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Departament d'Economia

Demand Analysis of Non-durable Goods.
Relaxing Separability Assumptions.

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(3 de 3)

Table B.1.3 - SOCIOECONOMIC VARIABLES DESCRIPTION

	VARIABLES	% OBS.
Quarterly distribution	first quarter	0,243
	second quarter	0,271
	third quarter	0,243
	fourth quarter	0,244
household type	single person	0,101
	couple and children	0,316
	others	0,582
head of household age	<=25	0,023
	>25 and <=35	0,221
	>35 and <=45	0,246
	>45 and <=55	0,241
	>55 and <=65	0,188
	>65	0,081
socioeconomic position	selfumployed	0,161
	unskilled	0,159
labor position	non-active	0,193
education level	no studies	0,293
	primary education	0,553
	secondary education	0,081
	university education	0,066

	VARIABLES	MEAN/STD
family composition	# members	3,990
		(1,387)
	# members <14	0,980
		(1,185)
	# earners	1,730
		(0,857)

Note: First part of the table presents information related to variables which enter as dummies in the specification. Second part of the table refers to quantitative socioeconomic variables.

APPENDIX B.2 - PARAMETER ESTIMATES

Table B.2.1 - FOOD OUT & LEISURE SERVICES

	Weak Sep.	1st.Selection	2nd.Selection
intercept	1,808	1,433	1,912
	(0,430)	(0,425)	(0,376)
single person	-0,017	-0,015	-0,017
	(0,003)	(0,005)	(0,004)
couple and children	-0,002	-0,002	-0,001
	(0,003)	(0,005)	(0,004)
self-umployed	-0,002	-0,002	-0,002
	(0,002)	(0,003)	(0,003)
unskilled	0,001	0,003	0,000
	(0,002)	(0,004)	(0,003)
non active	-0,002	-0,001	-0,002
	(0,003)	(0,004)	(0,004)
number earners	0,007	0,007	0,007
	(0,001)	(0,002)	(0,001)
number members	-0,011	-0,011	-0,011
	(0,001)	(0,001)	(0,001)
n. members < 14	0,012	0,010	0,012
	(0,002)	(0,002)	(0,002)
expenditure	-0,346	-0,288	-0,361
	(0,078)	(0,079)	(0,069)
square expenditure	0,017	0,015	0,018
	(0,003)	(0,003)	(0,003)
food out & leisure serv.	-0,553	-0,455	-0,674
	(0,287)	(0,175)	(0,163)
educ. & health services	-0,249	-0,286	-0,017
	(0,112)	(0,101)	(0,059)
fuel	-0,125	-0,094	-0,060
	(0,055)	(0,046)	(0,091)
transport	-0,093	-0,092	-0,277
	(0,124)	(0,097)	(0,094)
communications	0,073	-0,027	-0,025
	(0,032)	(0,025)	(0,024)
house non-durables	0,020	-0,041	-0,163
	(0,068)	(0,069)	(0,043)
leisure goods	-0,056	-0,051	-0,039
	(0,076)	(0,090)	(0,085)
alcoholic beverages	0,057	0,031	0,072
	(0,040)	(0,034)	(0,034)
clothing & food wear	0,046	0,074	0,111
	(0,201)	(0,075)	(0,073)
tobacco	-0,042	-0,049	-0,019
	(0,054)	(0,042)	(0,040)
housing	0,439	0,104	0,269
	(0,239)	(0,130)	(0,113)
petrol	0,156	0,129	0,210
	(0,081)	(0,039)	(0,037)
food	0,543	0,519	0,530
	(0,258)	(0,120)	(0,113)

Note: Standard errors are in parentheses

Table B.2.2 - SERVICES

	Weak Sep.	1st.Selection	2nd. Selection
intercept	0,725	0,842	0,640
	(0,277)	(0,264)	(0,238)
single person	-0,012	-0,014	-0,013
	(0,002)	(0,002)	(0,002)
couple and children	0,005	0,005	0,005
	(0,002)	(0,002)	(0,002)
self-umployed	-0,003	-0,004	-0,003
	(0,001)	(0,002)	(0,001)
unskilled	-0,004	-0,005	-0,004
	(0,001)	(0,002)	(0,001)
non active	-0,007	-0,007	-0,007
	(0,002)	(0,002)	(0,002)
number earners	-0,003	-0,003	-0,003
	(0,001)	(0,001)	(0,001)
number members	0,004	0,003	0,004
	(0,001)	(0,001)	(0,001)
n. members < 14	-0,005	-0,005	-0,005
	(0,001)	(0,001)	(0,001)
expenditure	-0,135	-0,158	-0,127
	(0,050)	(0,048)	(0,043)
square expenditure	0,007	0,008	0,006
	(0,002)	(0,002)	(0,002)
food out & leisure serv.	-0,249	-0,286	-0,277
	(0,112)	(0,101)	(0,094)
educ. & health services	-0,106	-0,089	-0,021
	(0,164)	(0,163)	(0,067)
fuel	0,022	0,015	-0,126
	(0,054)	(0,053)	(0,056)
transport	-0,129	-0,160	-0,031
	(0,069)	(0,062)	(0,157)
communications	-0,013	-0,008	-0,020
	(0,029)	(0,027)	(0,026)
house non-durables	-0,033	-0,022	0,001
	(0,067)	(0,074)	(0,050)
leisure goods	-0,141	-0,107	-0,106
	(0,098)	(0,111)	(0,107)
alcoholic beverages	-0,007	0,027	0,033
	(0,034)	(0,033)	(0,032)
clothing & food wear	0,160	0,138	0,131
	(0,099)	(0,070)	(0,070)
tobacco	-0,007	-0,087	-0,044
	(0,046)	(0,045)	(0,043)
housing	0,319	0,160	0,159
	(0,137)	(0,115)	(0,110)
petrol	0,018	0,017	0,026
	(0,045)	(0,032)	(0,029)
food	0,161	0,232	0,160
	(0,121)	(0,080)	(0,075)

Note: Standard errors are in parentheses

Table B.2.3 - FUEL

	Weak Sep.	1st.Selection	2nd.Selection
intercept	0,541	0,494	0,603
	(0,132)	(0,117)	(0,108)
single person	0,000	0,000	0,000
	(0,001)	(0,001)	(0,001)
couple and children	0,003	0,003	0,003
	(0,001)	(0,001)	(0,001)
self-umployed	-0,001	-0,001	-0,001
	(0,001)	(0,001)	(0,001)
unskilled	-0,001	-0,002	-0,001
	(0,001)	(0,001)	(0,001)
non active	0,002	0,002	0,002
	(0,001)	(0,001)	(0,001)
number earners	0,000	0,000	0,000
	(0,000)	(0,000)	(0,000)
number members	0,000	0,000	0,000
	(0,000)	(0,000)	(0,000)
n. members<14	0,000	0,000	0,000
	(0,001)	(0,001)	(0,001)
expenditure	-0,075	-0,065	-0,090
	(0,024)	(0,021)	(0,020)
square expenditure	0,003	0,002	0,003
	(0,001)	(0,001)	(0,001)
food out & leisure serv.	-0,125	-0,094	-0,163
	(0,055)	(0,046)	(0,043)
educ. & health services	0,022	0,015	0,006
	(0,054)	(0,053)	(0,033)
fuel	-0,010	-0,002	0,009
	(0,033)	(0,033)	(0,027)
transport	0,014	0,003	0,001
	(0,033)	(0,028)	(0,050)
communications	0,000	-0,014	-0,013
	(0,013)	(0,013)	(0,012)
house non-durables	-0,002	-0,004	-0,012
	(0,033)	(0,037)	(0,031)
leisure goods	-0,037	-0,017	-0,006
	(0,042)	(0,049)	(0,046)
alcoholic beverages	-0,001	0,001	0,006
	(0,015)	(0,015)	(0,014)
clothing & food wear	0,019	0,001	0,018
	(0,048)	(0,032)	(0,031)
tobacco	-0,034	-0,009	-0,018
	(0,021)	(0,021)	(0,020)
housing	0,015	-0,028	-0,003
	(0,061)	(0,047)	(0,045)
petrol	0,031	0,018	0,043
	(0,023)	(0,016)	(0,015)
food	0,070	0,050	0,078
	(0,060)	(0,037)	(0,035)

Note: Standard errors are in parentheses

Table B.2.4 - TRANSPORT

	Weak Sep.	1st.Selection	2nd.Selection
intercept	0,277	0,305	0,271
	(0,360)	(0,380)	(0,379)
single person	0,007	0,004	0,001
	(0,003)	(0,007)	(0,008)
couple and children	-0,001	0,000	0,001
	(0,002)	(0,006)	(0,007)
self-umployed	-0,005	-0,008	-0,009
	(0,002)	(0,004)	(0,005)
unskilled	-0,004	-0,003	-0,005
	(0,002)	(0,005)	(0,005)
non active	-0,004	-0,001	-0,002
	(0,002)	(0,005)	(0,006)
number earners	0,002	0,002	0,002
	(0,001)	(0,002)	(0,003)
number members	-0,005	-0,006	-0,006
	(0,001)	(0,002)	(0,002)
n. members<14	0,003	0,004	0,004
	(0,001)	(0,003)	(0,004)
expenditure	-0,046	-0,037	-0,018
	(0,065)	(0,070)	(0,070)
square expenditure	0,002	0,002	0,001
	(0,003)	(0,003)	(0,003)
food out & leisure serv.	-0,093	-0,092	-0,060
	(0,124)	(0,097)	(0,091)
educ. & health services	-0,129	-0,160	-0,008
	(0,069)	(0,062)	(0,045)
fuel	0,014	0,003	-0,006
	(0,033)	(0,028)	(0,153)
transport	-0,002	-0,002	-0,126
	(0,070)	(0,129)	(0,056)
communications	0,021	0,015	0,010
	(0,020)	(0,017)	(0,018)
house non-durables	-0,002	-0,023	0,009
	(0,036)	(0,057)	(0,027)
leisure goods	0,024	-0,005	0,015
	(0,044)	(0,067)	(0,071)
alcoholic beverages	0,022	0,018	0,026
	(0,017)	(0,022)	(0,024)
clothing & food wear	0,054	0,070	0,040
	(0,063)	(0,060)	(0,065)
tobacco	-0,016	-0,037	-0,015
	(0,029)	(0,025)	(0,026)
housing	0,091	0,090	0,095
	(0,106)	(0,132)	(0,128)
petrol	0,025	0,030	0,009
	(0,039)	(0,028)	(0,032)
food	0,094	0,118	0,052
	(0,110)	(0,086)	(0,085)

Note: Standard errors are in parentheses

Table B.2.5 - COMMUNICATIONS

	Weak Sep.	1st.Selecti)on	2nd.Selection
intercept	-0,245	0,046	0,040
	(0,071)	(0,067)	(0,065)
single person	0,000	0,000	0,000
	(0,001)	(0,001)	(0,001)
couple and children	0,000	0,000	-0,001
	(0,001)	(0,001)	(0,001)
self-umployed	0,000	0,000	0,000
	(0,000)	(0,001)	(0,001)
unskilled	-0,002	-0,002	-0,001
	(0,000)	(0,001)	(0,001)
non active	0,000	0,000	0,000
	(0,001)	(0,001)	(0,001)
number earners	-0,001	-0,001	-0,001
	(0,000)	(0,000)	(0,000)
number members	-0,001	-0,001	-0,001
	(0,000)	(0,000)	(0,000)
n. members<14	0,000	0,000	0,000
	(0,000)	(0,000)	(0,000)
expenditure	0,045	-0,009	-0,010
	(0,013)	(0,012)	(0,012)
square expenditure	-0,002	0,000	0,001
	(0,001)	(0,001)	(0,001)
food out & leisure serv.	0,073	-0,027	-0,025
	(0,032)	(0,025)	(0,024)
educ. & health services	-0,013	-0,008	0,001
	(0,023)	(0,027)	(0,017)
fuel	0,000	-0,014	0,010
	(0,013)	(0,013)	(0,018)
transport	0,021	0,015	-0,020
	(0,020)	(0,017)	(0,026)
communications	-0,027	-0,001	0,003
	(0,010)	(0,009)	(0,009)
house non-durables	0,006	0,007	-0,013
	(0,017)	(0,018)	(0,012)
leisure goods	0,054	0,010	0,013
	(0,022)	(0,025)	(0,025)
alcoholic beverages	-0,003	0,001	0,002
	(0,007)	(0,008)	(0,008)
clothing & food wear	-0,038	-0,007	-0,001
	(0,028)	(0,0169	(0,016)
tobacco	0,041	0,003	0,001
	(0,012)	(0,011)	(0,011)
housing	-0,060	-0,003	0,002
	(0,037)	(0,026)	(0,026)
petrol	-0,014	0,010	0,010
	(0,013)	(0,008)	(0,008)
food	-0,085	0,002	0,012
	(0,033)	(0,020)	(0,020)

