the EV is chosen over the CV because the EV always uses the observable current price vector as a benchmark price, while the CV uses the counterfactual price vector. The EV is also appropriate for the assessment of a program that is already in place, a perspective that we have adopted in defining the counterfactual.

$$EV_c = [wT(1- t^{LR})+y\,(1- t^{LR})/(1-t_s)] - (1-t_s)^{-ra/(1+r)}[\, wT(1- t^{LR}) + y(1- t^{LR})+ t^{LR}Y_c]. \qquad (17)$$

3.4 Choosing a benchmark income

We also need to choose a benchmark income for the purpose of defining a fiscal incidence index to compare the net benefit on parent and child. Income is almost always used as a benchmark for the purpose of defining beneficiary groups because it is thought to be highly relevant to the design and evaluation of public policies.[17]

There are at least three choices for benchmark income y_i that have been widely used in the literature. They are: *pre-fisc income, post-fisc income,* and a type of income lying between pre-fisc and post-fisc income referred to as *broad income* (Vermaetan et al., 1995). Pre-fisc income is private factor income in the absence of the fiscal policy in question. To compute pre-fisc income, shifting of taxes and benefits in the long run must be unwound to determine income in the absence of the policy under investigation. Post-fisc income is the income observed in the post-policy state which includes any government transfer payments and the benefits of government purchases, and is net of the corresponding tax payments. Broad income is essentially pre-fisc income plus transfer payments.

We shall use post-fisc income for the benchmark income relative to which net benefits are to be compared, because this is a natural choice for normalizing the welfare-based EV measure, and because we want to compare budgetary incidence that always depends on income and welfare incidence. In this case, no adjustment to benchmark (observed post-fisc) income for shifting is required.

Using post-fisc income as the benchmark income for the distribution of net benefits, the long run budgetary fiscal incidence index (BFI) of the parent may then be defined as[18]:

$$BFI_p^{LR} = \frac{NB_p^0 - NB_p^1}{Y_p^{post-fisc}} = \frac{(t_s qm - t^{\mathrm{LR}} Y_p) - 0}{Y_p^{post-fisc}}, \qquad (18)$$

where $Y_p = y$, $Y_p^{post\text{-}fisc} = y\,(1-t^{LR})+t_s qm$.

And the budgetary fiscal index of the child in the long run is:

$$BFI_c^{LR} = \frac{NB_c^0 - NB_c^1}{Y_c^{post-fisc}} = \frac{(0 - t^{\mathrm{LR}} Y_c) - 0}{Y_c^{post-fisc}}, \qquad (19)$$

where, $Y_c = wT - (rc+d)(wT+y)/(1+r)$, and $Y_c^{post\text{-}fisc} = Y_c\,(1-t^{LR})$.

[17] We might normalize by welfare in the benchmark (in the presence of the policy), which then effectively turns the exercise into a study of benefit-cost ratios. This is not done in fiscal incidence studies, and we shall continue in the same tradition, at least because we want to study the difference between budgetary and welfare based incidence indexes.

[18] An alternative way to measure budgetary fiscal incidence would be to define incidence according to savings of money spent on formal care (Mel McMillan, private communication). This approach essentially lies between a budgetary approach and a welfare-based measure. We do not pursue it further in this paper.

The welfare-based fiscal incidence indexes (WFI) using post-fisc income as the benchmark income for the parent and the child are

$$WFI_p^{LR} = \frac{EV_p}{Y_p^{post-fisc}} = \frac{[wT(1-t^{LR})(1-t_s)+y(1-t^{LR})]-(1-t_s)^{(b+c)}[wT(1-t^{LR})+y(1-t^{LR})+t^{LR}y]}{Y_p^{post-fisc}} \quad (20)$$

and

$$WFI_c^{LR} = \frac{EV_c}{Y_c^{post-fisc}} = \frac{[wT(1-t^{LR})+y(1-t^{LR})/(1-t_s)]-(1-t_s)^{[-ra/(1+r)]}[wT(1-t^{LR})+t^{LR}Y_c+y(1-t^{LR})]}{Y_c^{post-fisc}}. \quad (21)$$

In (20) and (21) we can see the roles of the subsidy rate for home care, t_s, the tax rate in the long run situation, t^{LR}, the child's degree of altruism towards the parent, r, the parent's taste parameters, a, b, and c, and the income measures of the parent and the child, y, wT, and Y_c.

The parent's welfare change is a result of the subsidization of consumption and the trade-off between market care and attention by the child. The change in welfare for the child is the outcome of the child's adjustments of purchase of formal care and time use, and the parent's behavioral adjustments. And as shown in equation (7), the equilibrium tax rate that balances the government budget is also a result of these adjustments.

3.5 Allowing for shifting of program benefits

The final step of incidence analysis is to allow for the shifting of benefits between the parent and the child. One should also note again that the shifting of net benefits is not the same as the analysis of the trade-off between public and private transfers within the family. Shifting is induced by the behavioral adjustment between the short and longer run while the crowding-out literature deals with a single time horizon.

The analysis of the shifting of tax burdens has been at the center of tax incidence studies at least since Harberger's (1962) seminal work on the corporate income tax. But there is virtually no theory concerning the shifting of benefits, in large measure, one suspects, because it is thought that such a comprehensive framework would be hard to actually apply, and the shifting of benefits is ignored in almost all incidence studies.

Shoup (1988) argued for, but did not provide, an analysis of the shifting of benefits. One of his examples concerns a city park constructed in the neighborhood of a rental residence. When the park is just constructed, the tenants living nearby receive the full benefit of the park. However, over time the benefit from the park leads to a rent increase. In the long run, part or all of the benefits from having the park nearby is shifted from the tenants to the landlord. It would be a mistake, Shoup argues, if all the benefits from the park were to be allocated to the tenants.

To study the shifting of benefits, we need a theory of behavior and a counterfactual distinguishing the incidence of program benefits in the short and the longer run, of a sort analogous to that used in the study of tax shifting. Shifting may be then defined as the difference in incidence over the two horizons. In a corporate income tax study, for example, assumptions need to be made about how adjustments in the capital stock occur over short and longer runs in response to taxation. The short run is often defined as a situation in which the capital stock is fixed and thus bears the full tax burden,

while the long run allows for capital mobility of some sort that leads to shifting of the tax burden from capital to labor.

