CONSUMPTION PARTIAL INSURANCE OF SPANISH HOUSEHOLDS

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Abstract

This paper measures how households smooth changes in consumption when incomes are shifted by permanent or transitory shocks at country and regional level. I compute insurance capacity using the Spanish Continuous Family Expenditure Survey skipping the imputation methods used by the previous literature to mitigate the significant lack of income and consumption panel data information. I find some partial insurance for permanent shocks and a downward bias when imputed data are used. There is significant sensitivity for the youngest and primary educated cohorts that becomes more relevant in some regions. I obtain that durable purchases are a source of insurance with respect to transitory shocks and the effect of family income transfers is almost negligible.

Keywords: Consumption, income, insurance.

JEL classification: D12, D91, I30.

Resumen

Este artículo analiza como los hogares españoles suavizan las variaciones en su nivel de consumo cuando su renta cambia de forma transitoria o permanente. Para ello, se utilizan los datos de panel disponibles en la Encuesta Continua de Presupuesto Familiares que permiten evitar el uso de procedimientos de imputación empleados en la literatura para disponer de información de renta y consumo para un mismo hogar. Los resultados muestran que las familias españolas tienen una capacidad parcial de asegurar el consumo ante cambios permanentes de su renta, que disminuye para el caso de los hogares más jóvenes o con menor nivel de estudios, existiendo también importantes diferencias a nivel regional. Por último, se observa que el momento de adquisición de los bienes de consumo duradero constituye una importante fuente de aseguramiento ante cambios transitorios de renta y que las tranferencias familiares tienen un papel poco significativo como instrumento para garantizar el consumo.

Palabras claves: Consumo, renta, aseguramiento.

Códigos JEL: D12, D91, I30.

1 Introduction

Most of the consumption literature has referred to the properties of consumption levels and consumption changes on average. However, developments in the cross-section distribution (or inequality) of income and consumption are also very informative about the relevant model that describes the data. This paper examines the link between changes in income and consumption distribution to identify households' consumption partial insurance capacity[1].

The partial insurance mechanisms are the smoothing devices households have to smooth changes in consumption, when incomes are shifted by permanent or transitory shocks. Therefore, in the context of this paper, insurance measures the degree of transmission of income shocks to consumption. Some examples in the literature to date are family networks or internal family income transfers (Kotlikoff and Spivak 1981; Attanasio and Rios-Rull 2000), the added worker effects (Lundberg 1985; Stephens 2002), selection of time of expenditures (Browning and Crossley 2000), progressive income taxation (Kimball and Mankiw 1989; Auerbach and Feenberg 2000), food stamps (Blundell and Pistaferri 2003) or unemployment schemes (Engen and Gruber 2001; Browning and Crossley 2001). This insurance depends on the persistence of income shocks (permanent or transitory) and on the access to credit markets. Moreover, it varies in importance across different types of households, at different points of their life cycle and at different points in time.

This paper is the first in the literature to measure household partial insurance capacity with respect to permanent and transitory shocks using a European dataset. It explores the differences in insurance capacity at regional level, analysing developments in the income and consumption distributions.

This article makes a second relevant contribution. The identification of partial insurance parameters requires a long-dated and good-quality income and consump-

[1] See Casado (2011) for a complete discussion of the different frameworks in the theoretical literature that analyzes the link between consumption insurance and income shocks.

tion panel data set. However, there is a significant lack of income and consumption panel data information in the US and UK surveys. This forces researchers to use several empirical strategies (e.g. imputation methods) to resolve the lack of data. To avoid these methods, I use a unique household-level data set of quarterly spending (Spanish Continuous Family Expenditure Survey, hereafter ECPF, by its Spanish abbreviation), which contains both good-quality income and consumption panel data information. Using this survey, I can estimate the income and consumption process skipping the imputation methods and compare the results with those obtained using the imputation methodology in order to compute the bias incurred using "artificial" data. I also recalculate the results for the US economy using the percentage of bias found in the Spanish data and compare the insurance parameters of the US and Spanish economies.

A better understanding of the level of households' consumption insurance capacity could be useful for a suitable implementation of economic policy. A sound knowledge of the household insurance capacity and of the specific mechanisms that families have to smooth recession periods, will help to mitigate the social and economic consequences of future economic shocks, improving the sustainability of our welfare state.

Furthermore, the comparison of the insurance capacity of Spanish households at NUTS-II level provides us with an additional measurement of regional inequality. I can calculate regional inequality using the traditional aggregate measures: Gini coefficient, Atkinson or Generalised Entropy Theil Index. However, knowing the joint course of the household income and consumption distribution for each region provides us with an additional instrument to measure inequality (at micro-level) that could be relevant for policymakers in better adjusting automatic stabilizers, regional countercyclical fiscal policies, redistributive policies or antipoverty strategies.

Both new methods and a good-quality database allow us to obtain results that make important contributions to the existing Spanish inequality literature. First of all, I find partial insurance with respect to permanent shocks and full insurance with respect to transitory disturbances. A 10% permanent income shock induces a 4.8% permanent change in consumption (5.2% of partial insurance). There is significant sensitivity for the youngest cohort and therefore only partial insurance with respect to transitory shocks and no insurance with respect to permanent income shocks. Durable goods are particularly useful as a smoothing mechanism, particularly in response to transitory shocks, and the impact of help from relatives is negligible. At regional level, results are heterogenous. I find how some of the Southern Spanish regions concentrate the households with lower insurance capacity. Households living in Andalusia, Extremadura and the Canary Islands have significantly fewer smoothing devices than the average Spanish family. Besides, this result becomes more evident when I distinguish between age or educational attainment. Further, regions with the highest aggregate level of the partial insurance in respect of permanent shocks are those where the gap between the insurance of tertiary and primary educated (an oldest and youngest cohort) is narrowest.

Finally, I find a downward bias of 25% for the whole sample in the point-estimated smoothing capacity when imputed data are used. This bias bears on our outcomes. The distortion leads to the result of non-insurance with respect to permanent shocks not only for the youngest cohorts but also for primary-educated and tenant households. Furthermore, the comparison with the US results[2] (once the imputation bias has been considered) shows us a similar smoothing capacity of Spanish households.

This work is related to other consumption papers in the literature, particularly Deaton and Paxson (1994), Moffitt and Gottschalk (2002), Blundell and Preston (1998) and Blundell et al. (2008), which examine the role of asymmetric information, moral hazard and heterogeneity, and ask how the complete markets model must be amended to include some forms of imperfect insurance. The regional literature on consumption sensitivity has focused on the properties of consumption levels and

[2] Blundell et al. (2008)

consumption changes on average. This paper is the first that examines consumption partial insurance at the regional level. Previously, Lustig and Nieuwerburgh (2010) found how regional consumption is about twice as sensitive to income shocks in the US regions with low housing collateral. The pattern of risk sharing at regional level has been documented for the US economy by Sorensen and Yosha (2000) and for rural India by Townsend (1994). Cavaliere et al. (2006) studied the regional consumption dynamics and risk sharing in Italy, finding a higher insurance capacity of Southern regions against permanent shocks explained by the leading role of the government consumption channel. Further, Hess and Shin (2000) explore whether individual diversify the risk associated within their industries and regions, as well as across industries and regions, finding stronger evidence of within-region and industry risk sharing than across-region and industry risk sharing. The study of partial insurance had not been previously explored for the Spanish economy. However, previous papers (Cutanda (2002), Cutanda et al. (2006) and Labeaga J.M. (2005)) have investigated consumption volatility to analyse changes to permanent income using the ECPF.

This paper goes on to define income and consumption dynamics, deriving the Euler equation, which provides a mapping from the transitory and permanent income shocks to optimal consumption growth. Section 3 discusses data issues and imputation methodology. Section 4.1 presents the partial insurance results at the country and regional levels. Section 4.2 compares the Spanish and US results and provides a measurement of the bias incurred by previous literature when the imputation method was used. Finally, Section 5 concludes with a final discussion about the main findings.

2 Model and Empirical Specification

In this section, I build a model that allows us to identify the degree of transmission of income shocks to consumption. To do that, I need to define an income and consumption model and, from this specification, determine the relevant moments to find the permanent and transitory partial insurance parameters. The income and consumption process of this section follows very closely that of Blundell et al. (2008).

I assume separability in preferences between consumption and leisure. Consequently, all new insurances provided will be reflected in disposable income variability. Therefore, added worker effects and changes in taxes or transfers will pass through income or they will be reflected in the variability of income. Taking this assumption into account, I define the income process for each household $Y_{i,t}$ as a linear function of a set of observable income characteristics that include demographic, education, calendar time and cohort effects variables labelled as $Z_{i,t}$, where the total income also depends on the permanent $P_{i,t}$ and the transitory components $v_{i,t}$. Assuming that the permanent component follows a martingale process and the transitory component follows $MA(q)$, where q is empirically computed using the Akaike Information and the Schwartz Bayesian Information Criterion, the income process is defined by:

$$\Delta y_{i,t} = \zeta_{i,t} + \Delta v_{i,t} \text{ where } y_{i,t} = \log Y_{i,t} - Z'_{i,t}\vartheta_t \tag{1}$$

and $\zeta_{i,t}$ is the random component of the permanent income $P_{i,t}$ and $v_{i,t}$ the transitory component of the income.