Note: Standard errors are in parentheses

Table B.2.6 - HOUSE NON-DURABLES

	Weak Sep.	1st.Selection	2nd.Selection
intercept	-0,046	0,126	0,025
	(0,182)	(0,197)	(0,156)
single person	0,000	0,001	0,000
	(0,001)	(0,003)	(0,002)
couple and children	0,002	0,003	0,003
	(0,001)	(0,002)	(0,002)
self-umployed	0,000	0,000	-0,001
	(0,001)	(0,002)	(0,001)
unskilled	0,002	0,002	0,001
	(0,001)	(0,002)	(0,001)
non active	0,001	0,000	-0,001
	(0,001)	(0,002)	(0,002)
number earners	0,001	0,001	0,001
	(0,001)	(0,001)	(0,001)
number members	0,001	0,001	0,000
	(0,000)	(0,001)	(0,001)
n. members < 14	-0,003	-0,002	-0,002
	(0,001)	(0,001)	(0,001)
expenditure	0,011	-0,030	-0,010
	(0,033)	(0,036)	(0,028)
square expenditure	0,000	0,001	0,001
	(0,001)	(0,002)	(0,001)
food out & leisure serv.	0,020	-0,041	-0,017
	(0,068)	(0,069)	(0,059)
educ. & health services	-0,033	-0,022	-0,022
	(0,067)	(0,074)	(0,057)
fuel	-0,002	-0,004	-0,008
	(0,033)	(0,037)	(0,045)
transport	-0,002	-0,023	-0,021
	(0,036)	(0,056)	(0,067)
communications	0,006	0,007	0,001
	(0,017)	(0,018)	(0,017)
house non-durables	0,007	-0,006	0,006
	(0,053)	(0,066)	(0,033)
leisure goods	0,068	0,011	-0,004
	(0,058)	(0,074)	(0,067)
alcoholic beverages	0,014	-0,005	-0,004
	(0,017)	(0,021)	(0,020)
clothing & food wear	-0,008	0,016	0,026
	(0,041)	(0,047)	(0,042)
tobacco	-0,010	-0,029	-0,026
	(0,027)	(0,030)	(0,027)
housing	-0,056	-0,013	-0,023
	(0,065)	(0,076)	(0,063)
petrol	0,002	0,007	0,002
	(0,022)	(0,022)	(0,019)
food	0,001	0,053	0,033
	(0,057)	(0,057)	(0,050)

Note: Standard errors are in parentheses

Table B.2.7 - LEISURE GOODS

	Weak Sep.	1st.Selection	2nd.Selection
intercept	0,294	0,047	-0,015
	(0,189)	(0,248)	(0,237)
single person	-0,006	-0,004	-0,003
	(0,001)	(0,003)	(0,003)
couple and children	-0,001	-0,002	-0,002
	(0,001)	(0,003)	(0,003)
self-umployed	-0,003	-0,002	-0,001
	(0,001)	(0,002)	(0,002)
unskilled	-0,001	-0,002	-0,002
	(0,001)	(0,002)	(0,002)
non active	0,001	-0,001	0,000
	(0,001)	(0,002)	(0,003)
number earners	0,001	0,001	0,002
	(0,001)	(0,001)	(0,001)
number members	-0,003	-0,003	-0,003
	(0,000)	(0,001)	(0,001)
n. members < 14	0,005	0,005	0,005
	(0,001)	(0,001)	(0,001)
expenditure	-0,056	-0,025	-0,014
	(0,034)	(0,045)	(0,043)
square expenditure	0,003	0,002	0,001
	(0,001)	(0,002)	(0,002)
food out & leisure serv.	-0,056	-0,051	-0,039
	(0,076)	(0,089)	(0,085)
educ. & health services	-0,141	-0,107	-0,004
	(0,098)	(0,111)	(0,067)
fuel	-0,037	-0,017	0,015
	(0,042)	(0,049)	(0,071)
transport	0,024	-0,005	-0,106
	(0,044)	(0,067)	(0,107)
communications	0,054	0,010	0,013
	(0,022)	(0,025)	(0,025)
house non-durables	0,068	0,011	-0,006
	(0,058)	(0,074)	(0,046)
leisure goods	-0,085	0,021	0,023
	(0,121)	(0,148)	(0,143)
alcoholic beverages	-0,029	0,007	0,008
	(0,027)	(0,031)	(0,031)
clothing & food wear	0,063	-0,002	0,010
	(0,066)	(0,072)	(0,071)
tobacco	-0,054	0,000	0,008
	(0,037)	(0,042)	(0,041)
housing	0,163	0,022	0,013
	(0,096)	(0,111)	(0,108)
petrol	0,049	0,021	0,024
	(0,028)	(0,027)	(0,028)
food	0,094	0,047	0,035
	(0,068)	(0,072)	(0,070)

Note: Standard errors are in parentheses

Table B.2.8 - ALCOHOLIC BEVERAGES

	Weak Sep.	1st.Selection	2nd.Selection
intercept	-0,060	-0,101	-0,190
	(0,108)	(0,084)	(0,083)
single person	0,005	0,004	0,004
	(0,001)	(0,001)	(0,001)
couple and children	0,001	0,000	0,000
	(0,001)	(0,001)	(0,001)
self-umployed	0,000	0,000	0,000
	(0,001)	(0,001)	(0,001)
unskilled	0,002	0,001	0,001
	(0,001)	(0,001)	(0,001)
non active	0,001	0,001	0,001
	(0,001)	(0,001)	(0,001)
number earners	0,001	0,001	0,001
	(0,001)	(0,000)	(0,000)
number members	0,000	-0,001	-0,001
	(0,000)	(0,000)	(0,000)
n. members < 14	0,000	-0,001	0,000
	(0,000)	(0,000)	(0,001)
expenditure	0,017	0,019	0,036
	(0,020)	(0,015)	(0,015)
square expenditure	-0,001	-0,001	-0,002
	(0,001)	(0,001)	(0,001)
food out & leisure serv.	0,057	0,031	0,072
	(0,040)	(0,034)	(0,034)
educ. & health services	-0,007	0,027	-0,004
	(0,034)	(0,033)	(0,020)
fuel	-0,001	0,001	0,026
	(0,015)	(0,015)	(0,024)
transport	0,022	0,018	0,033
	(0,020)	(0,022)	(0,032)
communications	-0,003	0,001	0,002
	(0,009)	(0,008)	(0,008)
house non-durables	0,014	-0,005	0,006
	(0,019)	(0,021)	(0,014)
leisure goods	-0,029	0,007	0,008
	(0,027)	(0,031)	(0,031)
alcoholic beverages	-0,015	-0,009	-0,014
	(0,013)	(0,014)	(0,014)
clothing & food wear	-0,025	-0,013	-0,024
	(0,023)	(0,021)	(0,022)
tobacco	-0,005	0,005	0,005
	(0,014)	(0,013)	(0,013)
housing	-0,020	-0,023	-0,047
	(0,038)	(0,034)	(0,034)
petrol	-0,006	-0,004	-0,015
	(0,013)	(0,010)	(0,010)
food	-0,024	-0,020	-0,041
	(0,034)	(0,026)	(0,026)

Note: Standard errors are in parentheses

Table B.2.9 - CLOTHING & FOOD WEAR

	Weak Sep.	1st Selection	2nd. Selection
intercept	-0,549	-0,762	-0,500
	(0,561)	(0,224)	(0,216)
single person	-0,009	0,000	-0,002
	(0,004)	(0,004)	(0,004)
couple and children	0,001	-0,002	-0,001
	(0,004)	(0,005)	(0,004)
self-umployed	0,001	0,004	0,003
	(0,003)	(0,003)	(0,003)
unskilled	-0,001	0,008	0,004
	(0,003)	(0,003)	(0,003)
non active	0,002	0,007	0,006
	(0,003)	(0,004)	(0,004)
number earners	0,005	0,001	0,003
	(0,001)	(0,001)	(0,001)
number members	0,000	0,006	0,006
	(0,001)	(0,001)	(0,001)
n. members < 14	-0,002	-0,007	-0,004
	(0,002)	(0,002)	(0,002)
expenditure	0,105	0,141	0,114
	(0,101)	(0,041)	(0,039)
square expenditure	-0,004	-0,005	-0,005
	(0,005)	(0,002)	(0,002)
food out & leisure serv.	0,046	0,074	0,111
	(0,201)	(0,075)	(0,073)
educ. & health services	0,160	0,138	0,026
	(0,099)	(0,070)	(0,042)
fuel	0,019	0,001	0,040
	(0,048)	(0,032)	(0,065)
transport	0,054	0,070	0,131
	(0,063)	(0,060)	(0,069)
communications	-0,038	-0,007	-0,001
	(0,028)	(0,016)	(0,016)
house non-durables	-0,008	0,016	0,018
	(0,041)	(0,047)	(0,031)
leisure goods	0,063	-0,002	0,010
	(0,066)	(0,072)	(0,071)
alcoholic beverages	-0,025	-0,013	-0,024
	(0,023)	(0,021)	(0,022)
clothing & food wear	0,003	-0,011	-0,041
	(0,126)	(0,068)	(0,069)
tobacco	0,029	0,041	0,025
	(0,041)	(0,028)	(0,028)
housing	-0,208	-0,091	-0,109
	(0,140)	(0,088)	(0,085)
petrol	-0,075	-0,067	-0,088
	(0,058)	(0,024)	(0,024)
food	-0,116	-0,105	-0,100
	(0,157)	(0,065)	(0,064)

Note: Standard errors are in parentheses

Table B.2.10 - TOBACCO

	Weak Sep.	1st.Selection	2nd.Selection
intercept	0,391	0,392	0,238
	(0,128)	(0,105)	(0,100)
single person	0,000	0,000	0,000
	(0,001)	(0,001)	(0,001)
couple and children	0,001	0,001	0,000
	(0,001)	(0,001)	(0,001)
self-umployed	-0,002	-0,002	-0,001
	(0,001)	(0,001)	(0,001)
unskilled	0,002	0,003	0,003
	(0,001)	(0,001)	(0,001)
non active	0,001	0,001	0,001
	(0,001)	(0,001)	(0,001)
number earners	0,002	0,001	0,002
	(0,000)	(0,000)	(0,000)
number members	0,000	0,001	0,001
	(0,000)	(0,000)	(0,000)
n. members < 14	0,001	0,001	0,001
	(0,001)	(0,001)	(0,001)
expenditure	-0,058	-0,061	-0,033
	(0,023)	(0,019)	(0,018)
square expenditure	0,002	0,002	0,001
	(0,001)	(0,001)	(0,001)
food out & leisure serv.	-0,042	-0,049	-0,019
	(0,054)	(0,042)	(0,040)
educ. & health services	-0,007	-0,087	-0,026
	(0,046)	(0,045)	(0,027)
fuel	-0,034	-0,009	-0,015
	(0,021)	(0,021)	(0,026)
transport	-0,016	-0,037	-0,044
	(0,029)	(0,025)	(0,043)
communications	0,041	0,003	0,001
	(0,012)	(0,011)	(0,011)
house non-durables	-0,010	-0,029	-0,018
	(0,027)	(0,030)	(0,020)
leisure goods	-0,054	0,000	0,008
	(0,037)	(0,042)	(0,041)
alcoholic beverages	-0,005	0,005	0,005
	(0,014)	(0,013)	(0,013)
clothing & food wear	0,029	0,041	0,025
	(0,041)	(0,028)	(0,028)
tobacco	-0,032	-0,033	-0,015
	(0,026)	(0,025)	(0,024)
housing	0,081	0,012	0,006
	(0,058)	(0,043)	(0,042)
petrol	0,034	0,020	0,025
	(0,019)	(0,012)	(0,012)
food	0,098	0,109	0,057
	(0,052)	(0,034)	(0,033)

