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TALL SOM FORTELLER
DISCUSSION PAPERS
969

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Discussion Papers No. 969, November 2021
Statistics Norway, Research Department

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Abstract:
The American Rescue Plan Act of 2021 implies that the US is effectively moving towards a general child benefit. However, the amount paid out is dependent on income, similar to schemes in several other countries. In the present paper, we argue that instead of suppressing the labour supply of middle income parents through withdrawing the transfer as a function of income, one should consider the obvious alternative of financing a generous universal child benefit by changing the overall income tax system. Implications of means testing relative to a tax financed universal alternative are discussed analytically in a piece-wise linear schedule. Moreover, we provide empirical illustrations of effects of child benefit design by combining information from behavioral and non-behavioral microsimulation models, representing the universe of Norwegian households. Results from both the analytical discussion and the simulations question the case for letting the child benefit be means tested.

Keywords: Child benefit design; Labour supply; Income distribution; piecewise linear tax schedule

JEL classification: C25, J13, J22

Acknowledgements: Financial support from the Ministry of Children and Equality is gratefully acknowledged. We thank Sigvart Bretteville-Jensen for research assistance and Bård Lian and Zhiyang Jia for assisting the work on the simulation models applied. We have benefitted from comments to earlier versions of the paper by Axel West Pedersen, Erling Holmøy and Terje Skjerpen.

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ISSN 1892-753X (electronic)

Sammendrag

Behovsprøving av overføringer er et viktig spørsmål som får mye oppmerksomhet av beslutningstakerne. For eksempel ble behovsprøving av barnetrygden diskutert av Barnefamilieutvalget (NOU 2017:6), der et flertall av utvalgsmedlemmene gikk inn for behovsprøving.

Det er forståelig at en spør seg om det ikke finnes mer fornuftige måter å gi støtte til barnefamiliene på enn en universell barnetrygd. Er det ikke sløsing med ressursene å gi like mye i barnetrygd til absolutt alle, millionærene inkludert? Et viktig argument for å beholde den universelle barnetrygden er at alternativet – at barnetrygden avkortes mot inntekt slik at de med høy inntekt ikke mottar barnetrygd – har uheldige effekter på foreldrenes arbeidstilbud.

I dette arbeidet diskuteres behovsprøving av den norske barnetrygden ved å vise til teoretiske implikasjoner og ved å vise til resultater på arbeidstilbud og inntektsfordeling av to ulike alternative utforminger av barnetrygden. I det første alternativet dobles barnetrygden (fra dagens nivå) og den økte satsingen finansieres ved at barnetrygden behovsprøves for inntekter over om lag median-inntekten i husholdningene. Barnetrygden fases ut ved at folk mister 10 øre i barnetrygd for hver krone over 756 000 kroner i brutto husholdningsinntekt. Det betyr at marginalskatten øker med 10 prosentpoeng under utfasingen. Det andre alternativet innebærer også en dobling av satsen, men nå finansieres den økte barnetygden ved at trinnskatten økes, med 1,2 prosentpoeng for alle (ikke kun barnefamiliene).

Simuleringsmodeller som tilhører LOTTE-familien anvendes i beskrivelsene av effektene på arbeidstilbud og inntektsfordeling. Blant annet anvendes simuleringsmodellen LOTTE-Arbeid til å beskrive hvordan arbeidstilbudet til foreldre og andre skattebetalere påvirkes av behovsprøving og økte skatter. Mens reduksjonen i barnefattigdom er om lag lik ved de to alternative utformingene av barnetrygden, innebærer behovsprøving-alternativet en større reduksjon i antall utførte årsverk, 13 000 årsverk, mot 8 000 årsverk i alternativet med generell skattefinansiering. Simuleringsresultatene tyder på det særlig er mødrene som responderer med lavere arbeidstilbud på behovsprøvd barnetrygd.

I tillegg til at effektene beskrives med hensyn til fordeling av inntekt, vises det også til fordelingseffekter i form av «pengemål på nytte».

1 Introduction

With the introduction of the American Rescue Plan Act of 2021 (ARPA) the US is now effectively providing a child benefit to families with children 0–17 years old. Prior to the ARPA, the child tax credit would allow eligible taxpayers to reduce their federal income tax liability by up to $2,000 per qualifying child (Congressional Research Service, 2021). Instead of the yearly and only partly refundable tax credit, families now receive monthly support corresponding to a yearly total of $3,000 per child aged 6 to 17 and $3,600 per child under 6.[1] The move to a general child benefit is signified by the support no longer being conditioned on a minumum earnings level.

However, in the present study we draw attention to another characteristic of the US schedule – namely that the support is income tested for high-income earners. It phases out at a rate of 5 percent as income exceeds specified thresholds until the credit amount equals the previous maximum level $2,000 per child.[2] We agree that scarce resources should primarily go to the poor and therefore provision of child benefit support to the very rich can be seen as a waste. But the present study challenges the view that child benefit schemes should be phased out for high income households and emphasises that there is an obvious alternative to means testing:[3] a universal child benefit financed by increased income taxation in general.

The present paper discusses the two alternative financing schemes of child benefit support: either reducing the tax bill by cutting down on recipients through means testing or maintaining the universal design by letting all taxpayers cover the costs. The alternatives are analyzed both analytically and by results from micro simulation models. First, we discuss means testing by placing the universal child benefit and the means tested alternative in a piecewise linear tax system, and by explaining the implications in a standard theoretical household framework. Next, we employ micro simulation models for Norway to analyze how the two alternative designs of the child benefit scheme is likely to affect labour supply and distributions of well-being.

In practice, the means tested alternative is defined by doubling the Norwegian child benefit rate of 2019, bringing it up to a yearly total of NOK 25,300 Norwegian kroner (NOK), which corresponds to €2,600 and $2,900; thus, the level of benefit is close to the new child credit rates of the US.[4] Then we let the entire child benefit phase out with a 10 percent rate for household income above average, to maintain revenue neutrality. The alternative to means testing, which we refer to as a "tax-financed universal scheme", uses the same start rate as for means testing (NOK 25,300), but now it is offered as a universal rate to all families regardless of the income of parents. We let the increased expenditures of this universal schedule be financed by a general increase in the labor income tax brackets, of 1.2 percentage points.

[1] At the time of writing it is not clear for how long the new support scheme will last.

[2] The thresholds are $75,000 for single filers, $112,500 for head of household filers, and $150,000 for married joint filers.

[3] We use the term "means testing" as synonymous to income testing here. Of course, many child benefit schemes would include other modes of means testing, such as giving preferential treatment to lone parents.

[4] Here and in the following we use average exchange rates for 2019 to obtain values in euros and U.S. dollars.

Results from both the analytical discussion and the simulations question the case for letting the child benefit be means tested. It is for instance not clear why parents in the middle of the income distribution should face the highest labor supply disincentives, as is the implication of means testing. The simulation results confirm that the middle of the income distribution bears the burden of letting the child benefit be means tested. Although this result follows from the precise design of the means testing, it brings forward a rather general result: blocking the well-off from getting the support leads to costs in terms of reduced income and reduced labour supply for households in the phase-out interval of the income distribution. As the labour supply of mothers is relatively more elastic, compared to that of males, a large part of this response comes from reduced working hours of mothers. Overall, we obtain results which suggest that a tax-financed universal scheme can be preferred both in terms of efficiency and with regards to distributional concerns.

It is not only the child benefit scheme of the US that is means tested – universal child benefit schemes seem to be under attack more generally. Some important institutions, such as the World Bank, the OECD and the European Commission, argue in favor of income tested transfers.[5] For example, in OECD (2011) it is argued that in times of constraint on public budgets, one should ensure that those most at risk do not lose (p. 58). Correspondingly, in the UK the universal child benefit scheme was replaced by a schedule introducing a "High Income Child Benefit Charge" in 2013, which means that the schedule is tapered off between £50,000 and £60,000 of earned income (based on the highest individual income of the family). The child benefit of several other countries is income tested too; for example the schemes of Canada and Australia. Also, in Norway, a government appointed expert group suggested to replace the low universal child benefit scheme by a transfer targeted at low income families. The present paper argues that one should reconsider the means-tested design against a tax-financed universal scheme.

The rest of the paper is organized as follows. In Section 2 we refer to the previous literature on implications of the child benefit and its design. Section 3 sets the scene analytically, by clarifying the role the child benefit plays in a piecewise linear tax schedule and implications of targeting are discussed. Further, in Section 4 we present the framework for the empirical investigation, presenting the simulation tool, defining the benchmark and the two policy alternatives – means testing and a generous universal scheme financed by increased taxation of income. Section 5 presents distributional and labour supply effects of the alternative designs, including describing effects of changes in terms of changes in money metric utility (equivalent variation). In order to connect more closely to the theoretical elaboration (in Section 3), we also present separate results for wage earner couples. Section 6 concludes the paper.

2 Previous studies

There are some general arguments for providing support to families with children, which relates to effects on fertility, smoothing out consumption over the life cycle

[5] See Moffitt (2003) for an overview over means tested transfers in the US.

and horizontal equity considerations. For example, a child benefit can be seen as a Pigovian subsidy to correct for an externality associated with inadequate fertility levels, rather than simply a transfer payment intended for poorer families. We will return to these aspects in the discussion of implications of the two alternative modes of financing the child benefit in Section 3.

