Durable Consumption during the Great Recession: the Role of *Ex-ante* Heterogeneity

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Abstract

Durable consumption is one of the main driver of business cycle volatility, and understanding its interaction with employment and income risk is key to study amplification mechanisms. This paper assesses the role of types of labour contract on households' durable consumption. It starts by presenting novel empirical evidence from Bank of Italy's Survey of Households Income and Wealth. Over the Great Recession, Italian households' car purchases contracted strongly along the intensive and the extensive margins. However this drop was much larger for workers employed with fixed-term contracts than for permanent contract holders. I then build and calibrate a structural model of households' saving and consumption behaviour augmented with types of contract in order to pin down the drivers of durable consumption's contraction along the intensive and the extensive margins, and for each type of contract. The results show that the decline in the intensive margin of car purchases is the result of actual income losses, while the drop in the extensive margin is driven by risk related mechanisms which differ by type of contract. Workers employed with permanent contracts adopt a "wait-and-see" strategy, while workers in fixed-term employment adopt a "wait-to-downgrade" approach. These risk related mechanisms have very different implications for the persistence of durables' demand contraction.

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1 Introduction

In many developed economies, institutional features like employment contracts, segment the labour-market. In Italy for instance, workers can be employed with a permanent contract (i.e. indefinitely) or with a fixed-term/temporary contract (i.e. for a short and predetermined period only). Beyond enjoying higher job security, permanent contract workers are on average better paid that their fixed-term counterparts. Consequently, the Italian labour-market is divided between "high wage, high security" workers at its center and "low wage, low security" workers gravitating at the margins. In addition, the proportion of fixed-term workers has been increasing in the past decades, rising from 10% of the employed population in 2000 to 17% in 2014.[1] What are the consequences of such a phenomenon? This paper answers part of this question by evaluating the impact of types of contract on households' durable and non-durable consumption patterns over the Great Recession.

A particular focus is put on durable consumption as such expenses are one of the main drivers of consumption and business cycle volatility. For instance, Italian households halved their durables expenses - cars, furniture, appliances - over the Great Recession. Similar patterns were observed in other European countries and in the US. Dupor et al. (2018) report that in the first year of the Great Recession, expenditures on cars alone dropped by one percent of total GDP. Likewise, durables and residential investment respectively represented 24% and 33% of the decline in real US GDP between 2007 and 2009. The decline in broad durables spending hence accounted for more than half of the recession (Berger and Vavra, 2015). Understanding the patterns of durable consumption is crucial for understanding recessions.

Moreover this paper studies durable consumption's extensive and intensive margins separately. The extensive margin of durable consumption corresponds to the share of households who purchase durable goods in a given period. On the other hand, the intensive margin of durable consumption is the amount spent conditional on buying durables. Prior to the Great Recession, most of durable consumption's business cycle fluctuations could be attributed to changes along the extensive margin, while the intensive margin remained mostly unaffected. This prompted the literature to focus on the share of adjusters (Bar-Ilan and Blinder 1992, Eberly 1994, Caballero and Engel 1999, *etc*). However, the Great Recession is exceptional as durable consumption contracted along the extensive and the intensive margins (Attanasio et al., 2020). For this reason, taking into account the probability of adjusting as well as the size of adjustments is key to understand what happened during the Great Recession. Besides, the decisions made at the two adjustment margins are driven by

[1] Source: SHIW data from the Bank of Italy.

different economic factors. Studying the two margins separately can help us identify the underlying mechanisms at play.

To study the impact of types of contract on households' consumption, this paper starts by presenting novel empirical evidence from the Survey of Households Income and Wealth (SHIW) conducted by the Bank of Italy. The main strength of the SHIW dataset is that, alongside many demographic and job related characteristics, it provides detailed information on households' income, wealth, durable goods expenditures and non-durable consumption. Having all these components in the same data set for such a long time span is unique in Europe. With the SHIW waves between 2000 and 2016, I compare unemployment risk, income and consumption patterns of two groups: workers employed with permanent contracts (referred as "Permanent households" for brevity) and workers employed with fixed-term or temporary contracts (referred as "Fixed-term households"). Car purchases are used to measure households' consumption of a durable good as restricting the analysis to a single good allows to meaningfully study the extensive and the intensive margins separately.

The data shows that both groups of households strongly decreased their car purchases between the boom (2002-2006) and the recession (2008-2014). This holds for overall car investments as well as for the car purchases' intensive margin and the share of households buying cars. Moreover, and this is a novel finding from this paper, Fixed-term households decreased their car purchases significantly more than Permanent households on the extensive margin. Over the Great Recession, the share of Fixed-term households buying a car dropped by more than 40%, this is twice as much as for Permanent households. However, the drop in the intensive margin is similar across the two groups. Finally, this tendency does not hold when we look at non-durable consumption as all households more or less maintained their non-durable purchases over the recession

I then build and calibrate a structural model of households' consumption and saving behaviour. The model is an incomplete market model where households consume durable and non-durable goods. durable purchases are subject to a non-convex market friction (close to Berger and Vavra, 2015 or Harmenberg and Oberg, 2021). Following the empirical specification, I model two types of contract - each associated with a particular unemployment risk and income process. The policy functions derived from the model highlight that households update their durables following a trigger-target (S,s) rule. As durable investments are subject to non-convex transaction costs, households wish to limit the frequency of such purchases. This result is consistent with the empirical literature that documents lumpy durable consumption patterns.

I solve for the model's policy functions by implementing the NEGM+ algorithm developed in Druedahl (2021). This algorithm extends the endogenous grid point method of Carroll (2006) to an economy with non-convexity and exploits the nested structure of the problem. An additional layer of optimisation is reached with an enhanced interpolation method. The rich income and risk processes associated with each type of contract are estimated with the SHIW data. Finally, the model is disciplined with the method of simulated moments and the calibrated parameters are consistent with the literature.

Using the model, I simulate households' consumption response to a shock calibrated to replicate the Great Recession. The model is successful in reproducing households' durable and non-durable consumption fluctuations. Further, to understand the different mechanisms at play in the consumption patterns of Permanent and Fixed-term households, it is useful to engage in a break down of the simulated impulse response functions. This exercise disentangles the role of changes in households' perceived risk from the impact of realised income losses (following a drop in labour income or an actual unemployment spell).

The results show that the mechanisms at play in durable consumption's contraction are different between the extensive and intensive margins and between Permanent and Fixed-term households. Most of the drop in households' car intensive margin can be attributed to realised income losses. This is true for Fixed-term as well as for Permanent households. Conversely, change in households' perceived risk is a strong driver of contraction along the extensive margin of car consumption. For Permanent households most of the car extensive margin drop can be explained by changes in households' perceived income risk. For Fixed-term households, one third of the drop in the share of car buyers can be attributed to this channel. Still, the story behind the importance of risk is different across both types of households.

For Permanent households, the change in the extensive margin of car purchases is well explained by a simple income uncertainty story. Upon entering the Great Recession, Permanent households expected their average income to remain the same and their income variance to rise by 7%. In such times, it is optimal for them to delay durable purchases and wait until the uncertainty recedes. This is the case as durable purchases are partially irreversible. Higher income uncertainty encourages Permanent households to "wait-and-see". This mechanism also explains why the drop in Permanent households' extensive margin is relatively short-lived. At the start of the recession, households put their project to buy a car in standby. However, as the recession draws longer and longer, the value of their existing car keeps depreciating before sinking to a level that will force them to adjust despite the absence of an economic recovery.

This simple uncertainty story cannot explain the behaviour of Fixed-term households. At the start of the Great Recession, Fixed-term households register a 4% drop in their expected income alongside with a drop of a quarter of their income variance. This is the case as a large part of Fixed-term households' income variance comes from the possibility to get upgraded to a permanent contract. Yet in recession, this positive income risk reduces significantly. The income uncertainty decreases because of a drop in upside income risk. Therefore, Fixed-term workers have no incentive to "wait-and-see" (as their Permanent counterparts do). Still, because their expected income decreased and they have less chance to get upgraded to a permanent contract, Fixed-term households actually wish that they could downsize their stock of cars. Once again the non-convex adjustment costs make selling durables extremely costly. Still, because of depreciation, the value of households' cars naturally decreases overtime. Fixed-term households exploit depreciation in order to save on the cars' transaction costs. They essentially "wait-to-downgrade". As depreciation rate is low, Fixed-term households' "wait-to-downgrade" is a slow process that is persistent throughout the recession.

