

## Technical Appendix to ARE CHILDREN DECISION-MAKERS WITHIN THE HOUSEHOLD?

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These Appendices present detailed estimation results based on the assumption that both the total expenditures *and* the three distribution factors are endogenous. We start by regressing each one on the full set of instrumental variables used in the article (Table A1 of this Appendix). Secondly, we present estimation results of the structural model for each strata considered in the article under the maintained assumptions that the aforementioned variables are endogenous (Tables B1 to B5). Finally, we compute the same rank tests as those of Table A3 of the main article under this maintained assumption (Table C1). We conclude that our results are very robust to the assumption of exogeneity or endogeneity of the distribution factors.

### A. Auxiliary Regressions

Table A1 presents the OLS auxiliary regressions for each endogenous variable (We only provide results for the full sample as those for the sub-samples are qualitatively similar.) These regressions are used to compute tests of weak instruments and to compute the four vectors of residuals (control functions) that are included in the structural model to account for the endogeneity of the explanatory variables. To test for weak instruments, we first computed a Stock-Yogo statistic based on TSLS for each equation in turn. The identifying instruments are considered weak when the bias of the TSLS estimators exceeds a certain threshold ' $b$ '. The threshold corresponding to  $b = 5\%$  is 21.28 (Stock and Yogo, 2005). Therefore, we reject the null that our instruments are weak for each endogenous variables except relative wife's earnings ( $\Delta \log(Y_{WH})$ ). We also computed the Stock-Yogo-Cragg-Donald statistic, which is appropriate in the case of multiple endogenous variables. The value of the statistic (5.024) suggests that we may have a problem of weak instruments.<sup>1</sup>

<sup>1</sup> These statistics are based on TSLS and may therefore be inappropriate since our model is *conditionally* linear and we impose parametric restrictions across equations.

Table A1  
*Auxiliary Equations for the Endogenous Variables – Full Sample*

Variables	(1) Tot expend	(2) log ( $Y_H$ )	(3) $\Delta$ log ( $Y_{WH}$ )	(4) $\Delta$ log ( $Y_{CH}$ )
Log HH income	0.574*** (0.009)	0.582*** (0.024)	−0.094* (0.053)	−0.244*** (0.045)
Log price index	1.263*** (0.002)	−0.008 (0.005)	2.720 (0.010)	−0.205 (0.008)
Age husband	−0.027** (0.013)	0.118*** (0.034)	−0.264*** (0.074)	−0.047 (0.062)
Age husband squared	0.000*** (0.000)	−0.001*** (0.000)	0.003*** (0.001)	0.001 (0.001)
Age wife	0.007 (0.017)	−0.025 (0.045)	0.115 (0.098)	0.025 (0.082)
Age wife squared	−0.000 (0.000)	0.000 (0.000)	−0.002* (0.001)	−0.000 (0.001)
Age child	−0.186** (0.076)	−0.108 (0.202)	0.669 (0.441)	1.946*** (0.372)
Age child squared	0.007** (0.003)	0.002 (0.008)	−0.026 (0.018)	−0.067*** (0.016)
Age child <sup>3</sup>	−0.000** (0.000)	−0.000 (0.000)	0.000 (0.000)	0.001*** (0.000)
Educ husband	−0.008*** (0.003)	0.032*** (0.008)	−0.077*** (0.017)	−0.046*** (0.015)
Educ wife	−0.015*** (0.003)	0.012 (0.009)	0.068*** (0.019)	−0.060*** (0.016)
Educ child	0.029 (0.025)	−0.003 (0.066)	−0.023 (0.145)	0.513*** (0.122)
educ3sq	−0.003 (0.003)	−0.004 (0.009)	0.006 (0.020)	−0.033* (0.017)
Educ child <sup>3</sup>	0.000 (0.000)	0.000 (0.000)	−0.000 (0.001)	0.001 (0.001)
Educ × age child	−0.000 (0.001)	0.001 (0.002)	−0.001 (0.003)	−0.006* (0.003)
Constant	−5.529** (2.309)	0.532 (6.172)	−19.715 (13.487)	−16.007 (11.380)
Prices	yes	yes	yes	yes
Other preferences shifters	yes	yes	yes	yes
Observations	2,745	2,745	2,745	2,745
Stock-Yogo Statistic	249.25	47.53	5.31	81.91
Stock-Yogo-Cragg-Donald Statistic	5.024			

Notes. Standard errors in parentheses. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1.

