Non-Market Household Time and the Cost of Children

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Abstract

Raising children demands a considerable amount of parental time, obliging working parents either to further reduce their leisure or to buy child-care services in the market. Parents may face additional opportunity costs upon deciding to participate in the labor market, but these are difficult to measure. Using a survey instrument in Belgium and Germany, we estimate the income compensation needed to maintain family well-being when adults work vs. when they do not enter the labor market. In both countries we find that full-time working parents face extra child costs and require higher labor-market-participation compensation compared to childless adults.

Key Words: equivalent income, household well-being, reservation wage, child costs, parental unemployment trap, survey method

JEL Classification: D13, J22, J13, C42, I38, H31

1. Introduction

In a literature survey about how children affect the economic behavior of households Browning (1992, p. 1470-1) noted:

> *"Every aspect of household economic behavior is significantly correlated with the presence of children in the household. [...] children [...] do play a central role in understanding all facets of household economic behavior."*

A particular feature of households with children is that children must be raised by the adults in the household. Child care requires the investment of time, effort, and other resources on the part of adult household members. The constraints faced by adults in this regard are affected by the labor-market-participation status of the adult household members: working adults have less non-market time available for child care and other household-production activities than do nonworking adults.

We design a survey instrument in order to estimate the tradeoff between non-market time and household income. This tradeoff is given by the income compensation for a reduction in non-market time required to keep family well-being constant. Empirically, we investigate whether the time/money tradeoff is higher in households with children vs. those without children. Further, we estimate child costs for households with working vs. non-working adults. Such estimates help in evaluating whether transfers to reduce child poverty are equitable across different household types. Examining whether children affect labor-market-participation compensation enables us to evaluate whether tax allowance policies that reward working parents create sufficient work incentives to move parents out of an un-employment/poverty trap (for example, see Brewer (2001), who discusses related policies in the US and the UK).

Econometric approaches such as this suggested in Apps and Rees (2001) specify demand systems in order to estimate child costs in different household types from consumption and time-use data. Various factors make this approach challenging. No existing database drawn from the same sample of households contains information about both time use and consumption (Gronau and Hamermesh (2006, p. 3)). Even if such a database existed, its informational content would be limited. For example, the variable 'wage' can be observed only for the sub-sample of working people, making –effectively– a sample selection correction necessary (Wooldridge (2002, p. 552)). Other information is not collected at all: the extent to which household members share goods within the household; the quantity/quality of domestic production; and not least, "who gets what" (Browning (1992, p. 1470)). As a result, to infer prices of domestic goods, including the value of time that adults devote to child-related activities, estimated demand systems depend critically upon (a-priori untestable) exogeneity assumptions, assumptions on within-household sharing rules and functional forms of household production processes, as well as identification restrictions (for example, see Donaldson and Pendakur (2004, 2006) for references concerning restrictions such as "equivalence-scale exactness" used to identify household cost functions, and generalizations they suggest).

Our approach does not rely upon the specification of a theoretical model and thus avoids the need to make modeling assumptions that are a-priori untestable. Our survey method requires respondents to perform a set of evaluation tasks that are directly related to the estimation of child costs in different household types. Similarly with Koulovatianos, Schröder, and Schmidt (2005), our approach relies on the idea that respondents, based on their daily experiences and choices, are capable of providing reliable assessments when asked the following type of question: "Which family-income level can make a household with one working and one nonworking adult with two children achieve the same well-being as a household

with a nonworking single childless adult and a monthly family income of $1,000, in your opinion? What income would one need if instead both adults were nonworking? If both adults were working?" The answers we obtain are equivalent incomes, i.e. disposable family incomes that make the well-being of households with different demographic composition and labor-market-participation status equal. So, the time/money tradeoff is captured by the difference between equivalent incomes of two household types that differ only with respect to the *non-market time endowment* (NMTE) of adult household members.

We have conducted this survey in two countries, Belgium and Germany, focusing on two types of reductions in NMTE. Starting from a household where all adult members are non-working, we distinguish: (i) a *nonrestrictive* reduction in NMTE that leads to a 'traditional' household with one working and one nonworking adult; (ii) a *restrictive* reduction in NMTE that leads to a situation in which all adults in the household work full time. We find that the time/money tradeoff corresponding to nonrestrictive reductions in NMTE is typically unaffected by the presence of children in the household. On the contrary, in both countries, it is always the case that, in response to a restrictive reduction in NMTE, the time/money tradeoff increases whenever children are present.

As a robustness check, we use regression analysis to estimate child costs relative to an adult, after controlling for economies of household size and also for several personal characteristics of the survey's respondents. Consistently with our results above, child-cost estimates are higher in time-constrained families when compared to households where at least one adult is nonworking. These findings suggest that parents may face additional opportunity costs upon deciding to start working full time, except in one important case: when one of the two nonworking parents decides to go to work. Accordingly, income-tax-allowance policies that aim at increasing work incentives need to favor working parents.

Our results also have broader implications for the building of applied models of the household: as in Apps and Rees (2001), both child-care time and that a household's adults can specialize in market vs. domestic activities need to be modeled explicitly. Apart from providing such general guidelines for modeling, survey-based estimates of equivalent incomes can be used to test the validity of identification restrictions that demand systems impose (for example, Koulovatianos, Schröder, and Schmidt (2005) test the restriction of "generalized equivalence scale exactness"). Furthermore, the 'calibration' line of research on the family, such as Aiyagari et al. (2000) and Greenwood et al. (2005) among others, can benefit from the additional, complementary information that a survey such as ours adds to existing databases. For example, calibration-based models use parameters that cannot be verified empirically due to econometric identification problems (see Gronau (2006)). Survey estimates of equivalent incomes add a 'goodness of fit' criterion to such models and help in assessing the validity of their parameters.

In Section 2 we describe the structure of our survey and the samples we use. In Section 3 we analyze the time/money tradeoffs faced by different family types with an emphasis on a comparison of families with children vs. families without children. In Section 4 we provide estimates of child costs in families with different labor-market-participation status. We discuss the policy relevance of our results in Section 5 and we make concluding remarks in Section 6.

2. Survey structure and samples

Our questionnaire consists of three sections, reproduced in the Appendix. The first section gives the respondents an overview and explains the task they are to perform. The second section collects some personal characteristics of the respondents that could possibly affect

their assessments.

The core questions of our survey are contained in the third section in the form of a 20-cell table (see the Appendix). Each cell corresponds to a particular household type characterized by: (i) number of adults; (ii) number of children; (iii) labor-market-participation status of adults. Moving downwards within each column of the table, the number of children increases (from zero to three children). Moving across rows from left to right, the number of adults increases, from one to two adults, and the labor-market-participation status of each adult also varies between nonworking and working full time. Denoting a nonworking adult by "N" and a full-time working adult by "W," the sequence from left to right is, "N, W, NN, WN, WW."

