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Andrea Neri, Concetta Rondinelli,
Filippo Scoccianti

Household spending
out of a tax rebate:
Italian “€80 tax bonus”

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Abstract

We estimate the consumption response of Italian households to the “€80 tax bonus” introduced in 2014, using the panel component on the Survey of Household Income and Wealth. We find that households that received the tax rebate increased their monthly consumption of food and means of transportation by about €20 and €30, respectively, about 50-60 per cent of the total bonus. There was a larger increase for households with low liquid wealth or low income. Our estimates are quite robust to different model specifications and are broadly in line with the evidence available from similar tax rebates in other countries but, due to the small sample size, are not always statistically significant. To understand the mechanism behind our results we then simulate an overlapping generations model of household consumption: the marginal propensity to consume generated by the structural model is in line with our empirical estimates.

Keywords: fiscal stimulus, expenditure, consumer behavior.

JEL Codes: D12, E21.

Non-technical summary

Policymakers often try to use tax policy to lessen the magnitude of economic fluctuations and help bump the economy out of a recession; they cut income taxes in recessions, assuming that the resulting increases in disposable income raise household spending. Yet, the effectiveness of such measures is still debated in the literature (both empirically and theoretically) and depends on the way Governments have financed the stimulus packages (Shapiro and Slemrod, 2003b) and how consumers have perceived it (permanent versus transitory, anticipated vs unanticipated; Christelis et al. 2015, Bunn et al. 2017).

To counteract the effects of the severe economic downturn, in 2014 the Italian Government introduced a tax credit (Decree Law 66/2014) aimed at by increasing household consumption. According to the Government's estimates the fiscal package entailed a transfer of €5.9 billion, equivalent to 0.5 per cent of household disposable income and 0.4 of Italian GDP. The tax credit was targeted at employees with a total gross annual income of between €8,145 and €26,000. The bonus resulted in an increase in the average individual's salary of about €80 per month ("€80 tax bonus") for each payroll employee earning up to €24,000, decreasing thereafter and no longer paid on annual salaries of €26,000 and over.

We estimate the consumption response of Italian households to the "€80 tax bonus" using unique data from the Italian Survey on Household Income and Wealth (SHIW) conducted by the Bank of Italy, which is part of the euro area Household Finance and Consumption Survey. We exploit the panel component of the SHIW to estimate the change in household expenditure for non durable (mainly food) and durable goods after the introduction of the tax rebate using a difference-in-difference methodology. Our identification strategy is based on matching a sample of treated and control households that display similar characteristics before the start of the program.

We find that about 50-60 per cent of the bonus has been spent on consumption; this proportion is in line with the relevant literature (Shapiro and Slemrod 2003a and 2009; Leigh 2012; Jappelli and Pistaferri 2014; Kan et al. 2017), but it is lower than the self-reported spending of the rebate directly provided by respondents in the same survey (about 90 per cent). One reason for this difference is that it may be difficult for respondents to recall

exactly how they have used the sum they received, especially if the amount is relatively small.

Moreover, we estimate that responses to the tax rebate were relatively larger for households with low liquid wealth or income (80 per cent), a finding consistent with the presence of liquidity constraints (as in in Johnson et al. 2006, Parker et al. 2013 and Jappelli and Pistaferri 2014). We do not find any difference between the spending behaviour of those who believed that the rebate was permanent and those who did not. Our estimates are quite robust to different model specifications and are broadly in line with the evidence available from similar tax rebates in other countries but, due to the small sample size, are not always statistically significant. To understand the mechanism behind our empirical findings we simulate an overlapping generations model where households consume housing and a composite non-housing good. The model builds on the work by Kaplan and Violante (2010, 2014) and includes some differences to account for the specific Italian setting. The marginal propensity to consume generated by the structural model is in line with our empirical estimates.

All in all, our results do suggest that the “€80 tax bonus” had significant macroeconomic impact. Applying the resulting estimates to the transfer from the Government we find that consumption increased by about €3.5 billion, that is, 40 per cent of the total increase in household spending in 2014 was due to the introduction of the tax rebate.

1 Introduction

In 2014 the Italian Government introduced a tax credit aimed at counteracting the effects of the economic downturn by increasing household consumption. According to the Government's estimates the fiscal package entailed a transfer of €5.9 billion, equivalent to 0.5 per cent of household disposable income and 0.4 of Italian GDP. The tax credit was targeted at employees with a total gross annual income of between €8,145 and €26,000. The bonus resulted in an increase in the average individual's salary of about 80€ per month.¹

Similar tax policies have often been used by policymakers to lessen the magnitude of economic fluctuations. Yet, the effectiveness of such measures is still debated in the literature (both empirically and theoretically) and depends on the way Governments have financed the stimulus packages (Shapiro and Slemrod, 2003b) and how consumers have perceived it. The proportion of the tax rebate actually spent on consumption can be influenced by many factors, such as the fraction of households that face liquidity constraints or the perceived horizon of the tax credit (permanent versus transitory, anticipated vs unanticipated; Christelis et al. 2015, Bunn et al. 2017).

Our paper contributes to the literature studying the change in household spending directly caused by the “€80 bonus”. In particular, our identification strategy compares the change in expenditure for households that received the payment with the change in expenditure for those that did not but were otherwise similar (as in Brzozowski, 2007). Moreover, we build a structural model of household behaviour to understand the mechanism behind our empirical estimates (as in Kaplan and Violante, 2010; Kaplan and Violante 2014; Violante et al. 2014; Huntley and Michelangeli, 2014; Cerletti and Pijoan-Mas, 2012).

Our analysis uses unique data from the Italian Survey on Household Income and Wealth (SHIW) conducted by the Bank of Italy. This survey has a panel component and contains a large set of components on household income and wealth. It also collects information on household expenditure. In the 2014 wave of the survey a special module of questions about the tax rebate was added to the standard questionnaire. This module asked households whether they received the rebate, the amount of the rebate and how they used it. They were

¹In this paper we will also call the tax credit a bonus or rebate.

also asked whether they perceived the rebate to be permanent or not.

We estimate the change in household expenditure due to the tax credit to be between 50 and 60 per cent of the sum received. This magnitude is in line with the relevant literature (Shapiro and Slemrod 2003a and 2009; Leigh 2012; Jappelli and Pistaferri 2014; Kan et al. 2017). Yet this figure is lower than the self-reported spending of the rebate provided directly by respondents in the same survey (about 90 per cent). Moreover, we find that responses to the tax rebate were larger for households with low liquid wealth or low income, as in Johnson et al. (2006), Parker et al. (2013) and Jappelli and Pistaferri (2014). We do not find any difference between those who believe that the rebate is going to be permanent and those who do not.

While our results are quite robust to different model specifications, the final sample size of the credit recipients is too small for us to always obtain statistically significant estimates. Therefore, we build a structural model of household consumption to understand the mechanism behind our empirical estimates. The model builds on the work by Kaplan and Violante (2010, 2014) and produces results that broadly confirm our empirical findings.

The remainder of the paper is organized as follows. Section 2 reviews of the most relevant literature, while Section 3 describes the tax credit together with the use of the SHIW, in assessing the effect of the rebate on household expenditure. Section 4 discusses our empirical methodology and presents the main results on the response to the rebate across different type of households. In Section 5 we use a dynamic structural model of household behaviour to further support our empirical estimates of the marginal propensity to consume out of the tax credit; the results and sensitivity analysis are presented in Sections 5.1 and 5.3, respectively. Section 6 wraps up the main findings of the paper.

2 Related literature

There is a large strand of research studying the response of consumption to changes in income (see the review article by Jappelli and Pistaferri, 2011, as an example).

Our paper is related to the literature that uses household data to test whether predictable changes in household income, in particularly those caused by tax policy, affect household

consumption expenditures. In general this literature uses two different approaches.

The first uses survey responses to directly estimate the consumption response to tax rebates. This approach consists in asking respondents about what they did (or plan to do) with the extra funds from the tax rebates. For example, Shapiro and Slemrod (2003 and 2009) and Sahn et al. (2010), use questions added to the University of Michigan Survey of Consumers to evaluate the effects of the 2001 and 2008 tax cuts in the US. In both papers, they find that around one-fifth of respondents said that the tax rebates would lead them to mostly increase spending. Under certain assumptions, the authors estimate that the aggregate marginal propensity to consume (MPC) from the rebate was about one-third. Leigh (2012) in analysing the 2009 fiscal stimulus introduced in Australia finds larger effects than those estimated for the United States. He shows that 40 per cent of respondents said that they spent the household stimulus payment and this translates into an average MPC of about 0.42. In a more recent paper Graziani et al. (2013) use an internet panel of workers to estimate the effect of a cut in their tax rate. They find that 35 per cent of individuals actually spent the majority of their tax-cut funds. The average actual MPC is around 36 per cent. Finally, Kan et al. (2017) study the 2009 Taiwan Shopping Voucher Program using survey data and find that the marginal propensity to consume is about one quarter.

The second approach, which is methodologically closer to the one adopted in the current study, uses micro data on expenditure surveys to indirectly infer household spending response to tax rebates. For instance, Johnson et al. (2006) and Parker et al. (2013) use the Consumer Expenditure Survey (CE) to measure the impact of the 2001 and 2008 fiscal stimulus packages introduced in the United States. The identification strategy exploits the randomized timing of receipt of the rebate across households. Johnson et al. (2006) find that households spent from 20 to 40 per cent of their rebates on nondurable goods during the three-month period in which their rebates arrived, and roughly two-thirds of their rebates cumulatively during this period and the subsequent three-month period. They also find that responses are larger for households with low liquid wealth or low income. Parker et al. (2013) find that households spent 12 – 30 per cent (depending on specification) of their payments on nondurable goods during the three-month period of payment receipt, and a significant larger amount on durable goods, primarily vehicles, bringing the total response to 50-90 per cent of the payments.