Here, we briefly refer to the other parts of the literature the present paper relates to. First, our discussion connects to the theoretical optimal tax literature in several ways. One part of the optimal tax literature emphasises that the existence of children or household size can be used as a "tagging device", along the lines of Akerlof (1978), addressing the screening problem of governments.[6] For example, Immonen et al. (1998) and Blumkin, Margalioth, and Sadka (2015) discuss the optimal design of tax/transfer schemes that involve elements of both tagging and means testing. However, not surprisingly, it is acknowledged that the optimal design of transfer programs depend on the relevant empirical evidence and on how society trades off gains to some against losses to others (Kaplow, 2007; Acs and Toder, 2007). We argue that the present study adheres to this by referring to labour supply effects of alternative schemes by obtaining results from an empirically estimated simulation model.

Second, the present study adds to the literature on labour supply effects in general and in particular to the literature on how support to families with children influences the labour supply of parents. With respect to the latter, there is a large literature on labour supply effects of the Earned Income Tax Credit of the US and various versions of the same type of support of the UK, see for example Brewer, Saez and Shephard (2010) and Kleven (2020). As these transfers are phased-out with respect to income, the analysis of the present study parallels the considerations of this literature. A previous analysis of means testing the child benefit in the Norwegian context, see Kornstad and Thoresen (2004), also falls into this category of studies.[7]

Third, there is a literature on labour supply effects of the universal child benefit itself ("income effects"). For example, both Milligan and Stabile (2009) and Schirle (2015) provide results which are consistent with the Canadian child benefit schedule having labour supply reducing effects for both single and married mothers. Similarly, Hener (2016) finds that increased generosity resulted in a substantial reduction in mothers' labour supply in Germany. Since an income transfer (as the child benefit) generates changes in both parental time and family income, there has been focus on effects on child development too. Both the Canadian and German experiences suggest that more generous child benefit schemes result in positive effects on child outcomes. For example, Hener (2016) refers to parents investing more time in children, whereas Milligan and Stabile (2011) find evidence consistent with increased parental time and increased family income having positive effects on child development.[8]

[6] Then, children as an indicator of earning capacity may come from a specialization on the quantity of children from low-ability parents.

[7] They argue against means testing because of detrimental female labour supply effects.

[8] Finally, there is also gender aspect of the support, which the present paper alludes to. There is evidence suggesting that the parents use the child benefit money differently from other types of income, see for example Lundberg, Pollak and Wales (1997) and Kooreman (2000). These studies

Finally, we also mention that there are studies discussing the macroeconomic and welfare implications of means tested transfers to households with children in a macroeconomic life-cycle framework, see for example Guner, Kaygusuz and Ventura (2020).

3 Analytics of means testing

3.1 High marginal tax rates in the middle of the income distribution

For a government to make a universal transfer to all households regardless of how high their incomes are may seem nonsensical, and the alternative of targeting the transfer to those "really in need" by a system of means testing would seem to be simple common sense. However, there are several analytical issues that have to be dealt with before it can be claimed that the introduction of means testing is a desirable policy change. We discuss these in the context of a piecewise linear tax system and a continuum of two-earner households.[9] The system assigns each tax unit - a single individual or a household to one of a number of specified tax brackets on the basis of the level of its taxable income. We illustrate this with the tax system shown in Figure 1. This graphs disposable income or, in the absence of saving, consumption, C, as a piecewise linear function of the tax base, gross taxable income Y. We assume the tax unit can be either the individual earner, so Y is individual taxable income, or the household, so Y is total household taxable income. The main assumption underlying the figure is that this gives all taxpayers the same *convex* budget in the (Y, C) - plane. The convexity of the budget set is satisfied by virtually all *formal* tax systems, but is often not maintained when additional aspects of the tax/transfer system are taken into account, as we see below in the case of means tested child benefits.[10]

Referring to the figure, tax units with income below Y_1 pay no tax, those with income in the interval $[Y_1, Y_2)$ pay $T_1 = t_1(Y - Y_1)$, and those in the interval $[Y_2, \infty)$ pay

$$T_2 = t_2(Y - Y_2) + t_1(Y_2 - Y_1) = t_2 Y - (t_2 - t_1)Y_2 - t_1 Y_1 \tag{1}$$

One interpretation of this figure is that it defines the tax system in terms of a set of pairs of marginal tax rates and upper bracket limits $\{(0, Y_1), (t_1, Y_2), (t_2, \infty)\}$. An equivalent alternative interpretation, suggested by Equation (1), is to define it as a set of pairs of bracket-specific lump sum transfers and marginal tax rates that are applied to the tax unit's *total income*, the set of pairs $\{[0, 0], (t_1, a_1], (t_2, a_2]\}$, with $a_1 = t_1 Y_1$ and $a_2 = (t_2 - t_1)Y_2 + a_1$. Given a tax unit's choice of gross income,

shows that paying child benefit to mothers gives higher expenditures on children's clothing. Blow, Walker, and Zhu (2012) also find that the child benefit is spent differently, but paradoxically, it appears to be spent disproportionately on adult-assignable goods, such as alcohol.

[9] In this discussion we draw extensively on Apps, Long and Rees (2014), Andrienko, Apps and Reese (2015) and Apps and Rees (2018).

[10] See Apps, Long, and Rees (2014) and Slemrod et al. (1994) for discussion of the nonconvex case.

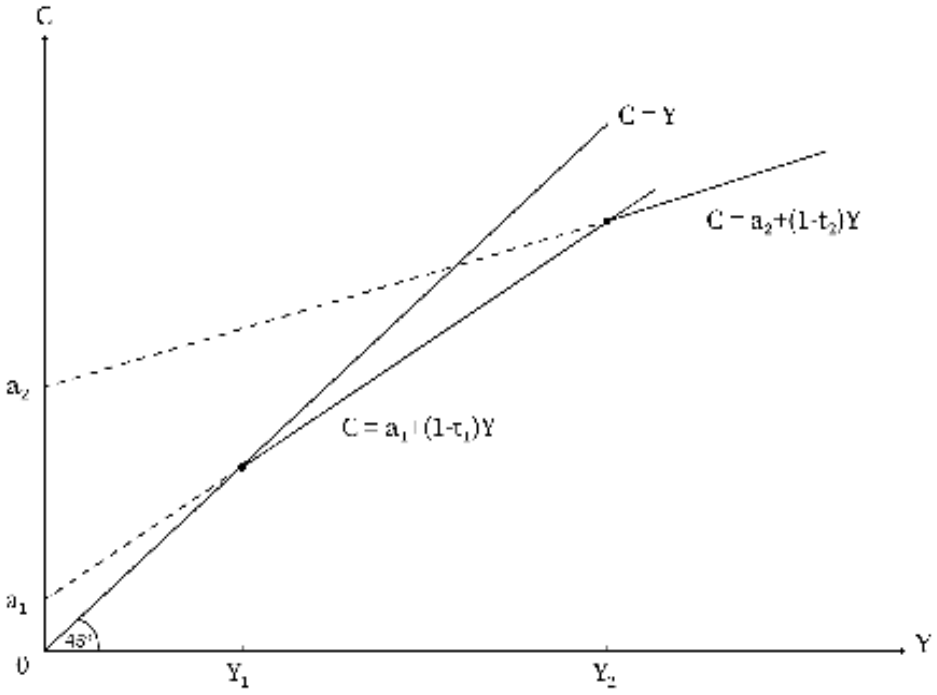

Figure 1: A piecewise linear tax system

the budget constraint it faces is simply defined as $C = a_j + (1 - t_j)Y$, $j = 0, 1, 2$, as shown in the figure, with $a_0, t_0 = 0$.[11]

It follows from this outline that the claim of "only giving support to those who really need it" as a justification for means testing is simply window dressing, since any universal transfer can be clawed back by an appropriately designed piecewise linear tax system defined as just described. This does not *have* to be of the form implied by means testing. The real issue is to design the system in a way that achieves an optimal trade-off between economic efficiency and distributional equity. The real effects of the means testing policy in respect of these goals have still to be identified.

The effect of the child benefit for households receiving it is simply to shift the intercept of the entire tax structure upward (assuming that the benefit is not counted as part of gross taxable income) as shown in Figure 2. Since the presence and age of children can be observed this is a "tagged" transfer, available only to households with children below some maximum age.[12] If this is to be funded from income taxation there will have to be some kind of change in the tax rate structure. We can think of means testing as one form of funding of the transfer. The obvious

[11] This has long been well known in econometric labor supply analysis, see for example Pudney (1989), van Soest (1995) and Dagsvik et al. (2014). Apps, Long, and Rees (2014) use this approach in the optimal taxation context.

[12] There are interesting issues in the context of couple households of exactly how this transfer is made, for example as a tax credit to the primary earner, who is typically but not necessarily male, or as a lump sum payment to the second earner, who is typically, but not necessarily, female. As already mentioned, empirical work, for example by Lundberg, Pollak and Wales (1979), shows that this matters for the household's consumption pattern and therefore for the within-household distribution of wellbeing.