Note: Standard errors are in parentheses

Table B.2.11 - HOUSING

	Weak Sep.	1st.Selection	2nd.Selection
intercept	-1,230 (0,611)	0,082 (0,433)	-0,463 (0,367)
single person	0,020 (0,004)	0,022 (0,007)	0,027 (0,006)
couple and children	0,000 (0,004)	0,001 (0,006)	0,000 (0,006)
self-umployed	-0,007 (0,003)	-0,006 (0,005)	-0,004 (0,004)
unskilled	-0,012 (0,003)	-0,015 (0,005)	-0,010 (0,004)
non active	-0,007 (0,004)	-0,009 (0,006)	-0,007 (0,005)
number earners	-0,010 (0,002)	-0,010 (0,002)	-0,011 (0,002)
number members	-0,008 (0,001)	-0,005 (0,002)	-0,005 (0,002)
n. members < 14	-0,007 (0,002)	-0,005 (0,003)	-0,007 (0,003)
expenditure	0,247 (0,109)	0,026 (0,079)	0,104 (0,067)
square expenditure	-0,010 (0,005)	-0,002 (0,004)	-0,004 (0,003)
food out & leisure serv.	0,439 (0,239)	0,104 (0,130)	0,269 (0,113)
educ. & health services	0,319 (0,137)	0,160 (0,115)	-0,023 (0,063)
fuel	0,015 (0,061)	-0,028 (0,047)	0,095 (0,128)
transport	0,091 (0,106)	0,090 (0,132)	0,159 (0,110)
communications	-0,060 (0,037)	-0,003 (0,026)	0,002 (0,026)
house non-durables	-0,056 (0,065)	-0,013 (0,076)	-0,003 (0,045)
leisure goods	0,163 (0,096)	0,022 (0,111)	0,013 (0,108)
alcoholic beverages	-0,020 (0,038)	-0,023 (0,034)	-0,047 (0,034)
clothing & food wear	-0,208 (0,140)	-0,091 (0,088)	-0,109 (0,085)
tobacco	0,081 (0,058)	0,012 (0,043)	0,006 (0,042)
housing	-0,313 (0,287)	0,070 (0,197)	-0,070 (0,174)
petrol	-0,097 (0,073)	0,014 (0,039)	-0,036 (0,039)
food	-0,466 (0,186)	-0,228 (0,105)	-0,246 (0,096)

Note: Standard errors are in parentheses

Table B.2.12 - PETROL

	Weak Sep.	1st.Selection	2nd.Selection
intercept	-0,451	-0,068	-0,453
	(0,262)	(0,116)	(0,110)
single person	0,000	-0,005	-0,002
	(0,002)	(0,002)	(0,002)
couple and children	0,007	0,008	0,007
	(0,002)	(0,002)	(0,002)
self-umployed	0,008	0,006	0,008
	(0,001)	(0,002)	(0,002)
unskilled	0,001	-0,003	0,002
	(0,001)	(0,002)	(0,002)
non active	-0,004	-0,005	-0,003
	(0,002)	(0,002)	(0,002)
number earners	0,003	0,004	0,003
	(0,001)	(0,001)	(0,001)
number members	-0,004	-0,004	-0,004
	(0,001)	(0,001)	(0,001)
n. members<14	0,002	0,005	0,002
	(0,001)	(0,001)	(0,001)
expenditure	0,092	0,052	0,097
	(0,046)	(0,021)	(0,020)
square expenditure	-0,004	-0,003	-0,004
	(0,002)	(0,001)	(0,001)
food out & leisure serv.	0,156	0,129	0,210
	(0,081)	(0,039)	(0,037)
educ. & health services	0,018	0,017	0,002
	(0,045)	(0,032)	(0,019)
fuel	0,031	0,018	0,009
	(0,023)	(0,016)	(0,032)
transport	0,025	0,030	0,026
	(0,039)	(0,028)	(0,029)
communications	-0,014	0,010	0,010
	(0,013)	(0,008)	(0,008)
house non-durables	0,002	0,007	0,043
	(0,022)	(0,022)	(0,015)
leisure goods	0,049	0,021	0,024
	(0,028)	(0,027)	(0,028)
alcoholic beverages	-0,006	-0,004	-0,015
	(0,013)	(0,010)	(0,010)
clothing & food wear	-0,075	-0,067	-0,088
	(0,058)	(0,024)	(0,024)
tobacco	0,034	0,020	0,025
	(0,019)	(0,012)	(0,012)
housing	-0,097	0,014	-0,036
	(0,073)	(0,039)	(0,039)
petrol	0,006	0,021	-0,011
	(0,049)	(0,015)	(0,015)
food	-0,135	-0,132	-0,147
	(0,074)	(0,033)	(0,032)

Note: Standard errors are in parentheses

Table B.2.13 - FOOD

	Weak Sep.	1st.Selection	2nd.Selection
intercept	-0,856	-0,979	-0,675
	(0,606)	(0,355)	(0,320)
single person	0,008	0,004	0,002
	(0,005)	(0,005)	(0,005)
couple and children	-0,017	-0,016	-0,015
	(0,004)	(0,005)	(0,004)
self-umployed	0,013	0,012	0,010
	(0,003)	(0,004)	(0,003)
unskilled	0,016	0,014	0,011
	(0,003)	(0,004)	(0,003)
non active	0,012	0,010	0,009
	(0,004)	(0,005)	(0,004)
number earners	-0,008	-0,006	-0,006
	(0,002)	(0,002)	(0,002)
number members	0,028	0,023	0,022
	(0,001)	(0,002)	(0,001)
n. members<14	-0,009	-0,008	-0,007
	(0,002)	(0,003)	(0,002)
expenditure	0,286	0,288	0,242
	(0,111)	(0,065)	(0,059)
square expenditure	-0,017	-0,016	-0,014
	(0,005)	(0,003)	(0,003)
food out & leisure serv.	0,543	0,519	0,530
	(0,258)	(0,120)	(0,113)
educ. & health services	0,161	0,232	0,033
	(0,121)	(0,080)	(0,050)
fuel	0,070	0,050	0,052
	(0,060)	(0,037)	(0,085)
transport	0,094	0,118	0,160
	(0,110)	(0,086)	(0,075)
communications	-0,085	0,002	0,012
	(0,033)	(0,020)	(0,020)
house non-durables	0,001	0,053	0,078
	(0,057)	(0,057)	(0,035)
leisure goods	0,094	0,047	0,035
	(0,068)	(0,072)	(0,070)
alcoholic beverages	-0,024	-0,020	-0,041
	(0,034)	(0,026)	(0,026)
clothing & food wear	-0,116	-0,105	-0,100
	(0,157)	(0,065)	(0,064)
tobacco	0,098	0,109	0,057
	(0,052)	(0,034)	(0,033)
housing	-0,466	-0,228	-0,246
	(0,186)	(0,105)	(0,096)
petrol	-0,135	-0,132	-0,147
	(0,074)	(0,033)	(0,032)
food	-0,371	-0,435	-0,305
	(0,332)	(0,119)	(0,113)

Note: Standard errors are in parentheses

CHAPTER 4 - TESTING INTERTEMPORAL SEPARABILITY ON A GROUP OF COMMODITIES USING PANEL DATA

4.1 - INTRODUCTION

A temporal perspective requires that decisions upon consumption and leisure must be taken considering not only the present but the next future. Life-cycle hypothesis allows to incorporate the idea of intertemporal planning and to explain how consumption evolves along time. The choice of a pattern of consumption and labor from today on is going to depend on intertemporal preferences. Usually, the literature has focused in the macroeconomic aspects of intertemporal substitution by considering a representative agent and taking consumption as an aggregate.[65] Thereby, the implied substitutability and complementarity relationships reduce to relations among periods. However, working with dissagregated consumption, the implied relationships among goods and periods are too wide. The usual invoked simplification is intertemporal weak separability of preferences. That is, given an intertemporal utility function we reduce the relations among goods belonging to different periods to general relations among periods. The admission of this hypothesis is generally dependent on the period of time of expenditure we consider. We expect recorded expenditures for one year to be less related to the next year decisions than recorded expenditures for a month with respect to the next one. The acceptance of the hypothesis will also depend on the sort of good we analyze. Hence, decisions on consumption of durable goods might be much more related in time than non-durables.

Most of the papers that develop an intertemporal set of preferences consider a representative consumer.[66] Only a few studies analyze dynamic structures in a microeconomic framework, that is exploiting data at the individual level. Meghir and Weber (1996) and Lopez-Salido (1995) are good examples with U.S. and Spanish data, respectively. Others use data constructed on the base of homogeneous consumers

[65]Among others, see Hall (1988) and Hansen and Singleton (1982,1983).

[66]See Flavin (1981) and Campbell and Mankiw (1991).

or cohorts (Browning, Deaton and Irish, 1985 for UK is an example, as well as Cutanda, 1995 using Spanish data).

Back to aggregated consumption analysis, Marshall (1980) and Browning (1991), among others, test up to what point intertemporal weak separability is a too restrictive hypothesis. In fact, empirical evidence shows that the introduction of lagged consumption implies an increase in the explanatory power of the models. Nevertheless, the accommodation of lagged consumption into the consumption function, forces to relax intertemporal weak separability in preferences. There are at least two possible alternatives for including past decisions in the utility function.

First of all, we may think about the consumer as an agent who does not know his consumption possibilities, or even his own tastes, out of previous experience. According to this idea, consumers will choose in order to approach their supposed optimal consumption path with a previous learning process. This assumption can be modeled by considering an adjustment cost process towards the optimal consumption. The inclusion of these costs, which do not enter explicitly in monetary units in the budget constraint but in disutility terms, may be justified because of searching costs, information and therefore in terms of time (Weissenberger, 1986).

Second, we can consider the dependence of choices on tastes and the fact that they are built from past decisions. This dependence of current consumption with respect to past decisions is characterized as habits or consumption inertia. According to this idea, current consumption is much more correlated with past consumption than with current income. In a life-cycle framework, dependence on income is described as an excess sensitivity of consumption. However, some papers justify this dependence in terms of liquidity constraints.[67] Nevertheless, empirical evidence of this correlation is usually

[67]See Hall and Mishkin (1982), Zeldes (1989) and Runkle (1991) all using individual U.S. data and López-Salido (1995) and Cutanda (1995) using Spanish data.

presented as an argument against the life-cycle hypothesis.[68] Other approaches do not reject the null hypothesis of non-excess sensitivity, once heterogeneity throughout socioeconomic and labor supply variables is introduced.[69] Instead, this observed correlation between consumption and income can also be explained if preferences are modified in such a way that allow for both habits and durability (Blinder and Deaton, 1985) and relax intertemporal separability.