The consumption dynamic is derived from the optimization problem of a utility function where preferences are of the CRRA form subject to the intertemporal budget constraint. Computing the mapping from the permanent $\zeta_{i,t}$ and transitory $\varepsilon_{i,t}$ income shocks to the optimal consumption growth following Appendix I, I obtain:

$$\Delta \log C_{i,t} \simeq \Gamma_{i,t} + \xi_{i,t} + \Delta Z'_{i,t}\vartheta'_t + \pi_{i,t}\zeta_{i,t} + \gamma_{t,L}\pi_{i,t}\varepsilon_{i,t} \tag{2}$$

where $\Delta \log C_{i,t}$ is the logarithm of the real non-durable consumption, and $\Gamma_{i,t}$ is the slope of the consumption path for individual i reflecting interest rate, impatience or precautionary savings. $\xi_{i,,t}$ is the innovation to higher moments of the income process, $\Delta Z'_{i,t}\vartheta_t$ is the deterministic preference shift and $\pi_{i,t}\zeta_{i,t}$ the impact of permanent income shocks. Finally, $\gamma_{t,L}\pi_{i,t}\varepsilon_{i,t}$ showed the impact of transitory income shocks where L is the retirement age after which labour income falls to zero and $\gamma_{t,L} = \sum_{j=0}^{q} \alpha_{t+j,L}^{\Delta Z\vartheta - r}\theta_j$ is a weight that increases with age and will be empirically considered as a known parameter rather than an estimated coefficient.

Rearranging (2), I obtain the following expression

$$\Delta c_{i,t} \simeq \xi_{i,t} + \pi_{i,t}\zeta_{i,t} + \gamma_{t,L}\pi_{i,t}\varepsilon_{i,t} \tag{3}$$

where $\Delta c_{i,t} = \Delta \log C_{i,t} - \Gamma_{i,t} - \Delta Z'_{i,t}\vartheta'_t$ is the log of real stochastic consumption component. This Euler equation (3) provides a mapping from the permanent and transitory labour income shocks to the optimal consumption growth. The most important coefficient is $\pi_{i,t} = \frac{\sum_{k=0}^{L-t} Q_{t+k}Y_{i,t-k}}{\sum_{k=0}^{L-t} Q_{t+k}Y_{i,t-k}+A_{i,t}}$, which can be interpreted as the share of future labour income in current human and financial wealth or, more simply, the ratio of human capital wealth to total wealth (the sum of financial and human capital wealth). For example, for a given level of human capital wealth, past saving implies higher financial wealth today, and hence a lower value of $\pi_{i,t}$ that can be interpreted as a first measurement of insurance or precautionary saving. When the current financial assets of the household are small relative to remaining future labour income $\pi_{i,t} \simeq 1$, permanent shocks are translated to consumption (the certainty-equivalence version of PIH where $\pi_{i,t} \simeq 1$ and $\gamma_{t,L} \simeq 0$). In addition, when the stock of assets built up is large relative to future labour income, it can provide insurance against permanent shocks $\pi_{i,t} < 1$ (complete market).

From equation (3) this paper suggests a more flexible model that allows other smoothing devices in addition to saving, borrowing and precautionary saving to smooth consumption against transitory or permanent income shocks, namely family networks, added worker effects, timing of durable purchases, progressive income taxation, mortgage refinancing or the social security public policy programmes. These mechanisms were defined in the introduction as partial insurance devices.

I can differentiate two partial insurance forms. Firstly, those mechanisms that smooth a fraction $(1 - \phi_{i,t})$ of permanent income shocks; and secondly, the devices that smooth a share $(1-\psi_{i,t})$ of transitory income shocks. Therefore, the consumption growth equation (3) can be written in a more flexible version as:

$$\Delta c_{i,t} \simeq \phi_{i,t}\zeta_{i,t} + \psi_{i,t}\varepsilon_{i,t} + \xi_{i,t} \tag{4}$$

where the permanent shock coefficient $\phi_{i,t}$ varies across individuals and time and whose equivalence in the equation (3) is $\pi_{i,t}$. $\psi_{i,t}$ is the coefficient of the transitory shock whose equivalence in equation (3) is $\pi_{i,t}\gamma_{t,L}$. I can interpret that there is full consumption insurance against permanent and transitory income shocks when $\phi_{i,t} = 0$ and $\psi_{i,t} = 0$, respectively, and no insurance when $\phi_{i,t} = \psi_{i,t} = 1$.

The Permanent Income Hypothesis (PIH) version of this model is straightforward. Individuals a long time from the end of their life have low value current financial wealth relative to remaining future labour income $\phi_{i,t} \simeq \pi_{i,t} \simeq 1$, and permanent shocks pass through to consumption. At the same time, transitory shocks are insured though saving $\psi_{i,t} \simeq \pi_{i,t}\gamma_{t,L} \simeq 0$. To include precautionary saving in the PIH, I have to consider that the stock of assets built up is large relative to future labour income $\phi_{i,t} \simeq \pi_{i,t} < 1$, in which case there will also be some smoothing of permanent shocks through self-insurance. However, I can compute $\phi_{i,t}$ and $\psi_{i,t}$ in a more flexible context measuring more general partial insurance parameters. These insurance parameters include self-insurance (precautionary saving) and partial insurance. I cannot identify each insurance component by itself, but I know the degree of transmission of income shocks into consumption for Spanish households, which is the immediate goal of the paper.

The identification of the parameters of interest ($\phi, \psi, \sigma_{\varepsilon}^2, \sigma_{\zeta}^2$ and σ_{ξ}^2), which requires panel data of at least four waves, is detailed in the Appendix II. Estimation procedure is defined in Appendix III.

3 Dataset and the imputation bias

The moments for the identification of the parameters require a long panel data set (at least 4 years) with income and consumption information alike. However, there is a significant lack of income and consumption panel data in UK and US. The lack of panel data containing both good-quality income and consumption information is puzzling given its economic relevance. CEX provides a data set only on the spending habits of US households for four quarters at most. PSID collects good-quality income information, but consumption information is limited to food expenditure (with major gaps). In the UK, the outlays of the Continous Family Expenditure Survey are not monitored over time and the British Household Panel Survey typically lacks consumption data.

This shortcoming has forced researchers to use several empirical strategies to mitigate this problem. Firstly, most of the tests involving individual consumption behaviour have been performed using the scant food expenditure information in the PSID for the US economy. Since the dynamic of food consumption differs in important ways from the dynamic of non-durable consumption, this approach has significant limits[3]. Secondly, an alternative approach to using food is to construct pseudo-panels from repeated cross-section datasets that have a comprehensive measure of consumption, such as the CEX or the FES. In this case, one can study the dynamics of pseudo-persons rather the genuine household dynamics. However, Blundell et al. (2008) show that certain dynamic issues in the consumption literature are better addressed with truly longitudinal data rather than pseudo-panels[4]. Nowa-

[3]First, food is a necessity, which would invalidate any assumption of unit-elastic preference and also implies that food volatility generally underestimates total consumption volatility. Second, if the goal of the empirical analysis is to estimate structural parameters such as the elasticity of intertemporal substitution or the extent of substitutability/complementarity between consumption and leisure, it is not clear that food consumptions are indicative of substitutability of total consumption over time or with respect to labour supply. Finally and third, one has to make a strong assumption ignoring the influence of price variation either by making the assumption that the demand for food is separable from that of other goods or assuming that relative prices movements are appropriately restricted.

[4]Panel data offer more identification power than repeated cross sections.

days, though, the most popular method is to impute consumption in the PSID using demand estimates from CEX. Skinner (1987) proposes imputing total consumption in the PSID using the estimated coefficient of a regression of total consumption on a series of consumption items that are present in both surveys (food, vehicles, utilities, etc.). Ziliak (1998) and Browning and Leth-Petersen (2003) suggest an alternative of imputing consumption on the basis of income and the first difference of wealth. More recently, Blundell et al. (2008) follow the Skinner imputation method but introduce prices, total non-durable expenditure and demographic variables into the food demand equation[5]

Nevertheless, I use a unique household-level data set of quarterly spending (ECPF), which contains both good-quality income and consumption panel data information. The good quality of the data allows us to make two important contributions. Firstly, I estimate the partial insurance parameters overcoming the limitation of the imputation used to solve the lack of information. Secondly, I compare the insurance parameters obtained based on true consumption data with those of imputed consumption data, identifying the direction and magnitude of the bias incurred when "artificial" data are used[6].