## B. Estimation Results with Endogenous Distribution Factors

Tables B1 to B5 provide estimation results for the full and for each sub-sample considered in the article. In particular, the third panel of each Table provides tests results for the exogeneity of the three distribution factors. Results show that in the case of the full sample, we reject exogeneity in 11 of 30 (=3 distribution factors × 10 demand equations). The rejection rate is smaller when we perform the tests for various sub-samples: 10/30 for daughters, 7/30 for sons, 5/30 for children aged 16 to 21 and 9/30 for children aged 22 and over. All in all, we reject the exogeneity of the distribution factors for only a little more than a quarter of the cases (26%).

Table B1  
*Parameter Estimates of the Demand System: Endogenous Distribution Factors – Full Sample\**

Variable	Food	Alcohol	Tobacco	Clothing	Leisure	Transport	Service	Restaurant	Personal goods	Recreational goods
<i>Price variables</i>										
Γ-Food	0.075 (0.738)	-0.130 (2.118)	-0.020 (0.387)	-0.120 (1.705)	-0.021 (0.397)	0.118 (2.661)	-0.074 (2.026)	0.034 (0.807)	0.125 (2.019)	0.146 (2.270)
Γ-Alcohol	-0.005 (0.119)	-0.031 (1.357)	-0.052 (2.662)	-0.012 (0.451)	-0.004 (0.199)	0.032 (1.904)	0.001 (0.071)	0.006 (0.401)	0.021 (0.883)	-0.052 (2.134)
Γ-Tobacco	-0.083 (2.193)	0.088 (3.850)	0.022 (1.138)	0.041 (1.587)	0.022 (1.122)	-0.008 (0.479)	-0.153 (11.312)	0.000 (0.001)	0.041 (1.807)	0.006 (0.268)
Γ-Clothing	-0.053 (0.890)	0.062 (1.745)	0.020 (0.669)	0.029 (0.717)	-0.010 (0.327)	-0.030 (1.168)	0.009 (0.447)	0.026 (1.060)	-0.009 (0.262)	-0.031 (0.825)
Γ-Leisure	0.016 (0.635)	0.004 (0.275)	-0.021 (1.719)	0.042 (2.464)	-0.006 (0.454)	0.019 (1.777)	-0.032 (3.589)	0.012 (1.195)	0.007 (0.459)	-0.023 (1.476)
Γ-Transport	-0.486 (4.005)	-0.347 (4.755)	0.078 (1.268)	0.279 (3.331)	0.027 (0.436)	0.140 (2.650)	-0.036 (0.834)	0.130 (2.621)	-0.085 (1.156)	0.088 (1.158)
Γ-Services	-2.440 (6.811)	0.061 (0.284)	-0.297 (1.636)	0.541 (2.187)	0.517 (2.802)	0.128 (0.818)	0.102 (0.795)	-0.078 (0.532)	0.307 (1.412)	0.174 (0.770)
Γ-Restaurant	1.045 (4.686)	-0.505 (3.760)	-0.080 (0.708)	-0.564 (3.660)	-0.365 (3.171)	-0.161 (1.658)	0.218 (2.735)	0.013 (0.140)	0.039 (0.292)	0.069 (0.494)
Γ-Personal	1.180 (3.548)	0.604 (3.019)	0.292 (1.734)	-0.052 (0.226)	-0.060 (0.352)	-0.154 (1.062)	-0.210 (1.770)	-0.056 (0.411)	-0.148 (0.737)	0.063 (0.299)
Γ-Recreational	0.646 (2.606)	-0.151 (1.012)	0.098 (0.781)	-0.056 (0.327)	-0.089 (0.696)	-0.090 (0.836)	0.210 (2.368)	0.027 (0.265)	-0.358 (2.384)	-0.382 (2.451)

Table B1  
(Continued)

