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# Welfare-Dependent Household Economies of Scale: Further Evidence

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## Abstract

We use a survey method designed to capture whether the consumption sharing ability of households varies systematically at different levels of well being. Evidence from Cyprus reconfirms our previous results from other countries, that household consumption economies of scale increase as the living standard of a household increases.

*Keywords:* household economies of scale, equivalence scales, survey method, independence of base

*JEL Classification:* C42, C90, D31, D63, I31

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## 1. Introduction

Households typically exhibit consumption sharing abilities along the dimension of household size: as the number of family members increases in a household, the sharing of goods such as housing, furniture, and related domestic outputs, increases. Having a reliable estimate of household economies of scale is important, for example, for addressing social-security issues across different family types.

Previous work has treated household economies of scale as being constant at all levels of well-being. While this is a convenient assumption for econometric analysis, recent work by Donaldson and Pendakur (2004) and Koulovatianos et al. (2005) reports evidence that household consumption economies of scale increase as the living standard of a household increases.<sup>1</sup> Koulovatianos et al. (2005) explore this question through a survey method, making the following type of questions: “which family-income level can make a household with one adult and two children achieve the same well-being as a household with a single adult only and a monthly family income of \$2,000, according to your opinion?”

In this note, we apply the survey method of Koulovatianos et al. (2005) that presented evidence from Germany and France, to a country with different socio-economic characteristics, Cyprus. Cyprus is a smaller, services-oriented country compared to the two northern industrialized countries we studied before, and also with different home production organization and social norms about female labor participation or about the role of females in child care.

We provide our subjects with a specific income level, a “*reference income*,” for a single-childless-adult household (our “*reference household type*”) and we ask them to give us “*equivalent incomes*” for different family types: incomes that make the well-being of different

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<sup>1</sup> Donaldson and Pendakur (2004) generalize a demand system to allow for variable household economies of scale for different welfare levels and they report evidence using Canadian data.

household types equal. The respondents are asked to repeat the same procedure for five different reference incomes. Dividing the *equivalent income* of a household type by the *reference income* gives its “*equivalence scale*.”

Thus, the answer to the question, “do the rich have a different household sharing ability compared to the poor?” rests upon finding the empirical correlation between *equivalence scales* and *reference incomes*. If equivalence scales fall (rise) with rising reference income, then the household sharing ability increases (decreases) as well-being also increases. Our evidence from Cyprus indicates, in accordance with our previous results in Koulovatianos et al. (2005), that equivalence scales fall with rising reference income.

## 2. Methodology and Data

We provide eight hypothetical families of different size and composition.<sup>2</sup> We also give a reference income for the single childless-adult household, and leave gaps next to the remaining seven family types. We ask our respondents to fill in the gaps, putting the after-tax *family* income that brings the other household types to the same living standard as the reference household. There are five tables with identical structure, each of them providing a different reference income for the single-adult (reference) household.

Our sample comes mainly from the Greek part of Nicosia and also from the cities of Larnaca and Limmasol. We conducted the study in June 2000. In Table 1 we present an outline of the personal characteristics that could be important in affecting people’s perceptions about equivalence scales.

We present two categories of income classes. The first is the family “after-tax income class.” The income level “P” is the poverty line for single-childless adults and the first after-

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<sup>2</sup> We tell our respondents to assume that adults are of age between 35 and 55, and children between 7 and 11.

tax income bracket is below  $1.75 \times P$ .<sup>3</sup> We define each next class by adding an increment of  $1.5 \times P$ . Within these five income intervals are our reference incomes in the questionnaire.<sup>4</sup> The second category of income classes, the “adjusted after-tax income class,” is constructed from our database so as to reflect our sample’s distribution of living standards.<sup>5</sup>

### 3. Average equivalence scales and comparisons with other studies

In Table 2 we give an outline of our sample means for the seven household types and for all reference incomes. The symbol “A” stands for one adult and “C” for one child in the household.<sup>6</sup> Underneath each of the sample means is the corresponding sample standard deviation, appearing in parentheses. We provide a visual outline of Table 2 in Figure 1, where we plot the average sample equivalence scales against the reference-income classes. Equivalence scales fall with rising reference income.<sup>7</sup>

In Table 3 we provide comparisons between our average equivalence scales across reference incomes with the estimates of Lyssiou (1997) who obtains equivalence scales for Cyprus using consumer-expenditure data. We observe that our averages across reference incomes are similar for two-adult households, but for the case of households with one parent her estimates are strikingly lower. It is easy to verify from Table 3, according to the estimates of Lyssiou (1997), that a child is relatively more expensive in two-adult households rather

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<sup>3</sup> The poverty line was 200 Cypriot pounds in year 2000.