The ECPF is a rotating panel based on a survey conducted by the Spanish National Statistics Institute (Instituto Nacional de Estadistica, INE) and the aim of the survey is the construction of weights of the Spanish consumer price index (CPI)[7]. The survey reports a continuous flow of data on the buying habits of Spanish consumers and collects information on socio-demographic variables and geographical information (census tracts, strata, provinces and regions), including income and a wide range of goods expenditures from the first quarter of 1985 to the first quarter of 1997 [8]. The ECPF reports interviews for a sample of 3,200 households every

[5]More details of the imputation method can be found in Appendix IV

[6]The imputation method used in this paper is the same as that used in Blundell et al. (2008) to make the results comparable with the previous literature.

[7]A full description of this survey can be found in (Browning and Collado 2001), Carrasco et al. (2005), Collado and Browning (2007) and Crawford (2010)

[8]Homogenous income information is only reported from the first quarter of 1985 to the fourth quarter of 1995; for that reason, the sample excludes the quarters of 1996 and 1997.

quarter, randomly rotating 12.5% of them each quarter. As a result, I can follow a household for a maximum of eight consecutive quarters. This is a significant advantage when I compare it with the rest. ECPF not only has better consumption and income information but this information is also available over a longer period of time. CEX only interviewed information for a maximum of five quarters[9] and, in the FES, households are interviewed only once.

Partial insurance parameters are initially computed making use of the same definition of non-durable consumption used in the work of Attanasio and Weber (1995). It is the sum of food, alcohol, tobacco and expenditures on other non-durable goods, such as services, heating fuel, public and private transport, personal care and semi-durables like clothing and footwear. Some results also compute the insurance capacity including the durable expenditures, in order to measure the relevance of them. Total income is the aggregation of after-taxes wage income, income from self-employment, capital income, properties income, pensions, unemployment wages, regular transfers and other monetary incomes.

Table 1: Sample selection and data cleaning of the ECPF

CRITERION	Removed Observations	Remaining Observations	Remaining Households
Initial Sample (1985-1995)	0	125394	26098
Single, widower and widow	12495	112899	23303
Age less than 30 or more than 65	31026	81873	16985
Female Head	7068	74805	15605
Born before 1925 or after 1965	2228	72577	15108
Income and consumption outliers	18962	53615	11973
Poor income subsample (below percentile 1%)	536	53077	11909
Rich income subsample (above percentile 1%)	536	52541	11844
Low Consumer (above percentile 1%)	525	52016	11787
Massive Consumer (above percentile 1%)	526	51490	11748

[9]However only four of these quarters are useful (see Bureau of Labor Statistics, Handbook of Methods, for additional details)

The original dataset includes 26,098 households (125,394 observations). I select a sample with the aim of focusing on stable families (married couples headed by a male with or without children), because usually these have higher income and assets and they are more successful in securing access to credit, family networks and other informal insurance devices. For that reason, I eliminate households where the head is single, a widower, a widow and those aged under 30 or over 65. Besides I eliminate households headed by a female and drop those born before 1925 or after 1965. Finally, I take out some graphically detected income outliers and I exclude households whose income and consumption are below or above percentile 1%. This process leaves us with 11,748 households (51,490 observations). Table 3 summarizes the effects of this data cleaning process.

4 The Results

This section presents the results of the insurance capacity of Spanish households at country and regional level and compares the Spanish insurance parameters with previously calculated for the US economy.

Partial insurance parameters are computed removing the impact of the deterministic effects $Z_{i,t}$ on log income and log consumption using separate regressions of these variables on year and year-of-birth dummies and on a set of observable family characteristics: dummies for education, family size, number of children, rural area, home ownership and employment status. I then work with the residuals of these regressions.

Results are introduced into two subsections. Subsection 4.1 shows the partial insurance parameters with respect to permanent and transitory shocks at country and regional level for the Spanish economy. I present the results for the full sample and for some sociodemographics subgroups of interest. Subsection 4.2 includes two stages: firstly, in order to compute the bias incurred from the usage of imputed "artificial" data, I compare the general insurance level calculated with the income and consumption information provided by the ECPF with that obtained using the information derived by the imputation methodology described in Appendix II. Secondly, I recalculate the results for the US economy using the percentage of bias found in the Spanish data and compare the insurance parameters of the US and Spanish economy.

Insurance parameters are estimated by the diagonally weighted minimum distance (DWMD) method, explained in Appendix IV, under the assumption that the coefficients[10] are constant over time[11].

4.1 Partial Insurance at country and regional level

Figure 1 shows the share of consumption insurance with respect to a permanent $(1 - \phi_{i,t})$ and transitory $(1 - \psi_{i,t})$ income shock for the Spanish economy. The estimation of ϕ, the partial insurance coefficient with respect to the permanent shock, for the whole sample, has a value of 0.484 with a 0.029 standard deviation providing evidence of partial insurance[12]. This value should be interpreted as follows: a 10% permanent income shock induces a 4.8% permanent change in consumption, ensuring the remaining 5.2% $(1-\phi_{i,t})$ (Figure 1A). The estimation of ψ, the insurance coefficient for the transitory shock, has a value of 0.038 but is not significant, so it can be concluded that $\psi = 0$ and that there is full insurance for transitory income shocks (Figure 1B).

[10]Coefficients and standard deviations are shown in Appendix V.

[11]I have repeated the exercise allowing the partial insurance parameters to vary over time, but no significant differences were found.

[12]The transitory and permanent coefficients and their standard deviations are reported in Table A.1 of Appendix V.

CONSUMPTION PARTIAL INSURANCE CAPACITY OF THE SPANISH HOUSEHOLDS FIGURE 1

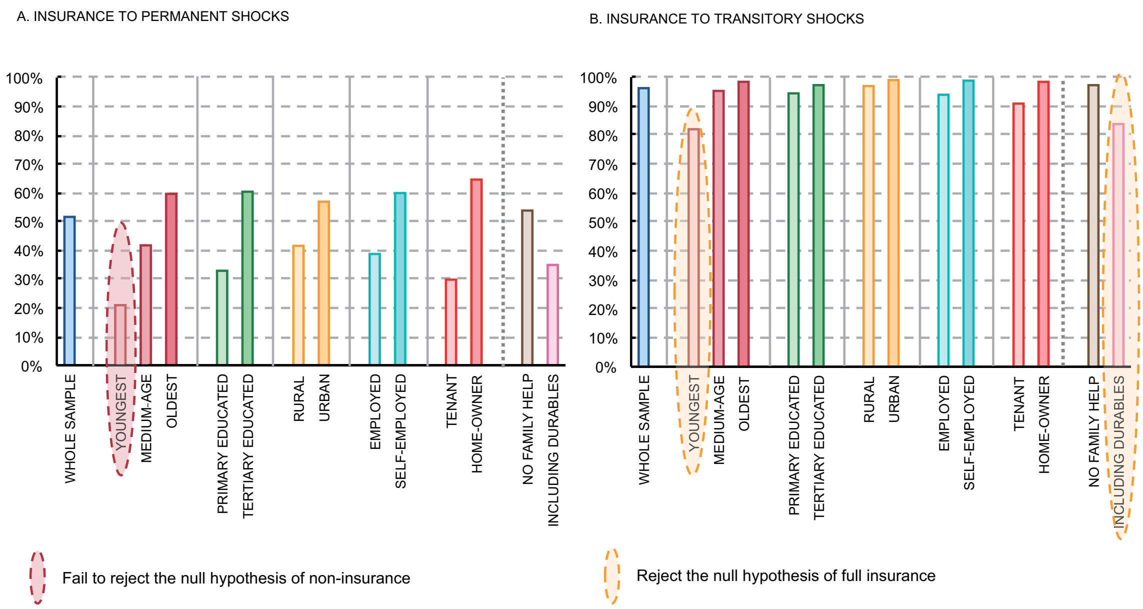


Figure 1 includes the results for some socio-demographic subgroups. When the sample is divided by year of birth[13], it reveals one of the main weaknesses of the Spanish economy. Although there is evidence of some level of insurance for the oldest and middle aged-cohort results, these show significant sensitivity for the youngest cohort, and therefore only partial insurance with respect to transitory income shocks and no insurance with respect to permanent income shocks. The insurance level with respect to permanent shocks of the youngest cohort fail to reject the null hypothesis of non-insurance and the low standard deviation of the ψ parameter also rejects the null hypothesis of full insurance with respect to transitory shocks. The relevance of age in insurance capacity has been explored by Kaplan and Violante (2010) who investigate whether the methodology of Blundell et al. (2008) provides an unbiased estimator of true insurance coefficients, under the assumption that the US economy is accurately described by a Bewley model. They find that the model has too little

[13] I consider three age cohorts: the youngest cohort, where the heads of household were born between 1945 and 1955; the medium-age cohort, for those born between 1935 and 1945; and the oldest cohort, for those born between 1925 and 1935.

insurance for young agents and too much for old agents, and conclude that the age profile of insurance coefficients with respect to permanent shocks is sharply increasing. However, the age profile is too steep relative to the data. Blundell et al. (2008) also document that in the data it is flat. Hence, to bring together model and data, the Bewley model must be modified to provide relatively more insurance to younger households. Kaplan and Violante (2010) propose some Bewley model extensions including saving motives for young (e.g. down-payment constraints) and for older households (e.g. bequest) that would shift wealth in the right way and help the model to reproduce flatter age-insurance profiles. Our results are in step with the Bewley intuition of little insurance for young agents and more for old agents, but with a less steep relationship between age and insurance. The presence of a higher precautionary asset accumulation among older cohorts could provide an explanation to these results. Moreover, older cohorts have more access to some specific insurance devices like social security, disability insurance and adult childcare.