Variable	Food	Alcohol	Tobacco	Clothing	Leisure	Transport	Service	Restaurant	Personal goods	Recreational goods
<i>Distribution factors</i>										
$\log(Y_H)$	-0.102 (14.116)	0.004 (0.807)	-0.011 (2.901)	0.017 (3.353)	0.033 (8.844)	-0.006 (1.875)	-0.006 (2.444)	-0.006 (2.098)	0.006 (0.268)	-0.021 (2.647)
$\Delta \log(Y_{WH})$	-0.021 (2.647)	-0.003 (0.711)	-0.006 (1.423)	0.006 (1.157)	0.000 (0.035)	0.002 (0.450)	0.003 (0.888)	-0.009 (0.262)	-0.031 (0.825)	-0.015 (5.986)
$\Delta \log(Y_{CH})$	-0.015 (5.986)	0.001 (0.849)	0.000 (0.287)	0.004 (2.105)	0.006 (4.322)	-0.001 (0.634)	0.012 (1.195)	0.007 (0.459)	-0.023 (1.476)	0.000 (0.084)
<i>Specification tests<sup>†</sup></i>										
Total expend (Residual)	-0.176 (18.362)	0.012 (2.035)	-0.009 (1.845)	0.034 (5.121)	0.128 (0.818)	0.102 (0.795)	-0.078 (0.532)	0.307 (1.412)	0.174 (0.770)	0.104 (12.346)
$\log(Y_H)$ (Residual)	0.104 (12.346)	-0.005 (0.909)	0.014 (3.254)	-0.365 (3.171)	-0.161 (1.658)	0.218 (2.735)	0.013 (0.140)	0.039 (0.292)	0.069 (0.494)	0.022 (2.714)
$\Delta \log(Y_{WH})$ (Residual)	0.022 (2.714)	0.004 (0.854)	-0.052 (0.226)	-0.060 (0.352)	-0.154 (1.062)	-0.210 (1.770)	-0.056 (0.411)	-0.148 (0.737)	0.063 (0.299)	0.016 (5.134)
$\Delta \log(Y_{CH})$ (Residual)	0.016 (5.134)	0.098 (0.781)	-0.056 (0.327)	-0.089 (0.696)	-0.090 (0.836)	0.210 (2.368)	0.027 (0.265)	-0.358 (2.384)	-0.102 (14.116)	0.004 (0.807)
p-value over identifi test	0.000	0.055	0.977	0.752	0.105	0.707	0.179	0.839	0.252	0.051

Notes. \*Asymptotic t-statistics in parentheses. <sup>†</sup>The first four rows of the Specification tests panel report the parameter estimates of the residuals for the four regressions presented in Table A1. The last row reports the p-value for the over-identification test of the instrumental variables.

Table B2  
*Parameter Estimates of the Demand System: Endogenous Distribution Factors – Daughters Sample\**

Variable	Food	Alcohol	Tobacco	Clothing	Leisure	Transport	Service	Restaurant	Personal goods	Recreational goods
	Price variables									
Γ-Food	0.238 (1.497)	-0.216 (2.306)	-0.069 (0.902)	-0.005 (0.043)	-0.094 (1.197)	0.213 (2.962)	-0.017 (0.300)	0.038 (0.600)	0.105 (1.104)	0.133 (1.321)
Γ-Alcohol	-0.020 (0.328)	-0.053 (1.473)	-0.054 (1.851)	0.010 (0.254)	-0.021 (0.685)	0.042 (1.546)	0.007 (0.315)	0.069 (2.880)	-0.038 (1.052)	-0.068 (1.763)
Γ-Tobacco	-0.146 (2.410)	0.140 (3.929)	0.020 (0.671)	0.009 (0.236)	0.033 (1.094)	0.028 (1.023)	-0.172 (7.999)	0.020 (0.826)	0.089 (2.467)	-0.015 (0.389)
Γ-Clothing	-0.191 (1.981)	0.075 (1.315)	0.050 (1.075)	-0.015 (0.235)	0.065 (1.357)	0.013 (0.289)	0.053 (1.557)	0.022 (0.590)	0.090 (1.560)	-0.039 (0.643)
Γ-Leisure	-0.015 (0.381)	0.019 (0.847)	-0.017 (0.908)	0.023 (0.913)	-0.034 (1.788)	0.011 (0.622)	-0.030 (2.202)	0.034 (1.492)	0.034 (1.490)	-0.036 (1.500)
Γ-Transport	-0.649 (3.400)	-0.255 (2.267)	0.024 (0.258)	0.322 (2.551)	0.035 (0.375)	0.089 (1.032)	-0.150 (2.219)	0.140 (1.865)	-0.122 (1.071)	-0.055 (0.458)
Γ-Services	-3.256 (5.813)	0.226 (0.683)	-0.474 (1.755)	0.982 (2.650)	0.540 (1.950)	0.326 (1.289)	0.124 (0.622)	0.013 (0.060)	0.658 (1.967)	0.162 (0.456)
Γ-Restaurant	1.708 (4.764)	-0.711 (3.362)	0.007 (0.039)	-1.108 (4.668)	-0.475 (2.675)	-0.039 (0.239)	0.303 (2.379)	-0.125 (0.884)	0.039 (0.184)	0.260 (1.145)
Γ-Personal	1.126 (2.117)	0.710 (2.266)	0.397 (1.545)	0.272 (0.774)	0.251 (0.952)	-0.280 (1.163)	-0.196 (1.038)	0.108 (0.514)	-0.290 (0.914)	-0.066 (0.195)
Γ-Recreational	1.067 (2.694)	-0.156 (0.668)	0.201 (1.053)	-0.347 (1.325)	-0.123 (0.625)	-0.282 (1.577)	-0.008 (0.055)	-0.031 (0.202)	-0.694 (2.935)	-0.410 (1.632)