It is debated in the literature whether survey questions that directly elicit the marginal propensity of tax funds usage accurately measure the actual behaviour of households. Shapiro and Slemrod (2003a, 2003b and 2009) show that for the 2001 and 2008 US tax rebates, direct survey methods yield contemporaneous marginal propensities of consumption similar to those obtained using the indirect approach of inferring them from self-reported consumption data. Parker et al. (2013) added a Shapiro-Slemrod style question to the 2008 Consumer Expenditure Survey and find that responses to survey questions are correlated with the reported consumption behaviour of households. The main advantage of this approach is that it provides very simple to use information. On the other hand it may be difficult for respondents to recall exactly how they have used the sum they received, especially if the amount is relatively small. Some authors (Sahm et al. 2012) have also argued that mental accounting may play an important role when households reply to the questions; when we ask people about their consumption, they should keep in mind a counterfactual state of the world in which they receive no tax credit (Shapiro and Slemrod, 2003b).

We contribute to the literature in three ways.

First, we provide new empirical evidence by using a different identification strategy. We estimate the actual usage of the extra income by comparing the change in expenditure for households that received the payment with that for those that did not receive the payment but were otherwise similar (diff-in-diff estimator). This estimator allows us to remove bias from the comparison between the treatment and control groups that could be the result of permanent and unobserved differences between those groups, as well as bias arising from the comparison over time within the treatment group that could be the result of trends.

Second, we use a unique survey data that permits us to test several assumptions. We are able, for instance, to test the liquidity constraint assumption using different definition of liquidity-constrained households. Moreover, we can verify whether there is a difference between the self-reported spending behaviour and actual behaviour. In fact, in the 2014 wave of the SHIW survey we included direct questions on the use of the tax credit. Finally, we also asked respondents whether they believed the rebate to be permanent or not. This question enables us to test the assumption that permanent rebates should have a larger impact than temporary ones.

Third, we present a structural model of consumption responses to earnings shocks with heterogeneous agents (as in Kaplan and Violante, 2010; Kaplan and Violante 2014; Violante et al. 2014; Huntley and Michelangeli, 2014; Cerletti and Pijoan-Mas, 2012). Using this structural model we are able to replicate all of our most relevant empirical findings and explain the main mechanism behind household's attitudes toward consumption in the face of an income shock. The model mainly builds on the work of Kaplan and Violante (2014) and includes some differences to account for our specific application.

3 The 2014 tax credit

The tax credit introduced by Decree Law 66/2014 benefited, starting from May 2014, employees with a total gross annual income of between €8,145 and €26,000. According to Government estimates, it entailed a transfer to households of €5,9 billions, equal to 0.5 per cent of household disposable income.

The Decree Law 66/2014 required the employer to reduce the tax withheld on behalf of the employee in order to increase the salary received by €80 per month. For earnings between €24,000 and €26,000, the amount of the bonus was smaller.²

If income tax deductions do not reach the €80 amount, the employer can reduce the withholding on pension contributions. The bonus hence represented a reduction in the so-called 'tax wedge', that is the difference between the total cost of an employee to his employer and the employee compensation.³

According to Government 10 million employees (including freelancers, independent contractors and project-based contract workers) received the tax credit.

The delivery mechanism was entirely automatic. Those who were judged to be eligible received the bonus in their pay envelopes.

Eligibility is determined based on the individual's total income, therefore a family can benefit from zero, one, or more tax credits depending on how many family members are

²In this specific income bracket the bonus was calculated as follows: $\text{€}80 \times (26,000 - \text{income}) / 2,000$.

³For a discussion in the media about the tax rebate see Gagliarducci and Guiso (2015a and 2015b); Guiso (2015) and Morelli (2014).

eligible.

It is worth noting that the assessment of eligibility was made based on 2014 gross income. At the time the bonus was distributed the eligibility status of a given employee was not known with complete certainty. Precise 2014 gross income information became available only in 2015 when people filed their tax forms. As a consequence, some of the persons with income close to the lower bound may have been initially misclassified as eligible, but a year later had to reimburse the bonus received. It is estimated that about 1.5 million people had to return the bonus in 2015 once their eligibility status was determined with certainty.⁴ Additionally, households that lost their jobs in 2014 may have had to repay part of the bonus received in the months they were employed. The monthly bonus is calculated on an annual basis, according to the number of months spent in employment. An employee with a gross annual salary of €15,000 who lost a job in September 2014, received €80 from May to September but, on balance, was entitled only to a part of this bonus, amounting to €60 (for nine months of work in a year). Similarly, those employees who obtained a job after January 2014, were entitled to less than €80: an employee who started a job at the beginning of May was entitled to only €60 (the bonus is again proportional for just nine months).

3.1 The income tax credit in the Survey on Household Income and Wealth

From January to July 2015, the Bank of Italy conducted the biannual Survey on Household Income and Wealth for 2014 covering 19,366 individuals and 8,156 households. It included a special module on the tax credit. Households were asked if they received the tax credit, the amount received and if it was spent, saved or used to repay debt (see Appendix A). In Table 1 we report the percentage of recipient households and the average amount of the bonus. Just over a fifth of all households (about 5.4 million) said they had benefited from this bonus, receiving on average €86 per month.⁵ The proportion of households that received

⁴According to Mobili and Parente, 1.7 million of people had to return the bonus in 2016.

⁵The under-reporting of tax transfers is well documented in the literature (see Meyer and Mittag, 2015 for a recent contribution). According to Government estimates the tax credit entailed a transfer of almost €6 billion, compared to €3.2 billion declared in the survey.

Table 1: **Distribution of beneficiary households and average amount received.**

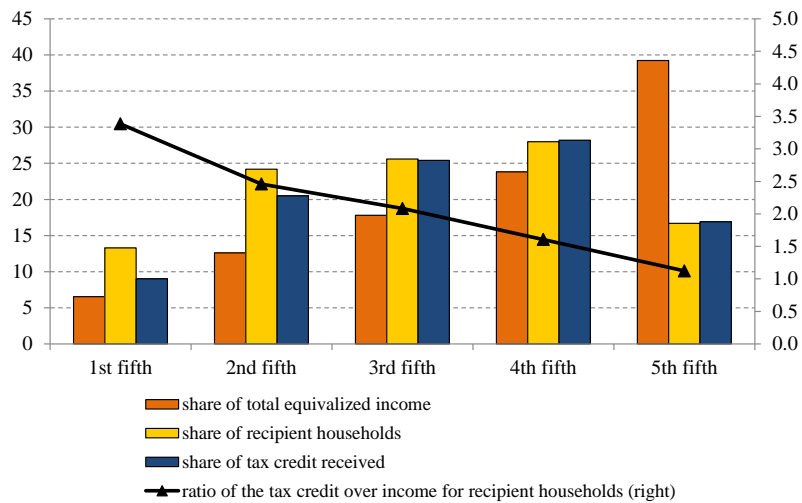
Characteristics	Beneficiary households	Average monthly amount (euro)
34 and under	37.5	89
35 - 44	37.5	85
45 - 54	30.6	85
55 - 64	25.1	87
over 65	2.4	82
Educational qualification		
none	2.2	69
primary school certificate	4.6	89
lower secondary school certificate	28.1	85
upper secondary school diploma	28.7	87
university degree	20.8	84
Work status		
Employee	42.2	87
Self-employed	10.8	77
Not employed	3.2	81
Number of income recipients		
1	14.8	76
2	28.2	90
3	35.6	89
4 or more	43.7	120
Geographical area		
North	25.4	86
Centre	19	89
South and Islands	18.5	83
Country of origin		
Italy	20.8	86
Other	33	89
Total	21.9	86

Notes: Authors' calculation based on the SHIW. Sample weights included. Individual characteristics refer to the head of household, i.e. the member with the highest income.

the bonus is higher in the North (25 per cent) and, among those with heads of household younger than 45 years (37 per cent) or foreign born (33 per cent). As pointed out in the previous section, the rebate does not take into account the economic situation of the entire family and, as a consequence, those households with more income recipients have benefited to a greater extent than those with fewer.

By dividing the population according to their level of prosperity, measured by equivalent disposable income (using the OECD-modified equivalence scale), individuals belonging to the lowest fifth of the distribution (with an equivalized income below €9,000) received about 10 per cent of the total amount allocated; those in the highest fifth (with an income equivalent

Figure 1: Distribution of the amount received and total income by equivalized income



Notes: Authors' calculation based on the SHIW. Percentages.

to more than €25,000) received almost a total of approximately 17 per cent of the funds (see Figure 1). The remaining 75 per cent or so was distributed almost equally among the other three quintiles.