Figure 1 also reports the results of the model for two education groups (primary and tertiary-educated) and distinguish between households living in a rural area (cities with fewer than 10,000 inhabitants) and households living in an urban area (cities with more than 500,000 inhabitants). I find a much greater degree of insurance for permanent shocks among the tertiary-educated and non-significant differences in the insurance capacity for permanent shocks between urban and rural areas. A cross-country comparison in the insurance capacity with respect to permanent shocks between graduate and non-graduate households discloses that, in Spain, the gap is small. The results from Blundell et al. (2008) show us that a 10% permanent income shock induces a 4.1% permanent change in consumption for college households and 9.4% for non-college ones (3.9 and 6.7 in Spain, respectively). Institutional disparities can explain, in part, the different results for insurance capacity between the educated and non-educated in the two countries. In particular, the different systems of wage bargaining, the dual (temporary-permanent) labour market contract, the divergences in wage flexibility, the higher Spanish firing costs, the generous Spanish unemployment benefit system and greater trade union power could explain the lower insurance gap between the skilled and non-skilled in the Spanish economy (Bover et al. 2000; Blanchard and Portugal 2001). Insurance against transitory changes shows full smoothness capacity for any educational and place-of-residence subgroup.

The last two columns of Figures 1A and 1B include two alternative experiments to measure the importance of durables and family help (private transfers) as smoothing devices. When durables are included in our consumption measurement, I find that they are particularly useful as a smoothing mechanism, especially in response to transitory shocks. This result confirms the evidence found in Browning and Crossley (2000) which shows how low wealth households with limited access to credit markets use durable purchases and the timing of durables replacement as some form of insurance with respect to transitory shocks. Finally, when family help is included in our income measurement, the impact of the private transfers is negligible. This conclusion is also supported in Hayashi et al. (1996) and Bentolila and Ichino (2008).

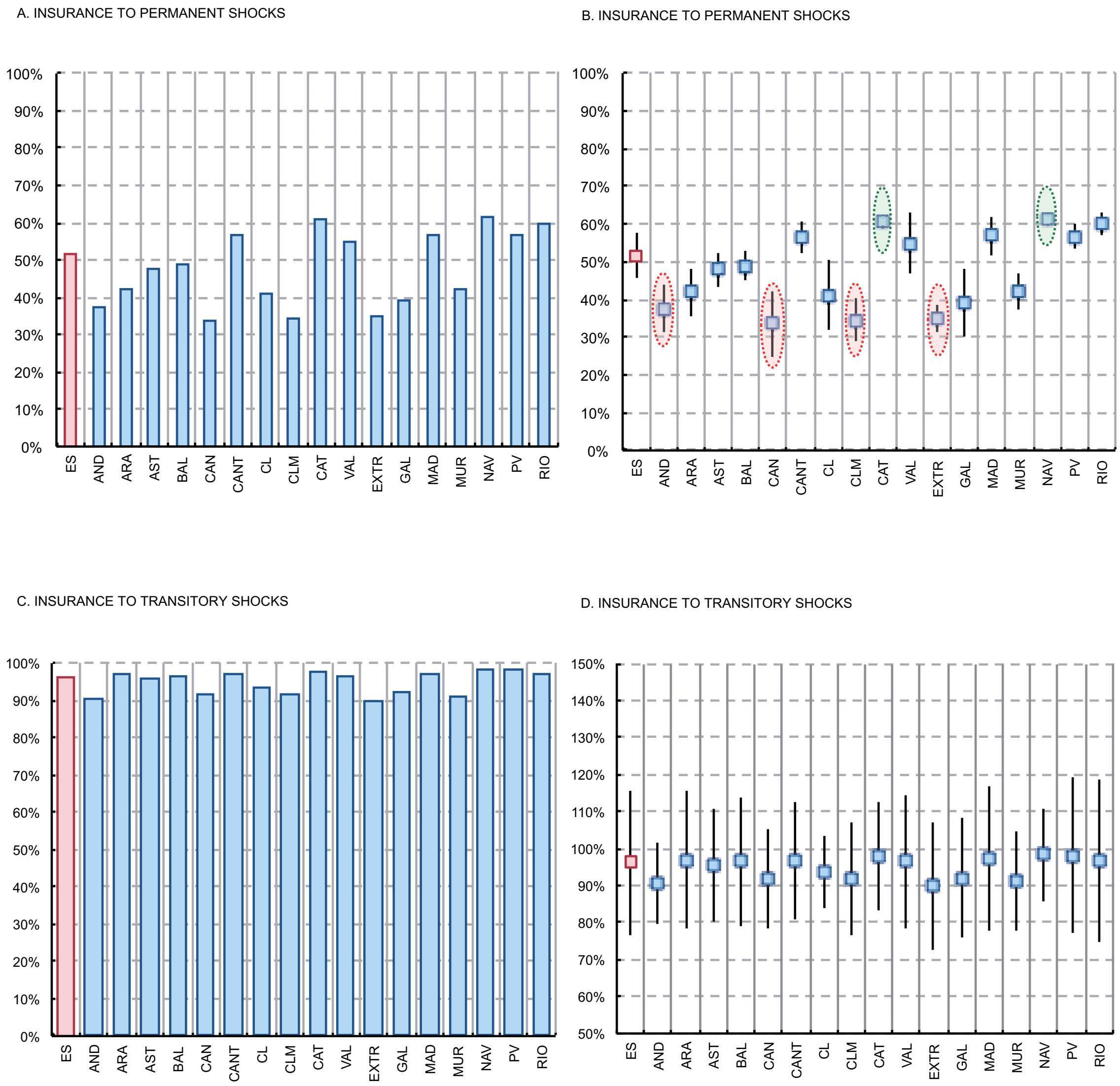
The comparison of the Spanish results with those of its regions evidences heterogeniety in the results of insurance capacity with respect to permanent shocks. Figures 2 and Table A.2 in Appendix V show the results of the consumption insurance capacity with respect to permanent and transitory changes for each of the 17 Spanish autonomous regions and for the whole sample[14]. Figure 2A shows the (1-ϕ) estimates (the share of consumption insured with respect to permanent income shocks) and Figure 2B denotes the regions with an insurance level with respect to permanent shocks significantly higher (green shade) or significantly lower (red shade) than the general Spanish level. From both graphs, I conclude that there is less significant insurance in response to permanent shocks in Andalusia, the Canary Islands, Castille la Mancha and Extremadura (some of the poorest regions in the country) and more insurance in Catalonia and Navarre (the richest ones). Divergences among the regions are huge: while households living in the Northern regions such as Catalonia, the Basque Country, Navarre or Rioja insure around 60% of the permanent

[14]The regional variable was obtained using the Census Tract information provided by the ECPF.

income shocks, the Southern households living in Andalusia, Extremadura, Castille la Mancha and the Canary Island only reach 40% of the insurance capacity.

CONSUMPTION PARTIAL INSURANCE CAPACITY OF THE HOUSEHOLDS AT REGIONAL LEVEL

FIGURE 2



Note: Colums and scatter charts show the permanent $1-\phi$ and transitory $1-\varphi$ insurance parameters
Shaded areas in the right scatter charts are the regions with a level of insurance significantly different to the Spanish one.