Table B2  
(Continued)

Variable	Food	Alcohol	Tobacco	Clothing	Leisure	Transport	Service	Restaurant	Personal goods	Recreational goods
<i>Distribution factors</i>										
$\log(Y_H)$	-0.129 (9.729)	0.016 (2.045)	-0.004 (0.658)	0.014 (1.582)	0.030 (4.630)	-0.002 (0.310)	-0.014 (3.071)	-0.008 (1.582)	-0.015 (0.389)	-0.070 (5.053)
$\Delta \log(Y_{WH})$	-0.070 (5.053)	-0.004 (0.454)	-0.009 (1.295)	0.007 (0.790)	0.009 (1.324)	0.005 (0.746)	-0.002 (0.475)	0.090 (1.560)	-0.039 (0.643)	-0.017 (4.366)
$\Delta \log(Y_{CH})$	-0.017 (4.366)	0.003 (1.237)	-0.001 (0.410)	0.004 (1.470)	0.006 (3.292)	-0.001 (0.846)	0.022 (1.492)	0.034 (1.490)	-0.036 (1.500)	0.000 (0.539)
<i>Specification tests</i> <sup>†</sup>										
Total expend (Residual)	-0.172 (11.659)	0.017 (1.912)	-0.017 (2.364)	0.041 (4.176)	0.326 (1.289)	0.124 (0.622)	0.013 (0.060)	0.658 (1.967)	0.162 (0.456)	0.133 (9.064)
$\log(Y_H)$ (Residual)	0.133 (9.064)	-0.013 (1.520)	0.006 (0.866)	-0.475 (2.675)	-0.039 (0.239)	0.303 (2.379)	-0.125 (0.884)	0.039 (0.184)	0.260 (1.145)	0.070 (4.945)
$\Delta \log(Y_{WH})$ (Residual)	0.070 (4.945)	0.007 (0.890)	0.272 (0.774)	0.251 (0.952)	-0.280 (1.163)	-0.196 (1.038)	0.108 (0.514)	-0.290 (0.914)	-0.066 (0.195)	0.018 (3.948)
$\Delta \log(Y_{CH})$ (Residual)	0.018 (3.948)	0.201 (1.053)	-0.347 (1.325)	-0.123 (0.625)	-0.282 (1.577)	-0.008 (0.055)	-0.031 (0.202)	-0.694 (2.935)	-0.129 (9.729)	0.016 (2.045)
p-value over identif test	0.000	0.509	0.884	0.456	0.329	0.760	0.614	0.989	0.895	0.084

Notes. \*Asymptotic t-statistics in parentheses. <sup>†</sup>The first four rows of the Specification tests panel report the parameter estimates of the residuals for the four regressions presented in Table A1. The last row reports the p-value for the over-identification test of the instrumental variables.

Table B3  
*Parameter Estimates of the Demand System: Endogenous Distribution Factors – Sons Sample\**