The Survey also includes a direct question about the use of the tax credit. The tax rebate module begins by briefly summarizing the tax rebate (see Appendix A) and then addresses the household's response to the rebate. Specifically, the key question asks, giving a value of 100 to the bonus, how it was divided in percentage terms between consumption, savings and the repayment of debt. Households reported that 90 per cent of the bonus was spent on consumption. The way in which the question is formulated largely resembles the one used in the pioneering paper by Shapiro and Slemrod (2003a), although they asked households whether the bonus was (mostly) spent, saved or used to repay debt. Although not directly comparable, our numbers are higher than the ones reported in Shapiro and Slemrod (about 20 per cent; 2003a, 2003b and 2009) for the 2001 and 2008 US stimulus payment and in Leigh (about 40 per cent; 2012) for the 2009 Australian fiscal stimulus. This higher declared spending rate may be reported when households already have the rebate in hand;

additionally, receiving the rebate confirms that the household is entitled to it and hence can add it to its lifetime resources available for spending (Shapiro and Slemrod, 2003b). Some authors (Sahm et al. 2012) have also argued that the role of mental accounting may be important when households reply to the questions, such as when we ask people about their consumption, they should keep in mind a counterfactual state of the world in which they received no tax credit (Shapiro and Slemrod, 2003b).

As an attempt to understand the way consumers reply to the question on the use of the tax rebate, Shapiro and Slemrod (2003a) find that consumers associate a short horizon (one month) with the concept of expenditure and a longer horizon (at least one year) with the concept of savings and debt repayment. Estimating the MPC out of the Regan tax cut, Souleles (2002) underlines that the Consumer Expenditure Survey asks people to remember detailed expenditure on goods and so it is possible that survey answers might not reflect actual household behaviour (see also Shapiro and Slemrod, 2003b).

Italian households were also asked whether or not they think the tax rebate will be confirmed in the future. In December 2014 the Stability Law made it permanent. The permanent income model of consumption would warrant an increase in consumption that could be at least the same size of the rebate. Nevertheless, about half of the households reported expecting the tax credit to be a permanent measure, while the other half believed that it will last no longer than 5 years (see Figure E.1). Overall, 68% of household expect the bonus to be in effect for at least three years. These different perceptions of life have not, however, induced significant differences in the way families said they have used the bonuses received, which range around an average of 90 per cent for both groups.

4 The empirical methodology

To estimate the marginal propensity to consume out of the fiscal stimulus we compare the change in spending for households that received the payment with the change in expenditure for those that did not receive it but were otherwise similar. Of the 1,514 households receiving the bonus, 862 were also surveyed in the previous wave (2012), therefore we can exploit the panel dimension of the survey and work with the actual level of household consumption.

The comparison group (non-recipient households) is chosen using propensity score matching (as in Brzozowski, 2007): this is intended to ensure that those in the comparison group who do not receive the payment have characteristics similar to those of the payment recipients.

The characteristics of households receiving the bonus are likely to be quite different from those that did not receive it: for example they are likely to be in a particular age group, be employed, living in the North (see Table 1). This implies that their expenditure patterns may be different from the rest of the overall population, and hence comparing the expenditure of households that received the bonus to that of the wider population would be inappropriate. This circumstance may create a bias (usually called non-random program placement), as the impact of the program could be due to the effects of the pre-existing disparities. To minimize the selection issue driven by observable pre-treatment disparities (that is, the potential effect of X on the outcomes), we compare eligible ($D=1$) and non-eligible ($D=0$) households that display strong similarities before the start of the program (in 2012). This is accomplished by using propensity score matching (PSM).

Table 2 shows the balancing properties for the baseline sample (based on panel households) selected by propensity score matching.⁶ The propensity score is estimated for each household using a probit model:

$$P(D_i = 1|x_i) = \Phi(x_i'\beta) \tag{1}$$

where D_i takes value one if the household is in the treatment group and zero otherwise and x_i is a vector of household characteristics. We include a number of variables to control for the probability of receiving the bonus (income bracket, work status), the demographic characteristics (geographical area, education, age, number of equivalized components, sample weights, variation in number of employees and in the number of older people in the household) and general economic conditions of the household. To account for the quality of household responses to the SHIW questionnaire we also control for the interviewer's subjec-

⁶We use the routine proposed by Leuven and Sianesi (2003). Matches are selected using the method of the nearest neighbour without replacement and within a caliper (0.01 percentage points), on the common support of fitted probabilities (see Dehejia and Wahba, 2002).

tive evaluation of household responses to income questions.⁷ All variables refer to 2012, that is, one SHIW wave before the tax credit was put in place. As is well known (see, for instance, Blundell et al., 2004), systematic differences in levels between treated and control groups are not a concern, as they can be controlled for by using the diff-in-diffs methodology. However, violation of the parallel trend assumption may invalidate the estimates. Figure E.2 provides a visual of the validation of the assumption.

As a result of the PSM, the sample includes 785 treated and 785 control households, both in 2012 and 2014. In Table 2 we report the mean and standard deviation for the treated and control groups for each of the explanatory variables. The two groups appear very similar for all observables.⁸

Table 2: **Balancing properties for the baseline sample.**

	Control		Treated		Mean differences	
	Mean	St.Dev	Mean	St.Dev	Mean	P-value
No. of components (equiv.)	1.971	0.586	1.973	0.55	0.002	0.926
Income	3.533	1.352	3.535	1.27	0.001	0.979
Free cash	31679	20208	31124	18653	-555	0.484
Delta income after bonus	2.668	0.966	2.668	0.96	-0.001	0.989
Geographical area	1.913	0.897	1.852	0.88	-0.062	0.114
Age class	3.267	1.030	3.188	1.00	-0.080	0.064
Educational level	3.474	0.919	3.477	0.83	0.002	0.948
Employment activity	1.637	0.862	1.554	0.86	-0.082	0.019
Make ends meet	2.888	1.251	2.845	1.17	-0.043	0.407
Δ (No. of employee) 2014-2012	0.001	0.547	0.006	0.51	0.005	0.826
Δ (No. of older people) 2014-2012	0.032	0.279	0.022	0.25	-0.010	0.339
Δ (No. of high educated people) 2014-2012	0.014	0.267	0.014	0.21	0.000	0.988
Δ (Sample weight) 2014-2012	0.070	0.659	0.096	0.56	0.026	0.339
Quality of income responses	8.318	1.533	8.368	1.50	0.050	0.443

Notes: Authors' calculation based on the SHIW. All characteristics refer to the head of household(HH). 'No. of components' are equivalized giving weight 1 to the HH and 0.5 (0.3) to the other household members aged ≥ 14 (< 14). 'Income' is broken down into 5 brackets (in fifths); 'free cash' is the income left over once actual rents (for renters) and the mortgage (for home owners) are paid; 'delta income after bonus' is the variation in income excluding the bonus; 'geographical areas' are North, Centre and South; 'age' is broken down into 5 categories (34 and under; 35-44; 45-54; 55-64; over 65); 'education' is divided into 5 classes (none, primary school, lower and upper secondary school, university degree); 'employment activity' is 1 for employees, 2 for self-employed and 3 for not employed; 'make ends meet' captures the ability of the households to make ends meet, i.e. 1. with great difficulty, 2. with difficulty, 3. with some difficulty, 4. fairly easily, 5. easily, 6. very easily. 'Quality of income responses' is the interviewer's subjective evaluation of household responses to income questions (on a scale of 1 to 10).

⁷This variable was inserted since we know that some households were reticent to declare that they had received the bonus.

⁸The assumption of the equality of means is not satisfied only for the employment activity of the head of household.

Once a suitable control sample has been formed we compare the difference in the (weighted) conditional means of expenditure for the treatment and control group to get an estimate of the effect of the tax credit. The decision about how much of the extra income to spend may be affected by some individual features such as risk aversion or future income expectations that cannot be captured by the observed data (which typically relate to socio-demographics characteristics). Those features are taken to be time invariant and their impact is eliminated by modelling the variation of expenditure. In practice we estimate:

$$c_{it} = \beta_1 + \beta_2 POST_{it} + \beta_3 BONUS_{it} + \beta_4 BONUS_{it} * POST_{it} + \epsilon_{it} \quad (2)$$

where c_{it} is the average consumption for household i at time t , $POST_{it}$ is a dummy variable taking value one in 2014 that accounts for the general time trend effect; $BONUS_{it}$ is a dummy variable equal to one if the household is treated and accounts for the effect of having received the tax rebate on the household consumption level; the interaction term $BONUS_{it} * POST_{it}$ captures the effect of the bonus for treated households in 2014 and is our variable of interest. We focus on different aggregate measures of consumption expenditure as in Johnson et al. (2006) and Parker et al. (2013). In particular we consider food, which includes food consumed away from home and at home, a proxy of non-durable expenditure. Durable expenditure is calculated for 1) means of transportation and 2) other durable goods. In particular, for means of transportation we computed the total value of the objects bought (cars and other means of transport like motorcycles, caravans, motor boats, boats, bicycles) net of the total value of objects sold; for other durable goods we considered spending on furniture, furnishings, household appliances and sundry equipment.⁹

4.1 Results

Table 3 shows the main results of the analysis. The first row refers to our benchmark model based on the radius method. We find that a household receiving the rebate increased its expenditure per month by €22 on food and by €33 on means of transportation. We do not find any effect on expenses for other durables.

⁹The consumption variables are winsorized to the bottom and top 1% of observations.

As a robustness check, we also present in Table 3 other estimates using different methods to match households. All the different models used provide consistent evidence of an increase in the spending patterns of those who have received the tax credit. We find the effect ranges between €14 and €22 for food and between €20 and €33 for means of transportation.

Yet, the estimators used present a high variability, mainly because of the small sample size. In particular, standard errors increase for cars and other transportation because of the variability of these expenses and the ability of households to afford means of transportation belonging to different a price segment.