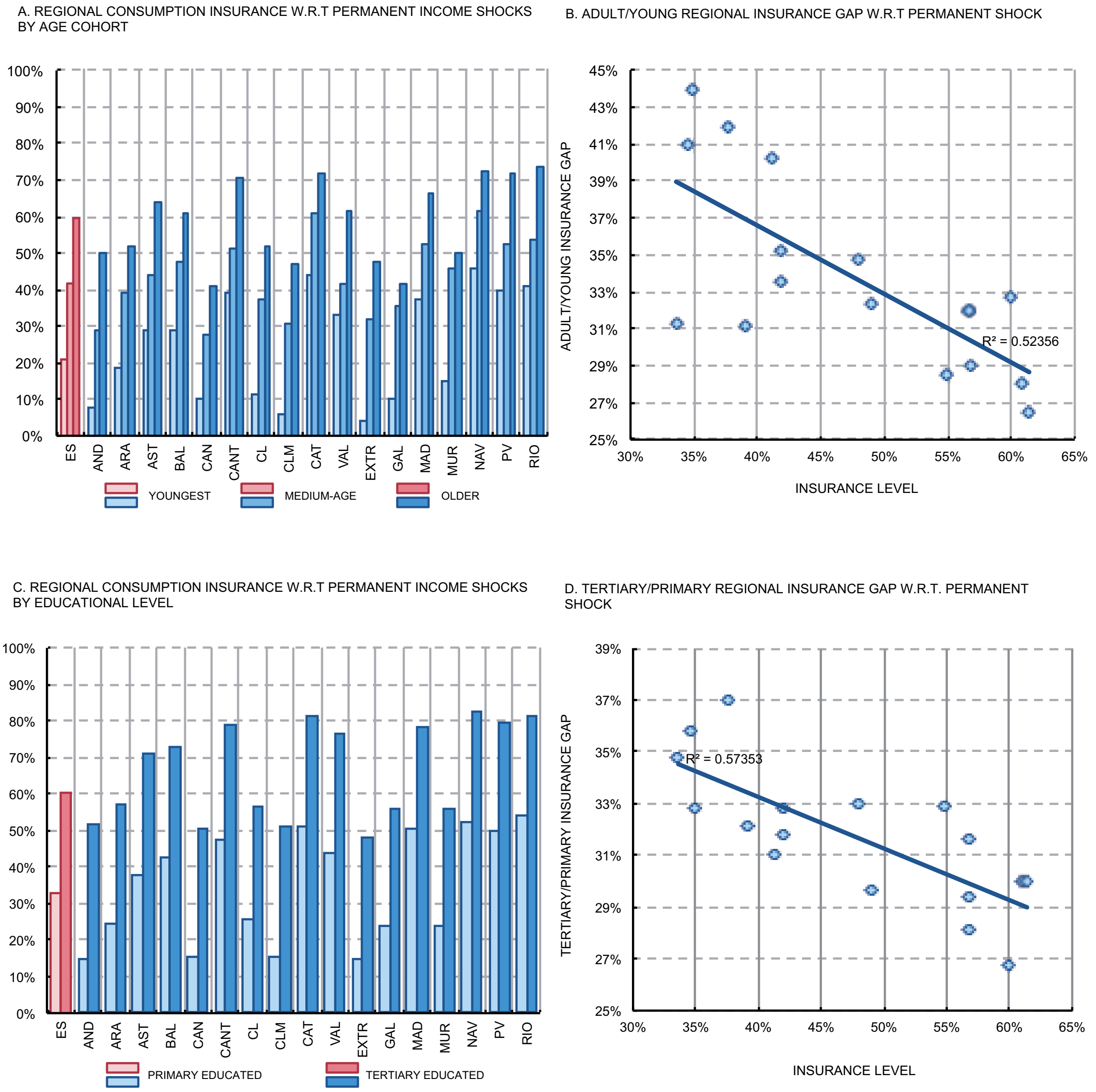
The results related to transitory shocks (Figures 2C and 2D) show homogenous results of insurance capacity with respect to transitory income changes. I cannot reject the null hypothesis that there is full smoothing capacity with respect to transitory shocks in all regions (Figure 2C) and I do not find significant differences among NUTS-II (Figure 2D).

As for the whole sample, I also compute the insurance capacity for some socio-demographical groups at regional level. Figure 3 shows the results of regional consumption insurance with respect to permanent shocks by age cohorts and educational levels. The results show that there is a higher partial insurance capacity with respect to permanent shocks for the older than for the youngest cohort and that, in many regions, the partial insurance of the youngest cohort is non-significant. I find significant sensitivity for the youngest cohort and therefore no insurance with respect to permanent income shocks in Andalusia, the Canary Islands, Castille Leon, Castille la Mancha, Extremadura, Galicia and Murcia[15]. This result is not surprising due to the presence of a low precautionary asset accumulation among the youngest Spanish cohorts. Following equation (3), the insurance coefficients reflect differences in $\pi_{i,t}$ (the share of future labour income in the present value of lifetime wealth). $\pi_{i,t}$ is higher for the youngest cohort because these households have both less accumulated financial wealth and higher prospective human capital wealth. Moreover, older people living in Cantabria, Catalonia, Navarre, the Basque Country and Rioja smooth a large significant amount of the permanent shocks. Finally, the regions where households with higher insurance are living are also the regions with a lower insurance gap between the youngest and the oldest households (Figure 3B).

[15]This subset of regions represents 46% of total Spanish consumption.

CONSUMPTION PARTIAL INSURANCE CAPACITY OF THE HOUSEHOLDS AT REGIONAL LEVEL

FIGURE 3



I conclude the analysis measuring the regional differences in the insurance with respect to permanent shocks distinguishing by education level (Figure 3C and 3D). When the education level of the head of household is low, the insurance capacity with respect to permanent shocks is lower than for those where the head of family is a graduate. Besides, I find higher regional insurance capacity with respect to permanent shocks in primary-educated households. Primary-educated households in Andalusia, the Canary Islands, Castille la Mancha and Extremadura have some difficulties sustaining permanent shocks; however, low-educated households living in Catalonia, Madrid, Navarre, the Basque Country and Rioja smooth an important share of the permanent income shock. Moreover, regions with the highest level of partial insurance are those where the gap between the insurance capacity of the tertiary and primary cohorts is lowest (Figure 3D).

Summing up, households show consumption partial insurance with respect to income permanent shocks and almost full smoothing capacity to transitory shocks. However, there is a significant sensitivity for the youngest cohorts and durable goods play an important role in smoothing transitory income changes. At the regional level, some of the Southern Spanish NUTS-II concentrate the households with the lowest insurance capacity. Besides, the regional differences become more evident when I distinguish between age or education level of the head of household. Further, regions with the highest level of partial insurance with respect to permanent shocks are those where the gap between the tertiary and primary-educated (and the oldest and youngest cohorts) is lowest.

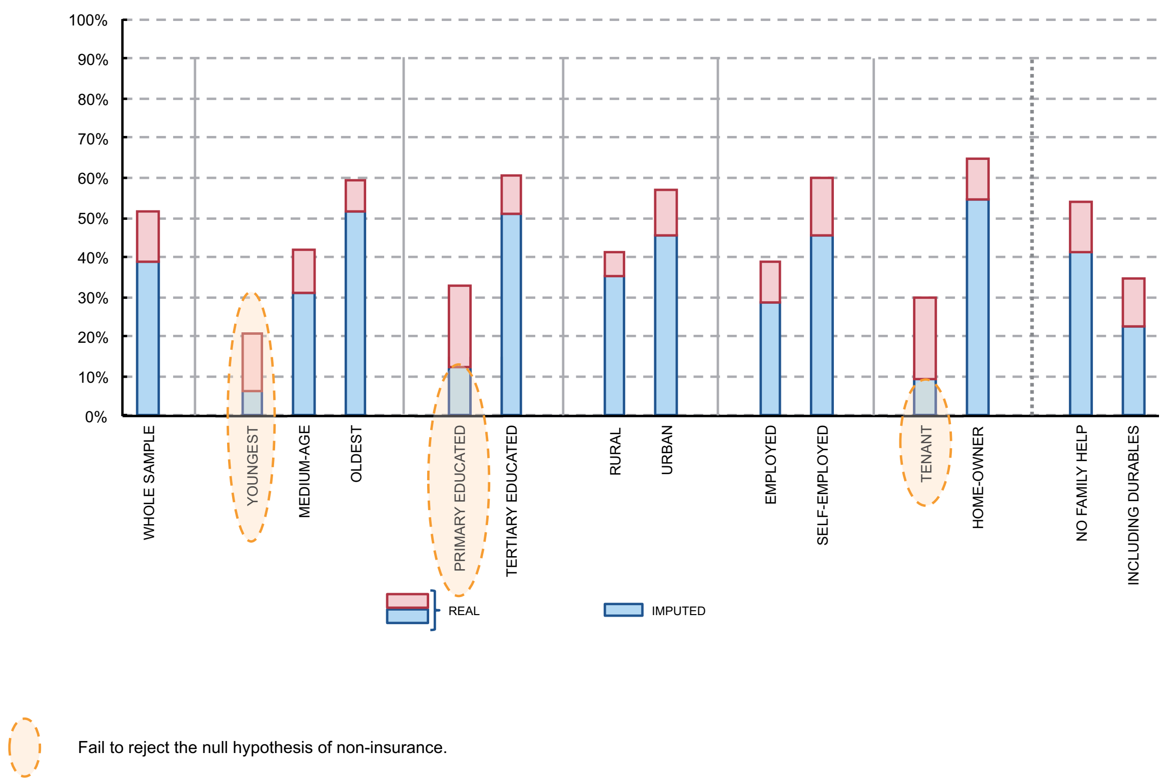
4.2 Imputation bias and comparison between Spanish and US Consumption Partial Insurance

In the previous section, thanks to the good properties of the ECPF, I compute the household consumption insurance parameters without having to calculate any imputation method to provide both income and consumption information in the same survey. However, the ECPF also contains the necessary information to impute consumption in the same way as Blundell et al. (2008) allowing the comparison of the results based on true consumption data (the parameters computed above) versus imputed consumption data.