<sup>4</sup> Throughout the paper we index reference incomes by 1, 2.5, 4, 5.5, 7 in order to show how many poverty lines each reference income is.

<sup>5</sup> We find each respondent’s stated equivalent income for his/her own family type that is closest to his/her own family income. Then, we divide this income with the respondent’s stated equivalence scale. In this way we convert each respondent’s stated family income to their equivalent childless-single-adult household income.

<sup>6</sup> So, for example, “ACC” means a household with one adult and two children.

<sup>7</sup> In order to test the statistical significance of the overall picture in Figure 1 we perform tests of differences of means for every two consecutive means for a given household type. Because all values are reported by the same group of individuals, they are not independent. Therefore, the tests we perform are t-tests of differences of pairs of observations. In all cases, the reported difference of means was statistically significant at the 99% level.

than in single-adult households. This is not very plausible if there are household economies of scale, and also because there is more adult time in two-adult households for child care. This implausible asymmetry between children costs in single- versus two-adult households might stem from the fact that single parents are typically poorer. So, in a consumer-expenditure analysis this clustering might lead to downwards biased estimators for single-adult equivalence scales.<sup>8</sup> Moreover, in Table 3 we present our results from Germany and France, taken from Koulovatianos et al. (2005). Except from the childless two-adult household, the average equivalence scales in Cyprus are higher compared to Germany and France.

#### 4. Relative Children Costs and Economies of Scale

We use the structural analysis of Banks and Johnson (1994) in order to examine whether it is the relative cost of children that falls more with rising reference income, or whether it is that household economies of scale drive the main result. In Table 2 we present results from a regression of the form,

$$E_{i,k} = (A + \alpha C)^\theta + bPERSONAL_i + \varepsilon_{i,k} .$$

$E_{i,k}$  is the equivalence scale stated by respondent “ $i$ ” and corresponding to reference income “ $k$ ”. Variable  $A$  is the number of adults and  $C$  is the number of children. So,  $A$  and  $C$  define the household type, while parameter  $\alpha$  captures the relative cost of children, whereas parameter  $\theta$  captures the extent of economies of scale in household consumption.  $PERSONAL_i$  is a set of personal characteristics of each respondent  $i$ , appearing in Table 1.

In all cases, most of the personal characteristics of our respondents were insignificant, or else, not robust to alternative model specifications. Therefore, we only report the estimates  $\hat{\alpha}$  and  $\hat{\theta}$  in Table 4 for each reference income,  $k$  ( $k = 1, 2.5, 4, 5.5, 7$ ). It is obvious that

<sup>8</sup> McClements (1978, p. 117) also notices this bias for pensioners, who typically have lower incomes.

both  $\hat{\alpha}$  and  $\hat{\theta}$  fall, i.e. both relative child costs decrease and economies of scale rise as living standards go up.

We perform Wald tests to compare these estimators with Germany and France.<sup>9</sup> The estimators for children costs,  $\hat{\alpha}$ , in Cyprus are always higher than these of both Germany and France at the 5% level.<sup>10</sup> On the contrary, Germany and Cyprus have similar economies of scale, captured by  $\hat{\theta}$ , and with two exceptions (reference incomes 1 and 5.5),  $\hat{\theta}$ 's are also similar to the French ones.

## 5. Conclusion

We implemented a survey method, appropriate for testing a possible dependence of equivalence scales on income. Our tests reconfirm our results from Koulovatianos et al. (2005) in Germany and France, that equivalence scales fall, i.e. household economies of scale increase with rising living standards. However, Cyprus is characterized by higher cost of children, whereas household-size scales are similar across all three countries.

Comparisons with the consumer-demand estimates by Lyssiotou (1997) show that, for the two-adult households, our results are quite close. Yet, single-adult equivalence scales in Lyssiotou (1997) are much lower than our estimates. This difference might stem from a systematic tendency to underestimate child costs in single-adult households in consumer-expenditure approaches, because this family type is predominantly poor in the data.

## REFERENCES

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<sup>9</sup> In each case we compare the countries in pairs, e.g. Cyprus with Germany.

<sup>10</sup>It is possible that expensive private tutoring for primary-school pupils in Cyprus is behind this result.

Lyssiotou, P. (1997): "Comparison of Alternative Tax and Transfer Treatment of Children using Adult Equivalence Scales," *Review of Income and Wealth*, 43, 105-117.