All in all, the implied increase in the propensity to consume ranges from 0.5 and 0.6. We also find that the increase in means of transportation expenditure is higher compared to the one for other durables (furnishings, household appliances, etc.), that is, in turn, also lower than that for food.

Table 3: **Baseline results.**

	Dep. Variable				Implied MPC
	Obs.	Food	Cars	Other durables	
Radius (0.1)	8,918	21.8*	33.2*	-2.1	0.62
NN - no repl (0.01)	3,140	14.3	19.4	10.6	0.48
		14.5	27.2	-0.1	
NN - repl (0.001)	3,180	21.2	283.2	147.5	0.62
		18.0	23.0	12.5	
NN - repl (0.01)	3,440	20.3	287.6	118.4	0.52
		13.6	19.1	12.3	
NN - no repl (0.001)- controls	2,668	19.6	280.2	112.2	0.65
		17.9	21.7	16.4	
		21.6	272.8	111.2	

Notes: Authors' calculation based on the SHIW. All characteristics refer to the head of household (HH). Standard errors in the second line of each model are clustered at the province level. With the radius method, matches are selected on a radius of 0.1; NN=matches are selected by the method of the nearest neighbour with replacement (repl) or without replacement (no repl). Caliper reported in bracket. Treated and controls in the last column are recovered from a probit model that also includes the wealth class of the household and a variable that captures the general feeling of the interviewer about the quality of the household's responses.

Our estimate of the increase in expenditure caused by the bonus is lower than the self-reported estimate provided by respondents. As already mentioned, those who received the tax credit reported to have spent around 90 per cent of it on consumption. Yet the self-reported spending effects do not present significant heterogeneity across households. Table E.1 shows the results of the regression of (the log of) the self-declared percentage used for

consumption on a set of demographics. None of the determinants included in the model seems to have significant explanatory power. This would imply that the propensity to consume is independent of demographic characteristics such as age or level of education which, on the contrary, are known to play a relevant role. Therefore the self-reported estimates provided by respondents should be interpreted with caution.

4.2 The effect of the bonus on liquidity-constrained households

The reaction of liquidity-constrained household to an increase in current income is not univocal in the literature. Some authors (Shapiro and Slemrod 2009; Leigh 2012; Berger-Thomson et al. 2010) have argued that there is no systematic relationship between household income and spending rate, as low-income households are needy today, and because they are expected to be needy in the future, they do not necessarily use the rebate to increase spending (see also Sahn et al. 2012). On the other hand Johnson et al. (2006) find that, consistent with the liquidity-constraint assumption, households with low levels of liquid assets or low income spend a significantly greater share of their rebate than the typical household.

Table 4 presents the results of the analysis for liquidity-constrained households. We use two different measures.

Our first measure of liquidity constraint is based on net financial wealth and labour income: we define a household as having low cash-on-hand if its net financial wealth (the difference between financial activity and financial liability) is smaller than half of its labour income (as in Broda and Parker, 2014). The first row of Table 4 shows the results for our benchmark model. The estimated increase in total expenditure is about 80 per cent of the tax credit received; it drops to about 60 per cent when the means of transportation category includes only cars. The increase is about €35 per month for food and €50 for means of transportation. The coefficient for other durables is negative.

Our second measure of constraints comes directly from the SHIW and is based on the subjective evaluation that households make about their general economic condition in making ends meet. A dummy variable is created for households that reported that their income was barely sufficient to see them through to the end of the month. Slightly less than one-fifth of the households (over 8,156) reported they had great difficulty in making ends meet; out of the

Table 4: **Results for low cash-on-hand households.**

		Dep. Variable				Implied MPC
Model		Obs.	Food	Means of transportation	Other durables	
Radius	Low cash-on-hand (cars)	2,276	35.1*	35.9*	1.61	0.84
			19.9	20.7	14.05	
NN	Low cash-on-hand	1,172	34.5	47.6	-14.6	0.79
			31.4	350.9	164.3	
NN	Low cash-on-hand (cars)	1,172	34.5	31.2	-14.6	0.59
			31.4	270.6	164.3	
NN	Make ends meet	480	47.8	19.4	5.4	0.84
			35.0	282.0	104.5	

Notes: Authors' calculation based on the SHIW. All characteristics refer to the head of household (HH). St. Errors on the second line are clustered at the province level. 'Low cash-on-hand' households own less net financial wealth (the difference between financial activity and financial liability) than one-half of labour income. 'Make ends meet' identifies households that reported that their income was barely sufficient to see the household through to the end of the month. '(Cars)' means that the transportation category includes only cars.

1,514 receiving the bonus, 15% reported great difficulty and were classified as low cash-on-hand. Only 129 of these households were also interviewed in 2012 and could be used in our analysis. After applying propensity score matching only 120 treated could be matched with the controls: we estimate that the tax rebate, on average, increased expenditure on food by €50, on means of transportation by €20 and on other durables by €5 for households experiencing greater difficulty in getting through to the end of the month (Table 4, last row). Notice that the implied marginal propensity to consume rises to 0.8, with a higher contribution from expenditure on non-durables compared to means of transportation.

We repeated the analysis, taking into consideration both households that perceived the bonus to be permanent and those viewing it as transitory, and we do not find any difference. There are two main factors driving this result. First, we define as "temporary" all the cases in which the answer is not "permanent" (about 52% of cases; see Figure E.1), yet some 38% of those who believe the bonus to be temporary think that it will last at least for three years; three years may be a sufficiently long period for a respondent to decide to modify his/her spending behaviour. Second, the uncertainty about the eligibility condition may also play a role. People may think that the bonus is going to be permanent but that they will no longer be eligible in the future so they don't change their spending patterns. About 10% of households who think the bonus is permanent also believe that their income in 2015 will be

higher than in 2014.¹⁰

Overall, we find that constrained households tend to spend more of their extra income compared to the average population. The estimated marginal propensity is between 0.6 and 0.8. This result is consistent with that found in Johnson et al. (2006).

5 A model of consumption responses to the tax credit

In this section we use a dynamic structural model of household behaviour to justify the empirical estimates of the MPCs out of the tax credit and understand the mechanism behind them.

We build an overlapping generation model where households derive utility from the consumption of both a non-housing good (a composite good made up of durables and non-durables) and housing services, that can be rented or bought. Full details on the model and the calibration are found in the Appendix B. There is a minimum house size that has to be bought to access homeownership. House sizes are not continuous but come in predetermined and quite large sizes. This implies that a house upgrade always represents a rather big cost. Houses cost twice as much as non-housing goods, whose price is normalized to one. Houses are illiquid in that transaction costs have to be paid when the house is bought or sold. Households can go into debt to finance up to 80 per cent of the value of a house through a long-term mortgage contract. Mortgage debt has to be repaid by retirement in fixed instalments, comprising a fraction of the principal plus interest payments every period. Households are born with zero housing or liquid savings and belong to one of five different levels of deterministic lifetime earnings. There are stochastic innovations to earnings that can be either persistent or transitory.¹¹ We fix the size of those stochastic innovations to equal the size of the Italian tax credit. The average net earnings of households that have received the bonus was €23,288, while the bonus amounted to €86 per month. In yearly terms, the bonus was equal to a positive earnings shock of 4.4 per cent. We accordingly

¹⁰Results are available upon request.

¹¹We treat the rebate as a positive random earnings shock that can be either persistent or transitory. We do so because survey respondents in the SHIW were almost evenly split between households that considered it to be permanent and households that expected it to be transitory (see Section 3.1).

calibrate the variability of the persistent and transitory component of the earnings shock to get a 4.4 per cent shock. Upon retirement households enjoy social security replacement income that equals a fraction of their last working-year earnings.

We contribute to the literature on consumption responses to shocks by showing that housing lumpiness is key to achieving MPC levels that are in line with data estimates, both against persistent and transitory positive shocks. The framework most similar to ours is Kaplan and Violante (2014), where the absence of housing lumpiness and the inaction region it introduces is circumvented by an increase in housing transaction costs and, at the same time, a negative real returns to liquid savings. In Kaplan and Violante (2014), the (risk-adjusted) return on the liquid asset is negative and high transaction costs on housing are needed to ensure that households do not find it profitable to liquidate their housing good to smooth out a transitory earnings shock. When households receive a transitory shock, they readjust non-housing consumption for two reasons: on the one hand, liquid savings are 'taxed' since their rate of return is negative; on the other hand, tapping liquidity from the housing good (in the case of a negative shock) is extremely costly because of the very high transaction costs involved. Household therefore end up consuming a fraction of their earnings shock even if this is transitory.

5.1 Results

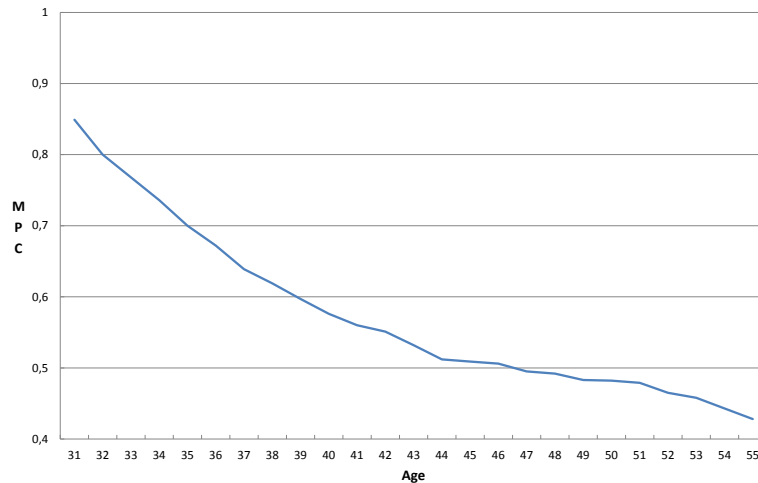
Our model delivers an average MPC out of the bonus equal to 0.57, a magnitude that is broadly in line with the result of our econometric estimation.¹² Figure 2 shows a decreasing evolution of MPCs by age up to retirement.