Finally, an interesting result relates to the composition of the Fixed-term group. The share of Fixed-term households in the population of employed households is higher in recession than in boom, implying that some Permanent households became Fixed-term over the Great Recession. On average, Fixed-term households have a level of risk-free asset and stock of cars that is a little less than three quarters of that of Permanent households. Consequently, at the start of the recession, the flow of Permanent households into the Fixed-term group brings up the group's average stock of cars and risk-free asset. This shift in the composition of the Fixed-term households is important because it implies that, at the start of the recession, the Fixed-term group is on average wealthier than it used to be. Still, its members reduce their car purchases by 42% and 12% in the extensive and intensive margins respectively. What would it be if the group was not richer to start with? The durable purchases' drop would be even starker. The change in the Fixed-term group composition renders the strong Great Recession car consumption crash that motivated this paper a conservative measure of what is going on for Fixed-term households.

This work is related to the strand of literature that studies lumpy durable consumption in macro models. The closest paper to this one is that of Harmenberg and Oberg (2021) where the authors estimate the consumption response to an adverse labour-market shock. They then decompose the overall durable consumption response between a realised income loss channel and an income uncertainty channel. The framework that they build is close to mine and they use the SHIW data as well. Relative to their work, my paper models a richer labour-market (through

types of contract) and separates the intensive and the extensive margins of durable consumption - which is particularly relevant in the context of the Great Recession. My work is also related to Attanasio et al. (2020) who are the first to study both adjustment margins in the context of a life cycle model. They use the CEX to derive cohort and business cycle decompositions of durable and non-durable consumption profiles. Finally Berger and Vavra's work (2015) is also of relevance as they show, in a framework similar to what I have, that non-convex adjustment frictions generate state-dependant responses to policy shocks. Compared to the previous studies in similar frameworks, the main contribution of my paper is the modeling of a rich employment risk process with the types of contract. I study the role of *ex-ante* heterogeneity among households, which has been neglected in the business cycle literature, to understand the unevenly distributed costs of recessions. This is key for designing policy responses to recessions and inequality.

The remainder of the paper is structured as follows. Section 2 shows some Italian empirical evidence that motivate the model. Section 3 presents the model. Section 4 describes the calibration, the numerical implementation and the policy functions. Finally, the Great Recession experiment and the impulse response functions break down exercise is found in Section 5. Section 6 concludes.

2 Motivational Facts: the Case of Italy

To study the impact of types of contract on the business cycle, this paper focuses on the case of Italy. The Italian labour-market is indeed segmented into permanent contract holders (employees hired indefinitely) and fixed-term/temporary contract holders (employees hired for a short and predetermined period only). These employees differ by their income level as well as their risk of falling into unemployment. This section presents some aspects of the Italian labour-market duality comparing permanent and fixed-term workers. Then, it investigates households' saving and consumption patterns in boom and recession depending on the type of contract held by their members.

2.1 Duality on the Italian labour-market

I use Italian data from the Survey on Households Income and Wealth conducted by the Bank of Italy.[2] The main strength of the SHIW dataset is that, alongside many demographic and job related characteristics, it provides detailed information

[2]see Appendix A for a more detailed presentation of the data.

on households' income, wealth, durable goods expenditures and non-durable consumption. Having all these components in the same data set for such a long time span is unique in Europe. With the SHIW waves between 2000 and 2016, I compare unemployment risk, income and consumption patterns of two groups: workers employed with permanent contracts and workers employed with fixed-term or temporary contracts. When the variables are reported at the household level (consumption for instance), I compare households with members employed under permanent contracts (called Permanent households for convenience) and households with members holding fixed-term or temporary contracts (called Fixed-term households).[3]

First, type of contract is associated with different degrees of income and unemployment risk. On the one hand, type of contract is linked to the subjective unemployment risk perceived by the workers. The last wave of the SHIW provides information on subjective unemployment risk by asking currently employed respondents to estimate their probability of keeping their job in the next 12 months[4]. In table 1, I report the answer to this question by type of contract. In 2016, individuals employed with a permanent contract estimated their likelihood of keeping their current job for the next 12 months to be 87% on average against 73% for the fixed-term or temporary employees. More strikingly, the share of respondents who were completely sure to keep their job in the following year was 64% for permanent contracts and only 29% for fixed-term or temporary workers. This evidence indicates that workers with different types of contract face different unemployment risk in expectation.

On the other hand, workers with different types of contract also face different realised unemployment risk. Let's consider agents' unemployment rate conditional on their type of contract in the previous wave of the survey. In this empirical section, the years between 2002 and 2006 are defined as a boom while the time between 2008 and 2014 is considered as a recession. In the boom period, the unemployment rate of workers employed with a permanent contract in the previous survey wave was 3% on average. For individuals previously employed with fixed-term contracts, this figure jumps to 15%. Similarly during the recession, the unemployment rate of past permanent contract holders was 5% on average against 20% for their fixed-term counterparts. Workers employed with permanent contracts face lower risk of falling into unemployment than workers employed with fixed-term/temporary contracts (this holds in expectations and in realisation).

[3]The analysis is restricted to households where employed members have the same type of contract or households with a single income earner. More details in the next subsection.

[4]The pool of respondents is restricted to workers who declare that they will not take steps to change or leave their job by their own will.

	Permanent	Fixed-term/Temporary
Mean	86.7	73.2
Median	100.0	80.0
25th pctile	90.0	60.0
Share at 100%	63.9	28.9

Table 1: Likelihood of keeping current job over the next 12 months (by type of contract)

In addition to heterogeneous unemployment risk, workers employed with different types of contract face unequal income and wealth levels. Between 2002 and 2014, the average income of Permanent households was roughly twice as large as that of Fixed-term households. This figure rises to 2.5 when we consider households' net wealth. Finally, heads of Permanent households tend to be more educated than heads of Fixed-term households. Over the 2002-2014 period, half of the Permanent households' heads did not graduate from high school against 69% for Fixed-term households [5].

2.2 Heterogeneous Consumption Patterns Following a Recession

The unequal income level and unemployment risk faced by the two groups of households might be accompanied by different saving and consumption patterns over the 2002-2014 period. Table 2 displays the average non-durable consumption and detailed car purchases[6] in boom and in recession for Permanent and Fixed-term households. I use car purchases to study households' consumption of a durable good. One aim of this paper is to study the extensive margin and the extensive margin of durable consumption separately. As explained above, the extensive margin of durable consumption measures the share of households who did purchase a durable good in a given period. The intensive margin reports the average amount of durables purchased by the households who bought some durables. In the literature, most at-

[5]Still, the average share of college graduates is closer between the two groups (11% for Fixed-term households and 14% for Permanent households).

[6]More precisely, cars encompass all means of transport including motorbikes and boats. In the data, the split between cars and other vehicles is available only from 2012 onward. For consistency, I keep cars and other vehicles as my measure of car purchases throughout the entire period. This should not alter the results as between 2012 and 2016, cars represented more than 90% of all vehicles purchased by households.

tention has traditionally been given to the extensive margin. However, during the Great Recession, durables' intensive margin fluctuated strongly (see Attanasio *et al.*, 2020). For this reason, particular care will be taken to model durables adjustments on both margins. On top of cars, the SHIW data provide other categories of durable goods like furnishing or household appliances. Still, restricting our attention to one category of durables will allow us to study the extensive and the intensive margins meaningfully. Studying the intensive margin on a basket of goods is misleading. If an agent buys a car in a given year and a couch in the following year, it does not mean that she downgraded her purchases of durables. The drop in the value of the durable goods purchased is merely a reflection of two different types of investment. Still, it could be wrongly interpreted as durables down-scaling. Therefore, to avoid such confusion, I restrict the durables to a single good: cars. I choose this particular item as - abstracting from houses as is done in this paper - cars represent, by far, the largest durable good purchased by households [7].

	Cars ext. margin		**Cars int. margin**		**Non-dur. cons.**		**Income**	
	Perm.	F.t.	Perm.	F.t.	Perm.	F.t.	Perm.	F.t.
Boom	15.77	12.08	12009	9175	24529	16334	30731	16601
Recession	12.39	7.03	10594	8034	24530	15854	28835	14845
Change	**-0.21**	**-0.42**	**-0.12**	**-0.12**	**0.00**	**-0.03**	**-0.06**	**-0.11**

Notes: Perm. stands for permanent contract and F.t. for fixed-term or temporary contract. Boom is 2002-2006 and Recession is 2008-2014. Non dur. cons. stands for non-durable consumption, ext. for extensive and int. for intensive. Top and bottom 5% are winsorised and households sampling weights are used.