The first cell of the questionnaire's table provides a reference income, the disposable monthly income of a reference household, a nonworking single childless adult. All remaining 19 cells are left empty. Respondents are asked to fill them in with *after-tax/transfer monthly household* incomes that bring all households to the same level of well-being as that of the reference household. Setting these equivalent incomes is the central task that respondents perform in this survey.

Implementing this survey in Belgium and Germany, we asked our respondents explicitly to assume only adults of age 35 to 55 and children of age 7-11 in the households they were asked to consider. Moreover, we were interested in obtaining child-cost estimates for different levels of household well-being. To this end, respondents were provided with *three* 20-cell tables of the form appearing in the Appendix, each giving a different income for the reference household. The three reference-income levels used in the questionnaire cover a broad range of the disposable-monthly-income distributions of the two countries. The lowest reference income, 500 Euros (EUR), is a proxy for the absolute poverty line (approximately

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the social-security benefit for single-childless adults in both Belgium and Germany). The other two reference incomes are EUR 2000 and EUR 3500.

Our samples consist of 149 respondents in Belgium and 164 in Germany. The questionnaire appeared on the internet and was advertised through web newsletters in both countries. Each respondent was offered the right to participate in a lottery with expected payoff equal to EUR 5. The Belgian sample was collected in April 2002, the German sample in February 2005. Table 1 presents a breakdown of the sample statistics for both countries. The gender distribution of the German sample is relatively male-biased. In both countries, most respondents are between 20-40 years of age and highly educated. These biases are related to the distribution of internet-user attributes.

3.   Equivalent-income profiles and time/money tradeoffs

3.1   Descriptive statistics

Table 2 presents the sample means of the stated equivalent incomes. An immediate observation is that respondents always compensate households for a reduction in NMTE. This is a plausible result, consistent with predictions by theories of the value of time in the literature.

Figure 1 depicts the information given by Table 2. The horizontal axis of each graph represents a household's available NMTE. The value "1" on the horizontal axis is for the case when all adults in the household are nonworking. The value "0" means that all adults in the household work full time. For the case of two-adult households in which one adult is working and the other is nonworking, the value "0.5" has been assigned. The vertical axis is used for equivalent incomes. Each point plotted represents an average equivalent income, one point for each mixture of household characteristics (given in Table 2). For example,

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consider the entry "WN, $y_r = 500$, 2 children" for Belgium in Table 2. There we have the average equivalent income of EUR 1614.35 for a couple with two children where one adult is working and the other is nonworking (reference income of EUR 500). This entry is plotted with a "▲" symbol which is in the middle of the line labeled "2 children" on the graph "Couples, poor (EUR 500)" in Figure 1.

For any given family type presented in Figure 1 solid lines connect equivalent incomes that correspond to particular levels of NMTE. All solid lines in Figure 1 are downward sloping. This implies that, in both countries, for any given family type, a reduction in NMTE is always associated with a positive income compensation that captures the time/money tradeoff. Figure 1 also shows that as the number of children increases equivalent incomes increase as well.

In each of the twelve graphs of Figure 1, the dashed lines are the "No children" lines shifted upwards in a parallel manner. Differences between slopes of dashed and solid lines reveal differences in the time/money tradeoff between families with children vs. families without children. In both countries, the dashed lines that correspond to couples and a reduction in NMTE from "1" to "0.5," are hardly distinguishable from the solid lines. So, the time/money tradeoff is not affected by the presence of children in the case of a nonrestrictive reduction in NMTE: a transition from "NN" to "WN." On the contrary, when reductions in NMTE are restrictive (transition from "N" to "W," or from "WN" to "WW"), solid lines are steeper than dashed lines. This means that the presence of at least one child increases the time/money tradeoff in response to a restrictive reduction in NMTE.

3.2 Testing the effect of children on time/money tradeoffs

Table 3 presents statistical tests of the pattern revealed by the comparison of solid lines and dashed lines in Figure 1. The symbols "$N \rightarrow W$," "$NN \rightarrow WN$," and "$WN \rightarrow WW$," denote a transition from a particular constellation of labor-market participation of adults in a household to another constellation. The reduction in NMTE implied by "$NN \rightarrow WN$" is nonrestrictive, while "$N \rightarrow W$" and "$WN \rightarrow WW$" imply restrictive reductions in NMTE. Table 3 presents compensations for specific reductions in NMTE by family type. Differences in these compensations due to the presence of more children reflect differences in the slopes of solid lines in Figure 1.

To test for the effect of children on time/money tradeoffs we investigate the statistical significance of differences in compensations for reductions in NMTE as the number of children increases. For each reference income, at the bottom and in-between each two consecutive columns of descriptive statistics in Table 3, appears a Wilcoxon signed-ranks test statistic and its p-value. It tests the equality of medians that correspond to these adjacent columns. The reason to use Wilcoxon signed-ranks tests instead of pairwise t-tests is that normality is not guaranteed for the errors of the sample means, as this can be seen by the descriptive statistics presented in Table 3. Since the compared observations come from the same sample of respondents they are not independent. For this reason, differences in compensations for reductions in NMTE *stated by each individual* are tested against a 0-value null hypothesis.

The Wilcoxon tests support the pattern seen in Figure 1. In all cases of restrictive reductions in NMTE children are associated with a stronger time/money tradeoff. In particular, in almost all of these cases the presence of *each additional child* increases this tradeoff. On the contrary, if the reduction in NMTE is nonrestrictive, children typically do not affect time/money tradeoffs; and if they do, their impact on these tradeoffs is quantitatively

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smaller compared to restrictive reductions in NMTE (this small impact can also be seen in Figure 1).

Our results indicate that time for child-related activities is an essential component of child costs. This is corroborated by research based on time-use data: according to Gronau and Hamermesh (2006, p. 5, Table 1), besides sleep, child care is the second most time-intensive activity after leisure; Bradbury (2005) shows that parents reduce leisure considerably in order to raise their children. Fully working parents (W and WW) must either reduce their already limited leisure even more, or buy child-care and other housework services in the market. Traditional households (WN) may still accommodate the time component of child related activities: for example, as in Apps and Rees (2001), the nonworking partner can specialize in these activities. The role of time for child related activities has a general implication for child costs that is consistent with Figure 1 and the tests appearing in Table 3: child costs should be higher in time-constrained families when compared to households in which at least one adult is nonworking. In Section 4 we estimate child costs conditional upon the NMTE of adults and test for this implication.

4. Labor-market-participation status of adults and child costs

The regression analysis in this section has two purposes. First, it checks the robustness of the results presented in Section 3 by controlling for respondents' personal characteristics. Second, the regressions provide estimates of child costs conditional upon the labor-market-participation status of adults after controlling for household-size economies.