Two sorts of intertemporal preferences may capture this behavior. Consumers can react myopically to past consumption or, on the contrary, their current decisions can influence future consumption. For the first assumption, we can recall the model of Pollak (1970), with intertemporal preferences fixed according to a moving average process. Spinnewyn (1981) considers the second framework by modeling consumption in terms of stocks. If services derived from a stock in the last period are high, it is going to be necessary a higher flow of those services for the next period.[70] Also, we can consider that consumers do not behave myopically by allowing past consumption to affect the marginal utility of current and future consumption. Hence, consumers are rational since they anticipate the expected future consequences of today's decisions (Becker and Murphy, 1988).

Our main goal is to specify an intertemporal non-separable set of preferences that capture the described and usually observed habit behavior effect in consumption for different composite goods, testing them on a panel data at the individual level.[71] From the specified model, we will be able to test the frequently invoked intertemporal weak separability of consumption once excess sensitivity of the different categories of

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[68]See Campbell and Mankiw (1989) for an study using U.S. aggregated data.

[69]See Attanasio and Weber (1995) for an application on U.K. data at the individual level and Blundell, Browning and Meghir (1994) and Attanasio and Browning (1994) using U.S. dissagregated data.

[70]See also Pashardes and Baker (1991).

[71]See Meghir and Weber (1996) for a similar study on dissaggregated consumption using also a panel data (CEX) which collects consecutive information, at the household level, across five periods.

consumption to income is tested. However, we are also interested in the identification of the sort of temporal linkages implied in the different categories of consumption. The nature of the dependence of actual decisions on past choices seems to be a matter which depends very much on the nature of the good. Therefore, we want to identify which goods show consumption inertia or habits, and which ones are revealed as durables. A second aim is to bring some empirical evidence on the degree of intertemporal substitution for the Spanish economy for the different categories of consumption we analyze.

The specifications we consider are Euler equations derived from a utility function which is additively separable among goods in a general life-cycle framework with forward looking behavior. Hence, testing excess sensitivity of each category of consumption to income becomes a necessary previous step, in order to ensure the consistency of our framework, rather than a target in itself.[72] Each subutility function includes as arguments the own current and lagged consumption and hence, it is intertemporally non-separable. Besides, the used preferences do not impose homotheticity since it is a testable restriction.[73]

We analyze four different categories of consumption on non-durable goods and therefore we are assuming separability among non-durables, durables and leisure.[74] The modeling on durable good consumption must deal with the non-convexities

[72]Meghir and Weber (1996) point out that preferences can be identified independently of the presence of liquidity constraints, by specifying the marginal rate of substitution among categories of consumption. Nevertheless, in the abscense of borrowing restrictions, the same sort of relationships may be identified if instead, preferences are specified through the Euler equations. Moreover, the derived dinamicity from the latter is much richer. In fact, they compare both specifications in order to test for the presence of liquidity constraints. See also Lopez-Salido (1995) who uses this representation for analyzing aggregated non-durable consumption for the Spanish economy, under the null of abscense of liquidity constraints.

[73]The utility function we use is a derived version of that used in Meghir and Weber (1996).

[74]It seems more difficult to identify whether the dependence between consumption and income arises from liquidity constraints or intertemporal non-separabilities, analyzing a single consumption aggregate (Meghir and Weber, 1996).

derived from discrete purchases and hence complicates the specification of preferences (Hayashi, 1985). This is out of the scope of this work.[75] Nevertheless, we analyze the possible effects of durability of non-durables since their consumption benefits can last in time. Separability among goods and separability between non-durable and durable consumption may be a rather restrictive hypothesis when working with life-cycle models. We relax both assumptions by allowing consumption on all the other groups to enter each equation as conditioning variables (Browning and Meghir, 1991). Also, introducing labor supply variables we overcome the implied separability among consumption and leisure. We work with data at the individual level set as a panel. Thereby, we are able to follow the different household units across time and control for both individual latent and observable effects, since socioeconomic variables are included.

Non-durable consumption does not display excess sensitivity to income once lagged consumption is introduced in the utility function. Nevertheless, a disaggregated analysis on different categories reveals that some goods may display an excess sensitivity. Our results show that when allowing for habits and durability, it vanishes for 3 out of 4 categories of consumption. Therefore, the life cycle hypothesis can not be rejected on those goods. Moreover, we observe a clear dynamic dependence on non-durable consumption for all the analyzed goods, according to an habit pattern.[76] The parameters that relax homotheticity are not very significant. Also, including socioeconomic variables as explanatory factors, we observe a lower significance on the dynamics, and thereby, we conclude that a poor specification on these sort of variables might lead to an spurious dynamicity.[77] We also derive elasticities of

[75]Moreover, durable consumption analysis requires data on stocks. This information is not available and can not be derived from our data, except since the moment we observe a purchase.

[76]Our results contrast with those obtained by Meghir and Weber (1996) since they do not find significance in the preference parameters.

[77] See Pashardes and Baker (1991) for an study on the links between dynamics at the macroeconomic level and household characteristics at the microeconomic level.

intertemporal substitution for the analyzed categories. Even though values move around one, we observe that luxuries display a higher degree of intertemporal substitution than necessities.

The rest of the chapter is organized as follows. In section 4.2, we present the theoretical model; section 4.3 is devoted to present the data and variables and to the discussion of the econometric treatment; in section 4.4 we present the results. The chapter ends up with a summary of the main conclusions in section 4.5.

4.2 - MODELING FRAMEWORK

Our model considers that agents maximize their life-cycle utility from today on, and hence, describe a forward looking behavior. The usual framework implies additive preferences over time so that consumption dynamics are directly introduced throughout the intertemporal budget constraint. Our target is to test intertemporal separability for different consumption goods. Therefore, we also introduce consumption dynamics by specifying a set of preferences which are intertemporally non-separable. That is, the arguments we consider in the current utility function are current and lagged consumption. Since we want to test only time separability for the different goods, we assume that preferences are also additively separable among goods.[78] The utility function for period t and household i we consider takes the following form:

[4.1]

$$U_{it}\ (C_{it}\ ,\ C_{it-1}) = \Sigma_k\ U_{ikt}(c_{ikt}\ ,\ c_{ikt-1}),$$

being $C_{it} = (c_{i1t}, \dots , c_{iKt})$ a vector of K goods. This representation of preferences within a period implies that the current utility derived from consumption of good k is

[78]Meghir and Weber (1996) do not impose strong separability. The specified utility function considers interaction terms among categories of consumption. Nevertheless, dinamicity across goods is not included.

affected only by past and current decisions on that good. Such a preference structure allows to pick up both the existence of consumption persistence, described as habits or durability.

Marginal utility of consumption changes over time because of the changes in the desirability of consumption along the life-cycle. Also, it varies across consumers. Family characteristics explain mostly the variation of consumption patterns, both in time and across households. We can capture these changes of the utility function by writing:

[4.2]

$$U_{it}(C_{it},\ C_{it-1}) = \beta^{t}\ U(C_{it},\ C_{it-1}, Z_{it}),$$

where the Z_{it}'s are socioeconomic characteristics of the family. Such a transformation allows to explain many life-cycle evidences in consumption such a U-inverted shape consumption pattern with age.[79] The β parameter introduces the discount factor of future consumption.[80] It reflects how impatient consumers are, since this rate of time preference gives a lower weight to future consumption the further away it occurs.

The general problem the consumer faces can be expressed as follows:

[4.3]

$$Max_{c_{ikt}} E_t \left[\Sigma_{s=t}^{\infty}\left(\beta^{t}\ U_1(c_{i1t}, c_{i1t-1}, Z_{it}) + \ldots + \beta^{t}\ U_K(c_{iKt}, c_{iKt-1}, Z_{it})\right)\right]$$

$$s.t.\ A_{it+1} = (1 + i_t)(A_{it} + Y_{it} - \Sigma_k p_{kt} c_{ikt}),$$

[79]Constructing age cohorts on our data, we also obtain evidence of this concave shaped curve on total consumption.

[80]It has the following form:

$$\beta = 1/(1+\rho).$$

being ρ the discount rate.

where A_{it} are the household assets at the beginning of period t, i_t is the nominal interest rate, and p_t is a vector of prices. Also, the above maximization problem can be written in terms of the Bellman equation as:

[4.4]

$$V_t(A_{it}, C_{it-1}, Z_{it}) = Max_{C_{it},\, A_{it+1}} \left[U(C_{it}\,,\, C_{it-1},\, Z_{it}) + \beta\, E_t \left[V_{t+1}\left(A_{it+1},\, C_{it},\, Z_{it+1}\right)\right] \right],$$

subject to the same budget constraint.

From the general maximization problem, we define λ_t as the Lagrange multiplier associated to the intertemporal budget constraint, and hence, as the marginal utility of wealth dV_t/dA_t. Deriving the Bellman equation, we obtain the process that characterizes the marginal utility of wealth over time according to the expression:

[4.5]

$$\lambda_t = E_t \left[\beta\, \lambda_{t+1}\, (1 + i_t)\right].$$

Expression [4.5] links consumption in periods t and $t+1$, and hence defines a stochastic difference equation that determines how consumption evolves over time. The discounted expectation of tomorrow marginal utility equals the current marginal utility according to a martingale stochastic process. This expression together with the K first order conditions derived from the maximizing problem define K Euler equations with the following form:

[4.6]

$$\frac{\partial U_{kt}}{\partial c_{kt}} + \beta_k\, E_t\left[\frac{\partial U_{kt+1}}{\partial c_{kt}}\right] - E_t\left[\beta_k (1 + i_t)\left(\frac{\partial U_{kt+1}}{\partial c_{kt+1}} + \beta_k\, \frac{\partial U_{kt+2}}{\partial c_{kt+1}}\right)\frac{p_{kt}}{p_{kt+1}}\right] = 0\,.$$

In a life-cycle framework, such a model predicts that in the absence of borrowing restrictions, consumption will evolve according to changes in needs and tastes, whereas it will show a lower dependence on changes in labor income.[81] Thereby, if

[81]Under the presence of binding borrowing restrictions, the Euler conditions would not be satisfied. The martingale process might be substituted for $\lambda_t = E_t\left[\beta(\mu_t + \lambda_{t+1})\,(1 + i_t)\right]$ being μ_t the Kuhn-

income is predicted to rise in the next future, a higher consumption profile will not be delayed till then. Tastes will be constructed according to previous experience and will translate into habits whereas needs will shift with age and other conditioning variables such as the socioeconomic structure of the household.

Before introducing the vector of socioeconomic variables, we follow Meghir and Weber (1996) in considering that each subutility function can be described by a modified version of the direct translog utility function.[82]

[4.7]

$$U_k\,(c_{ikt}, c_{ikt-1}) = \varepsilon_{kt}\, c_{ikt} + a_{kt}\ \ln\ c_{ikt} + \frac{1}{2}\gamma_k\ (\ln\ c_{ikt})^2 + \theta_k\ \ln\ c_{ikt}\ \ln\ c_{ikt-1}\,.$$

Considering the set of K subutility functions, we are forcing preferences to be additively separable. Moreover, such a utility function nests homothetic preferences and allows us to test for intertemporal separability.

Setting all the γ_k parameters to zero, we obtain Cobb-Douglas preferences. It is worth to point out that these sort of preferences would limit the possibilities of substitutability between present and future consumption. Engel curves for each good would be straight lines through the origin and consumers should allocate each period good expenditure in such a way that the proportion of that good expenditure with respect to total life-cycle assignment on that good was independent of the total

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Tucker multiplier associated to a liquidity constraint with the form $A_{it+1}\ \geq f(z_{it})$. The vector of variables $z_{i,t}$ might include wages, labor supply variables or durable good consumption. We assume that this function does not depend on the nondurable goods we model. We think it is unrealistic that these goods may be used to alleviate the liquidity constraint. It is worth to mention that if it did depend on nondurable consumption, its omission would bias the dynamic structure of the preferences.