Table 2: Consumption and Income Response to the Great Recession

Table 2 highlights a stark and unevenly distributed drop in car purchases over the Great Recession.[8] First, we note that both groups of households strongly decreased

[7]Between 2002 and 2014 cars alone accounted for roughly 30% of all durable purchases.

[8]In Table 2, I restrict my analysis to households with at least one employed income earner aged between 20 and 65 years old, without any self-employed member and without any currently unemployed member (I want to study changes in consumption behavior that do not result from job losses). Additionally, my analysis is restricted to households where employed members have the same type of contract or households with a single income earner. I exclude other households as they are difficult to sort in the permanent versus fixed-term contract groups. Finally I exclude households with missing information on type of contract. In Boom, the sample counts roughly 500 households in the Fixed-term group and 7,500 observations in the Permanent group. In recession, the Fixed-term and Permanent groups respectively gather 1,050 and 9,050 observations.

their car purchases between the boom and the recession. This holds for the car purchases' intensive margin and the share of households buying cars. This confirms the finding in Attanasio et al. (2020) that the Great Recession is unique in the sense that durable consumption dropped on the extensive and on the intensive margins. Moreover, and this is a novel finding from this paper, Fixed-term households decreased the extensive margin of car consumption significantly more than Permanent households. Over the Great Recession, the share of Fixed-term households buying a car dropped by more than 40%, this is twice as much as for Permanent households. However, the drop in the intensive margin is similar across the two groups. Finally, this tendency does not hold when we look at non-durable consumption as all households more or less maintained their non-durable purchases over the recession. This holds despite a drop in mean income from labour and transfers of 6% and 11% for Permanent and Fixed-term households respectively over the period.

In the next section, this paper models types of contract to reproduce the heterogeneous durable consumption patterns across households in boom and recession. Before turning to the model, we want to make sure that, besides the job market related characteristics, Permanent and Fixed-term households are comparable groups. Table 3 reports criteria that are likely to influence households' car purchases outside of job market characteristics. Such criteria are the age of the head of household, the number of children in the household as well as the location of the dwelling - living in a rural area or a small town [9] where public transports are unlikely to be well developed might increase the need for a car. Table 3 shows that on these characteristics, Permanent and Fixed-term households are very similar. This implies that, abstracting from job related characteristics, the two groups should have akin car purchases patterns.

	Perm.	F.t.
Mean age of head hh	45	42
Average number of children	1.19	1.06
Rurality / Small town (%)	0.58	0.59

Table 3: Factors likely to influence car purchases

[9] Less than 40,000 inhabitants.

3 The Model

This section turns to the model of households' consumption and saving behaviour. Following the empirical findings, I model two types of contract - each associated with a particular unemployment risk and income process.[10] The model is an incomplete market model where households consume durable and non-durable goods. durable purchases are subject to a market friction. This specification is close to Berger and Vavra (2015) or Harmenberg and Oberg (2021).

3.1 The households' problem

The economy is populated by a continuum of *ex-ante* identical households of measure one indexed by i [0, 1]. Households are infinitely lived, time is discrete and a period is a quarter. They supply labour inelastically and derive utility from their non-durable consumption (c_t) and their stock of durable goods (D_t). They discount the future at rate β. The value function of household i can be written as:

$$V_i = E_0 \max_{\{c_{it}, D_{it}\}} \sum_{t=0}^{\infty} \beta^t u(c_{it}, D_{it})$$

$$with \quad u(c_{it}, D_{it}) = \frac{\left[c_{it}^{\alpha} D_{it}^{(1-\alpha)}\right]^{(1-\sigma)}}{1-\sigma}$$

where α is the weight of non-durable consumption in the utility function and σ is the coefficient of relative risk aversion.

Households face an idiosyncratic employment risk. In a given period, a household can be either employed with a permanent contract, employed with a fixed-term contract or unemployed. Households with fixed-term contracts face a larger risk of becoming unemployed than households holding permanent contracts. Transitions between the three job market states follow a Markov process.

Households also face a degree of labour income risk when they are employed. The logarithm of income ($\log(y_t)$) follows an autoregressive process of order one given by:

$$log(y_{it}) = \mu + \rho log(y_{it-1}) + \xi_{it}$$

[10] In the data, different types of contract are associated with different unemployment risk, income and wealth levels as well as education. Type of contract specific unemployment and income risk are explicitly modeled. The wealth is then endogenously determined by the different income and risk processes. Finally, I assume that education level only enters durable consumption through the type of contract secured by the worker.

$$with \quad \xi_{it} \sim \mathcal{N}(0,\, \sigma_{\xi}^2)$$

where μ, ρ and σ_{ξ}^2 are the intercept, persistence and variance of the household's income process.

When unemployed, households receive unemployment benefit ($y_{it} = ub$) with probability p_{ub}. Alternatively, they receive a minor subsistence allowance ($y_{it} = sub$) with probability $1 - p_{ub}$.

In addition to households' idiosyncratic risk, the economy is either in good aggregate state (called *boom*) or in bad aggregate state (called *recession*). These aggregate states are characterised by two distinct matrices governing transitions between permanent employment, fixed-term employment and unemployment as well as different levels of unemployment benefit.

Asset markets are incomplete. Households may only self-insure against employment risk by saving in a risk-free, low return asset (a_t) or by accumulating durable goods. Durables stock cannot be negative and households may borrow up to an *had hoc* borrowing limit ϕ.

Moreover, durable purchases are subject to a friction. When households decide to adjust their stock of durables, they have to pay a non-convex adjustment cost τ following the specification of Grossman and Laroque (1990). The adjustment cost is proportional to the stock of durable goods held by the household before adjusting. Without new purchases, the stock of durables depreciates at a rate δ from one period to another.

If household i decides no to adjust his stock of durable goods in a given period, his borrowing constraint reads:

$$a_{it} + c_{it} \leq (1 + r)a_{it-1} + y_{it}$$

where r is the interest rate on the risk-free asset.

Conversely, if household i decides to adjust his stock of durable goods, his borrowing constraint becomes:

$$a_{it} + c_{it} + D_{it} \leq (1 + r)a_{it-1} + y_{it} + (1 - \tau)(1 - \delta)D_{it-1}$$

3.2 Recursive formulation of the problem

Following Druhedal (2021), the households' problem can be written as:

$$V(m, D, y; \omega) = max\{V^{keep}(m, D, y; \omega), V^{adj}(x, y; \omega)\}$$
$$s.t \quad x = m + (1 - \tau)(1 - \delta)D$$

Where V^{keep} is the value function of a household who does not purchase durables and V^{adj} is the value function of a household who purchases durables. m is the household's cash-in-hand and x is the cash-in-hand available to the household after having sold his beginning-of-period stock of durables (D). y is the labour income (that depends on employment status of the household) and ω is the aggregate state of the economy (boom or recession).

The keeper's problem is:

$$\begin{aligned} V^{keep}(m, D, y; \omega) = \max_{c} U(c, D') + \beta E\left[V(m', D', y'; \omega')\right] \\ s.t \quad a = m - c \\ D' = (1 - \delta)D \\ m' = (1 + r)a + y' \\ a \geq -\phi \\ y' \sim \Upsilon(y) \\ \omega' \sim \Gamma(\omega) \end{aligned}$$

where Υ is the conditional distribution of the idiosyncratic labour income and Γ is the conditional distribution of the aggregate state.

The adjuster's problem is:

$$\begin{aligned} V^{adj}(x, y; \omega) = \max_{c, D'} U(c, D') + \beta E\left[V(m', D', y'; \omega')\right] \\ s.t \quad a = x - c - D' \\ m' = (1 + r)a + y' \\ a \geq -\phi \\ y' \sim \Upsilon(y) \\ \omega' \sim \Gamma(\omega) \end{aligned}$$

Following the nested structure in Druedhal (2020), the adjuster's problem can be viewed as a sequential problem. The household first chooses how much durable goods to buy or sell and then chooses non-durable consumption. I rewrite the adjuster's problem as:

$$\begin{aligned} V^{adj}(x, y; \omega) = \max_{D'} V^{keep}(m, D, y; \omega) \\ s.t \quad D' = (1 - \delta)D \\ m = x - D' \end{aligned}$$

4 Calibration, Numerical Implementation and Policy Functions

4.1 Calibration

I calibrate the model using three steps. First, I use the SHIW data between 2000 and 2016 to calibrate the transitions between the different employment states in boom and in recession as well as the income processes. This is done outside the main model. I then fix a set of parameters using aggregate data and the literature. Finally, I calibrate the remaining parameters using the method of simulated moments inside the model.