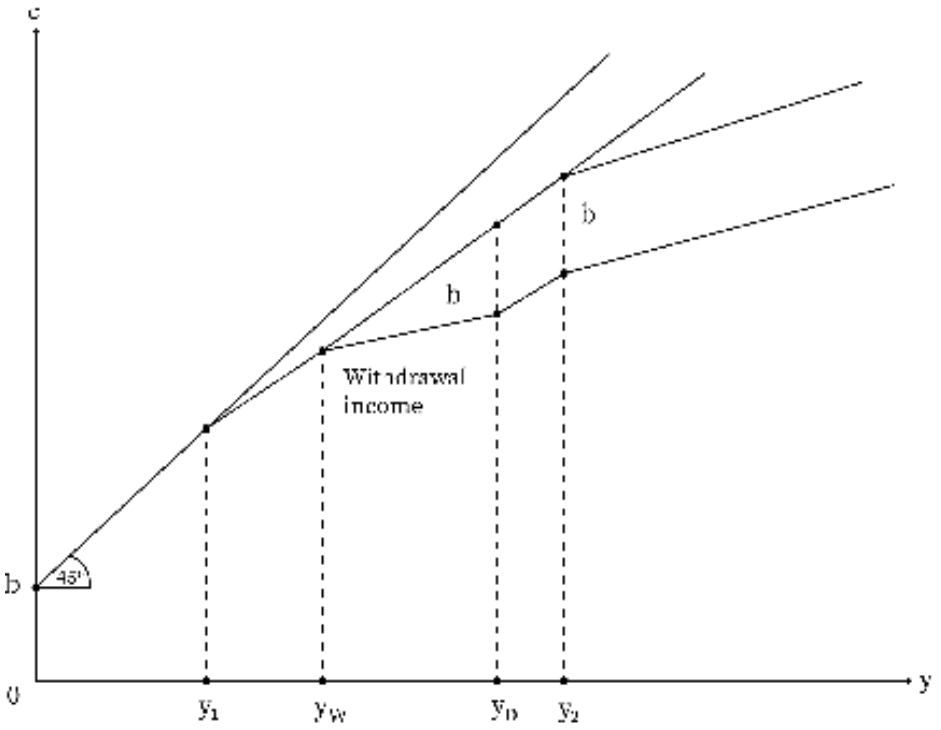

Figure 2: A piecewise linear tax system with transfers and means testing

property of means testing, with the accompanying benefit withdrawal, is that it restricts the deadweight losses resulting from the increase in effective marginal tax rate(s) equal to the withdrawal rate to the subset of tax units over which the benefit is withdrawn. Households with incomes below the withdrawal range are unaffected, while for those with incomes above that range it is effectively a lump sum income reduction of b in total household income with their marginal tax rates unaffected. The exact location of this subset in the distribution of taxable income is therefore of considerable importance.

Essentially, the argument of this paper is that withdrawal of benefits should take place by an appropriate addition to the income tax rates of the existing tax system, not only on grounds of equity, but also to reduce the size of the aggregate deadweight loss. This is because the lower income tax bracket contains a significantly higher proportion of workers with higher elasticities of labor supply, particularly women as second earners.

On the horizontal axis of Figure 2 we measure an individual earner's income,[13] since here we assume this to be the tax base. We now use y_1, y_2 to denote the initial bracket limits on individual incomes in the absence of means testing.

Suppose that it is now decided to means-test the child benefit and phase it out

[13]Strictly speaking, it represents a situation where only one earner receives the transfer and pays the withdrawal rate out of his/her income. This is to avoid having to add a further dimension to the figure to represent the income of the other earner, which would be necessary under a system with individual incomes as the formal tax base but with benefit withdrawal based on joint income, as is often the case in practice. This suffices to allow us to make the main points in a simple diagram. Taking joint income as the tax base, as in the US, makes the discussion simpler.

over the income range $y_W - y_D$ by choosing an appropriate withdrawal rate $t_W > 0$, which is just sufficient to reduce the lump sum benefit to zero at y_D. Adding this to the marginal tax rate over this range gives the new effective tax rate $t_1 + t_W$. In the case shown this adds two additional tax brackets, which replace the portion of the previous schedule over the range (y_W, y_2). In the figure as drawn, this implies that the marginal tax rate for taxpayers receiving child benefit is not only above that for non-recipients of child benefit in the (y_1, y_2) bracket, but also exceeds the top marginal tax rate t_2. This can be seen in the figure when comparing the slopes of the respective line segments, though this is not inevitably the case, since it depends on the withdrawal tax rate.[14] Obviously t_W is higher the narrower the bracket (y_W, y_D) and the higher the child benefit b.

The case shown in the figure implies that the tax system for the relevant subset of taxpayers loses the convexity of a portion of its budget set. In the interval (y_W, y_2) the marginal tax rate rises then falls, and this introduces the kind of phonemenon that in some contexts has been called a "poverty trap", though in this case it applies over the middle income range. A nonconvexity such as that shown in the figure theoretically implies that there will be a household type that is just indifferent between points on either side of y_D and the relationship between labor supply and income will then show a jump discontinuity.[15]

From the point of view of the efficiency and fairness of the system of joint taxation, the figure makes clear in a general way the difference in treatment between households with children at the middle and at the top of the income distribution. We now explore this further with an explicit household model. We compare the effects on two households, one with a joint income in the withdrawal range and the other with a joint income above it. The tax base is individual income, but the withdrawal rate is based on joint income.

3.2 Comparing effects across households

Each household has (potentially) two earners. The primary earner, with the higher wage rate and income, is assumed certainly to have a positive market labor supply, the second earner may or may not have - we explicitly model this participation decision as well as the effects of the tax system at the intensive margin. Each household receives the same child benefit b, which is simply paid "to the household". The presence of children in the household is modelled by assuming that child care is a "household public good".

To simplify derivation of the main results we assume the individuals have identical quasilinear, additively separable utility functions, so that household utility functions take the form:

$$U^j = \alpha^j[u(x_1^j) + v(L_1^j)] + (1 - \alpha^j)[u(x_2^j) + v(L_2^j)] \ + z^j \quad \alpha \in (0, 1) \tag{2}$$

[14] Apps and Rees (2021) show however that this has certainly been the case in the Australian tax system.

[15] This is further analyzed in the optimal taxation setting by Apps, Long, and Rees (2014). There it is shown under standard assumptions that with joint taxation the household can be treated formally as if it were an individual.

where $j \in \{M, H\}$ denotes the middle and higher wage households respectively;[16] $u(.), v(.)$ are strictly increasing and concave; x is consumption, z is child care (assumed to improve the welfare of the child and therefore yielding positive utility) and L is leisure. The "distributional weights" α^j remain constant throughout, in particular unaffected by changes in tax rates. The quasilinearity implies that income effects, for example from the child payments, are absorbed by child care.

Denoting labor supplies by l_i^j, $i = 1, 2$ for primary and second earners respectively, we assume the linear household production function $z^j = k^j h^j$, where $k^j > 0$ is exogenously given productivity[17] and h^j is the time the second earner spends in child care. The individual time constraints are:

$$L_1^j + l_1^j = 1 \tag{3}$$

$$L_2^j + l_2^j + h^j = 1 \tag{4}$$

As already mentioned, we assume $l_1^j > 0$, but we allow the possibility that the second earner does not participate in the labor market[18] and so impose the constraint $l_2^j \geq 0$, with $l_2^j = 0$ of course implying nonparticipation.

We make a significant departure from the ways in which child care costs and second earner participation are usually modelled. The usual assumption is that there are *fixed costs* of work, such as appropriate clothing and commuting, and an exogenously given distribution of these costs such that nonparticipation by the second earner in a household is the result of the fixed cost being too high relative to the income that could be earned. Here, on the other hand, as well as interpreting nonparticipation as a corner point in the second earner's time allocation among her three time uses, market work, leisure and child care, we assume that the "cost of work" is not a fixed cost. Someone has to look after the kids when she is at work, and costs of bought in child care will generally vary with the hours of second earner labor supply. We model this very simply by assuming that the household has to pay a cost c^j per unit of time spent in second earner labor supply.[19] Differences in second earner labor supply decisions at both intensive and extensive margins are the results of variation in: wage and tax rates, productivity in child care, and the unit price of non-parental child care.

Using the time constraints and the production function for child care therefore we can express each household's optimal choice problem as:

$$\max_{x_i^j, h^j, l_i^j} \alpha^j[u(x_1^j) + v(1 - l_1^j)] + (1 - \alpha^j)[u(x_2^j) + v(1 - l_2^j - h^j)] + k^j h^j \quad j \in \{M, H\} \tag{5}$$

subject to the respective budget constraints:

$$\sum_{i=1,2} x_i^M + c^M l_2^M \leq a_M + b + \sum_{i=1,2} \hat{w}_i^M l_i^M \tag{6}$$

[16] We are assuming the "collective household" model; see Apps and Rees (1988), Chiappori (1988). Essentially we are assuming that household equilibria are Pareto-efficient.

[17] We would expect k^j to be higher, the higher are both human and physical capital available to the household.

[18] In OECD countries on average about one-third of households with children have non-participating second earners.