The first regression model that follows Banks and Johnson (1994) and will serve as benchmark is,

$$EIR_{i,y} = \left(n_A + \alpha_y \cdot n_C + \beta_y \cdot n_W\right)^{\theta_y} + b_y \cdot PERSONAL_i + e_{i,y} \; . \qquad (1)$$

The variable $EIR_{i,y}$ is an equivalent-income ratio: it is the equivalent income stated by respondent i, divided by the reference income, y, of a nonworking single childless adult. The variable n_A is the number of adults, n_C is the number of children, and n_W is the number of working adults in the household. So, n_A, n_W, and n_C define the household type. Parameter θ_y controls for household-size economies at reference income y. Dividing the stated equivalent income by the corresponding reference income (i.e., using $EIR_{i,y}$ as the dependent variable) will give estimates of parameters α_y, β_y, and θ_y, that are comparable across different reference incomes, y. Parameter β_y is the compensation for a reduction in NMTE relative to the cost of a nonworking adult. Parameter α_y gives the cost of a child relative to a nonworking adult. PERSONAL$_i$ is a set of conditioning variables that comprise the personal characteristics of respondent i, listed in Table 1. Finally, $e_{i,y}$ is the error term.

Columns labeled "Spec. 1" in Table 4 show the regression results for the benchmark specification (1). In both countries and for all reference incomes, β_y is greater than α_y. This means that the compensation of an adult for working full time is greater than the cost of a child.

We extend the benchmark regression (1) in order to test the results of Section 3 using the three following regression models:

$$EIR_{i,y} = \left(n_A + \alpha_y \cdot n_C + \beta_y \cdot n_W + \gamma_y \cdot n_C \cdot D_{WN} + \delta_y \cdot n_C \cdot D_F\right)^{\theta_y} +$$
$$+ b_y \cdot PERSONAL_i + e_{i,y} \; , \qquad (2)$$

$$EIR_{i,y} = \left(n_A + \alpha_y \cdot n_C + \gamma_y \cdot n_C \cdot D_{WN} + \delta_y \cdot n_C \cdot D_F + \zeta_y \cdot n_A \cdot D_{WN} + \eta_y \cdot n_A \cdot D_F\right)^{\theta_y} +$$
$$+ b_y \cdot PERSONAL_i + e_{i,y} \; , (3)$$

$$EIR_{i,y} = \left(n_A + \alpha_y \cdot n_C + \gamma_y \cdot n_C \cdot D_{WN} + \zeta_y \cdot n_A \cdot D_{WN} + \varphi_y \cdot n_C \cdot D_W + \chi_y \cdot n_C \cdot D_{WW} + \right.$$

$$\left. + \psi_y \cdot n_A \cdot D_W + \omega_y \cdot n_A \cdot D_{WW} \right)^{\theta_y} + b_y \cdot PERSONAL_i + e_{i,y} . \qquad (4)$$

These models introduce the following four dummy variables:

D_{WN} : takes the value 1 for a traditional household (WN - either with or without children).

D_F : 1 for either W or WW households (the symbol "D_F" denotes the status of *full* labor-market participation).

D_W : 1 for W.

D_{WW} : 1 for WW.

Specification (2) extends (1) by distinguishing the effect of a nonrestrictive vs. a restrictive reduction in NMTE on child costs: the effect of a nonrestrictive reduction in NMTE is captured by including the interaction $n_C \cdot D_{WN}$, while $n_C \cdot D_F$ captures the other effect. Specification (3) extends (2) by adding a distinction of the effect of a nonrestrictive vs. a restrictive reduction in NMTE on the costs of *adults*: the inclusion of $n_A \cdot D_{WN}$ and $n_A \cdot D_F$ (which necessitates dropping n_W). Using D_W and D_{WW}, (4) further distinguishes the effects of restrictive reductions in NMTE on singles vs. couples.

The estimates of (2) through (4) are presented in columns "Spec. 2" through "Spec. 4" of Table 4. The pattern seen in Figure 1 and tested in Table 3 is reconfirmed: child costs are higher in time-constrained families compared to households in which at least one adult is nonworking. This can be seen by the general pattern that, in most cases, γ_y is statistically insignificant whereas δ_y, or φ_y and χ_y, are significant. In the two exceptions where γ_y is significantly positive, its value is smaller than the estimates of φ_y and χ_y.

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Two further results are of interest. The estimates of ζ_y are always lower than these of η_y, or ψ_y and ω_y. This comparison indicates that the traditional household is able to achieve gains from specialization not only with respect to child-related activities (as $\gamma_y < \chi_y$ implies), but also with respect to other home activities (see Apps and Rees (2001)). Moreover, as in Koulovatianos, Schröder and Schmidt (2005), the estimates of θ_y are seen to fall with reference income, implying that the rich exhibit a higher ability to share within the household. This property has received both theoretical attention and empirical support (see Donaldson and Pendakur (2004, 2006)).

All reported estimates in Table 4 are controlled for respondents' personal characteristics. Although the inclusion of personal characteristics adds some explanatory power to the regressions (it increases $\bar{R}^2$), it does not alter the levels of the reported estimates. None of the personal characteristics appeared robust, so they are not reported in Table 4 (these results are providable by the authors upon request).

Table 5 presents a summary of ranges of child costs based on estimates of (4) compared to estimates by Apps and Rees (2001) for couples. In Apps and Rees (2001, p. 645), the sum of time costs and purchased goods for child-related activities is about 78% to 98% of the total consumption of an adult male. These numbers are higher than ours. This difference may be due to: (i) the particular assumptions concerning within-household sharing rules and household-production functions that enable identification of the Apps-Rees demand system; (ii) that, for our survey, respondents were instructed to consider children of age 7-11 years, who may require less child-care time than preschoolers (Bradbury (2005, pp. 20-21)). Nevertheless, our questionnaire can be modified to focus on preschoolers in future research.

5. Policy implications for child tax allowances

Estimating equivalent incomes of families with children contingent upon the labor-market-participation status of adults has important implications not only for anti-poverty policies, but also for policies to reduce unemployment. For example, according to Table 2, a single *nonworking* parent of one child in Germany would need to receive EUR 802 monthly in order to be at the same level of well-being as that of a single childless adult living on social assistance (who receives about EUR 500). These numbers imply equitable social assistance for these two family types.

If this single parent was, instead, working, then the equivalent disposable monthly income is about EUR 1228, according to the estimates of Table 2. This number helps to understand the possibility faced by low-income single parents to fall into an unemployment trap: EUR 1228 corresponds to the 31-st percentile of the German disposable-income distribution of single parents with one child in year 2003 (authors' calculations based on the most recent German Income and Expenditure Survey "Einkommens- und Verbrauchsstichprobe (EVS)"). Thus, to provide work incentives to a single parent of one child, the tax/transfer system needs to ensure that the disposable income of this parent is *higher* than EUR 1228, *conditional upon that she/he works.*

In some countries the link between parenthood and work incentives is taken into account. The income transfer systems for low-income families, the "Earned Income Tax Credit" (EITC) in the US and the "Working Families' Tax Credit" (WFTC) in the UK, condition tax credits on the labor-market-participation status of parents. For example, WFTC is higher if families work longer hours in the labor market (at least 30 hours per week) and WFTC is increasing in the number of dependent children (see Brewer (2001) for further details). In some US states EITC also increases with the number of children (see Neumark and Wascher

(2007, p. 6)).