The theoretical benchmark against which to interpret these results is given by the standard permanent income hypothesis (PIH) model, which is usually framed within a one-asset, one-consumption good model.¹³ Contrary to the standard PIH, we use a life-cycle model

¹²The MPCs in the model are estimated in the following way: optimal policy functions are used to run a Monte Carlo experiment and create a sample of consumption changes and earnings shocks. Then we regress changes in log consumption on changes in earnings innovation to estimate the MPCs. The average MPC estimated on different samples (broken down by shocks durability and liquidity levels) are hence not completely comparable as different samples may sometimes give rise to rather different average estimates.

¹³The permanent income hypothesis suggests that consumption should react to unanticipated income shocks and that the response should be higher for permanent than for transitory innovations to income.

Figure 2: MPCs by age



where households derive utility from two goods: a housing good and a non-housing composite good. The former is also an asset since it can be liquidated at any time, subject to paying a transaction cost. Moreover, housing can be used to alleviate market incompleteness: households can borrow against their housing asset and hence limit the amount of savings they need to access homeownership, while at the same time freeing up resources for their non-housing consumption. All these characteristics make housing a valuable good to purchase, especially early in the life cycle, when the dual need to accumulate a target level of lifetime savings and overcome borrowing constraints in the face of a rising deterministic income profile is more urgent. We assume that the housing good is available only in very different size categories. This implies that the very nature of housing makes its adjustment lumpy.¹⁴ Moreover, ownership of a minimum-sized house is required to be considered homeowners.

This dual role of housing as both a consumption and a long-term savings good, coupled

Risk-averse households make optimal consumption plans that imply a strong form of consumption smoothing: a transitory positive innovation to income should be almost completely saved away in order to leave consumption as stable as possible, while a shock that raises permanent income should map into a rise in both the levels of consumption and lifetime savings.

¹⁴Households cannot decide to upgrade from a 50 square metre house to a 51 square metre house; they are forced to jump up to an 80 square metre house.

with collateral borrowing and the lumpiness of the housing adjustment, profoundly changes the implication of the standard PIH model. In particular, given that housing services and the non-housing composite good are substitutes in the utility function, young households tend to compromise on their level of non-housing consumption to acquire their target level of housing services. This substitution towards housing will be more important as the minimum housing size to be considered a homeowner increases. Also, since housing is expensive, most liquid savings are either used to buy a house directly or to enter into a mortgage contract so that many households are left with little liquidity. Once they become homeowners households find it optimal to leave their housing choice as stable as possible, since house sizes are lumpy and there are transaction costs to purchasing a new house. The stability of the housing choice is all the more understandable in the presence of a small positive shock, like the one represented by the Italian bonus which amounted to just around 4 per cent of average households yearly earnings. Part of the positive earnings shock is used to increase the level of liquid saving, but since the majority of households have either a considerable amount of wealth (compared to their earnings) tied in their house or are saving to become homeowners, their incentive to use the proceeds from the bonus to increase their liquid savings is reduced.

To sum up, since households have a consumption basket that is skewed towards housing during their working years and do not easily change the lumpy housing good in which they have stored a considerable amount of wealth, they rebalance their consumption basket by allocating a fraction of the positive tax credit to non-housing consumption. This rebalancing leads to higher MPCs compared to a model without lumpy housing, especially when households are young and have little liquidity. Indeed, when we observe the dynamics of the simulated MPCs over the life cycle, they are higher for young households - most of them initially renters - and progressively decrease later on (Figure 2).

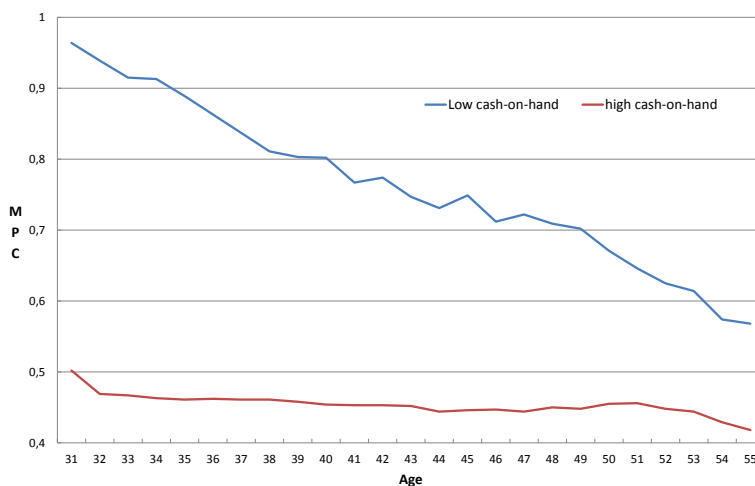
5.2 Assessing the use of the tax rebate by liquidity-constrained households

We report results dividing households into low and high cash-on-hand categories, as in Broda and Parker (2014) and Souleles (1999); they both found that households with low liquid

wealth have larger statistically significant responses to the refund.

We define households as having a low level of cash-on-hand as in Section 4.2, i.e. when they hold an amount of liquid savings that is smaller than half of their yearly earnings. The average MPC for households with low levels of cash-on-hand with respect to earnings is 0.84 and strongly decreases over the life cycle (Figure 3). Indeed, of households defined as having low liquidity, the young comprise the age group that has comparatively less liquidity. On the contrary, households with high levels of cash-on-hand have a lower average MPC (0.45) and the decreasing dynamics of the MPCs over the life cycle is attenuated. Jappelli and Pistaferri (2014; see Figure 2) also found that MPCs decrease by liquidity level, with the MPCs out of a transitory shock reported by survey respondents to the 2010 SHIW showing a clear pattern of decrease by level of cash-on-hand.

Figure 3: MPCs by age and cash-on-hand levels



When liquidity is sufficiently low, the current marginal utility of consumption is high relative to future periods. Therefore a positive shock raises current consumption, always assuming that the shock is not large enough to overcome completely the liquidity constraint. Moreover, when the household has a low level of cash-on-hand, it will be relatively constrained in its housing choice, leaving its non-housing consumption's MPC out of the positive persistent shock be comparatively higher than that of a household that has accumulated a

higher level of liquidity and can more easily pay the down payment and transaction costs required to become an homeowner.

In the model, low levels of liquidity are correlated with relatively low levels of income and a consumption basket skewed towards housing. In Figure E.3 we compare the housing wealth to non-housing consumption ratio by age of households with low cash-on-hand versus the average population. The ratio is almost twice as big for low cash-on-hand households with respect to the average household in the economy from age 30 to 60. The income of the average household in the economy is 20 per cent bigger than that of low cash-on-hand households over the same years. This shows that low income households optimally choose to deplete their liquidity to access the housing good and, in so doing, compress their non-housing consumption levels.

We further explore the differences between transitory and persistent positive shocks to earnings based on the size of the Italian bonus, for different liquidity levels. Table 5 shows that transitory shocks have higher MPCs only for low cash-on-hand households. The main difference between two such shocks lies in their discounted present value. Indeed a transitory shock is fairly small, in present value terms, compared to a persistent increase in earnings of the same size, especially if the two shocks happen early in the life cycle.¹⁵ In a model where most households already hold an important amount of housing wealth or, as renters, are already saving to become homeowners, the incentive to further save is considerably reduced, while at the same time it will not generally be feasible for the household to allocate the earnings increase to buy a bigger house, since the adjacent house size is much bigger and expensive than the one it currently owns. The household will then tend to allocate a substantial share of the shock to rebalancing its non-housing consumption path, even if transitorily, and the more so the closer it is to be liquidity constrained.

Our results do indicate that the MPCs out of a transitory innovation to earnings are high and are bigger for low cash-on-hand households (see Table 5). The MPC out of a transitory shock for low cash-on-hand households is 0.75. The same MPC for high cash-on-hand households is almost half as much (0.42). These MPCs' magnitudes out of a transitory shock are

¹⁵In a standard one-asset one-consumption good model a transitory shock entails too little additional consumption and therefore it is optimally saved to preserve a stable consumption path. MPCs out of transitory shocks should then be considerably lower than out of persistent shocks.

Table 5: MPCs by liquid assets and shock’s persistency

	Persistent	Transitory
Low cash	0.60	0.75
High cash	0.41	0.42

in line with the findings of Jappelli and Pistaferri (2014).¹⁶ MPCs out of persistent shocks for cash-constrained households are 0.6, while they stand at 0.41 for households that hold sufficient liquidity. When we calculate the MPCs by splitting the sample between persistent and transitory earnings shocks (thus mixing up households characterized by different liquidity levels), we find that the two MPCs are almost equal,¹⁷ in line with our empirical results: the average MPC out of a persistent or transitory shock is 0.46.

5.3 Sensitivity

In this Section we show how a lower relative price of the housing good, the absence of housing transaction costs or a smaller minimum house size can impact the level of the simulated non-housing consumption MPC out of the tax rebate.