4.1.1 Calibration of the employment risk

As mentioned above, households' transitions between the three employment states (employed with a permanent contract, employed with a fixed-term contract and unemployed) are governed by two Markov processes: one in boom and one in recession.

I recover the transition matrix in boom using SHIW data between 2002 and 2008. I extract individuals' transitions between the three employment states at a 2-year time horizon. I use a bootstrapping procedure with a thousand repetitions and take the average of the three 2-year transitions (2002 to 2004, 2004 to 2006 and 2006 to 2008) to obtain average transitions in boom. With this procedure, I gather nine moments from the data.[11] I then use the method of matching simulated moments[12] in order to calibrate the parameters of the quarterly transition matrix. To obtain the Markov transition matrix in recession, I repeat the above procedure with the SHIW data between 2008 and 2014.

The quarterly transition matrices obtained using this procedure are reported below. Rows represent employment state today and columns employment state next period. p stands for employed with a permanent contract, $f.t$ employed with a fixed-term contact and u unemployed.

$$\mathbf{P_{boom}} = \begin{array}{c} \\ p \\ f.t \\ u \end{array} \begin{array}{c} \begin{array}{ccc} p & f.t & u \end{array} \\ \begin{pmatrix} 0.988 & 0.008 & 0.004 \\ 0.103 & 0.858 & 0.039 \\ 0.029 & 0.041 & 0.930 \end{pmatrix} \end{array} \quad , \quad \mathbf{P_{recession}} = \begin{array}{c} \\ p \\ f.t \\ u \end{array} \begin{array}{c} \begin{array}{ccc} p & f.t & u \end{array} \\ \begin{pmatrix} 0.984 & 0.011 & 0.006 \\ 0.064 & 0.893 & 0.043 \\ 0.019 & 0.030 & 0.951 \end{pmatrix} \end{array}$$

[11] See Table 3 in Appendix A.

[12] I use the diagonal matrix of inverses of the moments' relative variances as a weighting matrix.

In a given aggregate state, permanent contract holders face a significantly lower risk of losing their job than fixed-term contract workers. Similarly, if a household is unemployed, he has more chance to find a fixed-term contract than a permanent one to exit unemployment. Moreover, I get intuitive comparative statics across aggregate states. In recession, employed households (with any type of contract) have higher risk of falling into unemployment than in boom. It is harder for an unemployed household to transition back into employment in recession than in boom. Finally in recession, moving from a fixed-term contract to permanent employment is less likely than in boom.

4.1.2 Calibration of the income processes

Income processes are calibrated using SHIW data between 2000 and 2006. The logarithm of household i 's income $log(y_{it})$, in period t is given by:

$$log(y_{it}) = Z'_{it}\beta + \tilde{y_{it}}$$

$$\tilde{y_{it}} = \tilde{\mu} + \tilde{\rho}\tilde{y_{it-1}} + \epsilon_{it}$$

$$\epsilon_{it} \sim \mathcal{N}(0,\, \sigma_\epsilon^2)$$

where Z_{it} is a set of household's observable characteristics (including type of contract, demographic, education and other variables). Income residuals ($\tilde{y_{it}}$) follow an auto-regressive process of order one with intercept $\tilde{\mu}$. Income residuals are obtained by performing a standard OLS regression of the logarithm of individuals' labour income on year dummies, type of contract, gender, age, age squared, education, region and size of city. I then use the following restrictions to identify the intercept as well as the persistence and variance parameters:[13]

$$\frac{Cov(\tilde{y_{it}}, \tilde{y_{it-1}})}{Var(\tilde{y_{it}})} = \tilde{\rho}$$

$$(1 - \tilde{\rho}^2)Var(\tilde{y_{it}}) = \sigma_\epsilon^2$$

I then discretize each AR(1) income process into a five states Markov process using Rouwenhorst method. The normalised income grids for each type of contract are displayed below.

[13] In the model, it is the log of households' income $log(y_{it})$ that follows an AR(1) process while in the estimation income residuals $\tilde{y_{it}}$ follow the AR(1). To bridge the gap between the two, I augment each group's income residuals by the group's mean for $Z'_{it}\beta$.

Permanent contract:

$$\begin{array}{rccccc} & y1 & y2 & y3 & y4 & y5 \\ \textbf{Income} = & (0.45 & 0.67 & 1 & 1.49 & 2.21) \end{array}$$

Temporary/Fixed-term contract:

$$\begin{array}{rccccc} & y1 & y2 & y3 & y4 & y5 \\ \textbf{Income} = & (0.23 & 0.34 & 0.51 & 0.76 & 1.13) \end{array}$$

Finally, unemployment benefit levels are set to reproduce mean unemployment related transfers of households who do receive unemployment benefit. For boom, I take the SHIW data between 2002 and 2006. For recession, I consider observations between 2008 and 2014.[14] The probability of receiving unemployment benefit is chosen to match the period's SHIW unemployment benefit coverage rate of roughly 12%.

4.1.3 Parameters calibrated outside the model

I calibrate a set of parameters in standard ways. I set households' discount factor to 0.97 and the coefficient of relative risk aversion to 2. The interest rate on the risk-free asset is set to .01, which delivers an annual interest rate of approximately 4%. The weight of non-durable consumption in the utility function is set to 0.92 as in Harmenberg and Oberg (2021). The subsistence allowance given to households who do not receive unemployment benefit is set to 0.07 (corresponding to €100 per month). Finally, I set the transitions between booms and recessions to match the average length of recessions (7.5 periods) and the share of total time spent in recessions (43%) in Italy between 1960 and 2016.[15] I use the OECD based recession indicators for Italy computed by the Fed of Saint Louis. All the calibrated parameters are summarised in Table 5.

4.1.4 Parameters calibrated with the model

I calibrate the remaining three parameters using the method of simulated moments on the SHIW data between 2002 and 2006.[16] I set τ, the non-convex adjustment cost

[14] See calibrated parameters in Table 2.

[15] Following the method in Krueger, Mitman and Perri (2016)

[16] As for the income process, I use a bootstrapping procedure with a thousand repetitions to get the moments' variances. I then take the diagonal matrix of inverses of the moments' relative

of durable goods, to match the share of households who buy cars in a given year. The depreciation rate δ is set to reproduce the mean of car purchases relative to income among households buying cars.[17] Finally, the *ad hoc* borrowing constraint ϕ is set to reproduce the share of households with negative wealth. The results of this calibration are reported in Table 4 and the calibrated parameters are in line with the literature.

Target	Model	Data	Parameter
Share of hh. buying dur.	0.16	0.16	Dur. adjustment cost
Norm. mean of dur. purchases	0.37	0.37	Dur. depreciation rate
Share of hh. with neg. wealth	0.04	0.04	Ad hoc borrowing constraint

Notes: Dur. stands for durables, Norm. stands for normalised, n.d.c. stands for non-durable consumption. Data source is the SHIW between 2002 and 2006.

Table 4: Targeted moments of the durables stock and wealth distribution

4.2 Numerical Implementation

I solve for the model's policy functions by implementing the NEGM+ algorithm developed in Druedahl (2021). This algorithm extends the endogenous grid point method of Carroll (2006) to an economy with non-convexity and exploits the nested structure of the problem. An additional layer of optimisation is attained with an enhanced interpolation method. I solve for households' policies on a 100 points grid for durables stock, 100 points logarithmic grid for cash-in-hand after reselling the stock of durables and 200 points logarithmic grids for liquid assets and cash-in-hand. I solve the model in Partial Equilibrium, therefore I solve the problem on an additional 24 points grid that combines the two aggregate and the 12 idiosyncratic states. I discretize the two autoregressive processes for labour income into distinct five states Markov processes using Rouwenhorst's method. In addition to the ten employment states, there also exists two unemployment states (unemployed households who receive unemployment benefit or not) bringing the number of idiosyncratic states to

variances as a weighting matrix. I calibrate the model to match the average data between 2002 and 2006. Still, in the model the evolution of wealth and durables stock are persistent. Therefore extra care should be taken when setting up initial conditions in the simulations. Starting from the stationary distribution for durables and liquid asset, I then simulate the model for a discard period of 22 years before computing moments over a 4-year period. In the discard period, I set the aggregate states to match Italy's OECD based recession indicators between 1980 and 2002.

[17] More precisely, the mean of car purchases normalised by labour and transfer income.