[82]See also Lopez-Salido (1995).

amount.[83] Intertemporal separability is also testable in a very simple way by analyzing the significance of the θ_k parameters. Notice that the sign of the θ_k parameters distinguishes between habits and durability. A negative sign implies that current utility decreases with an increase in lagged consumption and describes habit formation. For a positive sign, the effect on current utility is positive and therefore the benefits of consumption are durable.

Including these subutility functions into the Euler equation we will obtain the expression for the assignment of consumption over two consecutive periods *(t, t+1)* for each good as:

[4.8]

$$\varepsilon_{ikt} + a_{ikt}\frac{1}{c_{ikt}} + \gamma_k\frac{\ln c_{ikt}}{c_{ikt}} + \theta_k\frac{\ln c_{ikt-1}}{c_{ikt}} + \beta_k E_t\left[\theta_k\frac{\ln c_{ikt+1}}{c_{ikt}}\right]$$

$$- \; E_t\left[\beta_k(1+i_t)\frac{p_{kt}}{p_{kt+1}}\left(\varepsilon_{ikt+1} + a_{ikt+1}\frac{1}{c_{ikt+1}} + \gamma_k\frac{\ln c_{ikt+1}}{c_{ikt+1}} + \theta_k\frac{\ln c_{ikt}}{c_{ikt+1}} + \beta_k\theta_k\frac{\ln c_{ikt+2}}{c_{ikt+1}}\right)\right] = 0.$$

Notice that the above expression involves observations on consumption from four periods and therefore, we are dealing with a system of K equations each of fourth order. Moreover, the expression is non-linear in the parameters unless β_k is fixed.

At this point, it is worth noting that heterogeneity is a crucial issue when working with data at individual level. Besides, the above set-up is implicitly assuming separability of the utility function between consumption and leisure. This is a strong assumption when estimating consumption Euler equations. In our work, we do not model labor supply decisions. Nevertheless, it is possible to overcome this problem by introducing labor supply features as conditioning variables.[84] Shifts of the marginal utility of consumption will depend on characteristics of the family labor position. By

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[83]Since the consumption function cannot be derived in most of the utility functions used when there is uncertainty, some authors choice to simulate it. See Attanasio, Banks, Meghir and Weber (1996) using UK and US cohort data and Cutanda and Labeaga (1997) using Spanish cohort data.

[84]See Browning and Meghir (1991) and Attanasio and Weber (1995).

doing so, we are somehow considering a sort of reduced form model that considers both consumption and labor decisions. Moreover, life-cycle patterns of consumption vary across consumers and time, depending on other socioeconomic variables. Our framework specifies that consumption depends on needs which mostly depend on the household characteristics. Hence, we also allow other demographic variables referring to household composition to enter the first order conditions. Also, additive separability between consumed goods, imposed through the utility function may be very restrictive. This can be relaxed by allowing consumption on other goods, including durables, to enter as conditioning variables in a non-restricted way, each first order equation. All the above variables are specified throughout the parameter a_{ikt}.. This parameter is set linearly dependent on the vector of conditioning consumption categories and on socioeconomic and demographic variables, according to the following specification:

[4.9]

$$a(Z_{ikt}) = 1 + \sum_{j=1}^{s} \alpha_{jk} \; z_{ijkt} \, .$$

This specification captures partly the expected individual heterogeneity when working at the individual level.[85] Nevertheless, there are several features which are not picked up through the available demographic variables and whose omission leads to inconsistency of the estimated parameters. The importance of these unobservable effects will be greater the more dissagregated categories of consumption we consider. Effects of omitted variables capturing heterogeneity vanish when aggregating for both households and consumption categories. That is, we would expect that a unique composite good of non-durable consumption would not be very affected by its omission, whereas a detailed disaggregated analysis would be very sensitive if they were not included. As pointed out, we work with four categories and initially we expect the results to be sensitive to the consideration of stochastic heterogeneity. We

[85]Meghir and Weber (1996).

include this stochastic variability which is time dependent through the parameter ε_{ikt}. This expression might be split in two components, one variant in time that might pick up shocks in preferences and tastes, such as changes in taxes, and another time independent that might correspond to the latent individual effects.

4.2.1 - Elasticity of intertemporal substitution

In the absence of borrowing constraints or divisibility problems, households will desire and plan a flat pattern of consumption. Consumers will leave this flat profile and sacrifice some consumption today for more consumption tomorrow only if they are compensated with an interest rate that is sufficiently above the rate of time preference. The willingness of substitution between consumption at times t and $t+1$ is measured with the elasticity of intertemporal substitution. This elastiticy measures the degree of concavity of the utility function. Also, it can be seen as the reciprocal of the elastiticy of marginal utility, that is, the reciprocal of the proportionate change in the magnitude of the slope of the indifference curve in response to a proportionate change in the ratio c_t / c_{t+1}. The expression for this elasticity is:

[4.10]

$$\sigma = \left[\frac{c(t-1) \ / \ c(t)}{-U'[c(t-1)] \ / \ U'[c(t)]} * \frac{d\{U'[c(t-1)] \ / \ U'[c(t)]}{d[c(t-1) \ / \ c(t)]} \right]^{-1}.$$

If we let t-1 approach to t, we get the instantaneous elastiticy with the following form:

[4.11]

$$\sigma = \frac{-U'(c)}{c \ U''(c)}.$$

Applying this definition to our preferences, we obtain the following expression:

[4.12]

$$\sigma_{tk} = \frac{\varepsilon_{tk} C_{tk} + \alpha_k{}'Z + \gamma_k lnC_{tk} + \theta_k lnC_{t-1k}}{\alpha_k{}'Z + \gamma_k lnC_{tk} + \theta_k lnC_{t-1k} - \gamma_k}.$$ [86]

Since this elasticity measures the degree of concavity of the utility function, the rank for this derived parameter may be [0, ∞), depending on the degree of substitutability of the different categories of consumption. We are interested in obtaining estimations of this elastiticy from the parameters of the reduced form, for each category of consumption. Intuition suggests that those goods that might be characterized as necessities should exhibit a lower degree of intertemporal substitution, whereas those that usually come up as luxuries might present higher possibilities of postponing its consumption.

4.3 - VARIABLES AND ECONOMETRIC ISSUES

4.3.1 - Data and variables

The data used in this chapter is obtained from the Encuesta Continua de Presupuestos Familiares (E.C.P.F.). This survey conducted by the National Bureau of Statistics (INE, 1985) interviews households since 1985 rotating 1/8 each quarter. Our work covers the period I/1985 - IV/1991. We select those households that stay in the survey the maximum number of periods, that is, 8 quarters to form a balanced panel with T=8 and N=3024. It is worth to mention that representativeness of the selected sample is an important issue to take into account. Including only those units that report the 8 quarters we can question whether we are ensuring representation of the whole population. Besides, those families that abandon the survey before completing the 8 periods usually follow a certain pattern and, thereby, we may have an attrition

[86]Notice that this expression includes the modeled as unobservable term ε_{tk}.

problem. In fact, the sample composition does not change very much when including those units that participate 7 periods. However, it varies when we consider those units that cooperate up to four quarters. This is evidence for a certain attrition. Nevertheless, we can not overcome this problem since the first order conditions we specify involve observations on four consecutive periods. Moreover, the estimation procedure requires adequate instruments, that is, lagged variables, which demands a larger temporal profile. Besides, the gains of working with an unbalanced panel with 8 and 7 observations per household are scarce, whereas the implied computational costs are very high.

In this chapter, we analyze 4 categories of consumption which cover almost totally expenditure on non-durables.[87] We exclude those goods we consider are subject to a selection process, namely, tobacco and petrol.[88] For these categories we may observe a high percentage of zeros due to non-participation. The goods we analyze are: food and beverages, services, housing (including domestic fuel) and semidurables (with items such as clothing and housing semidurables). The construction of these broad consumption categories implies that zero expenditures are rarely observed. Nevertheless, we select those households that do not report any zero all through the covered period in any category.[89]

The price index for each group of consumption can be derived from the disaggregated consumer retail price index using the same weight as to construct the general index and provided by the INE. The nominal interest rate is an after-tax weighted average of different active and passive financial instruments for banks and saving banks.[90]

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[87]Consumption categories are expressed in real terms (pesetas of 1983).

[88]The exclusion of these categories implies to drop the 4.65% of total non-durable expenditure.

[89]Since consumption enters in log terms, we may set this filter. We drop out 16.5% of the observations.

[90]See Cuenca (1994) for further details.

The approach used by Browning and Meghir (1991) for the inclusion of labor variables on consumption choices requires to model a reduced form which takes into account both decisions on consumption and labor. The survey used in this chapter offers a poor information on labor supply variables. To model such a reduced form is somehow limited by the available variables which refer to employment status, dummies of participation, the number of earners in the family, education and age for the head of the household. Thus, we are omitting two relevant variables in labor supply such as wages and the number of worked hours.[91] Such a poor specification becomes a relative important problem for estimations in levels. Nevertheless, we neglect this problem since most of these variables rarely change in time. Specifying the model in first differences we will capture consumption growth due to shifts and changes of the variables that vary in time. According to this, we opt for including the labor position as conditioning variables, which in fact capture most of the predicted changes in income. Also, we include the number of members and the number of earners in each household.

4.3.2 - Econometric issues

The procedure used to estimate the K first order equations set as orthogonality conditions is the Generalized Method of Moments (GMM). These conditions are the products of equations and instruments. According to the notation used by Hansen (1982), the orthogonality conditions may be written, depending on consumption at different periods, nominal interest rates and characteristics of the household $\kappa_{it} = (i_t \, , \, z_{it} \,)$, as:

[4.13]

$$E\left[\eta_{ikt}\left(\beta_k \, , \, c_{ikt-1} \, , \, c_{ikt} \, , \, c_{ikt+1} \, , \, c_{ikt+2} \, , \, \kappa_{it,} \, \kappa_{it+1}\right) \otimes \chi_{ikt}\right] = 0 \, .$$

[91]The effect of number of hours is already captured by setting a dummy on participation since it is the same for all full-time workers. In Spain, part-time workers represent a low percentage of the working population.

In our case, the system will be overidentified because we have more moment equations than parameters to estimate. The GMM procedure minimizes the products of the equations and instruments using as a weighting matrix an estimate of the expected variance-covariance matrix. This is previously obtained from the generated residuals of a three step least squares estimation (3SLS). With serially independent errors, such a matrix is the optimal choice to weight the orthogonality conditions.[92] Arellano and Bond (1991) suggest another two step estimator which uses as a weighting matrix an arbitrary one in order to obtain a first step set of estimators. From these estimators, they compute a consistent variance-covariance matrix of the residuals which is used in a second step to calculate a new set of estimators. Both estimators are asymptotically equivalent under the null hypothesis of serially independent errors. If the errors are serially correlated, instruments for the previous 3SLS estimation must be chosen taking into account the possible non-orthogonality between the selected instruments and the error structure, in order to ensure consistency for the variance and covariance matrix of the residuals.

We obtain the equations to be estimated from the orthogonality conditions, after substituting the expectation by its realization, and introducing an error term dated at $t+1$. Moreover, we also must include the individual unobservable heterogeneity through the parameter ε_{ikt} which is time dependent, considered from the socioeconomic specification. This term ε_{ikt} can be decomposed in two parts: λ_{ik} will correspond to the latent individual effect whereas ω_{ikt} picks up shocks in preferences. The error we are dealing with has the following serially correlated structure:

[4.14]

$$\eta_{ikt} = -\varepsilon_{ikt} + \beta_k(1 + i_t)\frac{p_{kt}}{p_{kt+1}}\varepsilon_{ikt+1} + \upsilon_{ikt+1},$$

being

$$\varepsilon_{ikt} = \lambda_{ik} + \omega_{ikt}.$$

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92 Hansen (1982).