[19] This was used in the analysis of optimal taxation in Apps and Rees (2018). It assumes that the second earner's working time is nested within that of the primary earner.

$$\sum_{i=1,2} x_i^H + c^H l_2^H \leq a_H + \sum_{i=1,2} \hat{w}_i^H l_i^H \tag{7}$$

and the nonnegativity constraint $l_2^j \geq 0$.[20] The individual *net* wage rates $\hat{w}_i^j$ $i = 1, 2.$ are, given that $H-$ households have taxable incomes that place them in the top bracket and therefore above the withdrawal range

$$\hat{w}_i^M \equiv (1 - t_1 - t_W) w_i^M \tag{8}$$

$$\hat{w}_i^H \equiv (1 - t_2) w_i^H \tag{9}$$

Given the assumption that both M-type earners are in the interior of the withdrawal bracket (y_W, y_D) and both H-type earners are in the interior of the upper tax bracket,[21] the "virtual transfers" a_M, a_H are derived from the following individual tax functions: for $j \in \{M, H\}$:

$$T_i^M = t_1(y_W - y_1) + (t_1 + t_W)[w_i^M l_i^M - y_W] \quad i = 1, 2 \tag{10}$$

$$T_i^H = t_1(y_W - y_1) + (t_1 + t_W)[y_D - y_W] + t_1[y_2 - y_D] + t_2(w_i^H l_i^H - y_2) \quad i = 1, 2 \tag{11}$$

Of course the values of a_M, a_H in the above budget constraints will depend on whether or not the second earner participates in the labor market.

The details of the solutions to these problems are given in Appendix A, here we just note the main results. First, there is an obvious concentration of deadweight losses on households within the withdrawal range, while above it second earner labor supplies change only because of income effects acting through changes in the demand for child care. Within the lower income households the labor supply effects are likely to be proportionately larger because, empirically, a larger proportion of workers in this subset are second earners with higher compensated elasticities. Controlling for income effects, both their participation rate and labor supplies, where positive, fall.

Thus the overall effect of the targeting policy is to replace the set of lump sums and marginal rates existing under the universal payments system with a new system of lump sums, tax rates and tax brackets, and, other things equal, with a higher total cost in terms of deadweight losses. Against this, there is a saving in the total budgetary cost of the transfer programme.

A marked feature of the new system made clear by Figure 2 is the strong possibility of loss of full progressivity in the marginal rate structure: Why is it better to have the highest marginal rates around the middle of the distribution where labor supply elasticities are highest than a structure of marginal rates beginning at y_W which preserves progressivity, for example by extending the phase-out interval much further up the income distribution? Why indeed give women with children the same marginal rate structure as those without children outside the phase-out interval $[y_W, y_D)$, and a less favorable one within it? We need a more fundamental evaluation of the policy that goes beyond the crude argument for "not giving transfers to people who don't need it".

[20] It is reasonable to assume that all other choice variables will be strictly positive at the optimum.

[21] Clearly, many more cases are logically possible. For an analysis based on a full set of possibilities in the context of optimal taxation see Apps and Rees (2018).

3.3 Some extensions to the main arguments

An evaluation of the child benefit policy should take account of the following issues:

I. The use(s) to which the budgetary cost savings would be put and the benefits and costs associated with that. For example, if the budgetary cost savings are used to reduce income tax rates, there would be reductions in deadweight losses to the extent determined by the compensated labour supply elasticities of income earners. If they were used to reduce aggregate public expenditure then we would need an estimate of the marginal social cost of public funds.[22] If the purpose is to channel the whole child benefit expenditure to the lowest income households, the deadweight losses and participation disincentives associated with funding will be concentrated on families with children, and especially mothers in the middle of the distribution.

II. The income base for means testing and benefit withdrawal has to be more carefully considered. The discussion in this paper centers on the assumption that this would be household income, but clearly there are other possibilities. A means-testing scheme in the UK made the income withdrawal a function of the income of the primary earner,[23] who is typically male but in a minority of households female. The argument for this would be that primary earner compensated labour supply elasticities as well as participation elasticities are lower than female and so deadweight losses would be lower in this case. This still does not meet our other main objections however.

We have already pointed out that withdrawal on the basis of joint income implies that the disincentive effects resulting from increases in marginal tax rates are concentrated on households with joint incomes within the withdrawal range. As Figure 2 shows, the effects on households with incomes above the withdrawal range are a lump sum income effect: they lose the child benefit but their marginal tax rates are unchanged. If, as we show below (Section 4), mothers have significantly higher labour supply elasticities at both the intensive and extensive margins than men,[24] then in the aggregate, the deadweight losses from a means testing policy will be higher than those associated with increasing the tax rate on earnings in general.

III. The loss of social benefits, in addition to the increased deadweight losses, that arise from contracting the scope of the child benefit policy have to be taken into account. The "targeting" argument seems to ignore these entirely. There are three main arguments here against the introduction of means testing.

First is the well-known argument (see for example Ch. 8 in Atkinson (2015)) that means testing reduces the extent of take-up of benefits by people who are entitled to them. This seems to be empirically validated and therefore implies a loss of benefit in terms of the goals of the child support programme.

Second is the argument that we refer to as the "life cycle/fertility externality". Given that people expect the social insurance system rather than their children to look after them in their old age, they ignore in taking their fertility decisions the

[22] See Dahlby (2008), for a comprehensive analysis of the deteminants of this in a setting with piecewise linear taxation.

[23] Apps and Rees (2021) provide evidence to suggest that primary earner income is a more reliable measure of household wellbeing than joint income, and so provides a better tax base.

[24] The present study is not the only one to point out the difference between the responsiveness of males and females. See, for example, the review by Blundell and MaCurdy (1999).

fact that the future ability of society to do this depends inter alia on the size of the future working population. Child benefits therefore can be seen as a Pigovian subsidy to correct this externality associated with inadequate fertility levels, rather than simply a transfer payment intended only for poorer families.

The third argument also has a life cycle element and is based on the observation that capital markets are imperfect, especially with respect to the ability to borrow. Especially in that stage of their life cycle in which younger children are in the household, couples are faced with increased consumption costs, reduced leisure, and possibly a loss in earned income if one parent reduces her labour supply in order to supply child care. In a perfect capital market they would be able to borrow against future income to smooth this impact, but unsecured borrowing may be very expensive or unavailable. Child benefits may be viewed therefore as a response to this market failure. They are also important for the children as well as the parents, since they permit them to have greater consumption and investment in human capital than would otherwise be possible. These benefits could well be positive across a wide range of the household income distribution.

Moreover, the fact that child benefits are to a large extent funded by taxation on older people, whose children are grown up, means that in a life cycle context these are "repaying" the implicit debt incurred through the child benefit payments that their parents received. In this context, we can think of the generation that introduces means testing as reneging on an implicit intergenerational contract.

4 Using micro simulation models for empirical illustration

4.1 Simulation models

Our empirical approach is to use non-behavioral and behavioral models to illustrate the effects of a means tested and tax financed universal child benefit schedule. We employ models belonging to the Norwegian microsimulation model system LOTTE (Aasness, Dagsvik, and Thoresen, 2007), consisting of a standard non-behavioral tax-benefit model and an attached discrete choice labor supply model.

The non-behavioral model simulates personal taxes and child benefits for each individual and household under various tax-benefit schemes. The model version we apply for the present study is based on detailed administrative records of individual and household's income and wealth for the complete Norwegian population in 2019.

We analyse the predicted labor supply effects by a discrete choice labor supply model which is attached to a subset of the non-behavioral model, covering prime aged (25–62 years old) wage earners.[25] The model results from a standard static framework of labor supply with a discrete hours choice set, where the the preference parameters, and parameters of individuals' wage rates are estimated by combining

[25] In the category of structural labor supply modeling approaches, the discrete choice model of labor supply based on the random utility modeling approach (Van Soest, 1995) stands out, as it has gained widespread popularity among public finance practitioners. This type of models can easily handle non-linear and possibly non-convex budget sets caused by taxation and are thus more practical than the traditional approaches based on marginal calculus.

cross-sectional information from the Income and Wealth Statistics for Households (Statistics Norway, 2018) and the Labor Force Survey (Statistics Norway, 2019). See Dagsvik et al. (2014) and Dagsvik and Jia (2016) for further details on the model assumptions.

For the present study it should be noted that in the case of wage earner couples, we rely on a unitary family labour supply model, which means that the family is seen as a single decision-making unit. Thus, even though the child benefit is transferred to the mother, it affects the budget constraint of the father identically, as the spouses pool their income.[26] The difference in responses across gender come from different valuations of leisure, resulting in variation in response estimates. This is shown in Table B1 in Appendix B. The table presents Marshallian (uncompensated) elasticities for females and males in couples and for male and female singles, both at the extensive and intensive margin. In particular, females in couples are more responsive than others.

At the outset it is important to note that labour supply effects emanate from standard response regularities. For example, there is negative labour supply response to increased non-labour income (child benefit), similar to a standard income effect. Furthermore, the main effect with respect to means testing comes from the increased effective marginal tax rates in the phase-out income intervals.

In Section 5 we shall see to what extent the labour supply effects moderate initial (non-behavioural) effects of changing the child benefit schedule. We will present labour supply effects across income deciles. Given the probabilistic nature of the labour supply model, we obtain income by taking expectations across the discrete choices for each individual or household. However, in the reporting of distributional effects, individuals are ranked by income (or equivalent income) from observed data, such that the same subset of individuals are compared in each decile.