We shall assume that in the short run, and for any given degree of altruism, the child's behavior is fixed at the levels that would occur if there were no subsidy program. The parent, however, is assumed to fully adjust to the subsidy and to the child's behavior at the outset. In other words, the short run involves the absence of adjustment by the child only.[19] Here we have in mind a chain of events precipitated by the subsidy, which in the first instance is paid to the parent, and which the child may know about but cannot adjust to in the short run. Other assumptions are possible, and the literature gives little guidance. [20]

Accordingly, let the child in the short run maximize utility as if her parent was not subsidized. The parent's budget constraint is then regarded by the child as $y = x_p+qm$, instead of $y(1-t) = x_p+q(1-t_s)m$, and the child's budget constraint is seen to be $wT(T-h-l)=x_c+qs$, instead of $wT(T-h-l)(1-t) = x_c+qs$. The child's problem in the short run then amounts to maximizing the following:

$$U(x_c, l, x_p, m, h, s) = [(1-d)\log[w(T-h-l)-qs] + d\log(l)] + rU_p(x_p, m, h, s), \text{ where } x_p = y - qm. \tag{22}$$

The equilibrium tax rate in the short run is thus affected by the behavioral response to the subsidy by the parent and by the behavior of the child in the short run, so that $t^{SR}(Y_p^{SR}+Y_c^{SR}) = t_s q m^{SR}$. After substitutions, this short run tax rate is

$$t^{SR} = \frac{\frac{byt_s}{(1-t_s)} - ra(1-c)wTt_s + a(1+rc)yt_s}{\frac{byt_s}{(1-t_s)} + (1+r-d-rc)(1-c)(wT+y)}. \tag{23}$$

We can then use t^{SR} in (23) to calculate budgetary and welfare incidence indexes for the child and for the parent when the child has not fully adjusted to the post-fisc situation. The computation of these short-run fiscal incidence indexes is provided in the Appendix. Shifting is then measured by the difference in fiscal incidence indexes for the child and the parent over the two horizons.

4. A comparison of incidence indexes and shifting analyses using simulation

With the exception of some special cases which are presented analytically below, and in view of the algebraic complexity of the incidence indexes, it proves useful to explore the budgetary and welfare incidence indexes we have defined and the shifting of net benefits using simulation. To simulate the indexes under various conditions, we use data related to the Medicaid subsidy for home care, in part because Medicaid is the single largest source of financing for long-term care in the United States (Kaiser 2005), and in part because required ancillary data can be assembled in a

[19] If the parent also does not adjust in the "short-run", the behavioural solution is then simply same as in the pre-fisc case. It is harder for the child to adjust in the short run because she has to re-allocate her time among labor, leisure, and informal care.

[20] An alternative short run situation is one in which the child makes consumption decisions as if there were no subsidy, but she does respond to changes in the parent's behaviour. Simulations (not reported here) suggest that there is little difference between this setting and the one discussed in the text, at least for the parameter values we use.

reasonably consistent manner for this case.

The data we use are from various sources.[21] The Medicaid subsidy for formal home care and the income of the parents are derived from the Medical Expenditure Panel Survey (MEPS, 2007 wave) provided by the U.S. Department of Health and Human Services. The target population are those 65 years and older who are covered by Medicaid (The sample size is 579 in the survey). The average age of the sample population is 75.34 and their average income is $12081.83 annually or $33.10 daily. A subsidy rate for formal care is obtained by dividing the average amount of home health expenditure covered by Medicaid by the average total home health expenses of the sample population, so that the subsidy rate is $t_s = 0.3929$.

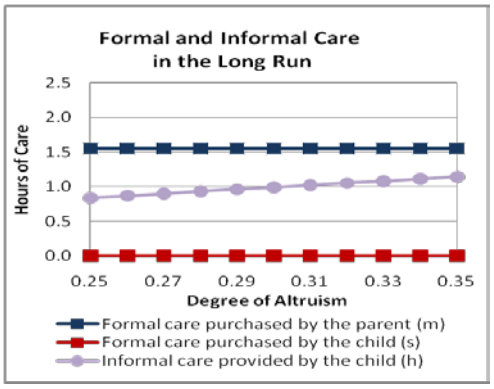
The child's wage rate and the hourly price of formal care are from the Occupational Employment Statistics (2007 wave) of the U.S. Bureau of Labor Statistics. The child's wage rate is the average hourly wage rate of the labor force for all occupations, and the price of formal home care is approximated by the average hourly wage rate of home health aid workers.[22] These data imply that in our simulated family, the child earns $19.56 per hour and the price of formal home care is $10.03 per hour. The child's total time available for work, leisure, or home care is assumed to be 12 hours a day.

We also assume that the parent's preference for numéraire consumption, for formal care, and for informal care are represented by Cobb-Douglas coefficients $a = 0.5$, $b = 0.2$, and $c = 0.3$, and that initially the child is altruistic towards to the parent to the degree of $r = 0.25$, a figure that appears to be in accord with some existing empirical work.[23] We treat the situation with $r = 0.25$ as our baseline case, and then gradually increase the degree of altruism to study its role in the incidence calculations.
In the baseline case, when the government budget is balanced, a subsidy rate of 0.3929 must be financed with a tax rate of 0.0332 in the long run and 0.0115 in the short run for a non-cooperative family, and at the rate of 0.0943 for the cooperative family to be considered later.

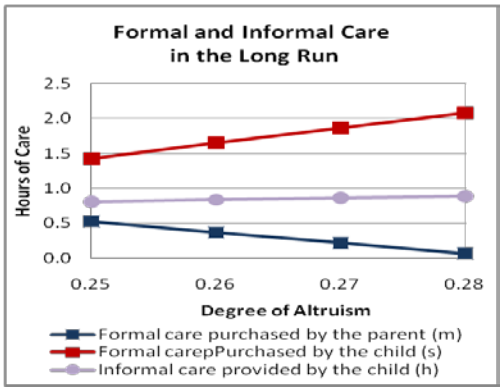
The above setup is such as to generate a child in our synthetic family who does not purchase any formal care for the parent in the long run as shown by case A of Figure 1 below. This is a corner solution for the family we have modeled. Simulations (not illustrated) show that only when the child's wage rate is higher than $28 per hour (versus about $33 a day for the parent) will the child start to purchase formal care. Case B of Figure 1 below describes the case of a high wage child who makes $36.49 per hour.[24] On the other hand, the figures show that informal care provided by the child increases steadily with the assumed degree of altruism, for both the average wage and high wage child. The sensitivity of the patterns in the figures to variations in wage level of the child and income of the parent will be considered further later on. Note that all the graphs are linear here and in following figures because of the nature of the (Cobb-Douglas) utility function.

[21] We want to thank Steven Stern for pointing to some of the data sources.
[22] This is a standard practice in the literature.
[23] Using a sample of German Socio-Economic Panel (2000-2002), Schwarze and Winkelmann (2005) estimated the degree of altruism as the correlation between the happiness of parents and children. They found that the altruism between parents and children is equal to 0.25 in a linear model.
[24] Note in this case, the graph ends when degree of altruism reaches 0.28 because when degree of altruism is higher, the parent stops purchasing formal care and there is no point of computing fiscal incidence for the subsidy any more.