The results presented here support the practice of the WFTC tax code to distinguish the hours worked by parents, as well as this of the EITC to increase benefits according to the number of children. These distinctions point in the right direction for increasing work incentives for parents. However, the empirical literature concerning the impact of EITC on unemployment is controversial. For example, the empirical literature typically finds evidence of positive effects of EITC benefits on the employment of parents (see Cancian and Levinson (2006, pp. 796-797) for a literature review), while Cancian and Levinson (2006) who focus on Wisconsin, where extra EITC supplements for families with children are provided, have found no such effect. It is therefore of critical importance to estimate the threshold income level that must be exceeded in order to provide sufficient work incentives for parents (such as our estimate of EUR 1228 for single parents with one child in Germany). We believe we have shown how survey-based data can help to identify these thresholds.

6.   Concluding remarks

Child rearing requires parental time. Time-use data indicate that parents devote a substantial part of their leisure time to raise children. Consequently, working parents must either reduce their already limited leisure even more, or buy child-care and other housework services in the market. This means that parents may face additional opportunity costs upon deciding to start working full time: children in the household can have an effect on the reservation wages of the adults.

We have designed a survey instrument in order to collect everyday people's insights about the magnitude of income compensation required to maintain a constant family well-being when adults are working vs. when they are nonworking. According to our survey respondents

in Belgium and Germany, labor-market-participation compensation is higher when children are in the household, except for the case when only one of two nonworking parents decides to go to work. Consistently our estimates of child costs are higher in time-constrained families, compared to households where at least one adult is nonworking.

Our study supports that policies channeling extra income-tax allowances to working parents are likely to reduce the possibility that parents find themselves trapped in unemployment and poverty. Examples of such policies are the EITC in the US and the WFTC in the UK.

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Table 1. Personal characteristics of respondents

	Belgium N=149		Germany N=164	
	N	%	N	%
Gender				
Female	69	46.3	56	34.1
Male	80	53.7	108	65.9
Partner				
Yes	109	73.2	69	42.1
No	40	26.8	95	57.9
Children				
None	80	53.7	140	85.4
One	17	11.4	18	11.0
Two	31	20.8	5	3.0
More than two	21	14.1	1	0.6
Siblings				
None	1	0.7	30	18.3
One	10	6.7	51	31.1
Two	69	46.3	57	34.8
More than two	69	46.3	26	15.8
Age				
Below 20 years	1	0.7	0	0.0
Between 20 and 40 years	108	72.5	147	89.6
Above 40 years	40	26.8	17	10.4
Education				
Unfinished education	0	0.0	1	0.6
Element. school	1	0.7	1	0.6
Second. school	10	6.7	3	1.8
Special German second. School	---	---	2	1.2
German second. School	---	---	98	59.8
Techn. school or university	138	92.6	59	36.0
Occupational group				
Social-sec. rec. or unemployed	1	0.7	1	0.6
Blue-collar worker	3	2.0	1	0.6
White-collar worker	118	79.2	45	27.4
Civil servant	11	7.4	8	4.8
Pupil/student/trainee	12	8.1	102	62.4
Self-employed	2	1.3	5	3.0
Pensioner	2	1.3	1	0.6
Housewife/houseman	0	0.0	1	0.6
Own working time				
Not working	3	2.0	27	16.5
Working irregularly	6	4.0	63	38.4
Working 1/2 day	3	2.0	25	15.2
Working 1/1 day	137	91.9	49	29.9
Working time of partner				
Not working	51	34.2	117	71.3
Working irregularly	0	0.0	6	3.7
Working 1/2 day	17	11.4	12	7.3
Working 1/1 day	81	54.4	29	17.7
After-tax household income				
Below EUR 875	4	2.7	64	39.0
Between EUR 875 and EUR 1625	36	24.2	46	28.0
Between EUR 1625 and EUR 2375	28	18.8	24	14.6
Between EUR 2375 and EUR 3125	41	27.5	18	11.0
EUR 3125 or above	40	26.8	12	7.4

Table 2. Average stated equivalent incomes (values in Euros)

y_r		Belgium					Germany				
		Singles		Couples			Singles		Couples		
		N	W	NN	WN	WW	N	W	NN	WN	WW
500	No children	---	803.34 (23.24)	879.09 (13.76)	1140.21 (31.23)	1449.88 (53.21)	---	903.35 (21.66)	977.13 (18.63)	1314.33 (33.50)	1715.85 (53.18)
	1 child	758.37 (9.45)	1089.86 (24.79)	1133.79 (20.00)	1392.81 (33.78)	1765.01 (56.74)	802.13 (8.43)	1227.90 (25.65)	1266.10 (20.52)	1603.96 (36.27)	2070.58 (55.63)
	2 children	970.12 (16.80)	1327.70 (30.53)	1350.72 (26.78)	1614.35 (37.39)	2014.79 (62.86)	1073.41 (16.59)	1498.63 (31.90)	1522.38 (27.41)	1866.16 (4.36)	2371.19 (61.40)
	3 children	1179.53 (24.82)	1560.98 (39.79)	1570.64 (34.96)	1826.42 (42.18)	2255.48 (71.41)	1323.05 (26.58)	1758.69 (40.93)	1747.35 (34.96)	2102.74 (52.20)	2645.58 (70.85)
2000	No children	---	2621.05 (64.76)	3096.03 (51.36)	3567.15 (89.02)	4177.36 (145.19)	---	2829.57 (67.48)	3227.29 (57.10)	3856.16 (89.18)	4718.60 (147.11)
	1 child	2465.65 (29.81)	3158.14 (78.34)	3541.10 (71.35)	4042.99 (105.57)	4743.60 (157.43)	2460.37 (36.42)	3308.08 (82.82)	3628.81 (78.24)	4287.35 (109.57)	5249.54 (168.85)
	2 children	2861.60 (54.66)	3602.28 (97.20)	3935.85 (96.26)	4450.42 (127.00)	5200.36 (174.53)	2812.20 (56.29)	3700.30 (98.11)	3960.06 (91.18)	4622.41 (119.55)	5660.76 (181.48)
	3 children	3248.36 (78.86)	4048.30 (123.27)	4334.96 (126.87)	4891.62 (162.00)	5680.31 (202.46)	3149.39 (78.51)	4066.74 (117.10)	4297.53 (116.45)	4969.21 (139.19)	6092.07 (203.18)
3500	No children	---	4283.06 (101.23)	5106.26 (96.35)	5814.46 (162.29)	6676.81 (246.29)	---	4540.70 (94.02)	5277.44 (92.51)	6135.82 (139.01)	7432.32 (228.72)
	1 child	4098.56 (51.18)	4992.76 (126.82)	5695.85 (128.51)	6403.61 (185.71)	7385.56 (272.41)	3980.95 (31.45)	5104.73 (105.89)	5752.10 (108.92)	6695.43 (157.54)	8077.59 (246.22)
	2 children	4642.07 (95.51)	5588.97 (160.52)	6275.42 (169.05)	6972.32 (215.22)	8035.56 (303.25)	4410.34 (63.10)	5576.07 (124.63)	6175.15 (128.12)	7141.49 (177.50)	8592.84 (265.15)
	3 children	5188.36 (141.92)	6210.34 (207.81)	6852.39 (203.06)	7574.81 (257.13)	8705.11 (344.42)	4815.52 (94.54)	6028.02 (148.12)	6594.02 (155.18)	7582.62 (201.16)	9100.91 (285.35)

NOTE: Standard errors in parentheses. y_r denotes the level of reference income in Euros; each N denotes a nonworking adult, each W denotes a (full-time) working adult.