Importantly, as the labour supply model describes behavioural responses of prime aged wage earners, labour supply effects among other groups are set equal to zero. In effect, this means that the responses from the self-employed are neglected.[27] Since the increased taxation that pays for the enhanced universal schedule applies to all (not only families with children), distributional effects are measured in the whole population. In order to illustrate the labor supply disincentive effects for secondary earners as described in Section 3, we also report results, separately, for wage earner couples.

We describe the distributional effects of changes in the child benefit schedule both before and after behavioural effects and both in terms of effects on disposable income and money metric utility. For the latter we discuss the distribution of equivalent variation (EV). For couples, we also show results when units are ranked according to other measures of well-being: non-weighted household income, primary earner's income and so-called full income. Full income is defined by letting both spouses in all couples work 37.5 hours per week, which is the working hours of a full time job

[26] It is acknowledged though that the evidence reported above, that children benefit from the child benefit being transferred to mothers (and not fathers), see Lundberg, Pollak and Wales (1997), may signify that parents do not always pool their income.

[27] A tax simulation model for the self-employed requires a completely different decision model. It is however worth noting that the share of self-employed in proportion to the total workforce is low in Norway, around 7 percent (Berg and Thoresen, 2020).

in Norway.

4.2 The 2019-benchmark and the alternative designs

We shall use the child benefit system of Norway of 2019 for the empirical illustration. Parents are entitled to a child benefit for each child below 18 years of age; in 2019 the recipients got NOK 1,054 Norwegian kroner (€107; $120) per child per month for children, which means that the yearly support is NOK 12,650 (€1,280; $1,440). Single parents are in addition entitled to extended child benefit and infant supplement. Extended child benefit means receiving benefit for one child more than the parent actually has, whereas the infant supplement, which was 660 NOK (€63; $75) in 2019, is paid (extra) for children 0–3 years of age. The total cost of the schedule reached NOK 15.8 billion (€1.6 billion; $1.8 billion) in 2019, which corresponds to approximately 3.1 percent of the revenue from the personal income tax in that year. The relatively modest child benefit support scheme of Norway results from the policy-makers having kept the child benefit nominally frozen over the period 1996–2019 in order to finance the development of child care services.

In the simulations of the two alternative child benefit designs, the means tested and the tax-financed universal schemes, we let both depart from an upgraded rate (relatively to 2019). More specifically, the starting point is a relatively generous child benefit, defined by doubling the rate of 2019, which results in a yearly support of NOK 25,300 (€2,600 and $2,900) for each child. This brings the support close to the rate of the child benefit for the US.

We depart from the income tax system of Norway in 2019 consisting of a flat tax on capital and labor (22%) coupled with a four-tier step scheme on labor or labor-related income.The step tax consists of four steps, starting at an annual income level of NOK 174,500. The tax rates in 2019 were 1,9%; 4.2%; 13.2% and 16.2%, respectively, where each range was defined by the income limits of NOK 245,650; NOK 617,500 and NOK 964,800.

Recall that we see the question of choice of child benefit scheme as a matter of choice of financing the benefit. Under the two alternatives, we let the increased expenditures following from an upgraded scheme be paid by means testing or by increased taxation, respectively.

Under the means testing alternative, we establish a threshold, around the average gross household income, NOK 756,000 (€45,750; $54,400) in (gross), from where the complete child benefit is tapered off by 10 percent of a krone for each NOK in income of the household. It follows that the length of the phase-out interval is determined by the size of the support, which, for example, depends on how many children there are in the family. Under the other alternative, the increased expenditures of a universal scheme are paid for by increasing the rates of the step tax system of labor income. All brackets are increased by 1.22 percentage points, see the last column of Table 1.[28] Thus, this alternative can be characterized as a "tax-financed universal scheme".

Both the means testing alternative and the tax financed universal alternative

[28]Note that the more generous scheme is financed by increased tax rates for all, not only for families with children.

Table 1: Benchmark and alternative schedules of child benefit

	Benchmark	Means-testing	Tax-financed universal
Child benefit rate	12,650 per child	25,296 per child	25,296 per child
Inc. threshold, household income	-	756,000	-
Phase-out rate of benefit	-	0.10	-
Tax rate change	-	-	+1.22 pp., all brackets

Notes: The benchmark corresponds to the 2019 tax-benefit system of Norway, with a four-tier step scheme of the personal income tax and a (low-rate) universal child benefit.

are revenue-neutral (before behavioural adjustments) to the benchmark schedules of 2019.

5 Means testing or higher tax?

5.1 Results for all households

Table 2 describes the direct distributional effects (before labour supply effects) of both alternatives, compared to the 2019-benchmark. All effects are measured in terms of the whole population, independent of having children or not. Recall that the increased taxation, which pays for the enhanced universal scheme, applies to all (not only families with children). The income rankings in the following build on equivalent disposable income, which is derived by aggregating income over household members, weighing with an equivalence scale (the so-called EU-scale[29]), and letting each household be represented with as many persons as there are household members.[30]

Table 2 shows that the universal child benefit in the benchmark already has a (modest) redistributional effect.[31] Further, the table reveals that there is a clear difference in the direct distributional effects between the two alternative child benefit designs. The means testing implies that families in deciles 5–10 lose, whereas negative values are observed for deciles 8–10 under the tax-financed universal scheme. With reference to the discussion in Section 3, this illustrates that means testing is not only paid for by the rich, but that it hits the middle part of the income distribution too. As the increase in disposable income is somewhat larger for the lower deciles under the means testing alternative, the reduction in the share of children living in poor families is slightly larger for means testing; a reduction of 2.5 percentage points compared to 2.3 percentage points.[32]

[29] This equivalence scale gives a weight of 1.0 to the first adult household member, 0.5 to the second adult household member and 0.3 to children.

[30] See e.g. Ebert (1997).

[31] This follows from families with children (or many children) being overrepresented in the lower and middle deciles. Extended child benefit for single parents, with on average relatively low income, also contributes to this redistributive pattern.

[32] A child is defined to live in a poor family if the household's equivalent disposable income is below 60% of the median equivalent disposable income in the population.

Table 2: Direct (non-behavioural) distributional effects of the alternative child benefit schedules. All households

				Effects of alternative design	
		Benchmark		Means-testing	Tax-financed universal
Decile	Disp. income	Income tax	Child benefit	ΔDisp. income	ΔDisp. income
1	134,300	26,600	5,700	5,600	5,300
2	251,200	46,500	6,200	6,000	4,800
3	302,200	66,600	6,300	4,900	4,100
4	343,400	85,400	6,000	2,500	3,200
5	380,900	104,900	6,000	-200	2,600
6	417,700	123,900	6,000	-2,500	1,900
7	460,000	147,500	5,500	-4,300	700
8	511,100	176,900	4,800	-4,500	-900
9	591,300	227,900	4,400	-4,200	-2,700
10	922,700	459,200	3,800	-3,700	-7,400
Child poverty (share in %)		12.4		-2.5	-2.3
Income tax revenue (billion)		525.5		0.0	15.5
Child benefit expense (billion)		15.5		0.0	15.5
Revenues−expense (billion)		510.0		0.0	0.0

Notes: Incomes are measured in terms of equivalent (EU-scale) household income in NOK in 2019, with the individual as the unit of analysis. Effects of the alternative designs are measured as differences to the 2019 benchmark.

Table 3: Aggregated labour supply responses. Wage earner households

	Benchmark		Changes			
			Means testing		Tax-financed universal	
	Hours	Man-years	Hours	Man-years	Hours	Man-years
All wage earners	34.56	1,406,000	-0.32	-13,000	-0.20	-8,000
Children in the househ.	34.61	625,000	-0.73	-13,000	-0.33	-6,000
No children in the househ.	34.52	781,000	0.00	0	-0.10	-2,000

Notes: Hours refer to mean working hours per week. A man-year is defined as 37.5 hours per week. Wage earners are divided into two categories, dependent on whether there are children (< age 18) in the household.

But improved distributional effects come at the cost of reduced labour supply. Table 3 summarises the labour supply effects of the two alternatives (compared to the benchmark), for wage earner households.[33] As expected, we find that the reduction in working hours is larger for the means testing alternative, 0.32 hours on average, compared to 0.20 hours on average for the tax-financed universal scheme. Recalculated into reductions in man-years, these effects correspond to approximately 13,000 man-years and 8,000 man-years being withdrawn from market work for the two alternatives, respectively.

Table 4 summarises the effects of behavioral changes on child poverty and on tax and expenditure revenues. First, when including the behavioral effects, the effect on child poverty is close to identical in the two alternatives; -2.1 percentage points (means testing) and -2.0 percentage points (tax financed universal). Second, the behavioral effects of means testing weaken the budget more than the universal alternative. Under means testing, income tax revenues are reduced by NOK 2.4 billion (€0.24; $0.27) because of reduced work, and, in turn, this gives increased child benefit expenses of NOK 0.4 billion (€41 mill.; $45 mill.). The latter follows from more households falling below the means testing threshold when households reduce their labour supply. The total effect on the budget is then NOK -2.8 billion (€0.28; $0.32). In comparison, the reduction in tax payments due to the labour supply responses because of higher taxes in the universal child benefit alternative is NOK 1.5 billion (€0.15; $0.17).