Figure 1: Formal and informal care received by the parent and altruism in the non-cooperative family in the long run. Average and high wage child cases



A. Average wage child



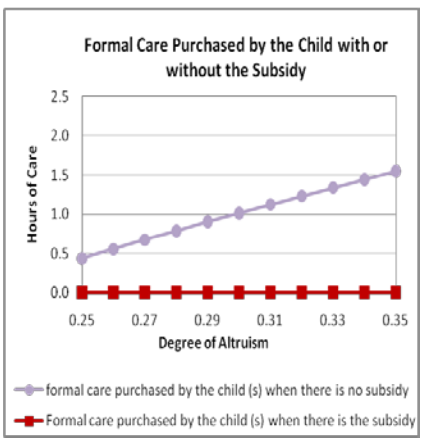
B. High wage child

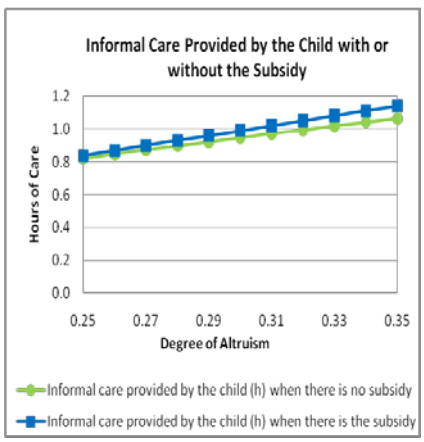
4.1 Behavioral changes and fiscal incidence as a result of the home-care subsidy

We can now compute incidence indexes for members of our hypothetical family when the child earns an average income, the family members are non-cooperative in the sense referred to earlier, and both family members fully adjust to the subsidy. Before computing the fiscal incidence indexes, however, it is useful to look at how behavior changes as a result of the subsidy program. Figures 2 and 3 illustrate.

Figure 2 shows how formal and informal care provided by the child react to the government subsidy. When the government subsidizes the purchase of formal care by the parent, the child eliminates her own purchase of formal care, but at the same time slightly increases informal care provision. On average, one dollar of government subsidy reduces the formal care purchase of the child by 0.72 dollars when the degree of altruism of the child is 0.25. This reflects the crowding-out hypothesis discussed by Cox and Jakubson (1995) and Gueth et al. (2002). When the degree of altruism increases, this crowding-out effect becomes more serious and the crowding-out ratio reaches 2.53 when the degree of altruism is 0.35. If we consider changes in both the formal and informal care transfer of the child, the crowding-out ratio is slightly reduced because, as noted earlier, informal and formal care contributions of the child respond to the subsidy in opposite directions.

Figure 2: Informal and formal care provision of the child with and without the subsidy





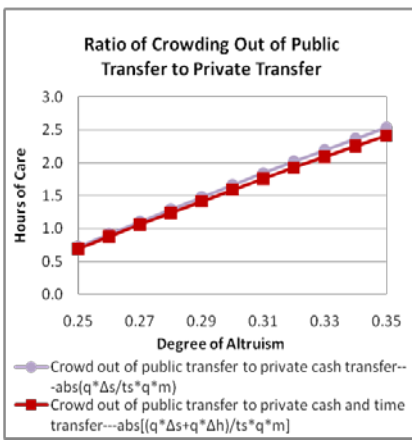
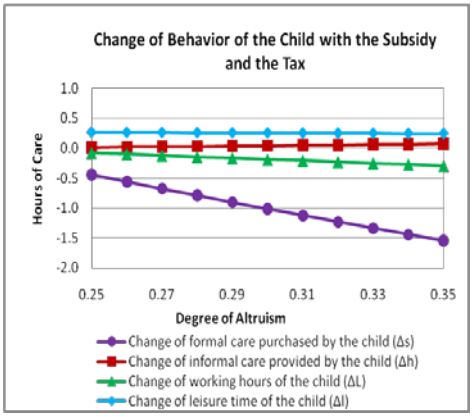
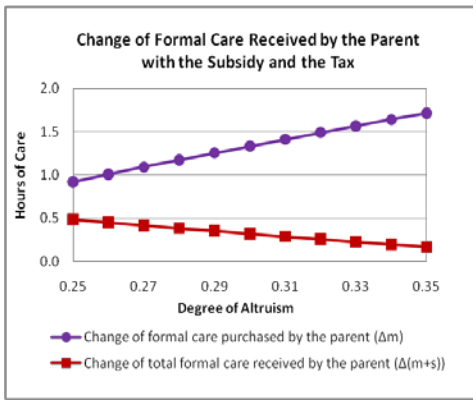


Figure 3 describes the change in behaviour of the child and the parent after the subsidy/tax policy bundle kicks in. As also shown on Figure 2, the child reduces her formal care purchase for the parent but increases informal care provision. Meanwhile, because of the effect of the tax payment, the child adjusts her working hours downwards and enjoys more leisure time.

Figure 3: Behavioral changes because of the subsidy for the child and the parent

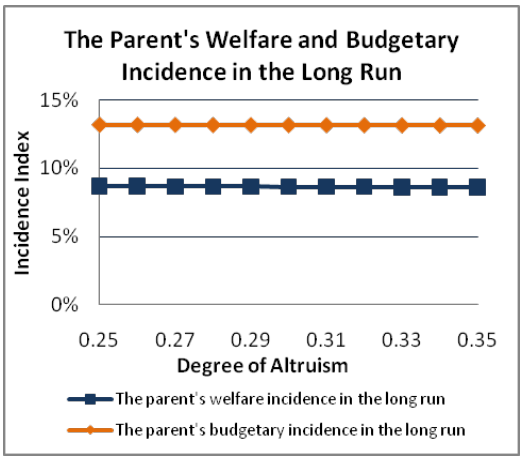


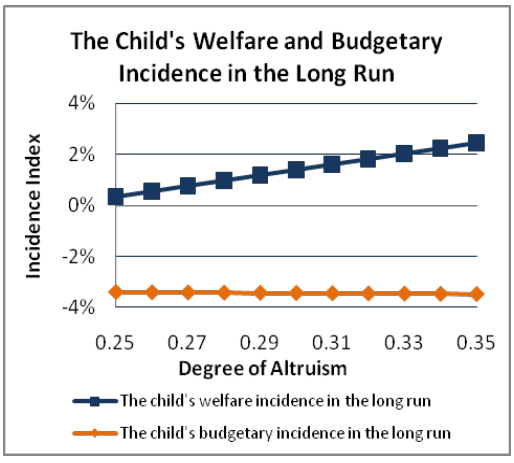


The parent purchases more formal care when subsidized. But because the child eliminates her formal care contribution, the total formal care received by the parent does not increase as fast as his own purchase. It should be noted that the total formal care received by the parent when the subsidy is in place is still higher than what would be without the subsidy, as shown by the positive change in Figure 3.

Finally, we turn to the relationship between fiscal incidence indexes and the degree of altruism shown in Figure 4. Here a positive (negative) BFI represents a gain (loss) from the subsidy program in terms of budgetary benefits, and a positive (negative) WFI represents a gain (loss) in terms of welfare changes. For example, a BFI = -3% for the child means that the child loses about 3% of post-fisc income as a result of her behavioral responses to the subsidy relative to the lump-sum transfer. A WFI = 8% for the parent means that the parent gains in terms of welfare because of the presence of the subsidy compared with the lump-sum transfer, and this gain is equivalent to 8% of his post-fisc income.