Variable	Food	Alcohol	Tobacco	Clothing	Leisure	Transport	Service	Restaurant	Personal goods	Recreational goods
<i>Price variables</i>										
$\Gamma$ -Food	0.024 (0.181)	-0.072 (0.882)	0.022 (0.315)	-0.230 (2.414)	0.021 (0.296)	0.041 (0.722)	-0.104 (2.168)	0.028 (0.502)	0.159 (1.938)	0.166 (1.982)
$\Gamma$ -Alcohol	0.026 (0.529)	-0.023 (0.776)	-0.047 (1.785)	-0.035 (0.988)	0.006 (0.211)	0.024 (1.140)	-0.001 (0.063)	-0.039 (1.888)	0.065 (2.143)	-0.043 (1.395)
$\Gamma$ -Tobacco	-0.011 (0.228)	0.052 (1.753)	0.029 (1.143)	0.058 (1.689)	0.007 (0.279)	-0.034 (1.688)	-0.137 (7.874)	-0.015 (0.735)	0.008 (0.262)	0.015 (0.499)
$\Gamma$ -Clothing	-0.070 (0.895)	0.048 (1.003)	-0.003 (0.074)	0.054 (0.983)	-0.040 (0.963)	-0.051 (1.558)	-0.032 (1.157)	0.019 (0.583)	-0.073 (1.532)	-0.008 (0.173)
$\Gamma$ -Leisure	0.017 (0.539)	-0.009 (0.444)	-0.024 (1.431)	0.053 (2.340)	0.023 (1.364)	0.024 (1.757)	-0.031 (2.722)	0.004 (0.279)	-0.010 (0.516)	-0.009 (0.459)
$\Gamma$ -Transport	-0.391 (2.489)	-0.427 (4.475)	0.127 (1.543)	0.222 (1.994)	0.029 (0.354)	0.169 (2.557)	0.044 (0.785)	0.108 (1.655)	-0.075 (0.780)	0.195 (1.988)
$\Gamma$ -Services	-1.771 (3.799)	-0.029 (0.102)	-0.152 (0.621)	0.216 (0.654)	0.413 (1.675)	-0.016 (0.082)	0.102 (0.610)	-0.184 (0.952)	0.068 (0.239)	0.203 (0.695)
$\Gamma$ -Restaurant	0.555 (1.929)	-0.409 (2.345)	-0.196 (1.302)	-0.185 (0.910)	-0.232 (1.525)	-0.261 (2.161)	0.180 (1.747)	0.152 (1.276)	0.003 (0.015)	-0.055 (0.307)
$\Gamma$ -Personal	1.242 (2.901)	0.577 (2.219)	0.274 (1.222)	-0.256 (0.844)	-0.297 (1.313)	-0.044 (0.245)	-0.256 (1.669)	-0.178 (1.002)	0.030 (0.314)	0.091 (0.338)
$\Gamma$ -Recreational	0.323 (1.017)	-0.178 (0.924)	-0.004 (0.027)	0.175 (0.777)	0.011 (0.068)	0.030 (0.224)	0.366 (3.223)	0.093 (0.707)	-0.183 (0.946)	-0.379 (1.914)

Table B3  
(Continued)

Variable	Food	Alcohol	Tobacco	Clothing	Leisure	Transport	Service	Restaurant	Personal goods	Recreational goods
<i>Distribution factors</i>										
$\log(Y_H)$	-0.090 (10.428)	-0.004 (0.827)	-0.015 (3.256)	0.021 (3.375)	0.034 (7.489)	-0.005 (1.332)	-0.001 (0.447)	-0.007 (1.839)	0.015 (0.499)	-0.008 (0.916)
$\Delta \log(Y_{WH})$	-0.008 (0.916)	0.002 (0.423)	-0.004 (0.947)	0.006 (0.946)	-0.001 (0.304)	-0.001 (0.284)	0.004 (1.317)	-0.073 (1.532)	-0.008 (0.173)	-0.015 (4.196)
$\Delta \log(Y_{CH})$	-0.015 (4.196)	0.001 (0.342)	0.000 (0.005)	0.004 (1.665)	0.005 (2.982)	0.001 (0.523)	0.004 (0.279)	-0.010 (0.516)	-0.009 (0.459)	0.000 (0.936)
<i>Specification tests</i> <sup>†</sup>										
Total expend (Residual)	-0.178 (13.898)	0.008 (0.990)	-0.002 (0.332)	0.032 (3.496)	-0.016 (0.082)	0.102 (0.610)	-0.184 (0.952)	0.068 (0.239)	0.203 (0.695)	0.088 (8.488)
$\log(Y_H)$ (Residual)	0.088 (8.488)	0.001 (0.159)	0.020 (3.590)	-0.232 (1.525)	-0.261 (2.161)	0.180 (1.747)	0.152 (1.276)	0.003 (0.015)	-0.055 (0.307)	0.010 (1.108)
$\Delta \log(Y_{WH})$ (Residual)	0.010 (1.108)	-0.003 (0.604)	-0.256 (0.844)	-0.297 (1.313)	-0.044 (0.245)	-0.256 (1.669)	-0.178 (1.002)	0.030 (0.114)	0.091 (0.338)	0.015 (3.413)
$\Delta \log(Y_{CH})$ (Residual)	0.015 (3.413)	-0.004 (0.027)	0.175 (0.777)	0.011 (0.068)	0.030 (0.224)	0.366 (3.223)	0.093 (0.707)	-0.183 (0.946)	-0.090 (10.428)	-0.004 (0.827)
p-value over identif test	0.000	0.074	0.986	0.739	0.322	0.351	0.759	0.784	0.077	0.372

Notes. \*Asymptotic t-statistics in parentheses.<sup>†</sup>The first four rows of the Specification tests panel report the parameter estimates of the residuals for the four regressions presented in Table A1. The last row reports the p-value for the over-identification test of the instrumental variables.