Figure 3 describes how the distribution of household income is affected by the two alternative child benefit schemes, when also the labour supply effects are accounted for. The figure demonstrates that the direct distributional effects are larger than the effects from labour supply adjustments. Negative effects on income (both direct and total) are observed for households in deciles 5–10 under means testing, whereas for the tax-financed universal alternative the negative effects start at a higher income level.

As an alternative to descriptions of policy changes in terms of effects on disposable income, we describe the policy changes when measuring effects as changes in money metric utility. We employ the EV measure, which is the maximum amount of money that the individual is willing to pay to avoid the policy change. In practice

[33] Household member are defined as wage earners or potential wage earners, i.e., households with self-employed, pensioners and unemployed are excluded.

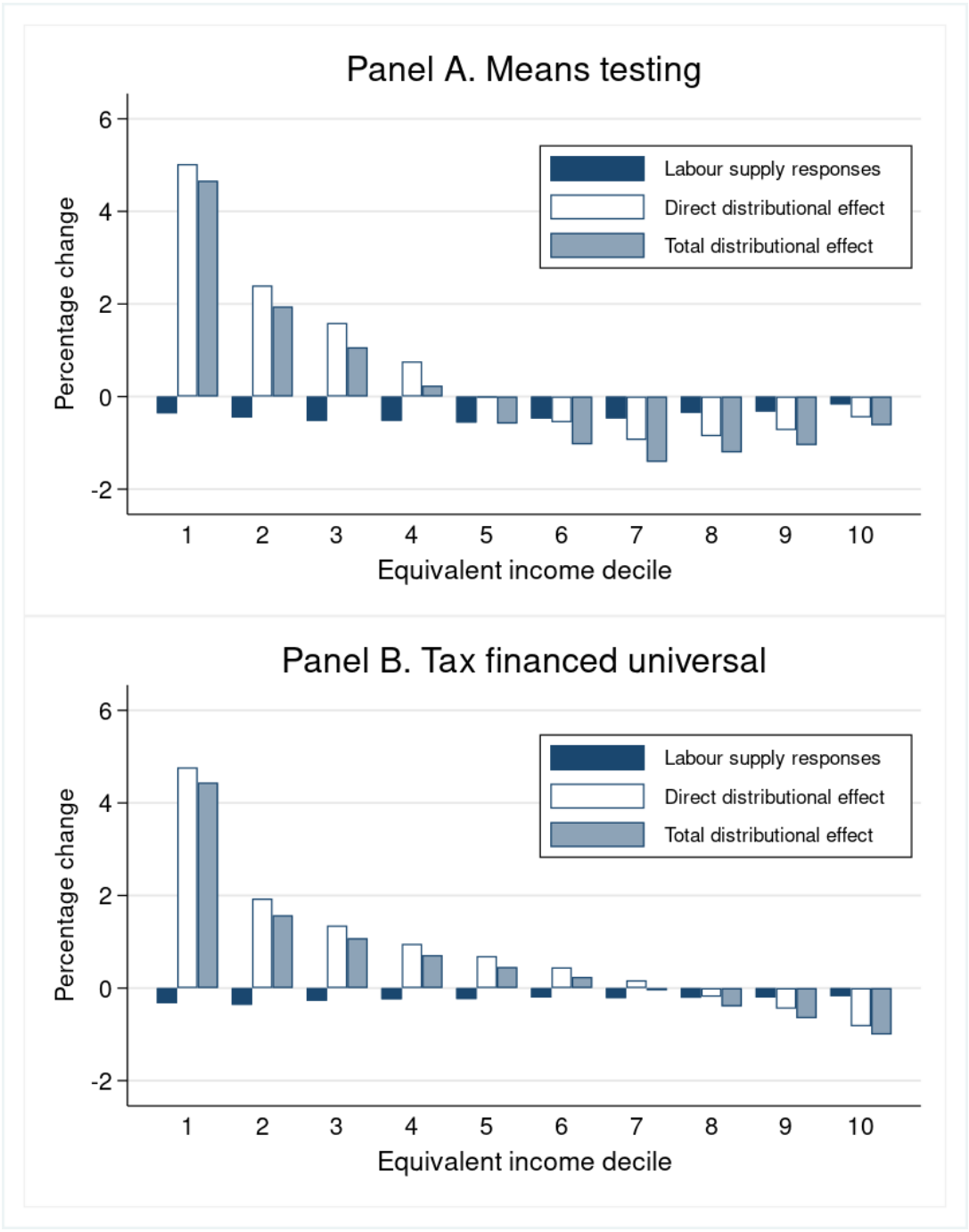

Figure 3: Effects of changes in the child benefit. Direct distributional effects, labour supply responses and total distributional effects in equivalent income deciles. All households

Table 4: Effects of changes in the child benefit. Direct (non-behavioural) effect and total effect on child poverty and revenue balance

		Changes			
	Benchmark	Means testing		Tax-financed universal	
		Direct	Total	Direct	Total
Child poverty (share in %)	12.4	-2.5	-2.1	-2.3	-2.0
Income tax revenues (billion)	525.5	0.0	-2.4	15.5	14.0
Child benefit expenses (billion)	15.5	0.0	0.4	15.5	15.5
Revenue balance (billion)	510.0	0.0	-2.8	0.0	-1.5

Notes: The total effect includes predicted behavioral responses. The expected change in labour income is subtracted from the observed income for each wage earner.

this means that we derive measures of EV by using the optimal choices of the economic agents, pre-reform and post-reform, obtained from the labour supply model.[34] We find it convenient to measure EV in terms of negative values, which means that Figure 4 shows measures of how much the agents are willing to pay to let the policy change happen.[35] We see the same pattern as in Table 2: means testing and the universal tax financed benefit are highly valued by the poor. The difference between them are found for households with middle and higher equivalent income, where the gradient for the means testing alternative flattens out in an L-shape for middle income households. The distributional gradient is (somewhat) flatter for the tax financing alternative, with positive valuation of the change for lower and middle income levels, and then clear negative values at the high end of the income distribution.[36]

5.2 Couple households results

5.2.1 Labour supply effects among wage earner couples

The analytical discussion of means testing in Section 3 most closely connects to the behaviour of spouses, and in this section we present simulation results for wage earner couples. As above, we address effects on couples both with and without children, since the tax-financed universal high-rate scheme also involves increased tax payments for households without children.[37]

[34] Dagsvik, Locatelli and Strøm (2009) and Jia and Thoresen (2021) provide further details about how measures of EV can be obtained, given that a discrete choice labour supply model is employed. It should be noted that there are controversies concerning interpersonal comparison of measures of utility, see the review in Slesnick (1998).

[35] For individuals others than wage earners, the EV is set equal to the amount of the transfer in NOK.

[36] As a matter of terminology, note that in Figure 4 both measures of equivalent variation and disposable income are weighted with equivalence scale.

[37] Table B2 in Appendix B provides some evidence on the difference between the two alternatives with respect to the response of mothers and fathers. It shows that among families with children, mothers, in particular, reduce their labour supply under means testing, see figures for unconditional working hours (extensive margin + intensive margin). Reductions are 1.2 and 0.77 hours of work

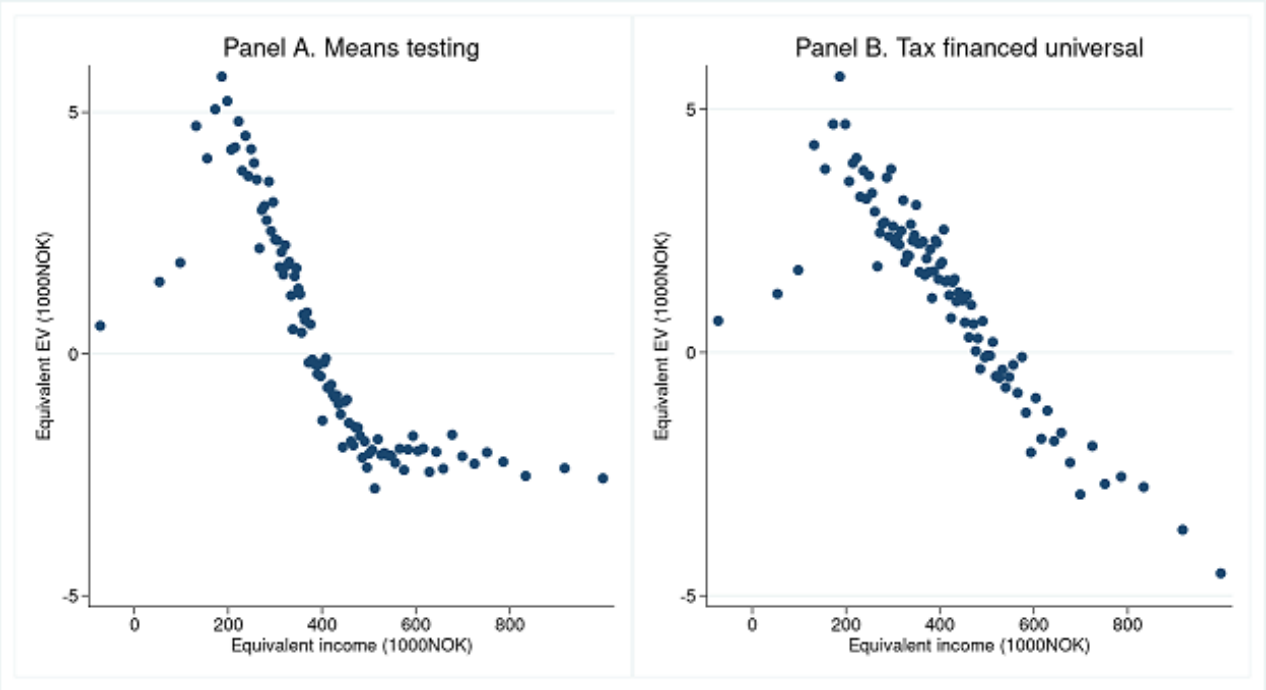

Figure 4: Effects of changes in the child benefit measured by equivalent variation (EV) against equivalent income. All households