Figure 4: Welfare vs. budgetary incidence in the long run





We see that simulated WFI and BFI indexes are different for both the parent and the child regardless of the degree of altruism. The parent's welfare gain from the subsidy is around 8% of his post-fisc income, lower than his budgetary gain of about 13%. The opposite story applies for the child: the welfare incidence for the child is positive while her budgetary incidence is negative.

What is going on here? The parent gains in terms of budgetary amounts because he receives the full subsidy as a benefit while the cost of the subsidy - the required tax payment - is shared by the child. Welfare incidence is lower than budgetary incidence for the parent essentially because all the *budgetary* benefit is attributed to the parent while a part of the *welfare* gain from the subsidy goes to the child when she eliminates her purchase of formal care and only slightly increases informal care provision. As for the child, her budgetary incidence is always negative because the only differential budgetary change for the child from the subsidy is her tax payment relative to the distributionally neutral counterfactual (see equation 19). But the child benefits indirectly from the subsidy in terms of welfare via the altruism channel and through the adjustment of home care provision and labour-leisure decisions, which leads to her positive welfare incidence

A comparison of Figure 2 with Figure 4 illustrates the connection as well as the distinction between a crowding-out analysis and a fiscal incidence study. Both crowding-out and fiscal incidence are the outcomes of the behavioural adjustments of the family to the government subsidy, as shown by the links among Figure 2, Figure 3 and Figure 4. But the crowding out pattern described in Figure 2 does not capture the full general equilibrium effects of the subsidy on individual budgets or welfare illustrated in Figure 4 and discussed above. For example, as shown in Figure 4, both the parent and the child gain from the subsidy in terms of welfare even when there is a high crowding-out ratio of public to private transfers as shown in Figure 2. Another difference between crowding-out analysis and fiscal incidence concerns the time horizons, which is discussed further below.

4.2 Special cases in which budgetary and welfare indexes are analytically equivalent

As the above simulations illustrate, welfare and budgetary incidence indexes will generally differ as a consequence of the interdependence of family members via altruism and the general equilibrium consequences of the subsidy policy. But can we find circumstances in which the two indexes are equivalent? The answer is yes, but these cases are exceptions that will not give much comfort to those wishing to use budgetary indexes in the present context.

Consider the special case when the degree of altruism is zero, so that the child does not contribute any formal or informal care to her parent, and the family is effectively dissolved. In that case, the child does not interact with the parent *over any horizon*, and there is no difference in short and long run incidence for the child or the parent. In this case, for the home-care subsidy program, a BFI index is equivalent to a WFI index for the child:

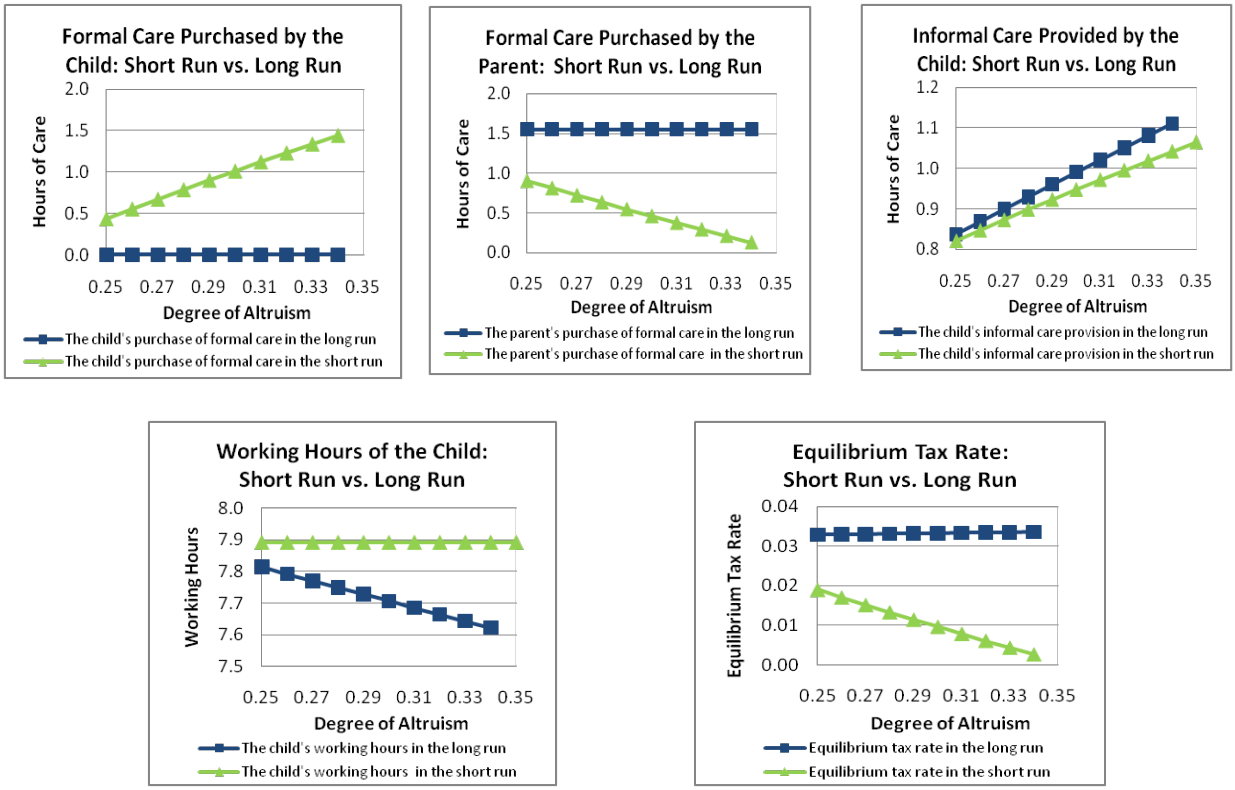
The case for the parent is different. The budgetary and welfare incidence when the degree of altruism is zero *over any horizon*, for the parent, are:

$$WFI_p^{r=0} = \frac{y(1-t)-(1-t_s)^b y}{Y_p^{post-fisc}}, \text{ and } BFI_p^{r=0} = \frac{\frac{bt_s(1-t)y}{(1-t_s)} - ty}{Y_p^{post-fisc}}. \quad (25)$$

Only when b=1 and t=t_s, will WFI and BFI for the parent be the same (and then both are equal to zero.) This no-altruism case shows that a key difference between a budgetary incidence and a welfare incidence analysis is that when translating behavioural changes in response to fiscal parameters into budgetary amounts, the budgetary analysis uses a simple linear formula: $t_s qm$-ty. But when translating the behavioural adjustments into a welfare change using the EV, the translation depends on the nature of the utility function (of course).