Figure 4 shows the results using both real (previous section) and imputed data computed following the method explained in Appendix IV. I find a downward bias of 25% for the whole sample in point-estimated smoothing capacity with respect to permanent income shocks when imputed data are used. Moreover, the imputation method has a higher effect on the youngest, primary-educated and tenant households. In particular, the bias leads to the result of non-insurance with respect to permanent shocks not only for the youngest (previously found) but also for primary-educated and tenant households.

CONSUMPTION INSURANCE w.r.t. PERMANENT SHOCK: REAL vs IMPUTED DATA

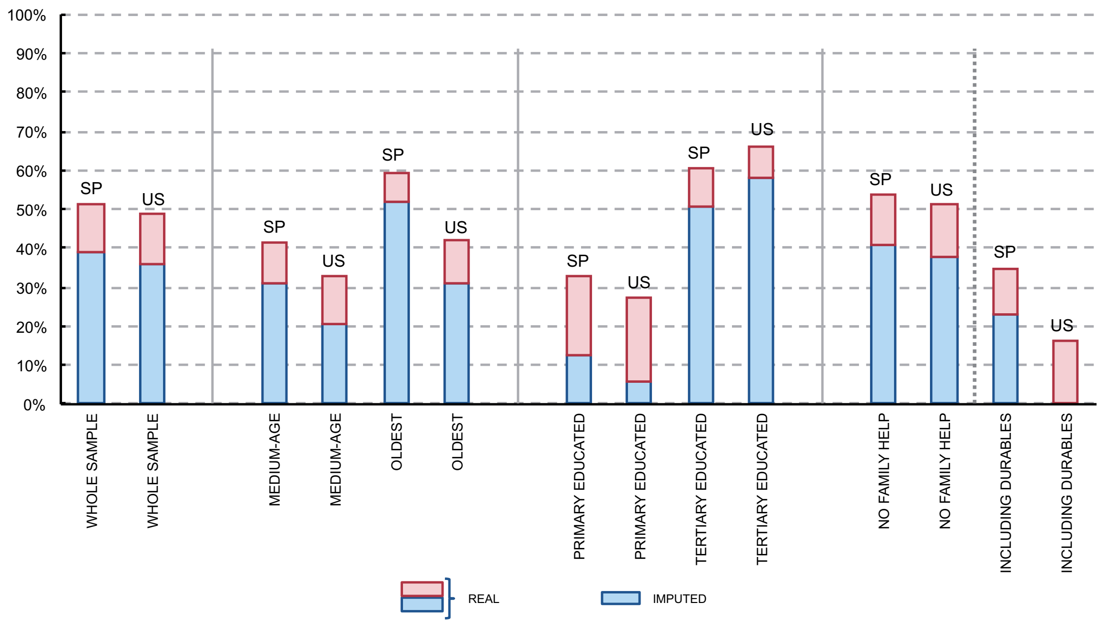
CHART 4



Using the share of imputation bias found for the Spanish sample, I recalculate insurance parameters for the US economy computed by Blundell et al. (2008). Figure 5 shows the insurance capacity with respect to transitory shocks of Spanish and US households for those subgroups methodologically comparable using both real[16] and imputed data.

Comparing the original US results (imputed) with the Spanish results (real) I conclude that the insurance capacity of Spanish households is higher not only for the whole sample but also for all the subgroups, with the sole exception of the tertiary-educated. However, when I recompute the US results using the bias found in the Spanish data, non-significant differences are identified between the insurance capacity of Spanish households and the US ones.

CONSUMPTION INSURANCE w.r.t. PERMANENT SHOCK: REAL vs IMPUTED DATA. SPAIN vs UNITED STATES FIGURE 5



[16] US real coefficients have been computed extrapolating the bias found in the Spanish sample to the US sample

Summing up, this section proves how the imputation method used determines the partial insurance parameters. Therefore, more attention must be paid to the imputation procedure chosen because it could condition the final insurance parameters. Besides, a simple comparison of the Spanish and US results evidences a higher smoothing capacity of Spanish households. However, when the imputation bias is considered, differences are negligible.

5 Conclusions

The main contribution of this paper is the measurement of the degree of consumption partial insurance with respect to transitory and permanent income shocks using a Spanish dataset at country and regional level. Secondly, I compare partial insurance parameters of the Spanish and US economy using imputed and real data in order to calculate the bias incurred when artificial methods are used.

Results evidence a significant level of insurance of households with respect to permanent income shocks and almost full smoothing capacity to transitory shocks. However, there is a significant sensitivity for the youngest cohorts, and durable goods play an important role in smoothing transitory income changes. At regional level, some of the Southern Spanish NUTS-II concentrate the households with the lower insurance capacity. Besides, the regional differences becomes more evident when I distinguish between age or education level of the head of household. Further, regions with the highest level of partial insurance against permanent shocks are those where the gap between tertiary and primary-educated (and the oldest and youngest cohorts) is lowest.

I also found a downward bias in insurance capacity when imputed data were used. The point-estimated smoothing capacity is 25% lower in comparison with the real data. Besides, using imputed data, I find significant sensitivity and therefore only insurance with respect to transitory shocks not only for the youngest cohort (as when real data are used) but also for primary-educated and tenant households. The comparison of US results with Spanish results, when imputation bias is considered, reveals negligible differences.

The findings of this paper have policy implications because they could be very useful for gauging the level and timing of generosity of the welfare system. Governments should take into account inequality not only as a macroeconomic problem but also as a microeconomic concern, where the insurance capacity of citizens and the specific devices used for households in each region to smooth income shocks should be considered. Previous papers such as Bentolila and Ichino (2008), Attanasio and Rios-Rull (2000) and Krueger and Perri (2009) show that when the welfare state fails (due to market rigidities or inefficiencies), households try to mitigate the consequences of income shocks using partial insurance devices. The relevance of this possible crowding-out effect (the role of insurance devices diminishes when public transfers increase) must be known by policymakers. A better knowledge of household insurance capacity and the importance of the crowding-out effect would help to mitigate the consequences of future economic shocks, to adjust the automatic stabilizers of the economy and to improve the sustainability of our welfare state.

Future advances in this research will consider the role played by tax and welfare systems and they could also extend the model of insurance to alternative income dynamics. Another area of interest is to determine the changes in insurance over the life cycle and how this insurance alters in response to changes in the economic environment. This paper could also be expanded to explain the reasons for the heterogeneity in the insurance capacity. Using the individual insurance capacity of each household measured in this paper, it is possible to estimate the relevance of sociodemographic characteristics, productive specialization, cultural features of each regions and individual heterogeneity.

Appendices

Appendix I. The Euler Equation

The Euler equation can be linearized to describe the behaviour of consumption growth. However, in this appendix, I focus on the approximation of the mapping between the expectation error of the Euler equation and the income shock using a CRRA functional form of the preferences.

I start with the problem faced by household i of age t. The household has to choose a path of consumption C so as to:

$$max_C E_t \sum_{j=0}^{T-t} \frac{1}{(1+\delta)^j} \frac{C_{i,t+j}^{\beta} - 1}{\beta} e^{Z'_{i,t+j}\vartheta_{t+j}} \tag{A1-1}$$

where $Z'_{i,t+j}$ includes taste shifters, subject to the budget constraint

$$A_{i,t+j+1} = (1 + r_{t+j})(A_{i,t+j} + Y_{i,t+j} - C_{i,t+j}) \text{ where } A_{i,T} = 0 \tag{A1-2}$$

where $A_{i,t}$ is given. I assume as known and certain the retirement age after which labour income falls to zero at L, and there is no uncertainty about the date of death or the end of the life cycle, T.