Table 3. Stated NMTE-decrease compensations (values in Euros)

		Belgium											
		Singles				*Couples*							
		N → W (restrictive NMTE decrease)				*NN → WN* (nonrestrictive NMTE decrease)				*WN → WW* (restrictive NMTE decrease)			
y_r		*No children*	*1 child*	*2 children*	*3 children*	*No children*	*1 child*	*2 children*	*3 children*	*No children*	*1 child*	*2 children*	*3 children*
500	*Mean*	303.34	331.49	357.58	381.45	261.11	259.02	263.63	255.78	309.67	372.20	400.44	429.07
	Median	250.00	250.00	275.00	300.00	150.00	150.00	150.00	150.00	200.00	250.00	250.00	300.00
	Std.error	(23.24)	(22.72)	(24.56)	(28.07)	(24.57)	(25.26)	(26.27)	(23.50)	(28.30)	(31.17)	(34.94)	(39.73)
	Wilcoxon	3.53***		4.53***	2.78***	0.50	0.77		0.39	5.41***		3.18***	4.01***
	p-value	[0.00]		[0.00]	[0.01]	[0.62]	[0.44]		[0.70]	[0.00]		[0.00]	[0.00]
2000	*Mean*	621.05	692.49	740.68	799.94	471.11	501.89	514.56	556.66	610.21	700.61	749.95	788.68
	Median	400.00	500.00	500.00	500.00	250.00	250.00	250.00	250.00	300.00	500.00	500.00	500.00
	Std.error	(64.76)	(70.41)	(75.30)	(81.77)	(61.94)	(66.32)	(69.99)	(84.01)	(68.70)	(70.32)	(73.10)	(74.60)
	Wilcoxon	4.31***		4.00***	5.13***	1.93*	0.73		2.69***	6.20***		4.31***	4.52***
	p-value	[0.00]		[0.00]	[0.00]	[0.05]	[0.46]		[0.01]	[0.00]		[0.00]	[0.00]
3500	*Mean*	783.06	894.19	946.90	1021.98	708.19	707.77	696.90	722.42	862.36	981.95	1063.24	1130.31
	Median	500.00	500.00	500.00	500.00	300.00	300.00	300.00	300.00	500.00	500.00	500.00	600.00
	Std.error	(101.23)	(105.82)	(110.61)	(118.70)	(107.56)	(106.56)	(105.83)	(109.54)	(107.45)	(116.76)	(126.65)	(132.15)
	Wilcoxon	6.40***		4.25***	3.90***	0.76	0.94		0.28	5.67***		5.16***	5.15***
	p-value	[0.00]		[0.00]	[0.00]	[0.45]	[0.34]		[0.78]	[0.00]		[0.00]	[0.00]

Table 3 continued.

	Germany											
	Singles				Couples							
	N → W (restrictive NMTE decrease)				NN → WN (nonrestrictive NMTE decrease)				WN → WW (restrictive NMTE decrease)			
y_r		No children	1 child	2 children	3 children	No children	1 child	2 children	3 children	No children	1 child	2 children	3 children
500	Mean	403.35	425.76	425.21	435.64	337.20	337.87	343.78	355.47	401.52	466.62	505.03	542.83
	Median	312.50	350.00	350.00	350.00	250.00	250.00	250.00	250.00	250.00	300.00	325.00	350.00
	Std.error	(21.66)	(22.95)	(25.48)	(28.12)	(24.85)	(26.26)	(28.15)	(34.20)	(29.06)	(29.59)	(31.95)	(34.91)
	Wilcoxon	2.26**	0.64	1.24		0.97	0.91	0.67		7.01***	5.14***	4.92***	
	p-value	[0.02]	[0.52]	[0.21]		[0.33]	[0.36]	[0.50]		[0.00]	[0.00]	[0.00]	
2000	Mean	829.57	847.71	888.11	917.35	628.87	658.54	662.35	671.68	862.44	962.20	1038.35	1122.87
	Median	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	500.00	575.00	625.00	750.00
	Std.error	(67.48)	(68.75)	(73.09)	(78.28)	(59.94)	(63.23)	(64.58)	(65.14)	(86.14)	(91.39)	(97.50)	(105.26)
	Wilcoxon	4.22***	4.03***	3.36***		2.96***	1.23	1.83*		7.27***	5.68***	5.88***	
	p-value	[0.00]	[0.00]	[0.00]		[0.00]	[0.22]	[0.07]		[0.00]	[0.00]	[0.00]	
3500	Mean	1040.70	1123.78	1165.73	1212.50	858.38	943.32	966.34	988.60	1296.49	1382.16	1451.34	1518.29
	Median	500.00	700.00	725.00	750.00	500.00	500.00	500.00	500.00	875.00	1000.00	1000.00	1000.00
	Std.error	(94.02)	(100.14)	(105.44)	(110.51)	(85.63)	(94.53)	(97.95)	(101.58)	(131.09)	(135.11)	(139.05)	(142.21)
	Wilcoxon	5.24***	3.97***	4.93***		3.97***	2.28**	2.70***		5.78***	5.44***	4.57***	
	p-value	[0.00]	[0.00]	[0.00]		[0.00]	[0.02]	[0.01]		[0.00]	[0.00]	[0.00]	

NOTE: y_r denotes the reference income in Euros. *** denotes significance at the 1% level; ** denotes significance at the 5% level; * denotes significance at the 10% level.