5.3.1 Lower relative price of housing

The degree to which the housing good is expensive with respect to non-housing is key in explaining the levels of MPCs out of a positive shock. When we make the housing good be less expensive and normalize to one, its relative price, as is usually done in the literature, the MPCs out of a positive transitory shock are halved for low cash-on-hand households and reduced by 13 and 31 per cent, respectively, against persistent and transitory shocks, for high cash-on-hand households.

¹⁶The authors find that for households with low cash-on-hand levels the MPCs vary between 0.6 and 0.8, decreasing to between 0.3 and 0.4 for high cash-on-hand households. It should be pointed out that our MPCs, both estimated and out of the model, refer to a sample characterized by an average income that is considerably lower than the one considered in the survey responses studied by Jappelli and Pistaferri (2014).

¹⁷We always calculate the MPCs by age for the range of 31 to 55 years, then average them out over different age categories.

When the housing good is less expensive, achieving the desired level of housing services is considerably less costly in terms of both forgone liquidity and non-housing consumption. In particular, the non-housing consumption lifetime path does not need to be as steep as before, since young households do not have to compress so much of their non-housing consumption to achieve their desired level of housing services. This can be seen in Figure E.4, where the steepness of the non-housing consumption profile when housing prices equal one is lower than for the baseline economy where housing prices equal to two.

In a sense, when housing prices are lower, the profile of non-housing consumption over the life cycle is smoother. As a result, given a positive shock, the need to rebalance the consumption basket in favour of non-housing decreases. Consistent with the intuition we have provided, the reduction in the non-housing MPC is bigger for low cash-on-hand households, for whom the cheaper housing good represents a bigger advantage for achieving a smoother non-housing consumption profile.

5.3.2 No transaction costs

The importance of transaction costs has been extensively studied in the literature. In most models, the illiquidity of the housing good is actually the main driver of MPCs, especially against transitory shocks. The higher transaction costs are, the more illiquid is the housing good and hence the more households prefer to leave housing constant and instead change non-housing consumption upon receiving a shock.

By contrast, in our model transaction costs are of second-order relevance with respect to relative house prices and - most importantly - housing lumpiness. Indeed, even when transaction costs are completely removed, the MPCs against transitory shocks continue to be quantitatively important. This is so because there is still an inaction region for which, given the shock, households do not change their housing consumption. This inaction region exists owing to the lumpiness and high relative price of housing. With no transaction costs, low cash-on-hand households still consume almost 56 per cent of the tax credit while high cash-on-hand households consume 37 per cent of the tax credit.

5.3.3 Lower minimum house size

When we lower the minimum house size in order to make it essentially inapplicable on first-time home buyers, MPCs against both persistent and transitory shocks decrease for both high and low cash-on-hand households. MPCs for low cash-on-hand households decrease to 0.54 (from 0.81 in the baseline) against a transitory tax credit, and to 0.47 (from 0.56 in the baseline) against a persistent tax credit. For high cash-on-hand households, the MPCs against a transitory and persistent tax credit decrease to 0.28 and 0.31 (from 0.36 and 0.31 in the baseline, respectively). This counterfactual scenario shows that a high minimum size has a considerable effect on MPC levels, by forcing households (especially low income ones) to skew their consumption basket towards housing services. When the minimum size is non-binding, the consumption basket is more balanced between the two types of goods and much less rebalancing is needed upon receipt of the tax credit.

6 Conclusions

We estimate the change in consumption expenditure prompted by the income tax credit introduced by the Italian Government in May 2014 using the Survey on Household Income and Wealth.

We exploit the panel component of the SHIW to estimate the actual purchasing attitude of Italian households towards non durable (mainly food) and durable goods after the introduction of the tax rebate using a difference-in-difference methodology. Our identification strategy is based on matching a sample of treated and control households that display similar characteristics before the start of the program. We estimate that about 50-60 per cent of the bonus has been spent on consumption; the expenditure responses are relatively larger for households with low liquid wealth or income (80 per cent), a finding consistent with the presence of liquidity constraints. We also find that household-reported spending effects are about 30 percentage points higher than our estimates. One reason for this difference might be that respondents may have difficulty disentangling the actual use of such a relative sum and therefore report the more acceptable answer (consumption instead of saving). This explanation seems to find some empirical support in the fact that the household-reported

effects are not associated with any relevant demographic characteristic. The quality of those replies should therefore be viewed with caution.

We do not find any difference between the spending behaviour of those who believed that the rebate was permanent and those who did not. One possible explanation is that, even if about half of respondents believe that the bonus is temporary, some 38% of them think that it will last at least for three years. This period may be sufficiently long to induce them to increase their spending in the year of the interview. A second possible explanation is the uncertainty about eligibility: indeed, eligibility for the tax rebate is confirmed only a year after the bonus is received, when people file their tax returns. Because of this about 1.5 million of people who received the rebate in 2014 had to pay it in 2015. So even if some respondents expected the bonus to be permanent, they probably did not modify their spending behaviour because they were not completely sure that they would be eligible for the rebate in the future.

The results are robust to different specifications of the estimated model but due to the low sample size, estimates are not always statistically significant. In order to understand the mechanism behind our empirical findings we used an overlapping generations model where households consume housing and a composite non-housing good.

We show that housing's lumpiness skews the household consumption basket towards housing, especially when households have low income. Since the tax credit is too small to allow for a housing upgrade, households tend to use it to rebalance their consumption basket and increase their non-housing consumption, giving rise to MPCs out of the shocks that are in line with our empirical estimates. The MPCs are higher when households have low cash-on-hand, as in our empirical estimates, and the shock is believed to be transitory.

All in all, our results do suggest that the “€80 tax bonus” had significant macroeconomic impact. Applying the resulting estimates to the transfer from the Government we find that consumption increased by about €3.5 billion, that is, 40 per cent of the total increase in household spending in 2014 was due to the introduction of the tax rebate.

A Selected questions from the Survey on Household Income and Wealth

Since May 2014, there has been a bonus in the paypackets of payroll and similar kinds of workers whose gross earnings are between €8,000 and €26,000 (called the "Renzi bonus").

B. Did anyone in your household benefit from this bonus in 2014?

- Yes ...1 (If "Yes") How many of you?
- No ...2 → E

C. How much did your household receive overall each month in €? a month

D. How was the bonus used by your household? Giving a value of 100 to the bonus, how was it divided up in percentage terms between:

- consumption
- savings
- repayment of debt

E. In your opinion, for how many more years do you expect the bonus to be paid?

- no. of years
- for ever

B The Model

B.1 Environment

We build an overlapping generations model with housing and non-housing consumption. Households' utility is derived from consumption of a non-housing good and housing services, which can be obtained by renting or owning a house. Houses are illiquid and transaction costs are incurred when the housing size or tenure is changed. Households make a mortgage down payment when buying a house and then they can use accumulated housing equity as

collateral for loans. The mortgage loan takes the form of a long-term contract: in each period indebted households make a fixed repayment of the principal plus interest on outstanding debt. Borrowing carries a premium over the risk-free interest rate. The tenure choice is based on different user costs for owners and renters. Specifically, renters pay the rental rate, defined as the sum of the risk-free interest rate and the depreciation rate of renting units multiplied by the house price level. The user cost for owners includes the depreciation rate, the house price level, and the transaction costs. Households start their life with housing and financial asset wealth of zero. They face idiosyncratic uninsurable earnings risk and receive their first-period labour productivity shock according to a random draw from the stationary labour shocks' distribution. The specifics of the model follow.

B.2 Demographics

There is a continuum of measure-one households at each point in time. Each household lives, at most, J periods. In each period $j \leq J$ of its life, the conditional probability of surviving to period $j + 1$ is denoted by $\alpha_j \in (0, 1)$. Define $\alpha_0 = 1$ and $\alpha_J = 0$. The probability of survival, assumed to be equal across households of the same cohort, is independent of other household characteristics, such as income or wealth. We assume that α_j is both the probability of survival for a particular household and the fraction of agents that, having survived until age j , will survive to age $j + 1$. It is assumed that there are no annuity markets. After death, a household is replaced by a descendant who starts its life with zero financial and housing wealth; its first-period productivity level is determined by a random draw from the stationary distribution of earnings shocks. In each period a number $\mu_1 = \left(1 + \sum_{j=1}^{J-1} i = 1^j \alpha_i\right)^{-1}$ of newborn households enter the economy, and the fraction of people in the economy of age j is defined recursively as $\mu_{j+1} = \alpha_j \mu_j$, with $\mu_{j+1} = \alpha_J = 0$. Let $\mathbf{J} = \{0, 1, \dots, J\}$ denote the set of possible ages of a household. Households are assumed to be renters in the first period of their life. Bequests are accidental and taxed away at a confiscatory rate by the government.

B.3 Preferences and endowments

Households are endowed with one unit of time in each period that they supply inelastically to the labour market. Households differ in their labour productivity due to differences in age and realizations of idiosyncratic uncertainty. The labour productivity of a household of age j is given by $\varepsilon_j \eta$, where $\{\varepsilon_j\}_{j=1}^J$ denotes the age profile of average labour productivity. The stochastic component of labour productivity, η , follows a finite-state Markov chain with state space $\eta \in \mathbf{E} = \{\eta_1, \dots, \eta_N\}$ and transition probabilities given by the matrix $\pi(\eta'|\eta)$. Let Π denote the unique invariant measure associated with π . We assume that all agents, independent of age and other characteristics, face the same Markov transition probabilities and that the fraction of the population experiencing a transition from η to η' is also given by π . This law of large numbers and the model demographic structure assure that the aggregate labour input is constant. We assume that households cannot insure against idiosyncratic labour productivity by trading contingent claims. Moral hazard problems may be invoked to justify the absence of these markets.