Table B4  
*Parameter Estimates of the Demand System: Endogenous Distribution Factors – Sample of Children 16–21\**

Variable	Food	Alcohol	Tobacco	Clothing	Leisure	Transport	Service	Restaurant	Personal goods	Recreational goods
<i>Price variables</i>										
Γ-Food	0.174 (1.303)	-0.227 (2.861)	0.007 (0.097)	-0.124 (1.347)	-0.036 (0.526)	0.118 (2.111)	-0.119 (2.523)	0.062 (1.136)	0.092 (1.197)	0.156 (1.901)
Γ-Alcohol	-0.010 (0.202)	-0.046 (1.521)	-0.070 (2.727)	0.000 (0.006)	0.023 (0.899)	0.021 (0.984)	-0.003 (0.182)	0.017 (0.802)	-0.020 (0.695)	-0.028 (0.890)
Γ-Tobacco	-0.046 (0.944)	0.124 (4.267)	0.029 (1.162)	0.046 (1.371)	-0.010 (0.386)	0.007 (0.340)	-0.152 (8.786)	-0.001 (0.030)	0.052 (1.848)	-0.004 (0.133)
Γ-Clothing	-0.070 (0.924)	0.069 (1.524)	0.043 (1.121)	0.058 (1.101)	-0.011 (0.280)	-0.043 (1.351)	0.046 (1.697)	0.008 (0.269)	-0.013 (0.286)	-0.062 (1.323)
Γ-Leisure	0.025 (0.777)	0.019 (1.031)	-0.029 (1.834)	0.074 (3.386)	-0.021 (1.315)	0.015 (1.130)	-0.029 (2.625)	0.012 (0.935)	-0.002 (0.115)	-0.028 (1.443)
Γ-Transport	-0.495 (3.153)	-0.307 (3.283)	0.021 (0.263)	0.303 (2.792)	0.071 (0.893)	0.159 (2.416)	-0.043 (0.768)	0.133 (2.070)	-0.013 (0.144)	0.052 (0.538)
Γ-Services	-2.395 (5.032)	0.258 (0.912)	-0.171 (0.709)	0.416 (1.266)	0.323 (1.340)	0.211 (1.059)	0.128 (0.762)	-0.081 (0.415)	0.384 (1.399)	-0.004 (0.013)
Γ-Restaurant	1.299 (4.491)	-0.692 (4.018)	-0.066 (0.448)	-0.760 (3.801)	-0.378 (2.579)	-0.181 (1.498)	0.163 (1.595)	0.062 (0.525)	0.101 (0.604)	0.080 (0.449)
Γ-Personal	0.637 (1.518)	0.767 (3.067)	0.227 (1.067)	0.290 (1.000)	0.048 (0.225)	-0.161 (0.917)	-0.114 (0.769)	-0.164 (0.959)	-0.332 (1.371)	0.167 (0.647)
Γ-Recreational	0.596 (1.786)	-0.191 (0.961)	-0.053 (0.311)	-0.066 (0.288)	0.006 (0.037)	-0.059 (0.425)	0.171 (1.447)	0.041 (0.304)	-0.315 (1.638)	-0.279 (1.358)

Table B4  
(Continued)

Variable	Food	Alcohol	Tobacco	Clothing	Leisure	Transport	Service	Restaurant	Personal goods	Recreational goods
<i>Distribution factors</i>										
$\log(Y_H)$	-0.090 (9.785)	-0.001 (0.167)	-0.007 (1.589)	0.019 (3.042)	0.030 (6.531)	-0.008 (2.156)	-0.007 (2.004)	-0.005 (1.218)	-0.004 (0.133)	-0.018 (1.937)
$\Delta \log(Y_{WH})$	-0.018 (1.937)	-0.008 (1.448)	-0.001 (0.304)	0.002 (0.346)	-0.002 (0.470)	0.000 (0.089)	0.004 (1.197)	-0.013 (0.286)	-0.062 (1.323)	-0.013 (4.174)
$\Delta \log(Y_{CH})$	-0.013 (4.174)	0.001 (0.729)	0.000 (0.148)	0.003 (1.401)	0.005 (3.172)	-0.001 (1.153)	0.012 (0.935)	-0.002 (0.115)	-0.028 (1.443)	0.000 (0.433)
<i>Specification tests</i> <sup>†</sup>										
Total expend (Residual)	-0.179 (14.667)	0.007 (1.029)	-0.013 (2.070)	0.038 (4.523)	0.211 (1.059)	0.128 (0.762)	-0.081 (0.415)	0.384 (1.399)	-0.004 (0.013)	0.092 (8.683)
$\log(Y_H)$ (Residual)	0.092 (8.683)	-0.001 (0.121)	0.008 (1.445)	-0.378 (2.579)	-0.181 (1.498)	0.163 (1.595)	0.062 (0.525)	0.101 (0.604)	0.080 (0.449)	0.018 (1.921)
$\Delta \log(Y_{WH})$ (Residual)	0.018 (1.921)	0.009 (1.569)	0.290 (1.000)	0.048 (0.225)	-0.161 (0.917)	-0.114 (0.769)	-0.164 (0.959)	-0.332 (1.371)	0.167 (0.647)	0.013 (3.577)
$\Delta \log(Y_{CH})$ (Residual)	0.013 (3.577)	-0.053 (0.311)	-0.066 (0.288)	0.006 (0.037)	-0.059 (0.425)	0.171 (1.447)	0.041 (0.304)	-0.315 (1.638)	-0.090 (9.785)	-0.001 (0.167)
p-value over identif test	0.000	0.109	0.930	0.792	0.206	0.977	0.297	0.469	0.903	0.278