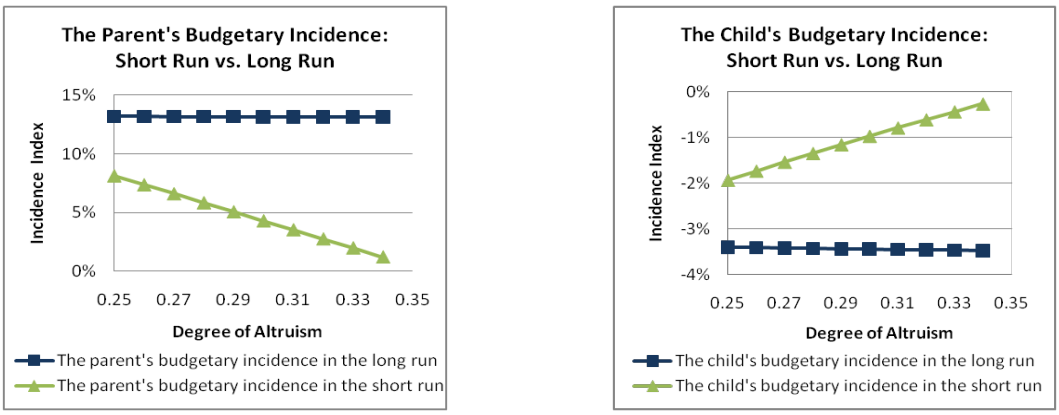
This leads to a third simplistic case where the equivalence of the two kinds of incidence indexes can be shown analytically. If the parent or the child receives a lump-sum transfer, R_i, rather than a price subsidy, t_s, *and* there is no altruism in the family, the welfare and budgetary incidence for either the parent or the child is

Figure 5: Behavioural adjustments from the short to longer run



The resulting shifting of net benefits in terms of budgetary measures is shown in Figure 6, where shifting is effectively measured by the vertical difference between short and long run incidence curves for a given degree of altruism.

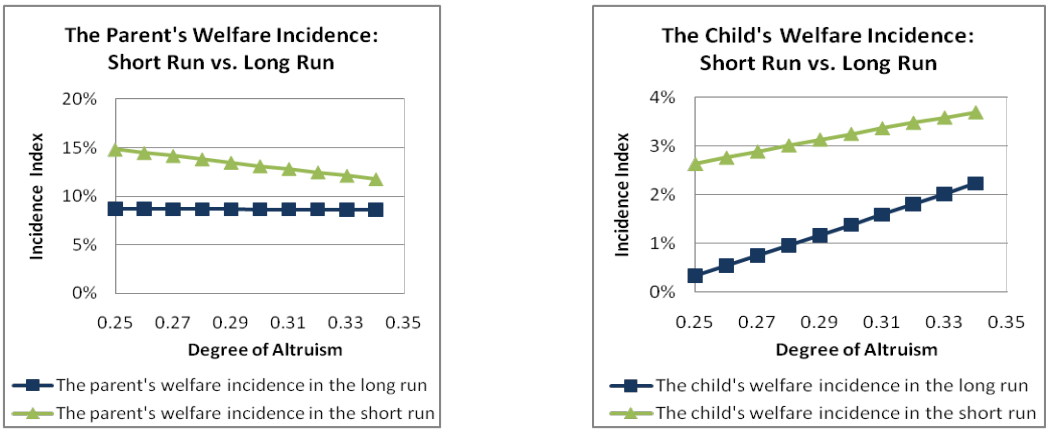
Figure 6: Shifting of program benefits based on the use of budgetary indexes



Using budget incidences in Figure 6, we observe a shifting of benefits *from* the child *to* the parent (contrary to the ad hoc sharing rule introduced previously), in the sense that one party gains while the other loses. The results here are largely driven by the increased taxation of the child necessary to pay for the benefits received by the parent in the longer run versus in the short run.

Shifting using welfare incidence indexes is quite different. We do not observe a shifting of benefits from the parent to the child in terms of welfare in Figure 7. We see that *both* the generations are worse off in the longer run compared with the short run. This is the outcome of the behavioural adjustments in the family illustrated earlier and the fact that in welfare terms, a subsidy may make all parties worse off in the longer run when compared to the short run, even though the subsidy is welfare improving relative to the counterfactual (see the positive WFIs on Figure 7).

Figure 7: Shifting of program benefits based on the use of welfare indexes



The above simulation results depend on the data we use. In this sample family, the parent is relatively poor with an income of $12082 a year or about $33 per day. This is likely due to the fact that the Medicaid subsidy covers only residents with a relatively low income. As a sensitivity test, we maintain the child's hourly wage rate at $19.56 per hour but set the parent's income equal to the average income of all the seniors included in the MEPS survey ($77.22 per day), and the average income of the richer group of seniors who are not eligible for Medicaid ($82.65 per day). The simulated pattern of incidence (not shown) turns out to be insensitive to this variation in the income of the parent.

It may be that the hourly wage rate of the child relative to the price of formal care affects the type of care that the child will provide. In the above simulations, the wage rate of the child, $19.56 per hour, is higher than the price of formal care, $10.03 per hour. To check this matter, we vary the wage rate of the child from a low equal to the 10th percentile of the wage rates of the labor force to a high equal to the 90th percentile. The 10^{th} percentile wage rate of the work force in 2007 was $7.72 per hour, lower than the price of formal care. In this case, the incidence indexes are similar with those when the child makes an average wage, and need not be discussed further.

The 90^{th} percentile wage rate of the work force was $36.49 per hour in 2007, much above the price of formal care. The simulations in this case are considered below.

4.4 The high-wage child case.

When the child's income is at $36.49 per hour, she purchases formal care in addition to providing informal care, as shown by case B of Figure 1. Figure 8 shows that the welfare and budgetary indexes for the high-wage child are then different from those in Figure 4 where the child's wage is at the average level.[25] The child's budgetary incidence is now higher than her welfare incidence, partly due to the fact that the child substitutes her own private purchase of formal care for the formal care purchased by the parent, so the tax rate gradually falls and the child's public budgetary situation improves, while for the same reason, the net welfare gain from the subsidy becomes negative for the child.

Figure 8: Welfare vs. budgetary fiscal incidence in the long run (High wage child case)

Despite the now different long run incidence indexes, shifting is not dramatically altered. Shifting from the child to the parent in budgetary terms again is found to occur. But just as in the average wage case, no shifting in welfare terms can be said to occur, since *both* the parent and the child are again worse off in the longer run relative to the short run.

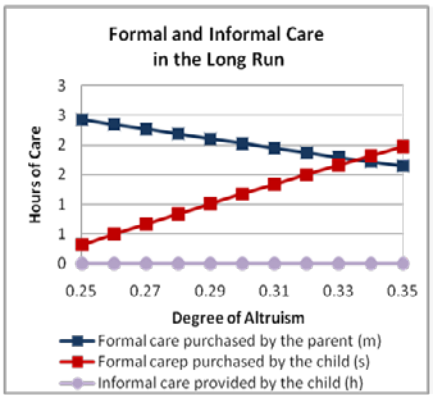
In summary we can say that the analysis of shifting when welfare matters, here and in the average wage case, raises serious doubts about the use of budgets for incidence calculations when family structure matters.