Parameter	Value	Description	Target
Households			
β	0.97	Discount factor	Standard value
σ	2.00	Relative risk aversion	Standard value
r	0.01	Interest rate	Annual interest rate of 4%
α	0.92	Weight of n.d.c.	Harmenberg and Oberg 2021
τ	0.085	Dur. adjustment cost	see Table 4
δ	0.027	Depreciation rate	see Table 4
ϕ	0.15	Borrowing constraint	see Table 4
ub_{boom}	0.38	U.b in boom	Mean u.b 2002-2006
$ub_{recession}$	0.30	U.b in recession	Mean u.b 2008-2014
sub	0.07	Subsistence allowance	€100 for 1 month
p_{ub}	0.12	Probability to get u.b	u.b coverage rate 2002-2014
Agg. state			
ρ_{bb}	0.90	Boom to boom transition	Time spent in rec.
ρ_{rr}	0.87	Rec. to rec. transition	Average length of rec.

Notes: All values are reported at the quarterly frequency of the model. N.d.c. stands for non-durable consumption, Dur. stands for durables, u.b stands for unemployment benefit, Rec. stands for recession.

Table 5: Calibrated parameters

12. As there are three grids to represent the same dimension (liquid assets, cash-in-hand and cash-in-hand after reselling the stock of durables), particular care should be taken in setting up these three grids relatively to each other. The top of the grid for cash-in-hand after selling the stock of durables should be larger than that of the assets grid. This is the case as households should use some of their resources for consumption. Moreover, setting the maximum level of cash-in-hand after selling durables equal to the sum of the tops of the cash-in-hand and durables stock grids ensures that the grid is wide enough for comparing the adjust and keep cases. I iterate the value function until convergence using the absolute value of the largest difference as an error metric and a tolerance level of 1e-3.

4.3 Decision Rules

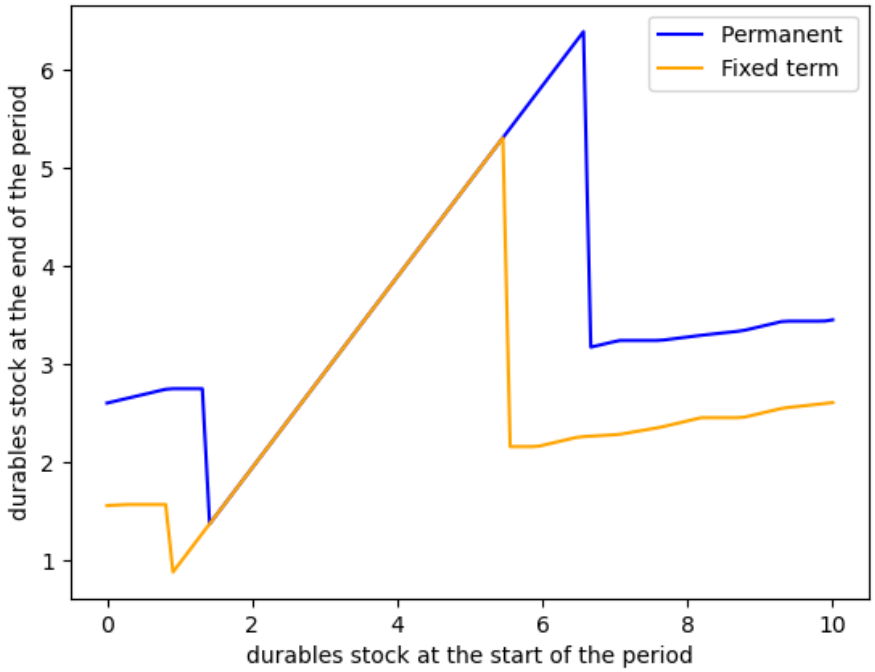
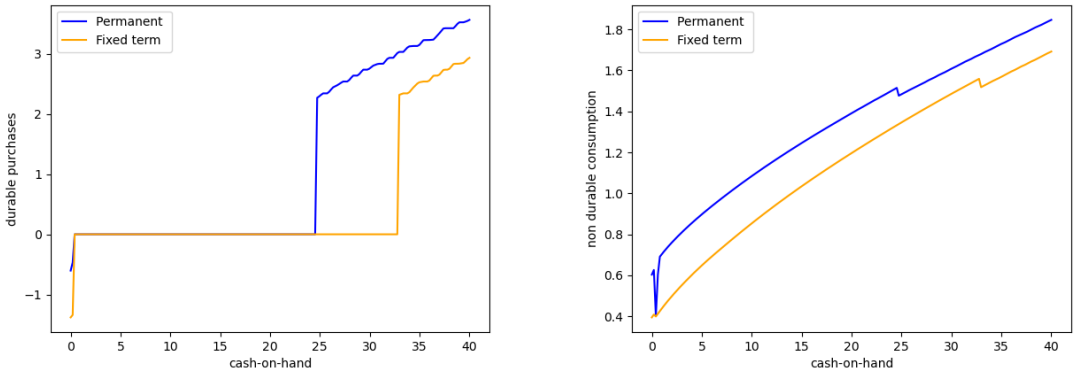


Figure 1: Model policies: stock of durables

Figure 1 plots choices of durables stock as a function of durables stock at the



(a) durable purchases (b) non-durable consumption

Figure 2: Model policies

start of the period for Permanent (in blue) and Fixed-term households (in orange).[18] These policy functions illustrate that households update their durables following trigger-target (S,s) rules. As durable investments are subject to non-convex transaction costs, agents wish to limit the frequency of such adjustments. Households will decide on a minimum stock of durables under which they do not want to sink and a maximum stock of durables above which it is inefficient for them to go. As long as their durables stock is between these two bonds, they will not make any adjustment and simply let their durables depreciate. Once the stock of durables depreciated below the lower trigger point, households will be willing to pay the adjustment costs to bring their durables up to a target value. If households started the period with holdings of durables above the upper trigger point, they would pay the adjustment costs and sell some of their stock to revert to a target value. Figure 1 shows adjustment trigger and target points for buying and selling durables. In between these points, households are in the inactivity region.

Figure 1 also highlights the difference between Permanent and Fixed-term households. In addition to facing lower income risk, Permanent households have, on average, higher income levels than their Fixed-term counterpart. This translates into the policy functions as their optimal durables targets after adjustment are higher than the ones of Fixed-term households. Moreover, Fixed-term households will wait longer before buying new durables and will sell their existing stock faster than Permanent

[18]These policy functions are for a given level of cash-in-hand that corresponds to the mean of the stationary distribution.

households.

The discrepancy between the two types of contract's durable consumption patterns is also illustrated in Panel a of Figure 2 where durable purchases are plotted against cash-in-hand.[19] Here, the inaction region of Fixed-term households is larger than the one of the Permanent group. Moreover, conditional on buying durables, the value of Fixed-term households' purchases is lower than Permanent households' tickets. We note here that for very low levels of cash-in-hand, durable purchases are negative. This is a region where households sell their current durables to afford non-durable consumption.

Finally, Panel b of Figure 2 plots non-durable consumption as a function of cash-in-hand[20] As non-durable consumption isn't subject to frictions, inaction regions and (S,s) types of behaviours are absent. The drop in consumption at the start of the x-axis corresponds to when households stop selling their existing durables to afford non-durable consumption. Similarly the drop in consumption for high cash-in-hand indicates that some resources are now allocated to buying durable goods.

5 The Great Recession

The model is used to evaluate the impact of households' types of contract on durable and non-durable consumption patterns during the Great Recession.[21]

5.1 The Great Recession

I simulate the model in response to a shock calibrated to reproduce the Great Recession and study the durable and non-durable consumption patterns of Permanent and Fixed-term households. The presence of non-convex adjustment costs in the model implies that households' durable consumption is path dependent (depends on past durable purchases). Consequently, extra care should be taken when setting up the initial condition in the simulations. To address this, I simulate the recession episode from an initial condition that takes into account the aggregate shocks that led to the Great Recession. More specifically, I stimulate the 22 years that led to the Great Recession by setting the aggregate states to match Italy's OECD based

[19] for a given level of durables stock that corresponds to the mean of the stationary distribution.

[20] once again for a given level of durables stock that corresponds to the mean of the stationary distribution.