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Table 1  
Breakdown of the sample

	N	%
<i>Gender</i>		
Female	57	43.8
Male	73	56.2
<i>Partner in the household</i>		
Yes	75	57.7
No	55	42.3
<i>Number of children in the household</i>		
None	82	63.1
One	18	13.8
Two	23	17.7
More than two	7	5.4
<i>Living with parents</i>		
Yes	37*	28.5
No	93	71.5
<i>Family after-tax income class</i>		
1 ( $Y < 1.75P$ )	9	6.9
2 ( $1.75P \leq Y < 1.75P + 1.5P$ )	25	19.2
3 ( $1.75P + 1.5P \leq Y < 1.75P + 3P$ )	24	18.5
4 ( $1.75P + 3P \leq Y < 1.75P + 4.5P$ )	31	23.8
5 ( $1.75P + 4.5P \leq Y$ )	41	31.6
<i>Adjusted after-tax income class</i>		
1 ( $Y < 1.75P$ )	29	22.3
2 ( $1.75P \leq Y < 1.75P + 1.5P$ )	40	30.8
3 ( $1.75P + 1.5P \leq Y < 1.75P + 3P$ )	31	23.8
4 ( $1.75P + 3P \leq Y < 1.75P + 4.5P$ )	24	18.5
5 ( $1.75P + 4.5P \leq Y$ )	6	4.6
<i>Occupational group</i>		
Welfare recipient	0	0.0
Unemployed	2	1.5
Blue-collar worker	2	1.5
White-collar worker	40	30.8
Pupil, student, trainee	30	23.1
Civil servant	40	30.8
Self-employed	13	10
Pensioner	0	0.0
Housewife, houseman	3	2.3
<i>Education</i>		
Below 9 years of education	4	3.1
Completed extended elementary school	8	6.2
Completed secondary school	65	50.0
Technical school and university degree	53**	40.7
<i>Number of siblings during childhood</i>		
None	9	7.0
One	34	26.2
Two	40	30.8
More than two	47	36.2

\* One of the respondents who were living with their parents also had a partner and two children.

\*\* 14 out of the 53 highly educated respondents in our sample had finished a technical school (3 years of higher education).

**Table 2**

Average equivalence scales for each demographic composition and income level.

Reference income	AC scale	ACC scale	ACCC scale	AA scale	AAC scale	AACC scale	AACCC scale
1.0	1.697 (0.343)	2.293 (0.592)	2.910 (0.929)	1.766 (0.327)	2.389 (0.511)	3.006 (0.805)	3.604 (1.053)
2.5	1.301 (0.181)	1.577 (0.319)	1.842 (0.454)	1.457 (0.318)	1.734 (0.356)	2.018 (0.481)	2.280 (0.589)
4.0	1.236 (0.163)	1.454 (0.278)	1.666 (0.403)	1.385 (0.278)	1.610 (0.364)	1.826 (0.463)	2.028 (0.563)
5.5	1.203 (0.173)	1.396 (0.303)	1.574 (0.424)	1.346 (0.261)	1.544 (0.358)	1.734 (0.459)	1.909 (0.558)
7.0	1.172 (0.275)	1.334 (0.275)	1.492 (0.381)	1.310 (0.266)	1.488 (0.359)	1.649 (0.446)	1.805 (0.525)

Standard errors in parentheses.

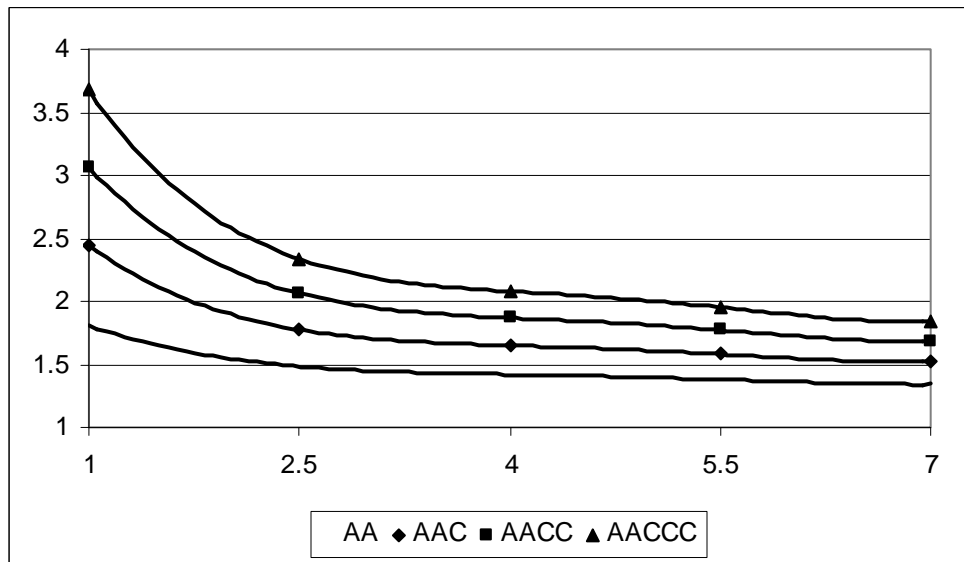
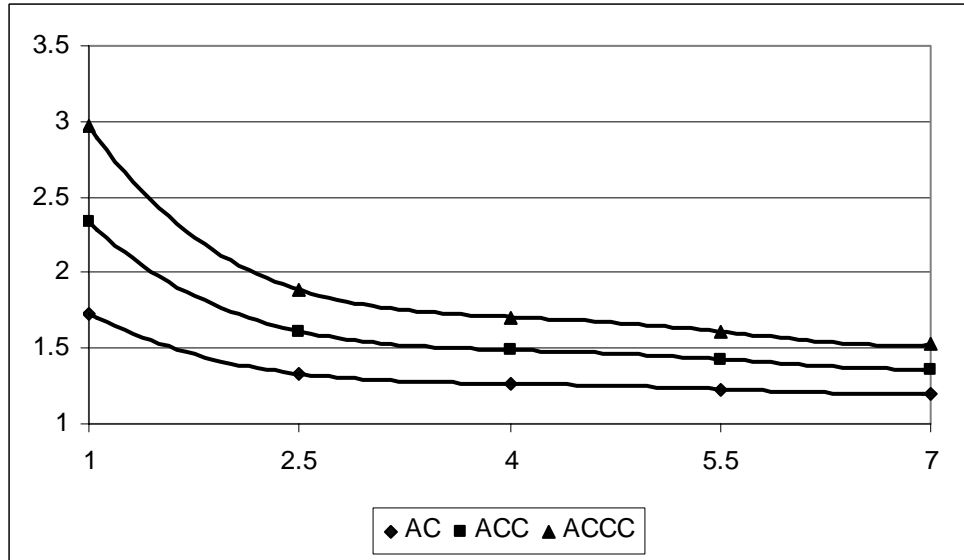
**Table 3** Comparisons of averages with other studies