Households derive utility from consumption of the non-housing good, c , and from the housing services acquired either through the rental market, $g(f)$, or through homeownership $g(h')$. Housing services are a function $g(\cdot)$ of the housing stock purchased or rented. The choice between homeownership and renting is exclusive at each period, and represented by the indicator function $I \in \{0, 1\}$. Households value streams of consumption and housing or renting services $\{c_j, g(s)_j\}_{j=1}^J$, where $s = (1 - I)f + Ih'$, according to

$$E_0 \left\{ \sum_{j=1}^J \beta^{j-1} u(c_j, g(s)_j) \right\} \quad (3)$$

where β is the time discount factor and E_0 is the expectation operator, conditional on information available at time 0. We assume that one unit of housing stock, either rented or owned, provides one unit of housing services. The per-period utility function $u(c, g(s))$ is assumed to be strictly increasing in both arguments and obeys the Inada conditions. The instantaneous utility from being dead is normalized to zero and expectations are taken with respect to the stochastic processes governing survival and labour productivity. We assume that the per-period utility function is given by the CRRA form

$$u(c, g(s)) = \frac{(c^\gamma g(s)^{1-\gamma})^\sigma - 1}{1 - \sigma} \quad (4)$$

where σ is the coefficient of relative risk aversion and $c^\gamma g(s)^{1-\gamma}$ is the Cobb-Douglas aggregator between non-housing consumption and housing services.

B.4 Debt contract

Households can access the mortgage market through long-term debt contracts. We have chosen this typology of contract instead of the more standard one-period kind since the latter implies that there is the possibility of mortgage refinancing, which is not a widespread feature of the Italian market. Once households have made the down payment, they make fixed per-period instalment payments which include interest and principal. In particular, the principal is repaid in fixed predetermined amounts and the interest rate on loans, which carries a premium over the risk-free rate, is exogenous and applies to the outstanding debt. Households can also decide to fully repay their remaining mortgage debt, but in this case they are not allowed to immediately take on a new loan. We assume that total debt must to be repaid before retirement. This implies that the length of the repayment period is endogenous for each households, since it depends on the age at which the contract was originated. The amount of mortgage debt is a state variable, since per-period debt repayments depend on the amount of outstanding debt.

B.5 Household optimization problem

Let p^h denote the relative price of one unit of residential housing stock in terms of non-housing consumption. In each time period t , households are characterized by their holdings of financial assets a , outstanding mortgage debt m and housing stock h , as well as by their labour productivity shock η and age j . The five variables state space of a household in each period is then denoted by (a, m, h, η, j) . Let $\Phi(a, m, h, \eta, j)$ denote the measure of households of type (a, m, h, η, j) . We normalize the price of the non-housing good to equal one. The price of renting units is denoted by $i \equiv r + \delta^f$, where δ^f is the depreciation rate for renting units. We allow renting units to have a different depreciation rate δ^f than owner-occupied

housing δ^h , possibly reflecting moral hazard reasons linked to tenure. Let r and w denote the interest rate and the wage rate per efficiency unit of labour, respectively. Households access the mortgage market through long-term debt contracts. They can only borrow up to $(1 - \theta)$ of the value of their desired housing stock. The interest rate on outstanding debt is r^m , and carries a mark-up with respect to the risk-free rate. The per-period principal repayment of mortgage debt M is given by $\frac{m}{jr-1-age}$. The household's problem can now be formulated recursively in the following way

$$V(a, m, h, \eta, j) = \max_{c, a', m', h', \{O, R\}} u(c, h') + \beta E\mathcal{V}(a', m', h', \eta', j + 1)$$

$$s.t.$$

If owners (O):

$$c + p^h h' + p^h \tau(h, h') + \frac{m}{jr - 1 - age} + r^m m + a' = wy_{jt} + (1 + r)a + m' + p^h(1 - \delta^h)h$$

$$m' \leq (1 - \theta)p^h h', \quad \theta \in [0, 1]$$

$$m' = m - \frac{m}{jr - 1 - age}$$

If renters (R):

$$c + (r + \delta^f)p^h h' + p^h \tau(h, h') + a' = wy_{jt} + (1 + r)a + p^h(1 - \delta^h)h$$

$$a' \geq 0$$

$$c \geq 0, I \in \{0, 1\}$$

After retirement, households receive a social security replacement income. We define h^{\min} as the minimum house purchasing size while $\tau(h, h')$ stands for non-convex housing stock's adjustment costs

$$\tau(h, h') = \begin{cases} 0 & \text{if } h' \in [(1 - \mu)h, (1 + \mu)h] \\ \rho_1 h + \rho_2 h' & \text{otherwise} \end{cases}$$

This formulation of transaction costs allows households to change their level of housing consumption by undertaking housing renovation up to a fraction of μ , the house value or by allowing depreciation up to a fraction of μ , the house value of an alternative to moving. If the housing depreciates by more than a fraction μ of the value, or if the value of the stock increases by more than a fraction μ of the value, we assume that the stock has been sold. In those cases, the household has to pay the transaction costs as a fraction ρ_1 of its selling value and ρ_2 of its buying value.

C Calibration

Some parameters of the baseline model are exogenous and based on microeconomic evidence, while others are calibrated to match selected long-run averages of the Italian economy in the stationary equilibrium. In particular, our calibrated parameters are set to reproduce the housing stock to disposable income ratio, the financial assets to disposable income ratio, and the homeownership rate of the Italian economy (see Tables E.2, E.3 and E.4).

C.1 Demographics

The model period is one year. Households enter the labour market at age 26 and retire at age 62, in line with the average retirement age found in the 1998-2010 SHIW waves. After retirement, households receive a constant replacement income equal to 67 per cent of the total average wages in the economy.¹⁸ Workers die with certainty at age 92. Survival rates are taken from the Italian national statistics institute (ISTAT).

¹⁸We do not consider replacement rates linked to individual household wages. Doing so would considerably increase the computational burden of the model while not adding much to the focus of our paper.

C.2 Discount factor and interest rate

We fix the risk-free real interest rate to 2 per cent. We calibrate the discount factor β to match an aggregate housing wealth to disposable income ratio of 4.0.¹⁹

C.3 Income Process

Instead of modelling a once and for all shock to earnings, we consider an earnings process that has a persistent and a transitory component. We do so because respondent households in the SHIW considered the bonus to be transitory or persistent in almost equal amounts. The earnings process is a parsimonious way of simultaneously taking into account both types of shocks. The logarithm of the income process y_{it} is specified as the sum of an AR(1) component z_{it} and an *i.i.d.* component ϵ_{it} .

$$y_{it} = z_{it} + \epsilon_{it} \quad (5)$$

where z_{it} follows the AR(1) process

$$z_{it} = \rho z_{it-1} + \eta_{it}$$

with persistency parameter ρ , where $\eta_{it} \sim N(0, \sigma_\eta^2)$. ϵ_{it} is an i.i.d. normal with zero mean and σ_ϵ^2 . We calibrate the deterministic age profile for the income process using data from the SHIW.

The persistency of the shocks depends on the autoregressive parameter ρ . We set it equal to 0.95.

Average net earnings of households that received the bonus is €23,288, while the bonus amounted to €86 per month. In yearly terms then, the bonus was equal to a positive earnings shock of 4.4 per cent. We accordingly calibrate the variability of the persistent and transitory component of the earnings shock in order to get a 4.4 per cent shock.

¹⁹The Italian housing wealth to disposable income ratio has been increasing from 3.95 in 1995 to 5.38 in 2008, see Bartiloro et al. (2008). The average target of 4.0 has been calculated by subtracting housing structures from total housing wealth.

Using Tauche's (1986) method, we approximate the continuous AR(1) processes and the *i.i.d.* component with, respectively, ten- and three-states Markov chains.

C.4 Preferences and Technology

The coefficient of risk aversion of the Cobb-Douglas utility function, σ , is set to 3, within the range of commonly used values. Housing services are assumed to be proportional to the housing stock, i.e. $g(s) = s$. The Cobb-Douglas aggregator can be considered a special case of the constant elasticity of substitution (CES) function when the elasticity of substitution parameter is equal to one. We select a Cobb-Douglas production function $Y(K_t, L_t) = NK_t^\alpha L_t^\alpha$ as a representation of the technology that produces the final good. We normalize $N = 1$. We follow the construction of measures of output, capital and stock of houses from Díaz and Luengo-Prado (2008). We define capital as the sum of non-residential private fixed assets plus the stock of inventories plus consumer durables. Investment in capital is defined accordingly. H is private residential stock. Finally we need a measure of output. Output is defined as GDP minus housing services. We proceed as Cooley and Prescott (1995) to calculate the capital share of the economy. We do not make any imputation to output for government owned capital since our focus is on privately held wealth. The implied share of capital in output α is 0.25.

C.5 Market Arrangements

Households pay transaction costs whenever they change house size or tenure. We consider non-convex costs of adjustment in the housing market, which results in infrequent changes in the housing stock. Transaction costs on housing sales and purchases are both set equal to 7 per cent, a level based on OECD calculations. We set the minimum down payment requirement θ (i.e. the share of the value of a house that cannot be borrowed and must be paid upfront by the buyer) equal to 20 per cent and we allow households to optimally choose their own down payment. The depreciation rate of owner-occupied housing δ^h is calculated from national accounts; the renting depreciation rate δ^f is calibrated together with the minimum house size that must be purchased to become a homeowner to match an aggregate

homeownership rate of 70 per cent. The parameter γ - the share of non-housing consumption in the utility function - has been calculated in the national accounts and set to 0.8. This value is also consistent with the housing expenditures share found in the SHIW. Finally, we choose the relative price of housing to get the right amount of indebted households along the life-cycle. All parameters are reported in Table E.2.