[21] Here, Great recession encompasses the recession that occurred in 2008-2009 as well as the recessionary episode of 2011-2013 - sometimes referred to as the sovereign debt crisis. These two episodes are bundled under the term Great Recession for brevity.

recession indicators between 1980 and 2002. I then simulate a boom for the 2002 to 2007 period and the Great Recession from 2008 to 2014. The length of the Great Recession shock is chosen to be consistent with the data available in this paper's motivation section. In the simulations, in addition to the recession specific employment risks, Permanent and Fixed-term households incur a labour income drop of 6% and 11% respectively during the Great Recession shock. Similarly, in line with the data, Permanent households also incur a 4% drop in their capital income.[22] These drops match the income data during the Great Recession and confer an exceptional nature to this particular recessionary episode (i.e. they ensure that the Great Recession is not any recession).

One aim of this exercise is to evaluate if the model is able to reproduce the empirical facts in the motivation section of the paper. Therefore, the data sample selection should be reproduced in the model simulations. In the data, households report their employment status for the majority of the year. Consequently, households who belong to the Fixed-term group in the simulations could have been employed with a Permanent contract or unemployed for a small time during the year. The same is true for Permanent households. Finally, as in the data, I take the average of the share of adjusters and the durable purchases[23] during the boom (2002-2007) and the Great Recession (2008-2014) before computing changes between these two periods.

The results for the Great Recession simulations are reported in Table 6 where the data from the motivation section (Table 2) are compared to their model counterparts. The last two columns (changes in income from labour and transfers) are targeted moments while the changes in cars and non-durable consumption are untargeted. The model is successful in matching most changes that occurred over the Great Recession. The small drops in both groups' model non-durable consumption track the data well. Similarly, the model share of households purchasing a car drops by 19% and 41% for Permanent and Fixed-term households against 21% and 42% in the data. Moreover, for Fixed-term households, the decline in car consumption's intensive margin is 14% in the model and 12% recorded in the SHIW. Yet, the model falls short in replicating the magnitude of the car intensive margin's response for Permanent households (-1% *versus* -12% in the data). In the current set up of the model, households do not face any wealth return risk. A promising path to correct for the unresponsiveness of Permanent households' intensive margin would be to have a different wealth return risk in boom and in recession. This would impact Fixed-term and Permanent households differently as they have different portfolio composition. I

[22] In the SHIW data, the mean capital income of Fixed-term households does not decrease during the Great Recession.

[23] conditional on adjusting

am currently implementing this addition to the model, still the results are not ready yet.

	Cars ext. margin		**Cars int. margin**		**Non-dur. cons.**		**Income**	
	Perm.	F.t.	Perm.	F.t.	Perm.	F.t.	Perm.	F.t.
Data	-0.21	-0.42	-0.12	-0.12	0.00	-0.03	-0.06	-0.11
Model	-0.19	-0.41	-0.01	-0.14	-0.03	-0.04	-0.06	-0.11

Notes: Perm. stands for permanent contract and F.t. for fixed-term or temporary contract. Non dur. cons. stands for non-durable consumption, ext. for extensive and int. for intensive.

Table 6: Consumption and Income Response to the Great Recession (Data vs. Model

5.2 Impulse Responses Break down

A quick glance at Table 6's extensive margins of car consumption might suggest a simple and straightforward risk story. One may think that over the Great Recession, household's income uncertainty increased. Therefore agents became less willing to make partially irreversible adjustments like buying a new car. This higher option value of waiting could explain the car extensive margin's drop upon entering the Great Recession. Besides, the extensive margin's dip was twice as large for Fixed-term households than for their Permanent counterparts. One might think that this is due to the fact that the former face on average a higher level of income risk and that their income process changed more than that of Permanent households during the recession. This simple mechanism is the most obvious one that comes to mind when looking at durable consumption in the presence of risk. However the following section illustrates that it is far from being the whole story to understand the difference between Fixed-term and Permanent households' car consumption patterns over the Great Recession.

In order to understand the different mechanisms at play in the durable and non-durable consumption patterns of Permanent and Fixed-term households, it is useful to engage in a break down of the impulse response functions exercise. In the simulation results presented above, the Great Recession shock encompasses two channels: 1) the transition matrix between the three employment states (i.e permanent contract, fixed-term contract, unemployed) changes and 2) households incur an extra drop in income from labour, transfers and capital[24]. Figure 3 (for Permanent house-

[24]this extra income drop is calibrated to match the decrease in labour, transfer and capital income that Permanent and Fixed-term households experienced during the Great Recession

holds) and Figure 4 (for Fixed-term households)[25] plot the baseline IRFs in blue. In the baseline IRFs, the two channels of the Great Recession shock are at play. Additionally, I compute the IRFs that would have occurred if the Great Recession only implied a change in the employment states transition matrix but no extra income drop. This is what happens if we shut the income drop channel. These IRFs are labeled "no income drop" and are plotted in orange. Finally, I also plot what happens if we shut down both recession channels (i.e the change in the employment transition matrix and the extra income drop). In that case, the economy is not different than in boom but the households still believe that they are in a recession (they use their recession policy functions). This experiment highlights what happens when households react to a change in income risk without facing the actual income loss and employment transitions associated with the recession. In that sense it shows the impact of a change in the risk perceived by the households only. These IRFs are labelled "placebo" and are plotted in green in Figures 3 and 4.

Let's start the IRFs break down exercise with the Permanent households in Figure 3. First, notice that the "no income drop" and the "placebo" IRFs are very similar. This is not surprising as households selected in the Permanent group are households that were employed with a permanent contract for at least six months in a given year. Given the persistence of the Permanent status, it is only a residual share of the selected sample that has gone through any other employment state during the year. This is true with the boom employment state transition matrix as well as with the recession one. Therefore, the sole change in realised transition matrix does not affect the households selected in the Permanent group much. Consequently, the "no income drop" IRFs are mostly driven by the fact that households use their recession policy functions, resulting in similar IRFs as the "placebo" experiment. Realised transitions between employment states is not a strong driver of consumption fluctuations for households who remain in the Permanent sample.

We now consider the top left panel of Figure 3 that plots changes in the share of Permanent households who bought a car in a given year. A large share of the baseline IRF is preserved when the extra income drop channel is shut, implying that the car extensive margin's drop is strongly driven by the change in households' perceived risk. This indicates that Permanent households' car purchasing decisions follow a standard uncertainty story. Table 7 displays how expected income and expected income variance change when the employment state transition matrix goes from boom to recession.[26] Upon entering the Great Recession, Permanent house-

[25] found at the end of the paper.

[26] this does not take into account the extra income drop that is added in the Great Recession experiment.

holds expect their average income to remain the same and their income variance to rise by 7%. As mentioned above, the presence of non-convex adjustment costs makes car purchases partially irreversible. In other words, buying a car is a commitment that Permanent households will be less willing to make in an environment with more income uncertainty. In such times, it is optimal for them to delay durable purchases and wait until the uncertainty recedes. Higher income uncertainty encourages Permanent households to "wait-and-see", widening the inactivity region of their policy function.[27] This mechanism also explains why the drop in Permanent households' extensive margin is relatively short-lived. At the start of the recession, households decide to wait for a less uncertain time and put their project to buy a car in standby. However as the recession draws longer and longer the value of their existing car keeps depreciating. Eventually, it sinks to such a low level that households will be forced into buying a car despite the ongoing recession. This is the reason why the drop in the car extensive margin is deep and short-lived for Permanent households.

Looking at the path of risk-free asset (Panel d) confirms the uncertainty story. In the baseline IRFs, Permanent households' stock of risk-free asset is worn down during the recession because of the realised income drop. In the other two experiments, the stock of risk-free asset actually rises during the recession as households engage in precautionary savings. Finally, Panel b of Figure 3 indicates that all the drop in car purchases' intensive margin is driven realised income losses (the IRFs fluctuations in the "no income drop" and "placebo" experiments are roughly zero). Consequently, the intensive margin's drop is deepening over the length of the recession as income stays low and the value of the risk-free asset declines. For Permanent households the mechanism behind the decrease in car purchases is different along the extensive and the intensive margins. On the one hand, most of the decline in the extensive margin of car consumption is driven by households expecting higher income uncertainty. This makes the consumption drop strong but short lived. On the other hand, the dip in car intensive margin is explained by the realised income losses and is growing as the recession draws longer.

	Perm.	F.t.
Change in expected income (%)	0.00	-0.04
Change in income variance (%)	0.07	-0.25

Table 7: Changes in households' risk (Boom v.s Recession)

[27]Here, it is worth highlighting that in the absence of non-convex adjustment costs, there would be no trigger-target types of behaviour and the car purchases would behave like non-durable consumption.