4.5 The case when the child cannot provide any informal care

In modern families many children live away from their parents. So in this section we explore the case when the average wage child cannot provide any informal home care to her parent. As seen from Figure 9, when the child lives away, she *does* purchase formal care for the parent, in contrast to the zero contribution of formal care when the child lives nearby shown in panel A of Figure 1. We also see that as the degree of altruism increases, the purchase of formal care by the child gradually substitutes for that of the parent.

[25] The simulation ends when degree of altruism reaches 0.28, instead of 0.35 as in previous simulations, because when the degree of altruism is higher than 0.28, the purchase of formal care by the parent becomes zero.

Figure 9: Formal and informal care when the child lives away (h=0)



However, the simulation of the corresponding fiscal incidence indexes (not shown) shows that they are similar to those when the child earns an average wage and always provides informal care as described above. Incidence analysis in our simulations thus turns out not to depend on the giving of informal care. Whether this is so for other data sets and choices of model structure of course remains to be seen.

5. A cooperative family, and comparison of incidence indexes for both family types

Under different behavioural assumptions, the distribution of the benefits from an expenditure policy will also be different, just as alternative assumptions about model structure lead to alternative conclusions about the final burden of taxation. Assume, for example, that the family in question is cooperative instead of non–cooperative, so that the parent and the child jointly make a decision which benefits the family as an entity. How does this change in family structure affect fiscal incidence indexes?

We can use a "collective model" to approximate the outcome of cooperative bargaining (Browning and Chiappori, 1998), and apply a generalized household welfare function based on Samuelson's idea that households can be modeled as if they maximized a social welfare function (Samuelson, 1956; Apps and Rees, 2007). Here we suppose that weights *B* and *(1-B)*, *0<B<1*, are put on the parent and the child respectively in the maximization of household welfare. Then the problem faced by the parent and the child when they act cooperatively is:

$$\underset{(x_p,\, x_c,\, m,\, h)}{Max}\ [BU_p+(1-B)U_c] = B\,[a\log(x_p) + b\log(m+s)+c\log(h)] + (1-B)\,[(1-d)\log(x_c) + d\log(l)]$$

subject to the joint budget constraint: $y(1-t)+w(T-h-l)(1-t)= q(1-t_s)(m+s)+x_p+x_c.$ (29)

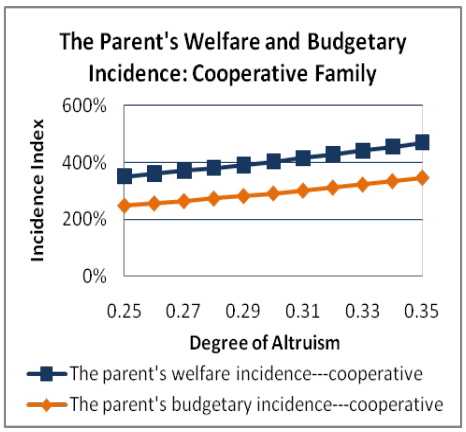
As indicated by the joint budget constraint, the family pools their resources and jointly purchases formal care at the subsidized rate. Because the parent's purchase of formal care is cheaper than that of the child, the family will not let the child purchase any formal care.

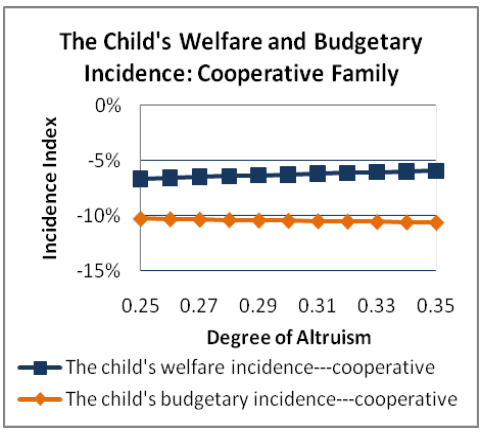
When the family collectively makes choices, the family members adjust to the subsidy program simultaneously. Thus there is no meaningful difference between short and longer horizons based on the child's ability to incorporate the subsidy into her decision making, and thus there is no cross-generational shifting when the family acts as a unit. In this way the choice of family structure profoundly affects the analysis of benefit shifting. However, we can still calculate the budgetary and welfare incidence indexes for a cooperative family, assuming that calculation of separate benefits for each generation still makes sense in this context. [26] The difference between the indexes in a non-cooperative and in a collective family are complex because of the difference in the equilibrium tax rates, and it proves revealing to again explore these differences in simulations.

In the simulations, the child is assumed to earn an average wage and lives nearby. The parent's weight *B* and the child's weight *(1-B)* in the family welfare function are defined as the ratio of the coefficient of his or her own utility to the total of the family, so that effectively $B = (1+r)/(2+r)$, and $1-B = 1/(2+r)$.[27] In the literature, the weights of individual utility in collective model depend on individual wage rates and total household income (Browning and Chiaporri, 1998) or exogenous non-labour income, wage rates or earnings, and productivity in household production (Pollak, 2007).We assume that only degree of altruism matters here because we want to study the role of the degree of altruism in a way that allows comparison to the indexes in the non-cooperative situations explored above.

Figure 10 shows that with these weights and as the degree of altruism increases, budgetary and welfare fiscal incidences exhibit a similar trend for both the generations in a cooperative family. In section four we illustrated the role of interdependence of utilities in the divergence between welfare and budgetary incidence indexes in a non-cooperative family. Here, because of the cooperative nature of the family, the budgetary account for a cooperative family reflects the behavioural adjustments of *all* family members more fully than in the non-cooperative case, so the two incidence indexes follow similar patterns, especially for the child (compared with Figure 4). Nevertheless, welfare and budgetary incidences are still different due to the nature of the two metrics in treating adjustments in consumption patterns.

Figure 10: Welfare and budgetary fiscal incidence in a cooperative family



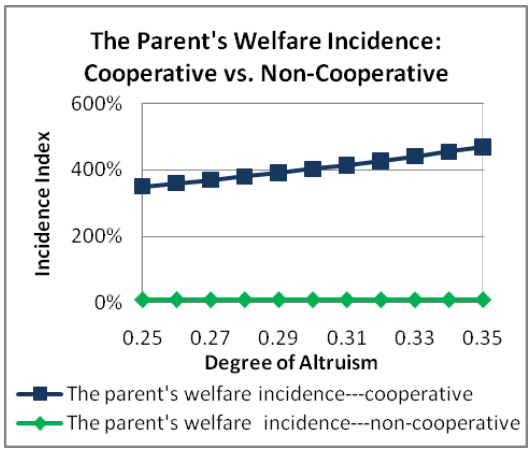


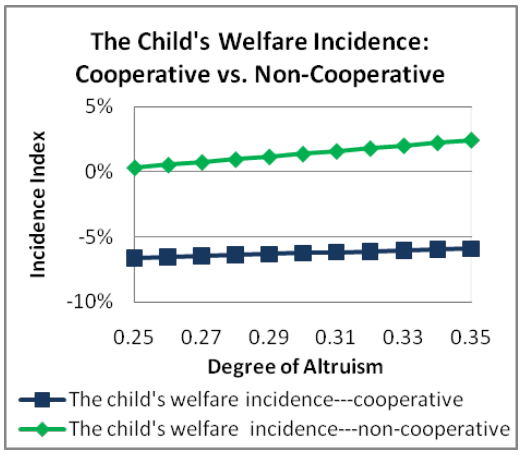
[26] See the Appendix for detailed calculations.
[27] When $r = 0$, B is effectively 1/2. B is always equal to or higher than a half because of the presence of the child's altruism towards the parent.