Table 4. Regressions for estimating child costs

		Belgium											
y_r		$y_r = 500$				$y_r = 2000$				$y_r = 3500$			
		Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 1	Spec. 2	Spec. 3	Spec. 4
α_y	n_C	0.67*** (0.03)	0.59*** (0.03)	0.57*** (0.03)	0.59*** (0.03)	0.44*** (0.03)	0.37*** (0.03)	0.35*** (0.03)	0.36*** (0.03)	0.39*** (0.03)	0.34*** (0.03)	0.32*** (0.03)	0.33*** (0.03)
β_y	n_W	0.91*** (0.05)	0.75*** (0.06)			0.64*** (0.05)	0.51*** (0.06)			0.57*** (0.05)	0.48*** (0.06)		
γ_y	$n_C \cdot D_{WN}$		-0.03 (0.04)	0.03 (0.05)	0.06 (0.06)		0.01 (0.05)	0.08 (0.06)	0.13* (0.07)		-0.01 (0.05)	0.05 (0.07)	0.10 (0.08)
δ_y	$n_C \cdot D_F$		0.11*** (0.04)	0.11*** (0.04)			0.11*** (0.04)	0.11*** (0.04)			0.07 (0.05)	0.07 (0.05)	
ζ_y	$n_A \cdot D_{WN}$			0.30*** (0.04)	0.32*** (0.05)			0.17*** (0.03)	0.18*** (0.05)			0.16*** (0.05)	0.18*** (0.06)
η_y	$n_A \cdot D_F$			0.74*** (0.06)				0.51*** (0.05)				0.48*** (0.06)	
φ_y	$n_C \cdot D_W$				0.10** (0.05)				0.10** (0.05)				0.07 (0.06)
χ_y	$n_C \cdot D_{WW}$				0.20** (0.09)				0.24** (0.11)				0.22* (0.12)
ψ_y	$n_A \cdot D_W$				0.75*** (0.06)				0.48*** (0.07)				0.42*** (0.08)
ω_y	$n_A \cdot D_{WW}$				0.77*** (0.06)				0.51*** (0.08)				0.49*** (0.09)
θ_y		0.85*** (0.02)	0.88*** (0.02)	0.88*** (0.02)	0.85*** (0.02)	0.68*** (0.02)	0.69*** (0.02)	0.70*** (0.02)	0.66*** (0.03)	0.63*** (0.02)	0.64*** (0.02)	0.64*** (0.02)	0.59*** (0.03)
$\overline{R}^2$		0.44	0.44	0.44	0.44	0.32	0.32	0.32	0.33	0.31	0.31	0.31	0.31

Table 4 continued.

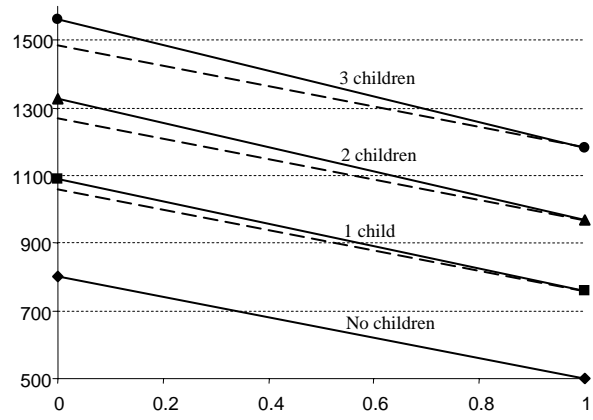|		Germany											
y_r		$y_r = 500$				$y_r = 2000$				$y_r = 3500$			
		Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 1	Spec. 2	Spec. 3	Spec. 4
α_y	n_C	0.64*** (0.03)	0.57*** (0.03)	0.55*** (0.03)	0.58*** (0.03)	0.36*** (0.02)	0.32*** (0.02)	0.30*** (0.02)	0.30*** (0.02)	0.26*** (0.02)	0.23*** (0.02)	0.21*** (0.02)	0.19*** (0.02)
β_y	n_W	0.95*** (0.04)	0.82*** (0.05)			0.77*** (0.05)	0.66*** (0.06)			0.68*** (0.04)	0.59*** (0.05)		
γ_y	$n_C \cdot D_{WN}$		-0.03 (0.04)	0.02 (0.05)	0.05 (0.05)		-0.04 (0.04)	0.03 (0.05)	0.07 (0.06)		-0.03 (0.04)	0.07 (0.05)	0.18*** (0.07)
δ_y	$n_C \cdot D_F$		0.08*** (0.03)	0.08** (0.03)			0.07* (0.04)	0.07* (0.04)			0.06* (0.03)	0.06* (0.03)	
ζ_y	$n_A \cdot D_{WN}$			0.34*** (0.04)	0.37*** (0.04)			0.24*** (0.04)	0.27*** (0.05)			0.18*** (0.04)	0.21*** (0.05)
η_y	$n_A \cdot D_F$			0.81*** (0.05)				0.66*** (0.05)				0.58*** (0.05)	
φ_y	$n_C \cdot D_W$				0.09** (0.04)				0.07 (0.05)				0.12*** (0.04)
χ_y	$n_C \cdot D_{WW}$				0.18** (0.07)				0.20** (0.09)				0.30*** (0.11)
ψ_y	$n_A \cdot D_W$				0.80*** (0.06)				0.62*** (0.07)				0.40*** (0.07)
ω_y	$n_A \cdot D_{WW}$				0.86*** (0.07)				0.70*** (0.08)				0.71*** (0.10)
θ_y		0.93*** (0.02)	0.96*** (0.02)	0.96*** (0.02)	0.92*** (0.02)	0.72*** (0.02)	0.74*** (0.02)	0.75*** (0.02)	0.70*** (0.02)	0.66*** (0.01)	0.68*** (0.02)	0.68*** (0.02)	0.58*** (0.02)
$\overline{R}^2$		0.53	0.53	0.53	0.53	0.38	0.38	0.38	0.38	0.37	0.37	0.37	0.37

NOTE: Regressions for each reference income (y_r denotes the reference-income level in Euros). Endogenous variable: equivalent-income ratio, i.e. equivalent income stated by respondents divided by the reference income of a nonworking single childless adult. Number of observations: 2831 in Belgium; 3116 in Germany. White's heteroskedasticity correction for covariance matrix; standard errors in parentheses; *** denotes significance at the 1% level; ** denotes significance at the 5% level; * denotes significance at the 10% level.

Table 5. Child costs relative to an adult in *WN* vs. *WW* households

| y_r | **Spec. 4** | | | | **Apps & Rees (2001)** | |
| | **Belgium** | | **Germany** | | | |
	WN	*WW*	*WN*	*WW*	*WN* (average income)	*WW* (average income)
Poor (500)	0.59	0.79	0.58	0.76	0.24-0.40[a] 0.82-0.98[b]	0.53-0.69[a] 0.78-0.91[b]
Middle (2000)	0.36	0.60	0.30	0.50		
rich (3500)	0.33	0.55	0.37	0.49		
NOTE: y_r denotes the reference-income level in Euros. [a] denotes a model specification without considering household production and parental child care. [b] denotes a model specification considering household production and parental child care.						