Following (A1-1) and (A1-2) the Euler equation is:

$$C_{i,t-1}^{\beta-1} = \frac{1 + r_{t-1}}{1+\delta} e^{\Delta Z'_{i,t}\vartheta_t} E_{t-1} C_{i,t}^{\beta-1} \tag{A1-3}$$

For empirical purposes, I approximate equation (A1-3) using the following technique: the logarithm of the sum of a series $X_t, X_{t+1}, ..., X_S$ can be written as:

$$\ln \sum_{k=0}^{S-t} X_{t+k} = \ln X_t + \ln \left[1 + \sum_{k=1}^{S-t} \exp\left(\ln X_{t+k} - \ln X_t\right) \right] \tag{A1-4}$$

Taking a Taylor expansion around $\ln X_{t+k} = \ln X_t + \sum_{i=0}^{k} \delta_{t+i}$, $k = 1, ..., S-t$ for some path of increments $\delta_t, \delta_{t+1}, ..., \delta_S$ with $\delta_t = 0$,

$$\begin{aligned}
\ln \sum_{k=0}^{S-t} X_{t+k} &\simeq \ln X_t + \ln \left[1 + \sum_{k=1}^{S-t} \exp\left(\sum_{i=0}^{k} \delta_{t+i} \right) \right] \\
&+ \sum_{k=1}^{S-t} \frac{\exp\left(\sum_{i=0}^{k} \delta_{t+i} \right)}{\left[1 + \sum_{k=1}^{S-t} \exp\left(\sum_{i=0}^{k} \delta_{t+i} \right) \right]} \left(\ln X_{t+k} - \ln X_t - \sum_{i=0}^{k} \delta_{t+i} \right) \\
&\simeq \sum_{k=0}^{S-t} \alpha_{t+k,S}^{\delta} \left[\ln X_{t+k} - \ln \alpha_{t+k,S}^{\delta} \right]
\end{aligned}$$

where $\alpha_{t+k,S}^{\delta} = \frac{\exp\left(\sum_{i=0}^{k} \delta_{t+i} \right)}{\left[1 + \sum_{k=1}^{S-t} \exp\left(\sum_{i=0}^{k} \delta_{t+i} \right) \right]}$ and the error in the approximation is $O\left(\sum_{k=0}^{S-t} \left(\ln X_{t+k} - \ln X_t - \sum_{i=0}^{k} \delta_{t+i} \right)^2 \right)$

If I apply this approximation method to the Euler equation (A1-3), that gives:

$$\Delta \log C_{i,t} \simeq \Delta Z'_{i,t}\vartheta'_t + \eta_{i,t} + \Omega_{i,t} \tag{A1-5}$$

where $\vartheta'_t = (1-\beta)^{-1}\vartheta_t$, $\eta_{i,t}$ is a consumption shock with $E_{t-1}\eta_{i,t} = 0$ and $\Omega_{i,t}$ represent the slope in the consumption path due to precautionary savings, interest rates, impatience and the error in the approximation $O(E_t\eta^2_{i,t})$.

When the idiosyncratic component to this gradient to the consumption path can be divided by a vector of deterministic characteristics $\Gamma_{i,t}$ and a stochastic individual component $\xi_{i,t}$, I can write $\Delta \log C_{i,t}$ as:

$$\Delta \log C_{i,t} - \Gamma_{i,t} - \Delta Z'_{i,t}\vartheta'_t = \Delta c_{i,t} \simeq \eta_{i,t} + \xi_{i,t} \tag{A1-6}$$

And following the income process defined above $\log Y_{i,t} = Z'_{i,t}\vartheta_t + P_{i,t} + v_{i,t}$

$$\Delta y_{i,t+k} = \zeta_{i,t+k} + \sum_{j=0}^{q} \theta_j \epsilon_{i,t+k-j}$$

and the budget constraint

$$\sum_{k=0}^{T-t} Q_{t+k} C_{t+k} = \sum_{k=0}^{L-t} Q_{t+k} Y_{i,t+k} + A_{i,t}$$

where T is end of the life, L is retirement and Q_{t+k} is the appropriate discount factor $\Pi^k_{i=i}(1+r_{t+i})$, $k = 1, ..., T-t$. Using the approximation method (A1-5) to each side

$$\begin{aligned}
& \sum_{k=0}^{T-t} \alpha^{\Omega+\Delta Z\vartheta'-r}_{t+k,T} \left[\ln C_{i,t+k} - \ln Q_{t+k} - \ln \alpha^{w-r}_{t+k,T}\right] \\
\simeq \; & \pi_{i,t} \sum_{k=0}^{L-t} \alpha^{\Delta Z\vartheta'-r}_{t+k,L} \left[\ln Y_{i,t+k} - \ln Q_{t+k} - \ln \alpha^{\Delta Z\vartheta-r}_{t+k,L}\right] \\
& + (1-\pi_{i,t}) \ln A_{i,t} - \left[(1-\pi_{i,t}) \ln (1-\pi_{i,t}) + \pi_{i,t} \ln \pi_{i,t}\right]
\end{aligned}$$

where $\pi_{i,t} = \frac{\sum_{k=0}^{L-t} Q_{t+k} Y_{i,t-k}}{\sum_{k=0}^{L-t} Q_{t+k} Y_{i,t-k} + A_{i,t}}$ is the share of future labour income in current human and financial wealth.

Taking differences in expectation gives

$$\eta_{i,t} \simeq \pi_{i,t} \left[\zeta_{i,t} + \gamma_{t,L} \varepsilon_{i,t} \right] \text{ where } \gamma_{t,L} = \left(\sum_{j=0}^{q} \alpha_{t+j,L}^{\Delta Z \vartheta' - r} \theta_j \right) \quad \text{(A1-7)}$$

where the error of approximation is $O([\zeta_{i,t} + \gamma_{t,L}\epsilon_{i,t}]^2 + E_{t-1}[\zeta_{i,t} + \gamma_{t,L}\epsilon_{i,t}]^2)$

Finally plugging (A1-11) in (A1-7) I obtain the equation (3) of Section 2

$$\Delta c_{i,t} \simeq \xi_{i,t} + \pi_{i,t}\zeta_{i,t} + \gamma_{t,L}\pi_{i,t}\varepsilon_{i,t} \quad \text{(A1-8)}$$

Appendix II. Partial Insurance Moment Identification

The identification of the partial insurance parameters requires defining a set of moments. Firstly, I assume no measurement error, a serially uncorrelated transitory component, stationarity and an i.i.d. transitory shock to income. To identify the parameters of interest ($\phi, \psi, \sigma_{\varepsilon}^2, \sigma_{\zeta}^2$ and σ_{ξ}^2) I need a panel data set of at least four waves. Previously, I specified consumption and income equations in periods s (s=t-1, s=t and s=t+1) as:

$$\Delta c_s = \phi\zeta_s + \psi\varepsilon_s + \xi_s \quad \text{(A1-9)}$$

$$\Delta y_s = \zeta_s + \Delta\varepsilon_s \quad \text{(A1-10)}$$

Following Meghir and Pistaferri (2004) I identify the parameters of interest $\sigma_{\varepsilon}^2, \sigma_{\zeta}^2$ and σ_{ξ}^2

$$E\left(\Delta y_t \left(\Delta y_{t-1} + \Delta y_t + \Delta y_{t+1}\right)\right) = \sigma_{\varsigma}^2 \quad \text{(A1-11)}$$

$$E\left(\Delta y_t \Delta y_{t-1}\right) = E(\Delta y_{t+1}\Delta y_t) = -\sigma_{\varepsilon}^2 \quad \text{(A1-12)}$$

Then, with panel data on income, the variance of permanent and transitory shocks can be identified without recourse to the consumption data.

And using the consumption process defined above, it can also be proved that:

$$\phi = \frac{E\left(\Delta c_t\left(\Delta y_{t-1}+\Delta y_t+\Delta y_{t+1}\right)\right)}{E\left(\Delta y_t\left(\Delta y_{t-1}+\Delta y_t+\Delta y_{t+1}\right)\right)} \tag{A1-13}$$

$$\psi = \frac{E\left(\Delta c_t \Delta y_{t+1}\right)}{E\left(\Delta y_t \Delta y_{t+1}\right)} \tag{A1-14}$$

$$\sigma_\xi^2 = E\left(\Delta c_t\left(\Delta c_{t-1}+\Delta c_t+\Delta c_{t+1}\right)\right) - \frac{\left[E\left(\Delta c_t\left(\Delta y_{t-1}+\Delta y_t+\Delta y_{t+1}\right)\right)\right]^2}{E\left(\Delta y_t\left(\Delta y_{t-1}+\Delta y_t+\Delta y_{t+1}\right)\right)} + \frac{\left[E\left(\Delta c_t \Delta y_{t+1}\right)\right]^2}{E\left(\Delta y_t \Delta y_{t+1}\right)} \tag{A1-15}$$

With these five moment conditions I provide the complete identification of the parameters of interest. The identification of the transitory insurance parameter (ψ) is computed using the fact that income and lagged consumption may be correlated through the transitory component E$(\Delta c_t \Delta y_{t+1}) = \psi\sigma_\varepsilon^2$ and is scaling by $E\left(\Delta y_t \Delta y_{t+1}\right)$. This moment is like a IV regression of Δc_t on Δy_t using Δy_{t+1} as an instrument. Similarly, in the ϕ moment identification there is a simple IV interpretation. It is identified by as a regression of Δc_t on Δy_t using $(\Delta y_{t-1}+\Delta y_t+\Delta y_{t+1})$ as an instrument.