Notes. \*Asymptotic t-statistics in parentheses. <sup>†</sup>The first four rows of the Specification tests panel report the parameter estimates of the residuals for the four regressions presented in Table A1. The last row reports the p-value for the over-identification test of the instrumental variables.

Table B5  
*Parameter Estimates of the Demand System: Endogenous Distribution Factors – Sample of Children 22 and Over\**

Variable	Food	Alcohol	Tobacco	Clothing	Leisure	Transport	Service	Restaurant	Personal goods	Recreational goods
<i>Price variables</i>										
Γ-Food	-0.116 (0.713)	0.086 (0.871)	-0.073 (0.887)	-0.077 (0.698)	-0.001 (0.008)	0.155 (2.043)	0.007 (0.113)	-0.013 (0.194)	0.223 (2.104)	0.112 (1.052)
Γ-Alcohol	0.060 (0.945)	0.000 (0.005)	-0.019 (0.610)	-0.020 (0.470)	-0.057 (1.674)	0.051 (1.743)	0.008 (0.325)	-0.017 (0.648)	0.108 (2.625)	-0.093 (2.250)
Γ-Tobacco	-0.168 (2.701)	0.016 (0.412)	-0.002 (0.064)	0.035 (0.827)	0.085 (2.561)	-0.031 (1.070)	-0.160 (7.015)	0.017 (0.672)	0.010 (0.242)	0.031 (0.760)
Γ-Clothing	-0.089 (0.893)	0.007 (0.118)	-0.006 (0.129)	-0.039 (0.569)	0.020 (0.374)	-0.022 (0.480)	-0.051 (1.398)	0.077 (1.912)	-0.043 (0.664)	0.040 (0.617)
Γ-Leisure	-0.011 (0.280)	-0.025 (1.023)	-0.015 (0.733)	-0.010 (0.365)	0.029 (1.329)	0.025 (1.303)	-0.037 (2.462)	0.014 (0.866)	0.027 (1.033)	-0.004 (0.139)
Γ-Transport	-0.526 (2.736)	-0.394 (3.387)	0.159 (1.644)	0.237 (1.813)	-0.017 (0.171)	0.114 (1.272)	-0.032 (0.448)	0.145 (1.864)	-0.198 (1.587)	0.136 (1.092)
Γ-Services	-2.512 (4.560)	-0.113 (0.338)	-0.546 (1.972)	0.706 (1.882)	0.761 (2.593)	0.010 (0.038)	0.085 (0.423)	-0.077 (0.345)	0.140 (0.389)	0.415 (1.158)
Γ-Restaurant	0.599 (1.686)	-0.190 (0.884)	-0.127 (0.712)	-0.204 (0.844)	-0.308 (1.631)	-0.149 (0.900)	0.314 (2.414)	-0.081 (0.559)	-0.099 (0.427)	0.086 (0.372)
Γ-Personal	2.087 (3.773)	0.230 (0.689)	0.530 (1.908)	-0.647 (1.718)	-0.215 (0.729)	-0.177 (0.689)	-0.398 (1.967)	0.129 (0.577)	0.206 (0.572)	-0.196 (0.544)
Γ-Recreational	0.803 (2.156)	-0.170 (0.755)	0.340 (1.818)	-0.028 (0.112)	-0.205 (1.033)	-0.152 (0.877)	0.257 (1.887)	-0.015 (0.096)	-0.376 (1.550)	-0.497 (2.051)