Belgium

Singles, poor (EUR 500)
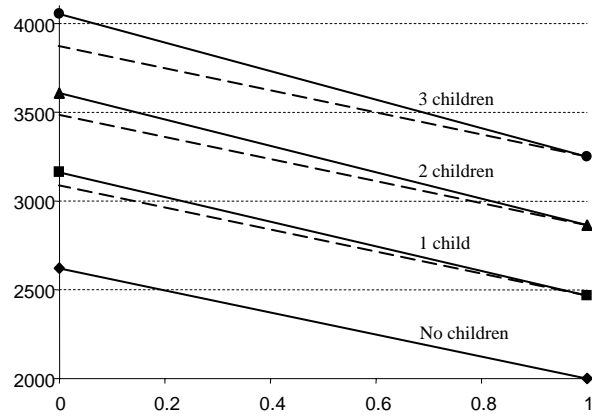
Singles, middle (EUR 2000)
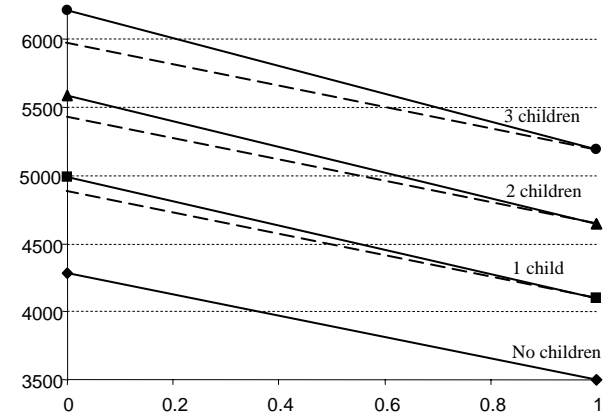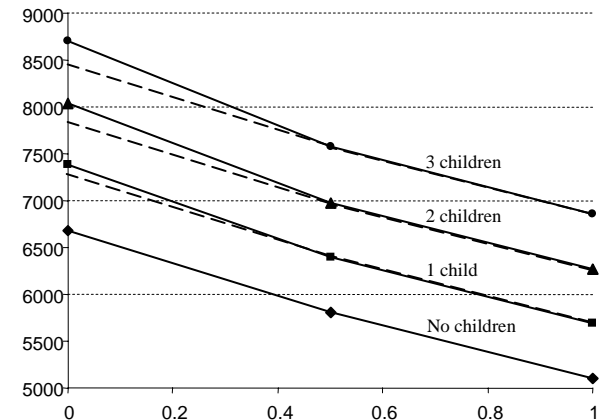
Singles, rich (EUR 3500)
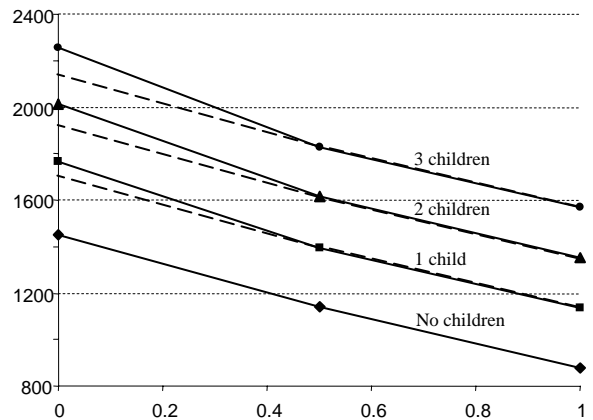
Couples, poor (EUR 500)
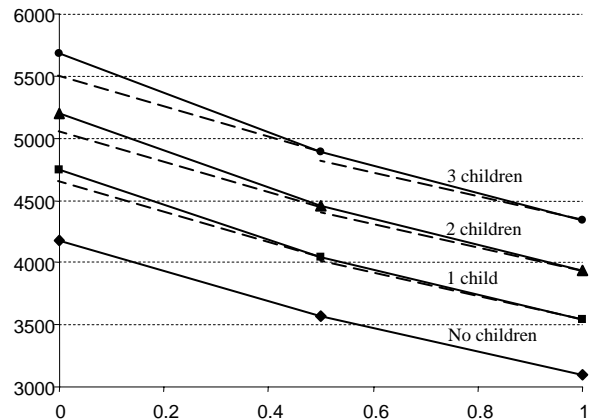
Couples, middle (EUR 2000)
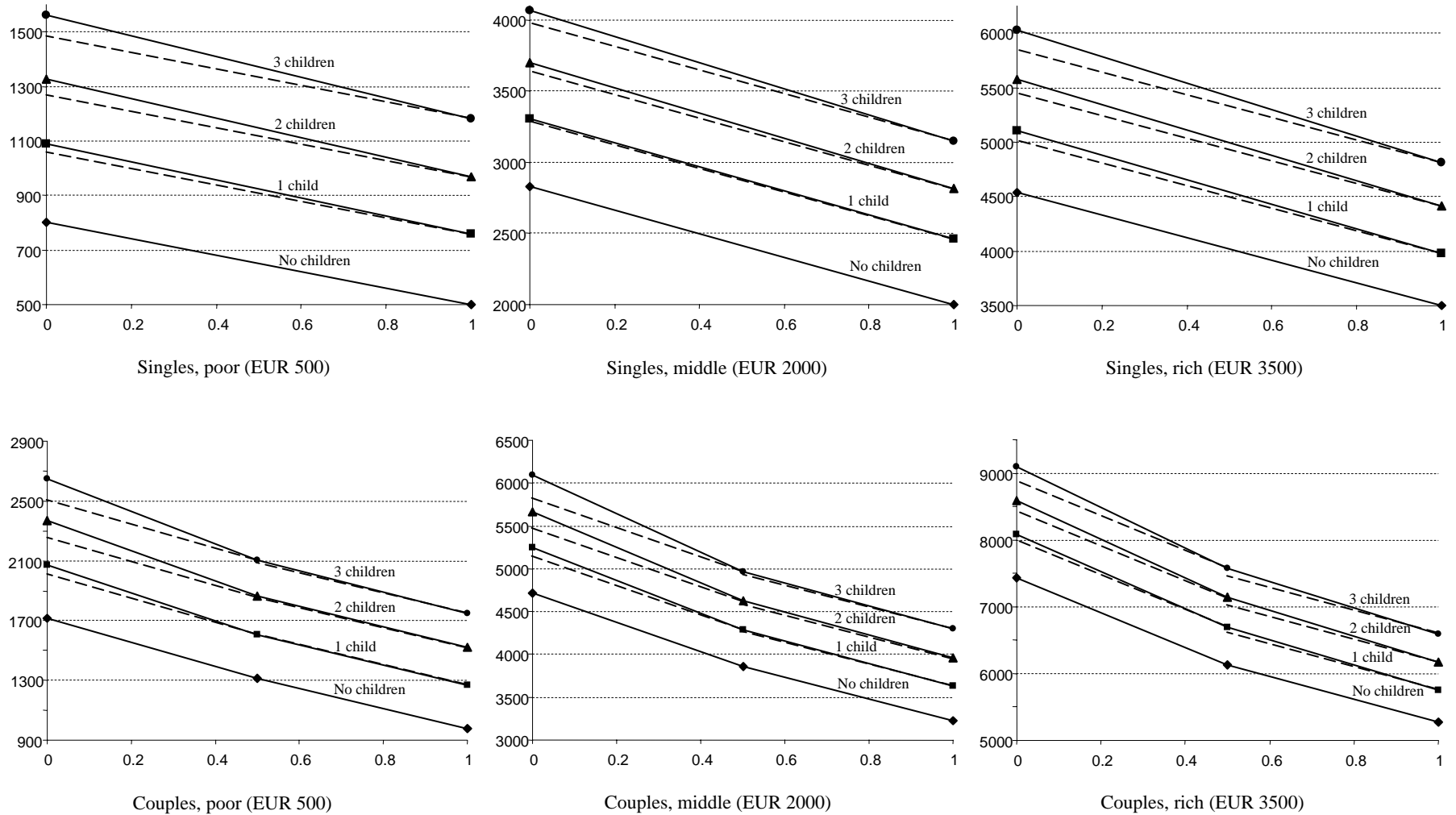
Couples, rich (EUR 3500)