It should be noted that the large positive index for the parent stems from the fact that incidence for the parent is expressed relative to income of the parent even though family resources are pooled in the cooperative case.

Finally, we directly compare the effects of the choice of family structure on welfare based incidence indexes. Figure 11 illustrates. The simulations here reflect the conflict of interest between the parent and the child on the issue of living arrangements for the elderly under alternative views of the family. We see that the parent is better off when the family is cooperative rather than non-cooperative and, in contrast, the child is worse off. The reason is that a higher weight of the utility of the parent in a cooperative family, *(1+r)/(2+r)*, versus *r/(1+r)* in the non-cooperative family, and the cooperative nature of the family induces a greater provision of both informal care and formal care for the parent and less leisure time for the child in a cooperative family. This result is consistent with observations on co-habiting intergenerational families where the parent usually receives more care while the child often suffers from stress or burn-out.[28]

Figure 11: Welfare fiscal incidence and family structure





6. Concluding remarks

How should we construct incidence indexes for children and parents in the case of public price-subsidies for home-care of the elderly? What is the nature of a fiscal incidence index on a budgetary basis versus a theoretically more satisfactory index that is welfare based? Can we find budgetary based measures that will serve as a proxy for incidence in welfare terms? Does the structure of the family including the altruism of children affect incidence indexes? How should fiscal shifting of the subsidy for home care paid to the parents be defined, in budgetary or in welfare terms, and what does simulation tell us about the distribution of benefits between the generations?

We have addressed these questions in this paper. We have constructed both budgetary and welfare–based incidence indexes appropriate for measuring the incidence, on children and parents, of a price-subsidy to the parents for the purchase of home care, and we have investigated the roles of altruism

[28] See, for example, George and Gwyther 1986, Hoyert and Seltzer 1992, Campbell and Martin-Matthews 2000, and Pezzin et al. 2007.

and family structure in this context both analytically and with simulation in a manner analogous to studies that explore the role of assumptions about economic structure in determining tax-shifting. The analysis is related to, but is conceptually distinct from a study that focuses on intra-family transfers.

We began with a behavioral model of a non-cooperative family in which the child is altruistic towards her parent, and then explicitly followed the key analytical steps required of any incidence study. The existing literature is enormously diverse, and we hope that this procedure will be useful in aiding those who wish to pursue analytical or empirical incidence work.

We have shown that in general, and except for very special circumstances, budgetary incidence is not an accurate measure of the level of incidence based on measuring equivalent variations in welfare. Budgetary and welfare fiscal incidences are different because of the welfare consequences of the consumption responses by the parents and children, and because of the interaction stemming from altruism by family members.

It is also readily apparent that the nature of incidence indexes of either type depends crucially on whether the family is non-cooperative or cooperative. Shifting of benefits between the generations, for example, makes sense only if the family is non-cooperative - that is, in the case considered here, when parents and children do not always agree on the amount of time that the children will personally devote to home care - *and* when budgetary indexes are used. In that case, the simulations with budgetary incidence indexes we have conducted show that shifting in the long run tends to benefit the parents, not the children.

When welfare indexes are used, shifting analysis of the classical kind, for either non-cooperative or cooperative families, loses most of its appeal. Shifting for a cooperative family is clearly not meaningful. For the non-cooperative family, both parents and children are worse off due to the further non-cooperative efficiency losses in the longer run versus in the short run.

Concerning the role of the child's wage rate and the living distance between the two generations, our simulations with Medicaid data show that for the non-cooperative family, children who earn an average income and live nearby provide only informal care to the parents, while children who earn a high income or who live away from their parents provide formal care. These factors may have an important influence on incidence among family members, especially when wages of family members are quite different and formal and informal care are imperfect substitutes. In further investigations, it will be wise to distinguish between families with different generational living distances and different intra-family income distributions.

More definitive analysis of the family-oriented policy we consider depends on the development of a theoretical consensus on how to treat the basic issues we have addressed, especially the nature of the family. In the absence of progress on these matters, as well as uncertainty regarding key values of parameters used in the simulations, we suggest that incidence analysis based on budgetary amounts should be regarded as a poor predictor of the distribution of benefits (among parents and children) from a program that works through family structure.

The analysis in this paper also conveys a more general message for the study of fiscal incidence: to incorporate the expenditure side of the budget into incidence calculations, a separate analysis for each major type of public service will have to be developed. Such work will parallel the development of tax incidence theory, which has been built up over time on the basis of study of each of the major

types of taxes. This paper is an initial contribution to this body of work for the class of public expenditure programs that depend importantly on family structure. Much remains to be done before incidence analysis of expenditure programs attains the status achieved by the incidence analysis of taxation.

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Appendix

1. The post-fisc solution for the non-cooperative family in the long run.

The parent's problem is:

$$\max_{(m)} U(x_p, m, h) = a\log(x_p) + b\log(m+s) + c\log(h), \text{ subject to: } y(1-t) = x_p + q(1-t_s)m .$$

The child's problem is:

$$\max_{(l,\,h,\,s)} U(x_c, l, x_p, m, h, s) = [(1-d)\log(x_c) + d\log(l)] + rU_p(x_p, m, s, h), \text{ subject to: } w(T-h-l)(1-t) = x_c + qs.$$

The post-fisc solutions to the non-cooperative family, in the long run when the child fully incorporates the receipt of a subsidy by her parent include:

$$m^{LR} = \frac{y(1-t^{LR})}{q(1-t_s)} - \frac{ra[wT + \frac{y}{(1-t_s)}](1-t^{LR})}{(1+r)q}, \quad s^{LR} = \frac{r(a+b)[wT + \frac{y}{(1-t_s)}](1-t^{LR})}{(1+r)q} - \frac{y(1-t^{LR})}{q(1-t_s)},$$

$$H^{LR} = \frac{rb[wT + \frac{y}{(1-t_s)}](1-t^{LR})}{(1+r)q}$$

$$l^{LR} = \frac{d[wT + \frac{y}{(1-t_s)}]}{(1+r)w}, \quad h^{LR} = \frac{rc[wT + \frac{y}{(1-t_s)}]}{(1+r)w}, \quad L^{LR} = T - h - l = T - \frac{(d+rc)[wT + \frac{y}{(1-t_s)}]}{(1+r)w},$$

$$x_c^{LR} = \frac{(1-d)[wT + \frac{y}{(1-t_s)}](1-t^{LR})}{(1+r)}, \text{ and } x_p^{LR} = \frac{ra[wT + \frac{y}{(1-t_s)}](1-t^{LR})(1-t_s)}{(1+r)}.$$

These solutions are used to derive indirect utilities (5) and (6).