The assumption of absence of correlation between the individual latent effects and consumption is a rather restrictive hypothesis when working with individual data. Therefore, the estimation in levels of the Euler equations will lead to inconsistent parameter estimates.[93] However, the latent effects λ_{ik} are related to time dependent variables such as prices and interest rates. Hence, first differences will not cancel the correlation unless first order conditions are transformed in such a way that these latent effects are isolated.[94] Doing so and under no correlation of the disturbances, two period lags of differentiated consumption will be suitable instruments for predetermined consumption and consistent estimates may be obtained (Arellano and Bover, 1995 and Blundell and Bond, 1995). If the error follows a moving average process, three period lags might be used instead. Besides, considering rational expectations, all variables known at current period t must be orthogonal to the disturbance. Assuming separability between consumption and leisure, income is also a possible instrument. Since it could be affected by the presence of innovations correlated with the error term (Flavin, 1990), differences of income might be the suitable instrument to use. If specific commodity prices and nominal interest rates are exogenous, current differences of these variables can be used. If not, two period lagged differences will be suitable instruments. The introduced socioeconomic variables which refer to labor market status may also be endogenous. If this is the case, two period lagged labor status variables must also be used as instruments. Also, consumption on conditioning goods must be instrumented with two period lags since these are clearly endogenous variables.

[93]The specification used by Meghir and Weber (1996) also involves observations on 4 consecutive periods. Their study uses the CEX survey which compiles information throughout 5 quarters which only 4 are usable. Hence, it is not possible to obtain a set of instruments in first differences that overcome the almost sure correlation among effects and regressors.

[94]Individual effects are isolated by pre-multiplying the Euler equations by:

$$\frac{\beta_k(1+i_t)p_{kt}}{\beta_k(1+i_t)p_{kt}-p_{kt+1}}.$$

The chi-square statistic derived from the minimization of the orthogonality conditions checks out the validity of the set of used instruments.[95] Also, it may be used to test the presence of correlation in the error structure.[96]

Given the nature of our data, we cannot rule out heteroskedasticity in the error terms. Therefore, we allow for heteroskedasticity of unknown from for the residuals and calculate robust standard errors (White, 1980).

4.4 - RESULTS AND DISCUSSION

Life-cycle hypothesis is not a suitable representation for the consumption behavior under the presence of liquidity constraints. If this is the case, consumption follows the income path too close to be consistent with the life-cycle model. Introducing exogenous variables, such as changes in the household composition and shifts in the labor position, we may control the excess sensitivity of non-durable consumption to predicted changes in income. Also, dependence of current decisions on past choices, modeled with preferences that include lagged consumption as an argument in the utility function, may smooth this correlation between consumption and income.

We first analyze whether the life-cycle hypothesis is a good framework to describe consumption behavior in our data. We analyze the sort of correlation displayed by our data between changes in current consumption and changes in lagged income. In particular, we specify a very simple model as:

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[95]This statistic is assymptotically a test of overidentifying restrictions of the model with degrees of freedom equal to the number of moment restrictions less the number of estimated parameters (Arellano and Bond (1991).

[96]It is possible to do so by comparing different tests, obtained from using suitable lags under the presence or in the abscense of correlation in the error structure. An acceptable test, with degrees of freedom equal to the difference, is ensuring no correlation in the errors.

[4.15]

$$\Delta c_t = \gamma + \beta \, \Delta y_{t-1} + \theta \varepsilon_t .$$

We first estimate this model by GMM, using as instrumental variables information available at t-1 such as two period lagged changes in income and consumption. These instrumental variables preclude that the possible correlation between changes in consumption and income may be due to endogeneity of income or transitory consumption.[97] Quarterly dummies are included in order to control for seasonality. We detect a clear significance for all the categories of consumption except housing (see Table 4.1).[98] These results might lead us to reject life-cycle hypothesis.[99]

If instead we perform the same instrumental variables estimation using lagged consumption as a regressor, we observe significance of lagged consumption changes except on services. This evidence is explained in terms of an expected collinearity between lagged consumption and lagged income changes, once we allow for habits or durability. These results coincide with some empirical works on aggregated data which detect the same sort of first-order autocorrelation for consumption series (Blinder and Deaton, 1985 or Heaton, 1993). Moreover, we expect a positive autocorrelation for non-durables whereas a negative autocorrelation would be much more consistent for durables. The estimates we obtain from this regression fit very much with this intuition. Food and housing are explained according to an habit formation pattern, whereas semidurables as clothing or house semidurables fit much

[97]Problems due to transitory consumption, or equivalently to measurement errors in consumption, may arise since we are not sure that the quarterly data we use correspond to the periods over which consumers decide (Deaton, 1991).

[98]Regressing differences of current consumption on differences of current income, we have obtained similar results in terms of the significance of the parameters.

[99]Mariger and Shaw (1990) argue that, when working with panel data, it is not correct to test excess sensitivity of income by analyzing the correlation in the cross-section between changes in consumption and lagged changes in income. In fact, they point out that cross-section moments cannot be treated as if they were time-series moments. We test for excess sensitivity for different quarters on our data and obtain very similar results than those reported in table 4.1.

more in a durable consumption behavior. Services display a negative correlation, which is non-significantly different than zero, although intuitively we might expect this category to behave with a habit behavior.

Regressing current changes of consumption on lagged changes of income and consumption, we observe that we do not loose the significance for the habit and durability behavior. On the contrary, the excess sensitivity of consumption to predicted income vanishes except for semidurable consumption.[100] Under no borrowing restrictions, life-cycle hypothesis predicts independence of consumption on income. However, detecting correlation among both variables does not imply liquidity constraints. In fact, misspecification in preferences (intertemporal separability) may lead to identify the presence of liquidity constraints. From the above results, we can conclude that once we relax intertemporal separability, by introducing lagged consumption, we do not reject the null of absence of liquidity constraints for all the categories of consumption, except for semidurables. Therefore, the life-cycle hypothesis is a good representation for describing non-durable consumption of Spanish households. It does not come up that clear for semidurable consumption. Nevertheless, it is worth to mention that this reduced specification is certainly very simple and does not include any sort of heterogeneity among individuals.[101] We think that introducing household specific variables, the excess sensitivity for semidurables might diminish.

[100]Cutanda (1996) tests the permanent income model with rational expectations using also data from the ECPF and detects excess sensitivity specially on durable consumption.

[101]See Blundell, Browning and Meghir (1994) who conclude that once they control for labor market status, the excess sensitivity vanishes.

Table 4.1 - EXCESS SENSITIVITY OF CONSUMPTION

		Dep. var. Δc_t	Dep. var. Δc_t	Dep. var. Δc_t
Food	Δy_{t-1}	0.016 (0.007)		0.001 (0.004)
	Δc_{t-1}		0.048 (0.021)	0.049 (0.022)
Housing	Δy_{t-1}	0.001 (0.008)		0.008 (0.005)
	Δc_{t-1}		0.073 (0.025)	0.074 (0.025)
Services	Δy_{t-1}	-0.050 (0.013)		-0.008 (0.008)
	Δc_{t-1}		-0.011 (0.017)	-0.012 (0.017)
Semidur.	Δy_{t-1}	0.026 (0.010)		0.029 (0.008)
	Δc_{t-1}		-0.140 (0.021)	-0.175 (0.021)
Sargan-Test (d.f.)		122.6 (80)	96.4 (80)	82.5 (76)
P-value		0.001	0.105	0.28

Note: Standard errors are in parentheses.

The analysis of correlation in consumption between different periods is also analyzed by running an autoregressive vector of third order for each category of consumption on its lagged levels and on the lags of the other categories, using OLS. According to the results presented in the following Table 4.2, we assess the presence of a high correlation between levels of consumption on different periods. The autoregressive vectors of third order show dependence of current consumption on all the lagged periods for all categories. We also detect some significance on the crossed effects, specially on the first lag.

Table 4.2 - AUTOREGRESSIVE VECTORS

	Food	Semidurables	Services	Housing
food t-1	0,342	0,097	0,047	0,002
	(0,009)	(0,018)	(0,015)	(0,008)
food t-2	0,264	0,061	0,005	-0,011
	(0,009)	(0,018)	(0,015)	(0,008)
food t-3	0,225	0,024	0,026	0,006
	(0,009)	(0,018)	(0,016)	(0,008)
semidur t-1	0,014	0,199	0,056	0,004
	(0,005)	(0,009)	(0,008)	(0,004)
semidur t-2	0,017	0,255	0,019	0,003
	(0,004)	(0,009)	(0,008)	(0,004)
semidur t-3	-0,003	0,128	0,017	-0,002
	(0,004)	(0,009)	(0,008)	(0,004)
services t-1	0,033	0,074	0,322	0,019
	(0,005)	(0,010)	(0,009)	(0,005)
services t-2	0,007	0,026	0,279	-0,002
	(0,005)	(0,011)	(0,009)	(0,005)
services t-3	-0,013	0,045	0,216	0,004
	(0,005)	(0,010)	(0,009)	(0,005)
housing t-1	0,013	0,052	0,060	0,410
	(0,010)	(0,019)	(0,017)	(0,009)
housing t-2	-0,015	0,014	0,001	0,270
	(0,010)	(0,020)	(0,017)	(0,009)
housing t-3	0,003	-0,001	0,009	0,238
	(0,009)	(0,019)	(0,016)	(0,009)

Note: Standard errors are in parentheses.

We now turn to the estimation of the K first order conditions. The derived K first order conditions are linear in the parameters if the parameter β, related to the discount factor, is fixed. If not, the estimation problem is not linear and convergence becomes much more difficult to achieve. We have tried several values for this parameter and the estimations of the rest of parameters do not differ markedly.[102]

[102]The results presented here use as a rate of time preference β=0.95. These results are not very sensitive to changes in the value of this parameter, especially estimations in first differences. The observed and intuitive pattern is that the EIS estimators increase their values for lower discount rates. We also have tried to distinguish a different β according to a different socioeconomic position by considering a lower impatience for consumption on those households for which the head is self-employed. Nevertheless, the estimations do not differ very much from those presented here.

We present results for the 4 categories. These results correspond to the specification in first differences (Tables C.1 and C.2 in Appendix C). Although the presented results are obtained exploiting cross-equation correlations, a detailed analysis on each equation detects the presence of autocorrelation for the error structure on the food consumption. First differences estimations reject as instruments two period lags of consumption for this equation. If instead we use three period lags, orthogonality is not rejected. For the rest of equations, two lags of their own consumption are used as instruments and the non-correlated error structure hypothesis is not rejected (see the Sargan-tests in Tables C.1 and C.2). Table C.1 uses one orthogonal lag in first differences for each consumption category whereas Table C.2 exploits all the available information and uses all the orthogonal lags. We also present estimations in levels (see Table C.3). Recall that the levels specification does not remove the individual effects and its correlation with consumption will bias the estimations.

We test whether labor status and socioeconomic variables are strictly exogenous or endogenous by using current differences or two period lag differences. We report the Sargan-tests for strong exogeneity for these variables. A test for strong exogeneity of the nominal interest rates variables is also provided. According to these tests, we assume endogeneity for labor variables whereas exogeneity applies for the nominal interest rates.

We pointed out that attrition was a problem when working with the subsample that completed the whole temporal rotation. When the specification is in first differences, attrition becomes a minor problem since we are controlling for both observable and unobservable heterogeneity. Socioeconomic variables have a small variation over time, specially those that are introduced as dummies. Hence, the estimation of the Euler equations in first differences can imply that these variables are not relevant. In general, the significance of the variables referring to the composition of the family is quite poor. However, labor status and participation dummies are in general very significant. The sign of these variables captures the effects of shifts in these variables on the marginal utility of each category according to the expected. For instance, a change from participation to non-participation implies a decrease in the marginal utility for a given level of consumption.