Germany

Figure 1. Equivalent incomes as functions of non-market time endowments. In each of the twelve graphs the dashed lines are the "No children" lines shifted upwards in a parallel manner in order to stress the change in the time/money tradeoff due to the presence of children. Reference incomes appear in parentheses.

Appendix

Survey instrument documentation

1. Purpose of the survey

In general, different household types may need different income amounts in order to attain a given living standard. These income amounts may depend on the number of adults and children living in the household. Furthermore, household needs may depend on the labor-market-participation status of the adults (nonworking or working full time) since this might affect, for example, the time adults can spend for cooking or educating their children. Therefore, the following question arises:

Given the income of a specific household type (reference household), what is the income that can make another household type (that differs with respect to the number of children and/or adults and/or number of working adults) attain an identical living standard as the reference household?

Since there does not exist an objectively correct answer, we would like to know your subjective assessment of this question.

2. Personal characteristics

We would like to ask you to state some of your own personal characteristics. Please mark the boxes that apply to you. Your answers will be treated confidentially and only for the stated research purpose.

1) Please state your gender:
☐ male
☐ female

2) Are you living together with a partner?
☐ yes
☐ no

   2a) In case your answer to question 2) is "yes:"
     Is your partner working
☐ not at all
☐ part time
☐ full time
☐ irregularly?

3) How many children live in your household?
☐ 0
☐ 1
☐ 2
☐ 3 or more

4) What is your **after-tax family income** per month?
☐ below 1.75P*
☐ 1.75P – 3.25P
☐ 3.25P – 4.75P
☐ 4.75P – 6.25P
☐ 6.25P and above

(*Note to researcher: P is the "poverty line" in a country (see Section 2 for details).)

5) Are you
☐ social-security recipient
☐ unemployed
☐ blue-collar worker
☐ white-collar worker
☐ civil servant
☐ pupil, student, or trainee
☐ self-employed
☐ pensioner
☐ houseman/wife?

6) Are you working
☐ not at all
☐ part-time
☐ full-time
☐ irregularly?

7) Please state your education level:
☐ no degree
☐ elementary school
☐ secondary school
☐ technical school or university

8) Please state the number of siblings you lived together with during your childhood:
☐ 0
☐ 1
☐ 2
☐ 3 or more

9) Please mark the correct age category you belong to:
☐ below 20 years
☐ 20 – 40 years
☐ 40 years and older

3. Income assessment
In the tables below you shall evaluate three different situations. These situations differ by the pre-specified after-tax monthly income (including all social transfers) of a nonworking-single-childless-adult household. Now consider, for each situation separately, that the size and composition of the households change as indicated in the table.

Below, we give you an example of such a table. Please take some time to familiarize yourself with the structure of the table.

	1 adult, nonworking	1 adult, working full time	2 adults, both nonworking	2 adults, 1 nonworking, 1 working full time	2 adults, both working full time
0 children	Reference income				
1 child					
2 children					
3 children					

Within a given table, all household types should attain the same living standard. Please, fill in the cells putting the **after-tax/transfer family income** that you believe brings the households that differ with respect to the numbers of children, adults, and working adults, to the same living standard as the one of the nonworking single childless adult.

Please, complete the following three tables. For your assessment assume that adults are between 35 and 55 and children between 7 and 11 years old.

(Note to researcher: In the actual survey three tables having the same structure as above were provided, each for a different reference income in increasing order).

Working Paper List 2007

Number	Author	Title
07/11	Rob Carpenter and Alessandra Guariglia	Investment Behaviour, Observable Expectations, and Internal Funds: a comments on Cummins et al, AER (2006)
07/10	John Tsoukalas	The Cyclical Dynamics of Investment: The Role of Financing and Irreversibility Constraints
07/09	Spiros Bougheas, Paul Mizen and Cihan Yalcin	An Open Economy Model of the Credit Channel Applied to Four Asian Economies
07/08	Paul Mizen & Kevin Lee	Household Credit and Probability Forecasts of Financial Distress in the United Kingdom
07/07	Tae-Hwan Kim, Paul Mizen & Alan Thanaset	Predicting Directional Changes in Interest Rates: Gains from Using Information from Monetary Indicators
07/06	Tae-Hwan Kim, and Paul Mizen	Estimating Monetary Reaction Functions at Near Zero Interest Rates: An Example Using Japanese Data
07/05	Paul Mizen, Tae-Hwan Kim and Alan Thanaset	Evaluating the Taylor Principle Over the Distribution of the Interest Rate: Evidence from the US, UK & Japan
07/04	Tae-Hwan Kim, Paul Mizen and Alan Thanaset	Forecasting Changes in UK Interest rates
07/03	Alessandra Guariglia	Internal Financial Constraints, External Financial Constraints, and Investment Choice: Evidence From a Panel of UK Firms
07/02	Richard Disney	Household Saving Rates and the Design of Public Pension Programmes: Cross-Country Evidence
07/01	Richard Disney, Carl Emmerson and Matthew Wakefield	Public Provision and Retirement Saving: Lessons from the U.K.

Working Paper List 2006

Number	Author	Title
06/04	Paul Mizen & Serafeim Tsoukas	Evidence on the External Finance Premium from the US and Emerging Asian Corporate Bond Markets
06/03	Woojin Chung, Richard Disney, Carl Emmerson & Matthew Wakefield	Public Policy and Retirement Saving Incentives in the U.K.
06/02	Sarah Bridges & Richard Disney	Debt and Depression
06/01	Sarah Bridges, Richard Disney & John Gathergood	Housing Wealth and Household Indebtedness: Is There a 'Household Financial Accelerator'?

Working Paper List 2005

Number	Author	Title
05/02	Simona Mateut and Alessandra Guariglia	Credit channel, trade credit channel, and inventory investment: evidence from a panel of UK firms
05/01	Simona Mateut, Spiros Bougheas and Paul Mizen	Trade Credit, Bank Lending and Monetary Policy Transmission