Figure 4 repeats the IRFs break down exercise for the Fixed-term group. In opposition to the result of the Permanent sample, the Fixed-term households' IRFs are different in the "no income drop" and in the"placebo" experiments. It is the case as being in a fixed-term contract is a lot less persistent than being employed with a permanent agreement. Therefore, households selected in the Fixed-term group (i.e households who hold a fixed-term contract for at least six months in a given year) are much more likely to go through other employment status over the period (mostly unemployment spells). The likelihood of going through some unemployment spell is dependent on the employment state transition matrix and it is higher in recession than in boom. Consequently, even when the extra labour income drop is shut down, the recession employment states transition matrix translates into more Fixed-term households experiencing unemployment spells.

Panel a displays the IRFs break down for Fixed-term households' extensive margin of car purchases. Once again, the plots are quite dissimilar to that of permanent contract holders. Firstly, roughly two thirds of the extensive margin's response to the Great Recession can be attributed to realised income losses (either through the drop in Fixed-term labour income or through more households experiencing unemployment spells) and one third can be attributed to households' perceived risk. Secondly, the shape of the response is different from that of Permanent households. The drop in the share of buyers is much more persistent than that of the Permanent group. This is the case as the nature of the risk faced by the two types of households is very different. Table 7 indicates that in recession, Fixed-tern households register a 4% drop in their expected income alongside with a drop of a quarter of their income variance. This is the case as a large part of Fixed-term households' income variance comes from the possibility to get upgraded to a permanent contract. Yet in recession, this positive income risk reduces significantly (fixed-term workers' probability to get upgraded goes from 10.3% in boom to 6.4% in recession). The income uncertainty decreases because of a drop in the upside income risk. Consequently, the standard uncertainty story that explained Permanent households' response along the car extensive margin does not hold here. Fixed-term workers have no incentive to "wait-and-see" and, because their expected income decreased and they have less chance to get upgraded to a permanent contract, they actually wish that they could downsize their stock of durables. Once again the non-convex adjustment costs play a key role by making selling durables extremely costly. Still, because of depreciation, the value of households' cars naturally decreases overtime. Fixed-term households exploit depreciation in order to save on the cars' transaction costs. They essentially "wait-to-downgrade". As depreciation rate is low, Fixed-term households' "wait-to-downgrade" is a slow process that is persistent throughout the recession.

Panel b plots the path of the intensive margin of car purchases. In the "placebo" experiment, Fixed-term households slightly reduce the value of the cars that they buy. This is the case as, as mentioned above, their target value of cars went down. Buying smaller cars when adjusting is a downgrading mechanism. Besides, like for the Permanent group, most of the drop in car purchases' intensive margin can be attributed to realised income losses (through the extra labour income drop or through the recession employment transition matrix).

A final interesting result relates to the composition of the Fixed-term group. In the model's simulations, the share of Fixed-term households in the population of employed households was 9.5% in boom and 12% in recession, implying that some Permanent households became Fixed-term. On average Fixed-term households have a level of risk-free asset and stock of cars that is a little less than three quarters of that of Permanent households. Consequently, at the start of the recession, the flow of Permanent households into the Fixed-term group brings up the group's average stock of cars and risk-free asset. This composition effect can be seen in Panel c of Figure 4 where the Fixed-term group's average stock of cars increases in the early periods of the recession despite a clear drop in new purchases (on both margins). This increase in mean stock of cars only occurs in the "baseline" and the "no income drop" experiments - the scenarios where the recession employment states transition matrix is used. Similarly, the average stock of risk-free asset displayed in Panel d rises at the start of the recession. In the "placebo" simulations, the rise in risk-free asset follows a precautionary savings motive triggered by households' lower expected income and the reduced upside income risk. In the "baseline" and the "no income drop" experiments, the early recession risk-free asset stock hike results from a combination of the precautionary motive and the composition effect. This shift in the composition of the Fixed-term households is important because it implies that, at the start of the recession, the Fixed-term group is on average wealthier than it used to be. Still, its members reduce their car purchases by 42% and 12% in the extensive and intensive margins respectively. What would it be if the group was not richer to start with? The durable purchases' drop would be even starker. The change in the Fixed-term group composition renders the strong Great Recession car consumption crash that motivated this paper a conservative measure of what is going on for Fixed-term households.

6 Conclusion

This paper uses a consumption saving model augmented with non-convex adjustment costs and types of contract to study the durable consumption response to the Great Recession. The model is successful at replicating most durable and non-durable consumption patterns of Fixed-term and Permanent households over the Great Recession. The results suggest that the main drivers of the car consumption fluctuations are different along the intensive and the extensive margins as well as across the Fixed-term and Permanent groups.

On the one hand, in the Permanent group, most of the decline in the extensive margin of car consumption is driven by households' higher income uncertainty. When income variance increases, households delay making partially irreversible investments and adopt a "wait-and-see" strategy. This makes the car consumption drop strong but short lived as agents will eventually have to replace their car when too depreciated. They will have to do so even if the recession is still ongoing.

On the other hand, the mechanism driving Fixed-term households' share of car buyers is related to risk in a different way. Upon entering the recession, Fixed-term households register a 4% drop in their expected income alongside with a 25% drop of their income variance. This is the case as their chance to upgrade to a permanent contract decreases. Consequently, the standard uncertainty story that explained Permanent households' response along the extensive margin does not hold here. Fixed-term households actually wish that they could downsize their stock of durables, but non-convex adjustment costs make selling their current cars extremely costly. Still, because of depreciation, the value of households' cars naturally decreases overtime. Fixed-term households exploit depreciation in order to save on the cars' transaction costs. They essentially "wait-to-downgrade". As depreciation rate is low, Fixed-term households' "wait-to-downgrade" is a slow process that is persistent throughout the recession. This explains why the drop in Fixed-term households' extensive margin of car consumption is so much longer lived than that of Permanent workers.

Finally, the simulations suggest that the main driver of a decrease in car intensive margin is realised income losses. This is true across both types of contract.

Understanding the heterogeneous mechanisms at play in the extensive and intensive margins of car consumption across the employed population is key to apprehend the length of the demand drought and to think about targeted stimulating policies. Moreover, this paper's model is a good laboratory to experiment how deep the Great Recession would have been if the use of Fixed-term employment was more or less developed. This question is particularly important in the current context of spread

in flexible working arrangements. These experiments are currently in progress and the final results should be available soon.

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A SHIW Data

This appendix provides additional discussion on the Survey on Households Income and Wealth (SHIW) conducted by the Bank of Italy between 1965 and 2016 (last wave available). I restrict my study to 2000-2016 because prior to 2000, the SHIW did not collect the data necessary for my analysis. From 2000, the SHIW provides detailed job-related characteristics, as well as information on households' income, wealth, non-durable consumption and durable goods expenditures. The SHIW also details vehicles sales and purchases - including cars, motorbikes and boats. From 2012, there the break down between cars and other vehicles is also available. non-durable consumption refers to all other consumption expenditures. Cars and non-durable expenditures are deflated using CPI price indices (CPI for durable goods and for non-durable consumption respectively) .

The survey is conducted every two years and has a panel component (that has been growing since its introduction and represents 55% of the sample in 2014). The units of observation are individuals and households. The sample size is approximately $8,000$ households and $20,000$ individuals in each wave. The survey provides sampling weights that are representative of Italian households and Istat computed monetary reevaluation coefficients.

The SHIW presents some advantages over American surveys that are often used to study durable consumption: the CEX and the PSID. The CEX has little information on households' characteristics and employment status, has a short panel element (households are part of the sample for a maximum of four consecutive quarters), the frequency of income, wealth and consumption are not synchronised and it does not ask respondents any subjective questions that can be used to measure expectations, preferences and constraints. On the other hand, the PSID also lacks subjective questions and has a small sample size (2,000 households).