Entering consumption on other goods as conditioning variables seems to have little impact on the estimated results (see Table C.1). Estimates reported in Table C.2 using all lags show a higher significance, specially for semidurables. A first interpretation suggests that such a poor correlation between consumption on different goods helps justifying the invoked additive separability for the utility function. It can also be considered as an evidence on the low degree of substitution among the different categories of consumption. Nevertheless, recalling the previous evidence of correlation detected from the autoregressive vectors, we may also think that such a low dependence may be due to a misspecification in preferences when assuming additive separability. Durable consumption does not affect non-durable consumption growth and separability can be imposed.

According to the sign and significance of the θ_k, parameters on Tables C.1, C.2, we conclude that all categories are intertemporally non-separable and exhibit habit behavior, including semidurables. Given the nature of goods included in this category, we would expect a positive sign and hence a durable pattern. However, we pointed out that life-cycle framework was not a suitable way to approach consumption on these goods. Moreover, we think that consumption on items included in this category might be proxied with data on stocks, as we should do for durables. Finally, the nature of both semidurables and durables implies an important presence or zeros mainly due to infrequency of purchase. The heterogeneity of items included in the aggregates in order to reduce its impact may explain somehow this positive sign.

The parameters associated to lagged consumption in the utility function increase their significance when omitting the socioeconomic variables. The first implication from this result is that the allocation of total non-durable consumption over time is affected by changes in the household composition and labor status. Therefore, we can conclude that a poor specification of this dependence may lead to a wrong non-rejection of the hypothesis of intertemporal separability. Since the parameters reflecting dynamics increase their significance, we may deduce that there are spurious dynamics. In other words, assuming separability between consumption and leisure and not conditioning on these variables, may imply that preferences are intertemporally non-separable.[103]

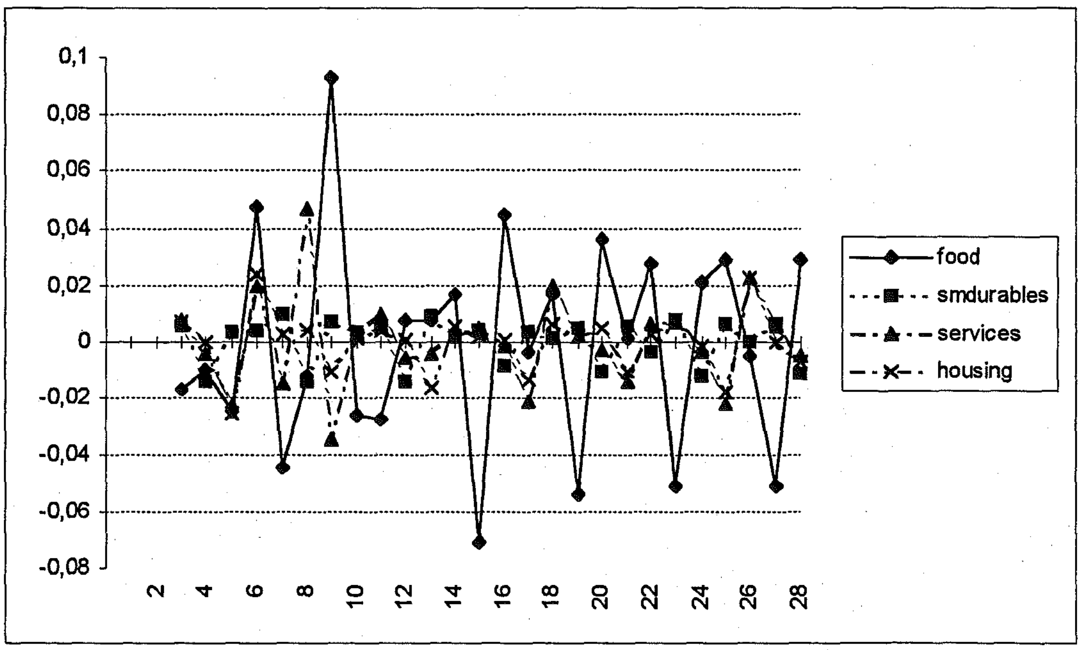
Our results contrast sharply with those obtained by Meghir and Weber (1996) using a panel data with only 4 observations per household. In their paper, preferences upon 3 aggregates are revealed as intertemporally separable. In Table C.4, we present estimations on our data selecting also the same profile for each household (t=4). Since our model involves observations on 4 periods, this application implies to consider data as a cross-section. First of all, we observe an upward bias on the EIS estimations with respect to those obtained using 8 quarters, but an even clearer result is the non-significance on the dynamics. From this evidence, we conclude that having a large enough profile for each household is crucial when testing intertemporal separability. Besides, we are able to control for individual effects.

The initial utility function does not impose directly homotheticity but it can be tested in a straightforward way. Imposing homotheticity leads to Cobb-Douglas preferences and, under this assumption, the proportion of expenditure of current and future consumption on each good will be independent of the amount of total expenditure. Such an assumption is very restrictive and will only make sense if we observe a constant in time commodity specific interest rate. If for instance, we observe a fall in the real interest rate, as a result of a rise in future prices, we expect a substitution of

[103] Intertemporal separability is also rejected in Lopez-Salido (1995) for an aggregate non-durable category of consumption.

future consumption for current consumption. However, an income effect will lead to a fall in current consumption and hence a rise in savings in order to provide a certain standard of future living. It seems very restrictive to assume a zero net result for current consumption. In a steady in time real interest rates environment, we expect present consumption to rise proportionally with future consumption. We derive real interest rates for each category of consumption by constructing relative price indexes. We might expect that those categories for which the relative prices from period to period had a large variation would reject homotheticity whereas those for which relative prices hardly change would pass the homotheticity test. Figure 1 plots the variation of first differentiated relative price indexes of each category of consumption. All of them, except food, display a slight variability. This explains the poor significance of the γ_k parameters which are only significant for consumption on food and housing.

Figure 4.1 - TEMPORAL RELATIVE PRICE INDEXES



From the reduced form parameters we obtain the elasticity of intertemporal substitution (EIS). We present results evaluated at individual means.[104] These structural parameters do not seem to be very sensitive to the discount factor we consider. The structural parameters are all highly significant. Furthermore, the inclusion of differences of income as instrument does not affect in an specific pattern the EIS.

Intuition suggests that luxuries might show a higher degree of intertemporal substitution whereas necessities might present a lower one. First of all, we characterize goods as luxuries or necessities by specifying an Almost Ideal Model (Deaton and Muellbauer, 1980) on the four categories of consumption we consider. Also, we take into account the presence of individual effects and consider the estimation in first differences. Once these effects are considered, and assuming no measurement error, we obtain the price and expenditure parameters by a seemingly unrelated regression. We present the expenditure parameters and the derived expenditure elasticities (see results on Table 3).[105] The results accord with a priori expectations since semidurables and services are revealed as luxuries whereas food and housing expenditures as necessities.

Comparing these expenditure elasticities with the intertemporal elasticity of substitution, we detect that, effectively, luxuries show a higher degree of substitutability in time whereas necessities a lower one. Moreover, the test on the rejection of the null of an EIS equal to unity is more powerful for necessities.

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[104]Recall that the derived expression for the EIS includes an unobservable term which is assumed to be zero when evaluated at the mean.

[105]The income elasticities are derived using the following expression:

$$\varepsilon_k = \frac{\beta_k}{\overline{w_k}} + 1,$$

being β_k the obtained parameters, and $\overline{w_k}$ the sample mean expenditure shares.

Table 4.3 - EXPENDITURE ELASTICITIES

	Exp. Parameters	Exp. Elasticities
Food	-0.111 (0.002)	0.67 (0.010)
Semidurables	0.099 (0.003)	1.50 (0.019)
Services	0.074 (0.002)	1.33 (0.020)
Housing	-0.062 (0.002)	0.73 (0.022)

Note: Standard errors are in parentheses.

Hall (1988) points out that the choice of proper instruments implies lower estimates of the EIS of consumption. For aggregate data, he finds values for a single aggregate commodity close to zero. Runkle (1991) finds an EIS of 0.45 for food consumption using individual data. Also for food consumption, Naik and Moore (1996) derive an EIS of 0.23 using a panel data at the individual level (PSID).[106] Attanasio and Weber (1995) obtain values among 0.56 and 0.67 for total non-durable consumption. López-Salido (1995) finds higher values for the Spanish economy also on total non-durable consumption, among 0.71 and 1.02. We report specific values for each commodity within this rank. Nevertheless, our parameter results for the EIS are not comparable with those obtained by Meghir and Weber (1996) since their results refer to intertemporal price elasticity of substitution.[107] Despite this inconvenience, all the elasticities derived from the use of 4 quarters per household on our study are in general upwardly biased (see Table C.4). Once more, we have evidence about the importance of having a long enough temporal profile for each household, in order to control for latent individual effects.

[106]Separability between food consumption and other goods is assumed.

[107]Their results describe the suggested proposition that luxuries display higher values than necessities. Moreover, the parameters are especially sensitive to labor market status.

Constantinides (1990) shows that, with habit formation, the EIS is substantially less than unity. Nevertheless, the above survey suggests higher values when working with data at the individual level. Although our results for necessities display lower values than luxuries, we can not characterize such low values for the EIS for the Spanish economy when evaluated at mean values. We analyze the stability of these parameters to different labor positions. We present results for different subsamples depending on the labor market status and on participation of the head of the household (see Table 4.4). First of all, we observe that the EIS moves within a wider rank. Values for the self-umployed subsample do not differ very much from those for the unskilled except for food and semidurables. Self-umployed display a higher value for the former and a lower one for the latter. For participation subsamples, we may characterize that elasticities for non-active households are below those for active households except for housing. From this evidence, we might conclude that there are substantial differences on the parameters depending on the subsample we consider, and hence, composition and representativeness of the final sample seems to be of crucial importance.

Table 4.4 - ELASTICITY OF INTERTEMPORAL SUBSTITUTION (on different subsamples)

	Mean	Self-umployed	Unskilled	Non-active	Active
Food	0,945	0,965	0,844	0,861	0,943
	(0,002)	(0,045)	(0,048)	(0,008)	(0,005)
Semidurables	1,004	0,603	1,004	0,934	0,964
	(0,010)	(0,069)	(0,035)	(10,455)	(0,142)
Services	0,967	0,814	0,812	0,911	0,917
	(0,008)	(0,050)	(0,014)	(0,021)	(0,010)
Housing	0,865	1,106	1,132	2,032	1,158
	(0,004)	(0,032)	(0,042)	(0,009)	(0,008)
Sargan-test	190,7 (157)	144,1 (129)	156,1 (129)	158,31 (129)	158,3 (129)
P-value	0,021	0,309	0,171	0,052	0,040
Number obs.	3024	387	217	845	2031

Note: Standard errors are in parentheses

4.5 - SUMMARY AND CONCLUSIONS

In this chapter, we specify a set of intertemporal preferences that nest habits and durability in a life-cycle framework. These preferences impose within period separability among the modeled goods, durable goods and leisure. Nevertheless, we relax all these assumptions by including as conditioning factors consumption on other goods and labor variables. Estimation in both first differences and levels of the derived K-Euler equations is by the GMM procedure. We use the E.C.P.F. survey to contrast our set of preferences. Following households across 8 quarters, we have a large profile for each household. It allows us to control for individual effects over the life-cycle of both observable heterogeneity and individual latent effects.