Table 5 shows female labour supply effects with respect to combinations of wage levels of the spouses: nine combinations of low (L), median (M) and high (H) wages. Whereas labour supply effects of the tax-financed universal schemes are relatively equally distributed across wage combinations, the table shows that means testing has strongest effects on persons with low wages; see for example the effects in the case where both spouses having low income (L/L). These results therefore suggest that means testing may induce initially poor people to reduce their labor supply, and in that sense acts in direction of a poverty trap, preventing people from moving out of a situation with little market work. Table B3 in Appendix B presents results of similar calculations for males.

for females in couples and single females, respectively. These figures are well above corresponding estimates both for males under means testing and for females under the tax-financed universal scheme.

Table 5: Female labour supply effects of changes in the child benefit schedule by combinations of female/male wage levels in the couple

			Wage combinations: female/male wage rate levels								
			L/L	L/M	L/H	M/L	M/M	M/H	H/L	H/M	H/H
	Benchmark	Participation	0.921	0.913	0.905	0.961	0.957	0.949	0.978	0.973	0.967
		Work. hours, int. marg.	32.13	32.06	31.75	33.68	33.54	33.22	34.58	34.33	34.05
		Uncond. working hours	29.68	29.37	28.79	32.42	32.16	31.59	33.85	33.44	32.96
Change	Means testing	Participation	-0.013	-0.013	-0.012	-0.008	-0.010	-0.012	-0.004	-0.006	-0.006
		Work. hours, int. marg.	-0.56	-0.51	-0.35	-0.54	-0.56	-0.50	-0.31	-0.41	-0.31
		Uncond. working hours	-0.90	-0.87	-0.67	-0.78	-0.87	-0.85	-0.43	-0.61	-0.50
	Tax-financed universal	Participation	-0.005	-0.005	-0.004	-0.003	-0.003	-0.003	-0.002	-0.002	-0.002
		Work. hours, int. marg.	-0.25	-0.23	-0.22	-0.22	-0.23	-0.23	-0.19	-0.20	-0.21
		Uncond. working hours	-0.38	-0.36	-0.33	-0.30	-0.31	-0.32	-0.23	-0.26	-0.27
Number of observations			467	626	135	597	1388	706	164	695	754

Notes: Wage rate levels (per hour) defined by percentiles: L=low wage, 0-25; M=medium wage, 25-75; H=high wage 75-100. Changes measured in absolute values of hours of work.

Next, given that the distribution of labour supply effects described in Figure 3 depends on individuals being ranked according to equivalent income, it is interesting to see to what extent the pattern of labour supply effects can be retrieved for other definitions of income or well-being for wage earner couples. Figure 5 shows distributions of labour supply effects for females and males for three definitions of income: household disposable income (without weighting with an equivalence scale); disposable income of the primary earner; and full income. The full income concept is calculated here by letting both spouses in all couples be represented by working hours corresponding to a full time job, which is 37.5 hours per week in Norway.[38] The difference in labour supply effects between the two alternative schedules for wage earner couples is clearly depicted in Figure 5. Means testing gives a large reduction in working hours at low and median levels of income, and in particular for mothers. Males are less influenced by the changes, which follows from males being less responsive than their female counterparts. The labour supply effects for a tax-financed universal schedule are (in contrast) relatively equally distributed across the income distribution.

The other main message of Figure 5 is that the distribution of labour supply effects is relatively robust to alternative income definitions, when either household disposable income, disposable income of the primary earner, or full income is used.

5.2.2 Redistribution among wage earner couples

Whereas Figure 3 describes distributional effects of alternative schedules for all households, we here present direct and total distributional effects (including labour supply effects) when restricting attention to wage earner couples. Figure 6 reveals several interesting findings. Firstly, we note that under the means testing alternative most households lose when restricting the sample to wage earner couples. In terms of total effects (bottom right corner of the figure), now only decile 1 get an increase in income, compared to deciles 1–4 in Figure 3.

Secondly, the difference between the two alternatives in terms of distributional effects stands out very distinctively. In particular, whereas the large labour supply effects (included in total effects) for couples with low and median income lead to negative figures under means testing, the tax-financed universal scheme gives negative total effects only for couples at the high end of the income distribution. Thirdly, again results are very little sensitive to the choice of definition of income.

[38] This income concept is meant, at least to some extent, to control for the measurement errors following from conventional methods that ignore the value of household production. Some households may wrongly be characterised as belonging to a low-income household because their market income is low.

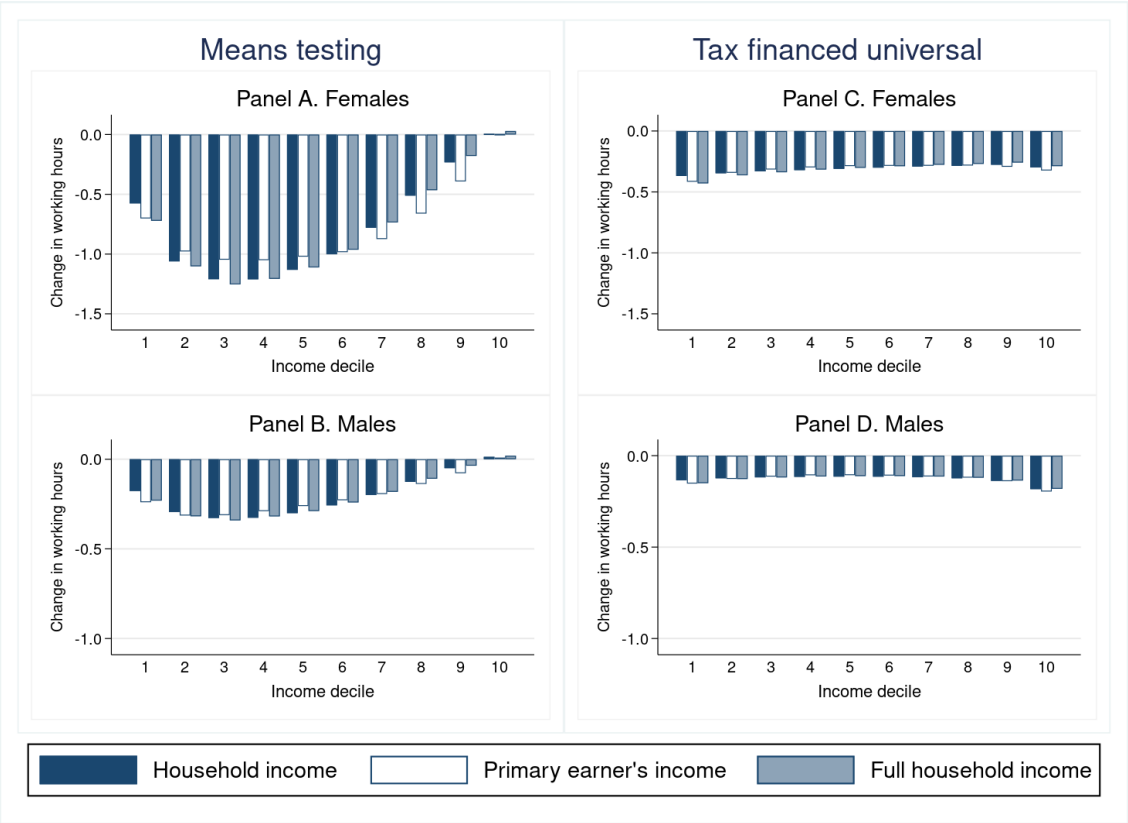

Figure 5: Distribution of reductions in labour supply in couples (females and males) for changes in the child benefitt. Effects for different definitions of income