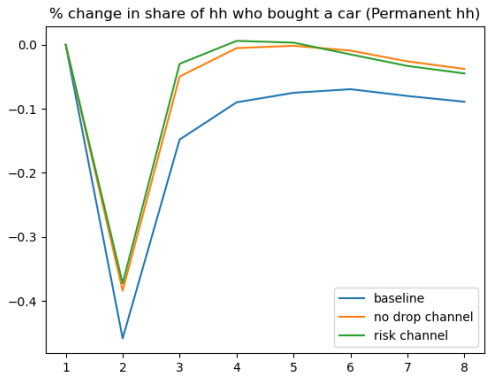
B Calibration

B.1 Employment State Transitions

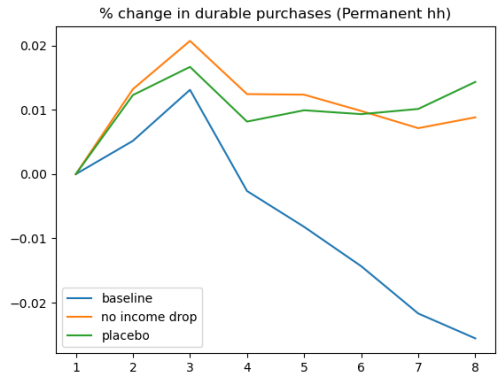
Boom		
Target Transitions (2-year time horizon)	Data	Model
Perm. to Perm.	0.93	0.93
Perm. to F.T.	0.04	0.04
Perm to Unem.	0.03	0.03
F.T. to Perm.	0.49	0.49
F.T to F.T	0.36	0.36
F.T. to Unem.	0.15	0.15
Unem. to Perm.	0.23	0.23
Unem. to F.T.	0.15	0.15
Unem. to Unem.	0.62	0.62
Recession		
Target Transitions (2-year time horizon)	Data	Model
Perm. to Perm.	0.90	0.90
Perm. to F.T.	0.06	0.06
Perm to Unem.	0.05	0.05
F.T. to Perm.	0.33	0.33
F.T to F.T	0.47	0.47
F.T. to Unem.	0.20	0.20
Unem. to Perm.	0.14	0.14
Unem. to F.T.	0.13	0.13
Unem. to Unem.	0.73	0.73

Table 8: Targeted moments of the employment transitions

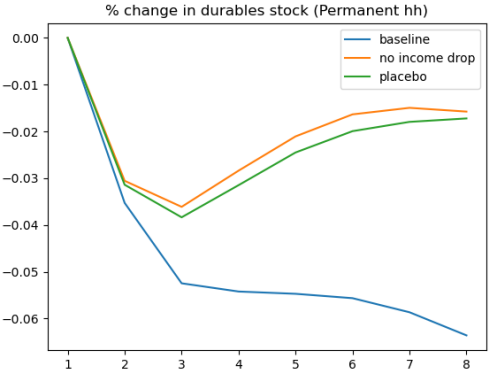
Notes: Note that the Perm. to Perm. transition in the first column does not imply that the household stayed in a permanent employment for two full years. It simply means that, at the two survey dates, the household was employed under a permanent contract (he could have gone through other employment states in-between the two surveys).



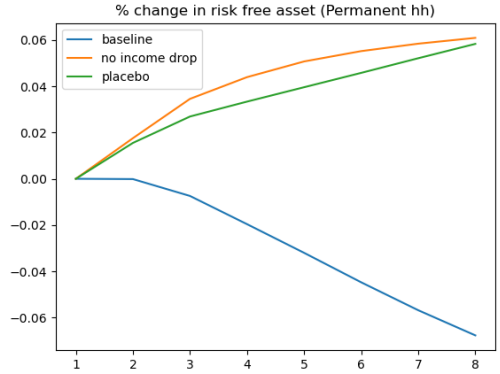
(a) Cars (Extensive Margin)



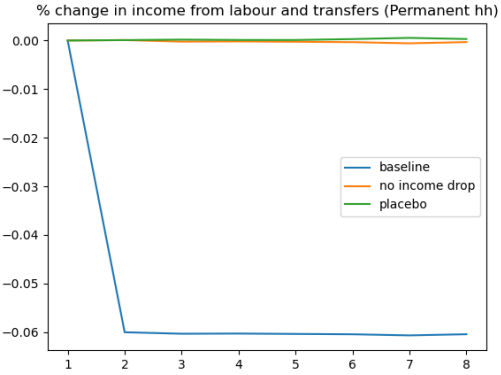
(b) Cars (Intensive Margin)



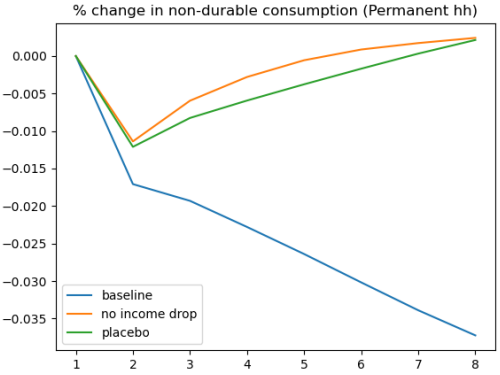
(c) Stock of Cars



(d) Risk-free Asset

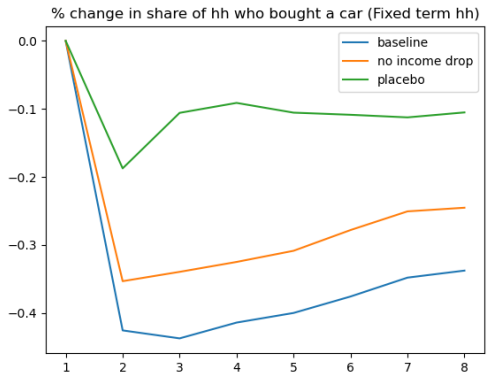


(e) Income

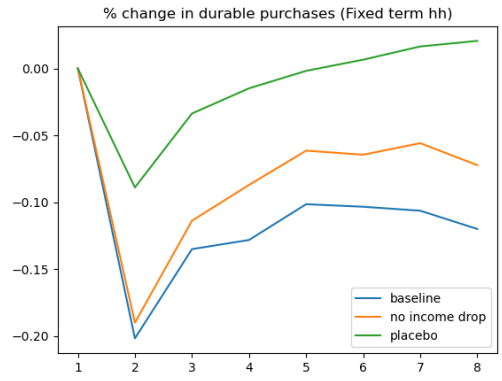


(f) Non-durable Consumption

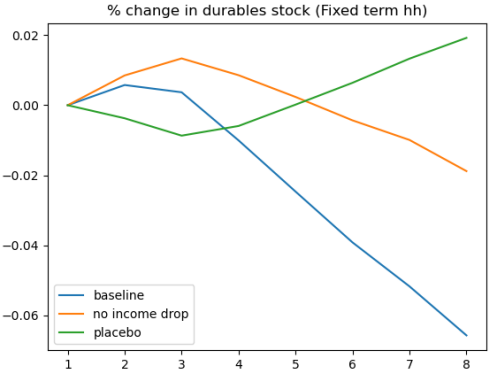
Figure 3: IRFs Decomposition (Permanent group)



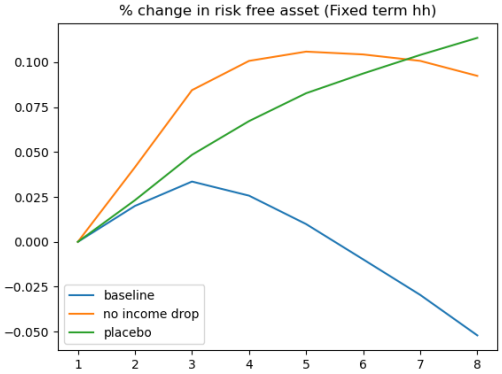
(a) Cars (Extensive Margin)



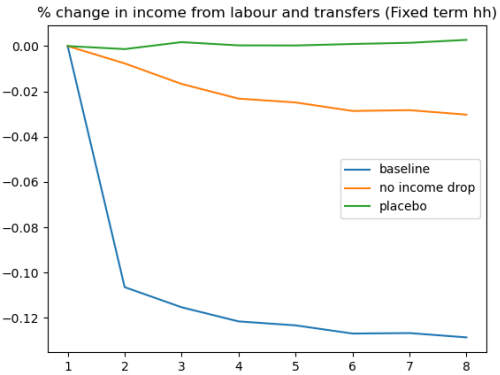
(b) Cars (Intensive Margin)



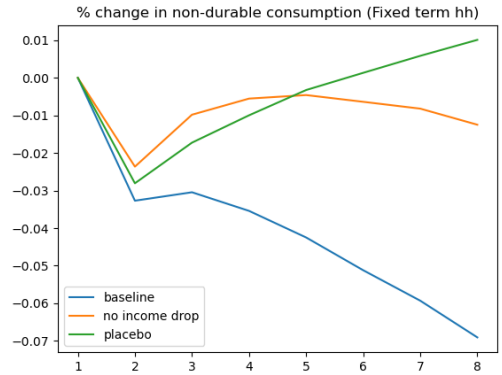
(c) Stock of Cars



(d) Risk-free Asset



(e) Income



(f) Non-durable Consumption

Figure 4: IRFs Decomposition (Fixed-term group)