2. Incidence indexes for the non-cooperative family in the short run.

In the short run, the child's choice of *s*, *h*, *l*, and *L* are fixed at the level as if $t_s=0$. Either the child does not know that the subsidy exists, or cannot adjust to its presence in the short run.

The parent's problem is:

$$\max_{(m)} U(x_p, m, h) = a\log(x_p) + b\log(m+s) + c\log(h), \text{ subject to: } y(1-t) = x_p + q(1-t_s)m .$$

The child's problem is:

$$\max_{(l,\,h,\,s)} U(x_c, l, x_p, m, h, s) = [(1-d)\log(x_c) + d\log(l)] + rU_p(x_p, m, s, h), \text{ subject to: } w(T-h-l) = x_c + qs.$$

Firstly, the child's choice of *l*, *h*, and *s* are as if $t_s=0$ and $t=0$ for both the child and the parent:

$$s^{SR} = \frac{r(1-c)[wT+y]-(1+r)y}{(1+r)q}$$

$$h^{SR} = \frac{rc(wT+y)}{(1+r)w},\quad l^{SR} = \frac{d(wT+y)}{(1+r)w} \text{ ,and } L^{SR} = T - h^{SR} - l^{SR} = \frac{(1+r)wT-(d+rc)(wT+y)}{(1+r)w}.$$

The child's income and private consumption are subject to the income tax determined in the equilibrium:

$$Y_c = \frac{(1+r)wT-(d+rc)(wT+y)}{(1+r)},\quad Y_c^{post} = \frac{(1+r)wT(1-t^{SR})-(d+rc)(wT+y)(1-t^{SR})}{(1+r)}$$

$$x_c = Y_c^{post} - qs = \frac{(1+r)[wT(1-t^{SR})+y]-(d+rc)(wT+y)(1-t^{SR})-r(1-c)(wT+y)}{(1+r)}.$$

Secondly, given the child's choice of s and h, and the policy parameters t_s and t, the parent chooses m. Total formal care H, and the private consumption of the parent, x_p, are then also determined:

$$m^{SR} = \frac{\frac{by(1-t^{SR})}{(1-t_s)} - ra(1-c)wT + a(1+rc)y}{(1+r)(1-c)q},\quad H^{SR} = m^{SR} + s^{SR} = \frac{\frac{by(1-t^{SR})}{(1-t_s)} + rb(1-c)wT - b(1+rc)y}{(1+r)(1-c)q}.$$

$$x_p^{SR} = \frac{[a+r(1-c)]y(1-t^{SR}) + ra(1-c)wT(1-t_s) - a(1+rc)y(1-t_s)}{(1+r)(1-c)}.$$

The tax required to finance the subsidy is determined by the government budget $t(Y_p + Y_c) = t_s qm$ in the short run is:

$$t^{SR} = \frac{\frac{byt_s}{(1-t_s)} - ra(1-c)wTt_s + a(1+rc)yt_s}{\frac{byt_s}{(1-t_s)} + (1+r-d-rc)(1-c)(wT+y)}.$$

The indirect utilities of the parent and the child in the presence of the subsidy in the short run, where the subsidy is actually in place and not fully adjusted to, V_p and V_c, are:

$$V_p = a\log\left[\frac{(a+r-rc)(1-t^{SR})y + ra(1-c)wT(1-t_s) - a(1+rc)(1-t_s)y}{(1+r)(1-c)}\right] + b\log\left[\frac{\frac{by(1-t^{SR})}{(1-t_s)} + rb(1-c)wT - b(1+rc)y}{(1+r)(1-c)q}\right] + c\log\left[\frac{rc(wT+y)}{(1+r)w}\right]$$

and

$$V_c = (1-d)\log\left\{\frac{[(1+r-d-rc)(1-t^{SR}) - r(1-c)]wT + [1+rc-(d+rc)(1-t)]y}{(1+r)}\right\} + d\log\left[\frac{d(wT+y)}{(1+r)w}\right] + rV_p.$$

The EV for the parent can be solved using $V_p^0[q(1-t_s), Y_p(1-t) - EV_p] = V_p^1[q, Y_p(1-t) + R_p]$.
And similarly, the child's' EV is solved using $V_c^0[q(1-t_s), Y_c(1-t) - EV_c] = V_c^1[q, Y_c(1-t) + R_c]$.

The budgetary and welfare fiscal incidences for the family in the short run can be therefore defined by the formulas in equation (18) to (21).

3. Fiscal incidence in a cooperative family

The problem faced by the cooperative family is:

Max $[BU_p+(1-B)U_c] = B\,[a\log(x_p) + b\log(m+s)+c\log(h)] +(1-B)\,[(1-d)\log(x_c) + d\log(l)]$
(m, s, h, l)

subject to the joint budget constraint: $y(1-t)+w(T-h-l)(1-t)= q(1-t_s)(m+s)+x_p+x_c$.

The solutions to the cooperative game (C) include:

$$H^C = m^C + s^C = \frac{Bb(wT + y)(1-t^C)}{q(1-t_s)}$$

$$h^C = \frac{Bc(wT + y)}{w},\ l^C = \frac{(1 - B)d(wT + y)}{w},\ L^C = T - h - l = T - \frac{[Bc + (1 - B)d](wT + y)}{w},$$

$x_c^C = (1-B)(1-d)(wT + y)(1-t^C)$, and $x_p^C = Ba(wT + y)(1-t^C)$.

The equilibrium tax rate for the cooperative family is defined by the government budget, $t(Y_p + Y_c^{pre})=t_sqm$:

$$t^C = \frac{\frac{Bbt_s}{(1 - t_s)}}{\frac{Bbt_s}{(1 - t_s)} + 1 - Bc - (1 - B)d}.$$

Following the steps outlined in the text, we then have the following budgetary incidence indexes for a cooperative family, assuming that calculation of separate benefits for each generation still makes sense in this context. The BFIs over both horizons are[29]:

$$BFI^C_p = \frac{t_s qH^C - t^C y}{Y_p^{post-fisc}}, \text{ and } BFI^C_c = \frac{-t^C Y_c^C}{Y_c^{post-fisc}}.$$

In contrast, using welfare as a metric we have:

$$WFI^C_p = \frac{[wT(1 - t^C) + y(1 - t^C)] - (1 - t_s)^b [wT(1 - t^C) + y(1 - t^C) + t^C y]}{Y_p^{post-fisc}},$$

and

$$WFI^C_c = \frac{[wT(1 - t^C) + y(1 - t^C)] - (1 - t_s)^{[rb/(1+r)]} [wT(1 - t^C) + + t^C Y_c^C + y(1 - t^C)]}{Y_c^{post-fisc}},$$

where
$Y_p^{post-fisc} = y\,(1-t^C) + t_sqm^C$,
$Y_c^C = wT-[Bc+(1-B)d](wT+y)$, and
$Y_c^{post-fisc} = Y_c^C(1-t^C)$.

[29] Altruism and shifting do not matter in a cooperative family.