Our main conclusions from the results are:

a) We show that the usually observed excess sensitivity of consumption to income vanishes for all categories expect semidurables, when modifying preferences in such a way that habits and durability are allowed for. From this result, we might conclude that the life-cycle hypothesis is not a good representation for the behavior of households as far as the consumption of this category is concerned.

b) The significance of the dynamic parameters shows that preferences are intertemporally non-separable. This result is sensitive on the availability of suitable instruments for the consumption categories. Therefore, a large enough profile for each family is required in order to derive instruments that may ensure consistency. In fact, if we take too a short profile for each family (so short that it does not allow to treat data as a panel) intertemporal separability is not rejected. Besides, the panel data structure allows to control for individual latent effects.

c) Consumption on the modeled goods is also non-separable from labor variables. Entering labor status variables and participation dummies diminishes the significance of the dynamic parameters and hence their omission may lead to spurious dynamics.

d) Within period separability among goods seems to be a restrictive hypothesis. Estimates for simple VAR of order 3 detect that some of the cross-relationships are significant. Moreover, evidence in this line is detected conditioning consumption on the other categories for the estimated Euler equations. Therefore, we think that interaction among goods should be modeled through preferences instead of assuming additive separability.

e) For all the estimations, we observe that consumption on the modeled goods shows inertia or habits. Furthermore, we obtain values for each category for the EIS within a rank of (0.71-1.00). This reflects the existence of intertemporal substitution on non-durable consumption. Moreover, comparing the EIS derived for each category of consumption when using t=8 with the same parameters on t=4, we observe a clear upward bias for the latter. Besides, we describe a correlation between the EIS and expenditure elasticities. Those goods that are revealed as necessities show a lower EIS whereas those that are luxuries are associated to a higher one. This range is wider for different subsamples defined from labor market variables. Therefore, representativeness of the sample becomes an important issue.

From these results we conclude that two issues are of crucial importance. First, treating consumption as a single aggregate that includes semidurables may lead to biased estimators. Second, it is necessary to have a large enough profile for each household in order to test for intertemporal separability. Moreover, following households across a long enough period, we are able to control for the latent effects. Their omission leads to biased estimators.

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APPENDIX C

Table C.1- ESTIMATION IN FIRST DIFFERENCES (ONE LAG)

	FOOD	SMDURABLES	SERVICES	HOUSING
food		0,00001	-0,00004	-0,00014
		(0,00008)	(0,00005)	(0,00002)
smdurables	0,00001		-0,00007	-0,00003
	(0,00002)		(0,00005)	(0,00004)
services	-0,00001	0,00005		0,00000
	(0,00002)	(0,00004)		(0,00004)
housing	-0,00002	-0,00013	0,00005	
	(0,00002)	(0,00005)	(0,00006)	
others	0,00001	0,00005	0,00001	0,00000
	(0,00002)	(0,00002)	(0,00002)	(0,00001)
n.members	0,02579	-0,03367	-0,01961	0,00425
	(0,00856)	(0,02000)	(0,01308)	(0,01124)
n.earners	-0,00170	-0,02848	-0,00294	-0,01490
	(0,00637)	(0,01546)	(0,02020)	(0,00786)
1st.quarter	0,00170	0,02289	-0,02188	-0,03317
	(0,01082)	(0,03117)	(0,02002)	(0,01596)
2nd. quarter	-0,01904	-0,03642	-0,04009	0,01687
	(0,01858)	(0,03548)	(0,02328)	(0,02511)
3rd. quarter	-0,05349	-0,07957	0,02371	0,00319
	(0,01139)	(0,04610)	(0,02617)	(0,01277)
non-active	-0,05449	-0,22399	-0,33254	-0,46484
	(0,03597)	(0,06376)	(0,04933)	(0,07967)
unskilled	0,05239	-0,12211	-0,20208	-0,42557
	(0,03763)	(0,06362)	(0,08130)	(0,07586)
self-employed	-0,08009	-0,23579	-0,32661	-0,21928
	(0,03928)	(0,09146)	(0,09358)	(0,10892)
gamma	0,03187	0,00385	0,03330	0,098876
	(0,00884)	(0,01957)	(0,02239)	(0,02780)
theta	-0,08554	-0,06094	-0,06964	-0,07890
	(0,00253)	(0,01144)	(0,00744)	(0,01046)
EIS	0,90452	0,99774	0,94253	0,71268
	(0,00165)	(0,15321)	(0,01231)	(0,00853)
EIS=1	-0,09548	-0,00226	-0,05747	-0,28732
	(0,00165)	(0,15321)	(0,01231)	(0,00853)

Sargan-Test: 114,6 (99) P-value 0,08

Exog. Test:

interest rates 6,58 (13)

labor var. 56,42 (12)

Note: Standard errors are in parentheses.

Table C.2 - ESTIMATION IN FIRST DIFFERENCES (ALL LAGS)

	FOOD	SMDURABLES	SERVICES	HOUSING
food		0,00001	-0,00006	-0,00013
		(0,00005)	(0,00004)	(0,00002)
smdurables	-0,00001		-0,00002	-0,00002
	(0,00001)		(0,00004)	(0,00003)
services	-0,00000	-0,00001		-0,00001
	(0,00001)	(0,00002)		(0,00003)
housing	-0,00001	-0,00013	-0,00002	
	(0,00002)	(0,00003)	(0,00002)	
others	0,00000	0,00003	-0,00001	0,00001
	(0,00001)	(0,00001)	(0,00002)	(0,00001)
n.members	0,02276	-0,01209	-0,02266	-0,00780
	(0,00619)	(0,01584)	(0,00961)	(0,01082)
n.earners	-0,00415	-0,02344	-0,00367	-0,01775
	(0,00466)	(0,01053)	(0,01823)	(0,00759)
1st.quarter	0,00306	0,03116	-0,00670	-0,02502
	(0,00660)	(0,02402)	(0,01542)	(0,01150)
2nd. Quarter	-0,01625	-0,06720	-0,04252	0,00626
	(0,01150)	(0,01962)	(0,01979)	(0,01878)
3rd. quarter	-0,00058	-0,11021	0,03699	0,00416
	(0,00758)	(0,02484)	(0,01863)	(0,01004)
non-active	-0,05941	-0,29126	-0,35643	-0,55892
	(0,02636)	(0,04573)	(0,04274)	(0,05771)
unskilled	0,04357	-0,01649	-0,16623	-0,50738
	(0,02837)	(0,04402)	(0,06138)	(0,06543)
self-employed	-0,08356	-0,26744	-0,21273	-0,26991
	(0,04080)	(0,04834)	(0,05427)	(0,09331)
gamma	0,02293	-0,00385	0,02291	0,06609
	(0,00587)	(0,01359)	(0,01316)	(0,02140)
theta	-0,08406	-0,05171	-0,06597	-0,06189
	(0,00173)	(0,00578)	(0,00549)	(0,00806)
EIS	0,94554	1,00452	0,96721	0,86553
	(0,00194)	(0,00954)	(0,00769)	(0,00432)
EIS=1	-0,05446	0,00452	-0,03279	-0,13447
	(0,00194)	(0,00954)	(0,00769)	(0,00432)

Sargan-Test: 190,7 (157) P-value 0,021

Exog. Test:

interest rates 3,6 (4)

labor var. 125,4 (12)

Note: Standard errors are in parentheses.

Table C.3 - ESTIMATION IN LEVELS

	FOOD	SMDURABLES	SERVICES	HOUSING
food		-0,00021	-0,00010	-0,00007
		(0,00008	(0,00006)	(0,00002)
smdurables	0,00001		-0,00004	0,00001
	(0,00002		(0,00004)	(0,00003)
services	-0,00002	-0,00003		0,00001
	(0,00002	(0,00005)		(0,00003)
housing	-0,00000	-0,00006	-0,00001	
	(0,00001	(0,00003)	(0,00005)	
others	0,00001	0,00004	0,00004	0,00002
	(0,00001	(0,00003)	(0,00004)	(0,00002)
n.members	0,03267	0,03088	-0,09919	-0,14031
	(0,00947	(0,03050)	(0,00755)	(0,02477)
n.earners	-0,00953	-0,06640	0,01364	-0,10482
	(0,01034	(0,02844)	(0,01974)	(0,01834)
1st. Quarter	0,01361	-0,02489	-0,06041	-0,03197
	(0,00652	(0,04433)	(0,02728)	(0,01922)
2nd. Quarter	-0,01539	-0,06776	-0,05369	-0,03176
	(0,00985	(0,03011)	(0,02357)	(0,01755)
3rd. Quarter	0,02016	-0,04357	-0,07559	-0,02777
	(0,01289	(0,04662)	(0,03720)	(0,02005)
non-active	-0,14529	-0,48125	-0,65024	-0,63001
	(0,03144	(0,06188)	(0,05260)	(0,04884)
unskilled	-0,08292	-0,12798	-0,38391	-0,13517
	(0,04271	(0,08739)	(0,06787)	(0,08457)
self-umployed.	0,03512	-0,32494	-0,48981	-0,17459
	(0,02451	(0,05992)	(0,06115)	(0,09080)
gamma	-0,01195	0,02030	0,01775	0,02747
	(0,00525	(0,01834)	(0,02108)	(0,01230)
theta	-0,07666	-0,04127	-0,01849	-0,02986
	(0,00276	(0,00582)	(0,00447)	(0,00759)
EIS	1,02584	0,99655	0,97445	0,96441
	(0,00802)	(0,01698)	(0,01122)	(0,01253)
EIS=1	0,02584	0,00345	-0,02555	-0,03559
	(0,00802)	(0,01698)	(0,01122)	(0,01253)

Sargan-Test: 154,2 (127) P-value 0,002

Exog. Test:

interest rates 4,60 (4)

labor var. 14,54 (12)

Note: Standard errors are in parentheses.

Table C.4 - ESTIMATION IN LEVELS (t=4)

	FOOD	SMDURABLES	SERVICES	HOUSING
food		-0,00055	0,00072	0,00021
		(0,00228)	(0,00104)	(0,00032)
smdurables	-0,00021		-0,00018	-0,00011
	(0,00029)		(0,00121)	(0,00024)
services	-0,00061	-0,00032		-0,00012
	(0,00083)	(0,00093)		(0,00069)
housing	-0,00003	0,00009	-0,00063	
	(0,00024)	(0,00016)	(0,00130)	
others	0,00000	0,00005	-0,00055	-0,00008
	(0,00047)	(0,00030)	(0,00092)	(0,00016)
n.members	0,02342	0,02166	0,29206	-0,15901
	(0,25899)	(0,51774)	(0,51768)	(0,49735)
n.earners	0,05607	-0,21501	-0,50871	0,08154
	(0,47026)	(0,17841)	(1,03987)	(0,07607)
1st. Quarter	0,18238	0,08963	0,01026	0,04094
	(0,34436)	(0,22094)	(0,25071)	(0,14588)
2nd. Quarter	0,16705	-0,30645	-0,96241	0,01938
	(0,37347)	(0,71693)	(1,40567)	(0,16099)
3rd. Quarter	0,23511	0,13703	0,77004	-0,00600
	(0,45055)	(0,25226)	(1,23529)	(0,24551)
non-active	-0,34228	-0,58174	0,46573	-1,20431
	(0,53354)	(0,94384)	(1,87349)	(0,85557)
unskilled	-1,15478	-0,64835	0,27645	-0,08987
	(1,66667)	(1,83828)	(1,69018)	(0,68807)
self-umployed.	1,02876	-0,27926	-0,31236	-0,02772
	(1,47823)	(0,38349)	(1,66921)	(0,96026)
gamma	-0,24628	0,37127	0,45578	0,03949
	(0,27957)	(0,62075)	(0,85225)	(0,01713)
theta	0,00257	-0,07049	-0,19513	-0,05457
	(0,10469)	(0,07169)	(0,19548)	(0,10869)
EIS	1,14421	2,12600	1,37075	0,95550
	(0,01235)	(2,32665)	(0,80125)	(0,42113)
EIS=1	0,14421	1,12600	0,37075	-0,04045
	(0,01235)	(2,32665)	(0,80125)	(0,42113)

Sargan-Test: 0,436 (4) P-value 0,979

Note: Standard errors are in parentheses.