However, as is usual in microeconometric literature, I am going to assume in this paper that income and consumption data are measured with multiplicative independent error due to the data collection process of the survey. Income ($y_{i,t}^*$) and consumption ($c_{i,t}^*$) data are made up of income and consumption real data plus the income and consumption error component.

$$y_{i,t}^* = y_{i,t} + u_{i,t}^y \tag{A1-16}$$

$$c_{i,t}^* = c_{i,t} + u_{i,t}^c \tag{A1-17}$$

where $y^*_{i,t}$ and $c^*_{i,t}$ denote measured income and consumption, $y_{i,t}$ and $c_{i,t}$ are the true income and consumption and $u^y_{i,t}$ and $u^c_{i,t}$ the measurement errors.

Measurement error in consumption induces serial correlation. Just as consumption is a martingale with drift the variance of measurement error is

$$E(\Delta c^*_t \Delta c^*_{t-1}) = E\left(\Delta c^*_t \Delta c^*_{t+1}\right) = -\sigma^2_{u^c} \tag{A1-18}$$

and ϕ is still identified by (A1-16). Although, ψ cannot be identified as before, It is possible to think in $\psi = \frac{E\left(\Delta c^*_t \Delta y^*_{t+1}\right)}{E\left(\Delta y^*_t \Delta y^*_{t+1}\right)}$ as a lower bound due to measurement error in income[17].

Appendix III. Estimation Procedure

All moments of interest and their standard deviations are estimated using the generalized method of moments. In particular, I use diagonally weighted minimum distance (DWMD) GMM method, where firstly, I define two main vectors

$$\Delta c_i = \begin{pmatrix} \Delta c_{i,1} \\ \Delta c_{i,2} \\ \dots \\ \Delta c_{i,T} \end{pmatrix} \quad \text{and} \quad \Delta y_i = \begin{pmatrix} \Delta y_{i,1} \\ \Delta y_{i,2} \\ \dots \\ \Delta y_{i,T} \end{pmatrix}$$

According to these vectors, I define $d_i = \begin{pmatrix} d^c_i \\ d^y_i \end{pmatrix}$ where $d^c_{i,t} = 1\{\text{if } \Delta c_{i,t} \text{ is not missing}\}$ and $d^y_{i,t} = 1\{\text{if } \Delta y_{i,t} \text{ is not missing}\}$. Stacking observation on Δc and Δy for each individual I get the vectors $x_i = \begin{pmatrix} \Delta c_i \\ \Delta y_i \end{pmatrix}$ and $d_i = \begin{pmatrix} d^c_i \\ d^y_i \end{pmatrix}$ and I derive the

[17] An extension of the downward bias measurement can be found in Meghir and Pistaferri (2004). Given that our estimate of ψ is close to zero in most cases, an adjustment using the Meghir and Pistaferri inflation factor would make little difference empirically.

moments vector

$$m = vech\left\{\left(\sum_{i=1}^{N} x_i x_i'\right) \oslash \left(\sum_{i=1}^{N} d_i d_i'\right)\right\} \tag{A1-19}$$

$\oslash$ denotes an elementwise division. The vector m contains the estimates of $cov(\Delta y_t, \Delta y_{t+s})$, $cov(\Delta y_t, \Delta c_{t+s})$ and $cov(\Delta c_t, \Delta c_{t+s})$; a total of $T(2T+1)$ unique moments, some of those required to obtain the (7)-(11) partial insurance parameters. Finally, the variance-covariance matrix of m that can be used for inference is:

$$V = \left[\sum_{i=1}^{N} \left((m_i - m)(m_i - m)'\right) \circledast D_i D_i'\right] \oslash (D_i D_i') \tag{A1-20}$$

where $D_i = vech\left\{d_i d_i'\right\}$ and $\circledast$ denote an elementwise product. The square roots of V provide the standard error of the corresponding elements in m. What I do in the empirical analysis to get the partial insurance parameters of Appendix 2 is to estimate models for m:

$$m = f(\Lambda) + \Upsilon \tag{A1-21}$$

where Λ is the vector of parameters of interest and Υ capture sampling variability. I solve equation (17) and obtain Λ minimizing

$$\min_{\Lambda} (m - f(\Lambda))' W (m - f(\Lambda)) \tag{A1-22}$$

where W is the weighting matrix that for the particular case of diagonally-weighted minimum distance (DWMD) is a diagonal matrix with the elements in the main diagonal given by $diag(V^{-}1)$. The standard errors required for inference purposes can be obtained as:

$$\widehat{var\left(\widehat{\Lambda}\right)} = (G'WG)^{-1} G'WVWG (G'WG)^{-1} \tag{A1-23}$$

$G = \frac{\partial f(\Lambda)}{\partial \Lambda} |_{\Lambda = \widehat{\Lambda}}$ is the Jacobain matrix evaluated at the estimated parameters $\widehat{\Lambda}$.

Appendix IV. Imputation Method

To obtain the imputed consumption data, I follow the approach designed by Skinner (1987) and improved by Blundell et al. (2004). Skinner (1987) proposes imputing total consumption in the PSID using the estimated coefficients of a regression of total consumption on a series of consumption items that are present in both the PSID and the CEX. The Blundell et al. (2004) approach differs from the Skinner one in that they start from a standard demand function for food (available in both surveys) and they make this dependent on prices, total non-durable expenditure, and demographic and sociodemographic characteristics. Under monotonicity of food demand, these functions can be inverted to obtain a measure of non-durable consumption in the PSID.

Following this method, in our particular case, I create a mapping from food to non-durable consumption estimating a demand function for food.

$$f_{i,t} = D'_{i,t}\beta + p'_t\theta + \gamma ND_{i,t} + e_{i,t} \tag{A1-24}$$

where f is the log of real food expenditure, D a set of demographic variables and p the relative prices. Finally, ND is the log of non-durable expenditure and e captures unobserved heterogeneity and measurement error in food expenditure. The estimated demand equation for food consumption includes the log of real food consumption, the log of real food prices, the log of total real non-durable expenditure and its interaction with education and number of children dummies. I also include dummy variables for male and female part-time workers, full-time labour market participation and their interactions with the number of children. The vector of demographic variables incorporates family size and its interaction with regional dummies, age of members, region of residence, education levels and home property. I estimate this equation instrumenting the log of non-durable expenditure and its interactions with the log of before-tax total income and its interactions with previous demographic variables. The demand function is estimated consistently using

ECPF data. Finally, under monotonicity (normality) of food demand, this function can be inverted using the estimates from the ECPF to obtain an imputed measure of non-durable consumption.

Appendix V. Tables

Table A.1: Consumption Partial Insurance of Spanish Households

Cohort	ϕ (P.I perm shock)	ψ (P.I tran shock)
Whole Sample	0.484	0.038
	(0.029)	(0.098)
Youngest	0.791	0.180
	(0.011)	(0.021)
Medium-age	0.583	0.048
	(0.021)	(0.065)
Oldest	0.404	0.016
	(0.031)	(0.097)
Primary Educated	0.671	0.056
	(0.049)	(0.110)
Tertiary Educated	0.397	0.028
	(0.030)	(0.079)
Rural	0.585	0.031
	(0.054)	(0.053)
Urban	0.431	0.010
	(0.036)	(0.048)
Employed	0.613	0.061
	(0.110)	(0.058)
Self-Employed	0.401	0.012
	(0.103)	(0.041)
Tenant	0.702	0.091
	(0.053)	(0.071)
Home-Owner	0.354	0.016
	(0.103)	(0.204)
No Family Help	0.462	0.028
	(0.011)	(0.034)
Including Durables	0.651	0.162
	(0.101)	(0.032)

Table A.2: Consumption Partial Insurance at Regional Level

Region	ϕ P.I perm shock	ψ P.I tran shock
SPAIN(ES)	0.484	0.038
	(0.072)	(0.098)
ANDALUSIA(AND)	0.661	0.094
	(0.029)	(0.056)
ARAGON(ARA)	0.347	0.031
	(0.062)	(0.092)
ASTURIAS(AST)	0.521	0.044
	(0.022)	(0.077)
BALEARIC ISLANDS(BAL)	0.477	0.036
	(0.011)	(0.107)
CANARY ISLANDS(CAN)	0.517	0.031
	(0.011)	(0.066)
CANTABRIA(CANT)	0.402	0.031
	(0.033)	(0.079)
C.LEON(CL)	0.436	0.036
	(0.046)	(0.049)
C.L.MANCHA(CLM)	0.655	0.083
	(0.016)	(0.077)
CATALONIA (CAT)	0.342	0.021
	(0.009)	(0.173)
VALENCIA(VAL)	0.451	0.035
	(0.041)	(0.089)
EXTREMADURA(EXTR)	0.677	0.102
	(0.017)	(0.086)
GALICIA(GAL)	0.621	0.079
	(0.076)	(0.082)
MADRID(MAD)	0.293	0.017
	(0.026)	(0.179)
MURCIA(MUR)	0.522	0.088
	(0.018)	(0.066)
NAVARRE(NAV)	0.277	0.017
	(0.009)	(0.163)
BASQUE COUNTRY(PV)	0.229	0.019
	(0.016)	(0.105)
RIOJA(RIO)	0.302	0.022
	(0.015)	(0.109)

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