Table B5  
(Continued)

Variable	Food	Alcohol	Tobacco	Clothing	Leisure	Transport	Service	Restaurant	Personal goods	Recreational goods
<i>Distribution factors</i>										
$\log(Y_H)$	-0.140 (9.527)	0.000 (0.023)	-0.023 (3.114)	0.013 (1.307)	0.042 (5.350)	-0.002 (0.253)	-0.005 (0.912)	-0.001 (0.190)	0.031 (0.760)	-0.025 (1.925)
$\Delta \log(Y_{WH})$	-0.025 (1.925)	-0.004 (0.532)	-0.012 (1.906)	0.011 (1.296)	0.003 (0.505)	0.004 (0.631)	0.003 (0.583)	-0.043 (0.664)	0.040 (0.617)	-0.073 (3.921)
$\Delta \log(Y_{CH})$	-0.073 (3.921)	-0.010 (0.858)	-0.013 (1.334)	0.009 (0.688)	0.022 (2.208)	0.002 (0.179)	0.014 (0.866)	0.027 (1.033)	-0.004 (0.139)	0.000 (0.015)
<i>Specification tests</i> <sup>†</sup>										
Total expend (Residual)	-0.166 (9.826)	0.008 (0.786)	-0.002 (0.245)	0.034 (2.962)	0.010 (0.038)	0.085 (0.423)	-0.077 (0.345)	0.140 (0.389)	0.415 (1.158)	0.146 (8.612)
$\log(Y_H)$ (Residual)	0.146 (8.612)	-0.004 (0.361)	0.031 (3.682)	-0.308 (1.631)	-0.149 (0.900)	0.314 (2.414)	-0.081 (0.559)	-0.099 (0.427)	0.086 (0.372)	0.027 (2.046)
$\Delta \log(Y_{WH})$ (Residual)	0.027 (2.046)	0.005 (0.634)	-0.647 (1.718)	-0.215 (0.729)	-0.177 (0.689)	-0.398 (1.967)	0.129 (0.577)	0.206 (0.572)	-0.196 (0.544)	0.079 (4.095)
$\Delta \log(Y_{CH})$ (Residual)	0.079 (4.095)	0.340 (1.818)	-0.028 (0.112)	-0.205 (1.033)	-0.152 (0.877)	0.257 (1.887)	-0.015 (0.096)	-0.376 (1.550)	-0.140 (9.527)	0.000 (0.023)
p-value over identif test	0.000	0.479	0.198	0.368	0.414	0.140	0.438	0.964	0.736	0.210

Notes. \*Asymptotic t-statistics in parentheses. <sup>†</sup>The first four rows of the Specification tests panel report the parameter estimates of the residuals for the four regressions presented in Table A1. The last row reports the p-value for the over-identification test of the instrumental variables.

### C. Rank Tests

Table C1 provides rank tests when distribution factors are assumed endogenous. The results, based on price variations and on distribution factors, are qualitatively similar to those obtained when assuming that distribution factors are exogenous. Therefore our results are robust to relaxing the assumption of distribution factors exogeneity.

Table C1  
 $\chi^2$  Test Statistics: Endogenous Distributions Factors\*

	Rank of <b>M</b>			Rank of <b>Θ</b>			Rank of ( <b>M</b>   <b>Θ</b> )
	(Proposition 2)			(Proposition 3)			(Proposition 4)
(Rank)	0	2	4	0	1	2	4
(DF)	45	28	15	30	18	8	54
Sample:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Complete	357.938 (0.000)	56.134 (0.001)	5.494 (0.987)	961.372 (0.000)	76.061 (0.000)	5.709 (0.680)	241.430 (0.000)
Daughters	259.708 (0.000)	41.135 (0.050)	1.967 (1.000)	545.408 (0.000)	39.612 (0.002)	2.358 (0.968)	62.729 (0.194)
Sons	172.818 (0.000)	17.634 (0.935)	610.951 (0.000)	28.416 (0.056)			
Children 16–21	224.670 (0.000)	39.565 (0.072)	2.932 (1.000)	635.532 (0.000)	75.857 (0.000)	9.138 (0.331)	660.459 (0.000)
Children 22+	153.157 (0.000)	17.481 (0.938)		552.212 (0.000)	18.819 (0.403)		

Notes. \*Probability under the null between parentheses.

### Reference

Stock, J. and Yogo, M. (2005). ‘Testing for weak instruments in linear iv regression’, in (D. Andrews and J. Stock, eds), *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*, pp. 80–108, Cambridge: Cambridge University Press.