Household Type	Germany <sup>a</sup>	France <sup>a</sup>	Cyprus <sup>b</sup>	Cyprus <sup>c</sup> (this study)
AC	1.24 [1.11 - 1.57]	1.30 [1.20 - 1.58]	1.12 – 1.20	1.32 [1.17 – 1.70]
ACC	1.44 [1.21 - 2.02]	1.55 [1.34 - 2.06]	1.23 – 1.41	1.61 [1.33 – 2.29]
ACCC	1.64 [1.30 - 2.47]	1.77 [1.47 - 2.49]	1.30 – 1.60	1.90 [1.49 – 2.91]
AA	1.50 [1.39 - 1.75]	1.50 [1.40 - 1.73]	1.51	1.45 [1.31 – 1.77]
AAC	1.72 [1.49 - 2.27]	1.75 [1.55 - 2.22]	1.73 – 1.85	1.75 [1.49 – 2.39]
AACC	1.92 [1.59 - 2.72]	1.97 [1.68 – 2.67]	1.90 – 2.18	2.05 [1.65 – 3.01]
AACCC	2.12 [1.68 - 3.17]	2.18 [1.81 – 3.09]	2.01 – 2.48	2.33 [1.81 – 3.60]
Notes:				
<sup>a</sup> Survey data taken from Koulovatianos et al. (2005). German data are from 1999 and French data are from 2002.				
<sup>b</sup> Econometric estimates from consumer data, Flori-Lyssioutou (1997): the smaller number reported is the equivalence scale for children of age between 0-11 and the higher equivalence scale pertains children of age between 11-17				
<sup>c</sup> Average equivalence scale among all income levels. In brackets: equivalence scales of the highest and lowest reference-income level.				

**Table 4** Children weights and economies of scale

Reference Income	Cyprus		France		Germany	
	$\hat{\alpha}$	$\hat{\theta}$	$\hat{\alpha}$	$\hat{\theta}$	$\hat{\alpha}$	$\hat{\theta}$
1	0.86 (0.05)	0.85 (0.03)	0.72** (0.03)	0.76** (0.02)	0.67*** (0.03)	0.83 (0.02)
2.5	0.62 (0.04)	0.64 (0.02)	0.51** (0.02)	0.61 (0.02)	0.42*** (0.02)	0.63 (0.02)
4	0.58 (0.04)	0.56 (0.02)	0.47** (0.03)	0.52 (0.02)	0.32*** (0.02)	0.58 (0.02)
5.5	0.55 (0.04)	0.52 (0.02)	0.42** (0.03)	0.49** (0.02)	0.27*** (0.02)	0.51 (0.02)
7	0.52 (0.04)	0.49 (0.02)	0.38** (0.03)	0.49 (0.02)	0.23*** (0.02)	0.50 (0.02)

Note. \*\*\* Results are significantly different at the 1 percent level. \*\* Results are significantly different at the 5 percent level. Standard errors in parentheses.



**Figure 1** Average equivalence scales per reference-income level for each household type