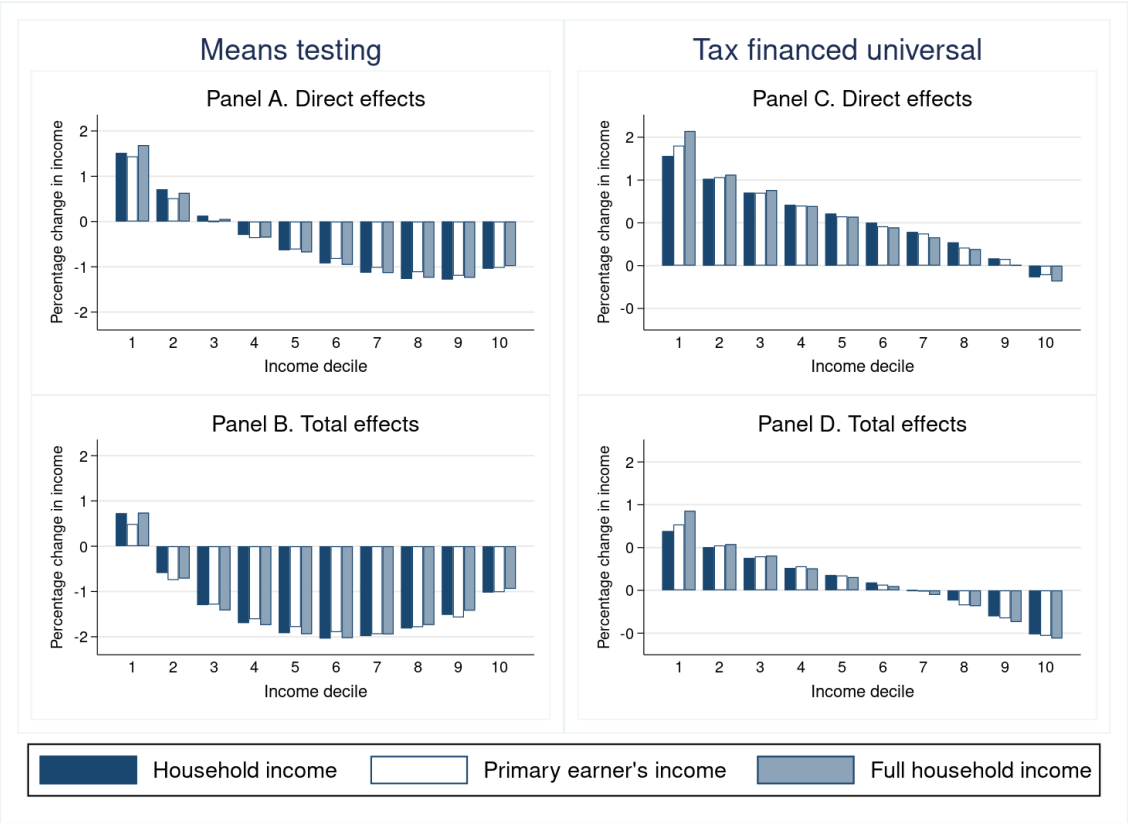

Figure 6: Direct and total distributional effects of changes in the child benefit. Wage earner couples

6 Conclusion

Several child benefit schemes around the world, including the new one in the US, involve means testing, in the sense that the transfer is phased out above an income threshold. Universal transfers, as child benefit to all, are in the public debate often characterized as a waste of money on the rich. But is the answer to this to target the support towards lower income families through means testing? This paper argues for a more fundamental evaluation of the policy that goes beyond the crude argument for "not giving transfers to higher income households". Here it is shown that redistribution can be achieved through higher taxation in general in combination with a fairly generous universal schedule.

One important message is that the "middle class" is treated differently by the child benefit designs discussed. Means testing implies that the highest effective marginal tax rates arise around the middle of the income distribution for families with children, which means that there are incentives of low- and middle-income households to reduce their labor supply in order to get access to the means tested support.

Our empirical analysis show exactly this. We use microsimulation models representing the universe of Norwegian households to illustrate the distributional and labor supply effects empirically. When contrasting a generous universal scheme and a means tested alternative, we find that they reduce child poverty approximately to the same degree. Further, we see that the means tested scheme is reducing overall labor supply more than a tax financed universal child benefit scheme. The means tested schedule is mostly harmful to mothers' labor supply in households with low and middle income. We therefore conclude that a tax financed universal scheme is preferable, both from an efficiency and redistributional point of view. A universal scheme is likely also preferable from the perspective of compliance and administrative burdens. But of course, a generous tax-financed universal scheme means that part of the bill is paid by households without children, though we have argued that this should be considered in an intergenerational life-cycle context.

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A Appendix

The Lagrange functions of the two household types are as follows:

$$\mathcal{L}^M = \alpha^M[u(x_1^M) + v(1 - l_1^M)] + (1 - \alpha^M)[u(x_2^M) + v(1 - l_2^M - h^M)] + k^M h^M$$
$$+\lambda^M(a_M + b + \sum_{i=1,2} \hat{w}_i^M l_i^M - \sum_{i=1,2} x_i^M - c^M l_2^M) \tag{12}$$

$$\mathcal{L}^H = \alpha^H[u(x_1^H) + v(1 - l_1^H)] + (1 - \alpha^H)[u(x_2^H) + v(1 - l_2^H - h^H)] + k^H h^H$$
$$+\lambda^H(a_H + \sum_{i=1,2} \hat{w}_i^H l_i^H - \sum_{i=1,2} x_i^H - c^H l_2^H) \tag{13}$$

We focus on the first order condition (FOC) for second earners, since, because of the quasilinearity assumption, those for primary earners are standard and separable. Also, since b is constant, it does not affect the form of the FOC, so the extent to which it is present in the budget constraint has only an income effect. Then from the FOC, assuming $x_2^j, h^j, L_2^j > 0$, $j \in \{M, H\}$ at the optimum, we have the conditions:

$$v'(1 - l_2^j - h^j) = k^j \tag{14}$$

$$\frac{v'(1 - l_2^j - h^j)}{u'(x_2^j)} \geq \hat{w}_2^j - c^j; \quad l_2^j \geq 0; \quad l_2^j \frac{\partial \mathcal{L}^j}{\partial l_2^j} = 0 \tag{15}$$

The first of these tells us that, given the labor supply decision, the second earner's leisure choice and her labor supply if positive depends on her productivity in child care. The second condition tells us that, if $l_2^j > 0$, second earner labor supply depends also on the net of tax wage rate net of child care costs, but in the case of

nonparticipation, with $l_2^j = 0$, this is only a lower bound to the marginal value of the second earner's supply of time to child care and her own leisure. Using both conditions we derive a very simple condition[39] for the participation decision:

$$\frac{k^j}{u'(x_2^j)} \geq \hat{w}_2^j - c^j \tag{16}$$

Marginal child care costs and the marginal productivity of the second earner in child care production (measured in units of consumption), in conjunction with the net of tax wage, determine the participation decision.[40] This tells us that in the case of $j = H$, the withdrawal of the child care payment can have only an income effect on second earner labor supply at both the intensive and extensive margins. On the given assumptions it will reduce x_2^j, thus increasing u' and making it less likely that the above condition is satisfied, while at the intensive margin there may be an increase in labor supply, conditional on it being positive and child care being a normal good. Across the withdrawal range on the other hand, net wage rates are lower and so there are deadweight losses and a possible fall in participation.

[39] Though of course this simplicity owes a lot to the quasilinearity and additive separability of the individual utility functions.

[40] This differs from the standard analysis of the participation decision, in which all that matters is the level of the exogenously determined (and presumably observable) fixed cost of work.

B Table appendix

Table B1: Uncompensated wage elasticities for individuals in couples and singles

	Female own wage elast.	Male own wage elast.	Female cross wage elast.	Male cross wage elast.
Individuals in couple				
Prob. of work (extensive margin)	0.135		-0.048	
Cond. on working (intensive margin)	0.197	0.095	-0.043	-0.009
Unconditional (total)	0.332		-0.091	
Single individuals				
Prob. of work (extensive margin)	0.012			
Cond. on working (intensive margin)	0.057	0.009		
Unconditional (total)	0.069			

Table B2: Labour supply effects of changes in the child benefit by groups of individuals

			Families with children				Households without children	All
			Couple		Single			
			Female	Male	Female	Male		
	Benchmark	Participation	0.953		0.940		0.969	0.970
		Work. hours, int. marg.	33.36		33.83		35.49	35.49
		Uncond. working hours	31.87	38.04	31.98	37.53	34.52	34.56
Change	Means testing	Participation	-0.015		-0.010		-	-0.003
		Work. hours, int. marg.	-0.76		-0.47		-	-0.23
		Uncond. working hours	-1.20	-0.32	-0.77	-0.13	-	-0.32
	Tax financed universal	Participation	-0.004		-0.010		-0.001	-0.002
		Work. hours, int. marg.	-0.26		-0.44		-0.08	-0.15
		Uncond. working hours	-0.38	-0.15	-0.75	-0.10	-0.10	-0.20

Notes: Changes measured in absolute values of hours of work

Table B3: Male labour supply effects of changes in the child benefit schedule by combinations of female/male wage levels

			Wage combinations: female/male wage rate levels								
			L/L	L/M	L/H	M/L	M/M	M/H	H/L	H/M	H/H
	Benchmark	Uncond. work. hours	37.05	37.68	38.32	37.09	37.80	38.45	36.64	37.60	38.33
Change	Means testing	Uncond. work. hours	-0.23	-0.20	-0.13	-0.25	-0.23	-0.20	-0.17	-0.19	-0.13
	Tax fin. univ.	Uncond. work. hours	-0.13	-0.12	-0.13	-0.13	-0.13	-0.14	-0.12	-0.12	-0.13
Number of observations			467	626	135	597	1388	706	164	695	754

Notes: Wage rate levels (per hour) defined by percentiles: L=low wage, 0-25; M=medium wage, 25-75;
H=high wage 75-100