D Computation of model

Non-convex adjustment costs to housing expenditure and a minimum house purchasing size break the smoothness of the optimization problem: first-order conditions could not be used to simulate the model. We resort instead to discretization of the state space and value function iteration, which is computationally costly but very robust. The upper bounds on the grids for financial assets and housing are chosen large enough so that they are not binding on the optimization problem.

The choice of housing stock and renting units is found by grid search. The choice of financial assets and mortgages is found by one-dimensional optimization that does not use differentiability of the value function.

We use 40 points for the financial assets grids, 20 points for the housing assets grid, and 10 points for the mortgage holdings grid, a 30-states earnings Markov matrix and 5 states for the house price shock matrix.

We solve for the steady state equilibrium as follows:

1. Guess β and use the equilibrium conditions in the factor markets to obtain w .
2. Solve for the value function in the last period of life, then solve recursively for all other ages.
3. Compute the associated stationary distribution of households Φ .
4. Given the stationary distribution and prices, compute factor inputs of demand and supply and check market clearing.
5. If all markets clear, we have found an equilibrium. If not, return to step 1 and update β .

All the programs needed for the computation of the model were programmed in Fortran 90 and compiled in Intel fortran to run on a Unix cluster.

E Tables and Figures

Table E.1: OLS estimates of log of amount of the bonus spent in consumption.

Characteristics	Estimates	P-value
Age (over 65)		
34 and under	0.0200	0.6858
35 - 44	-0.0024	0.9587
45 - 54	-0.0073	0.8726
55 - 64	-0.0081	0.8522
Educational qualification (Ref. University degree)		
none	0.0304	0.7738
Primary	0.0129	0.7182
Lower secondary	-0.0367	0.0554
Upper secondary	-0.0355	0.0658
Work status (Ref. Not employed)		
Employee	0.0298	0.3523
Self-employed	-0.0317	0.4302
Number of hh members (Ref. 4 or more)		
1	-0.0553	0.0058
2	-0.0176	0.2999
3	-0.0188	0.1906
Geographical area (Ref. South)		
North	0.0110	0.4347
Centre	0.0144	0.4206
Income quintile (Ref. 5th fifth)		
1st fifth	0.0381	0.1930
2nd fifth	0.0333	0.0925
3rd fifth	0.0292	0.1137
4th fifth	0.0068	0.6864
Constant	45.757	<.00001

Notes: Authors' calculation based on the SHIW. Sample weights included. Individual characteristics refer to the head of household, i.e. the member with the highest income.

Table E.2: Parametrization

Parameter		Value
Preferences		
σ	risk aversion coefficient	2
Technology		
r	real interest rate	1.5%
α	capital share	0.25
δ^h	housing depreciation	0.024
Income Process		
ρ	persistence	0.96
σ_z	variance persistent shocks	0.014
σ_ϵ^2	variance transitory shocks	0.024
Housing market		
θ	minimum down payment	20%
ρ_1	housing transaction cost	7.0%

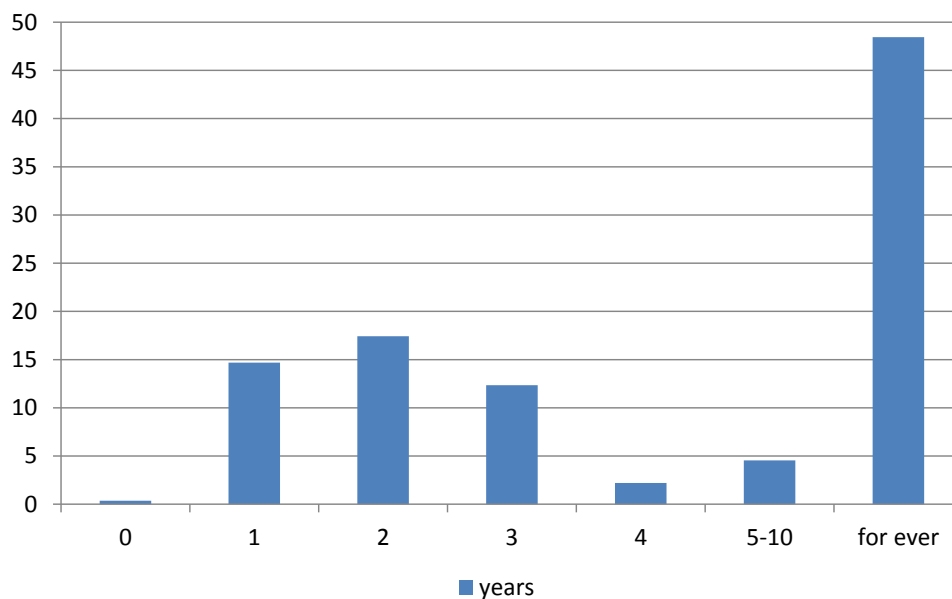
Table E.3: Moments to Match

Target	Value
Housing to Disposable Income	4
Net Financial Assets to Disposable Income	2.2
Homeownership rate	70%
Average Mortgage Debt to Disposable Income	0.3

Table E.4: Calibrated parameters

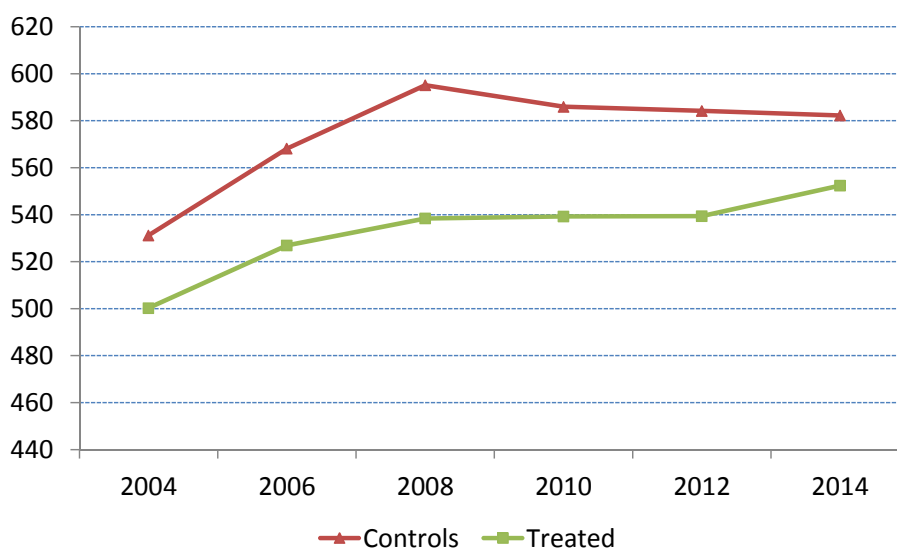
Parameter		Value
γ	weight of non-durable consumption	0.8
β	discount factor	1.0
r_m	mortgage interest rate	3.0%
δ^f	renting depreciation	0.027
p^f	relative price of housing services	2.0

Figure E.1: Expectations of how many years the bonus will be in effect



Notes: Authors' calculation based on the SHIW. Percentages.

Figure E.2: Checking the parallel trend assumption



Notes: Average monthly food consumption for treated and control groups.

Figure E.3: H/C ratio by age

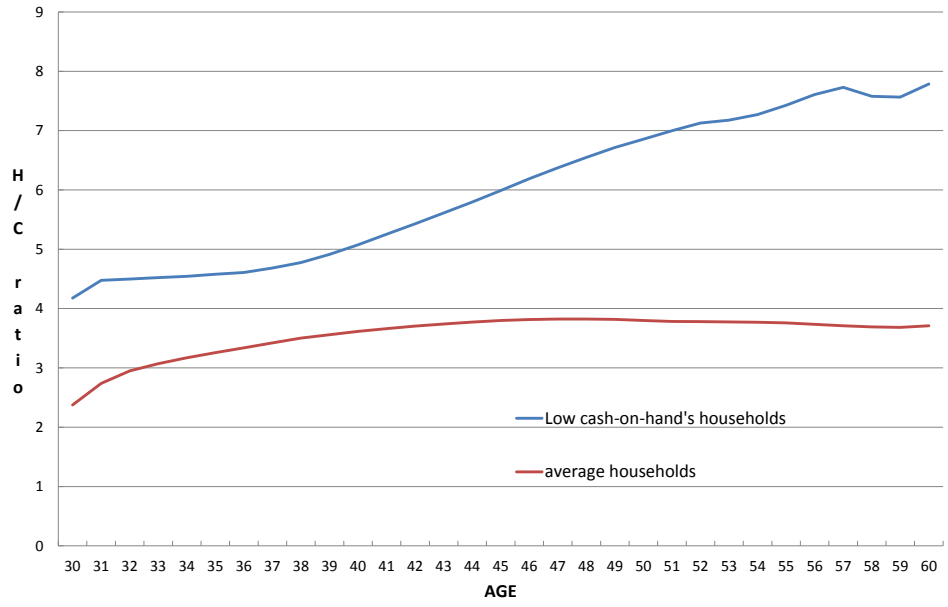
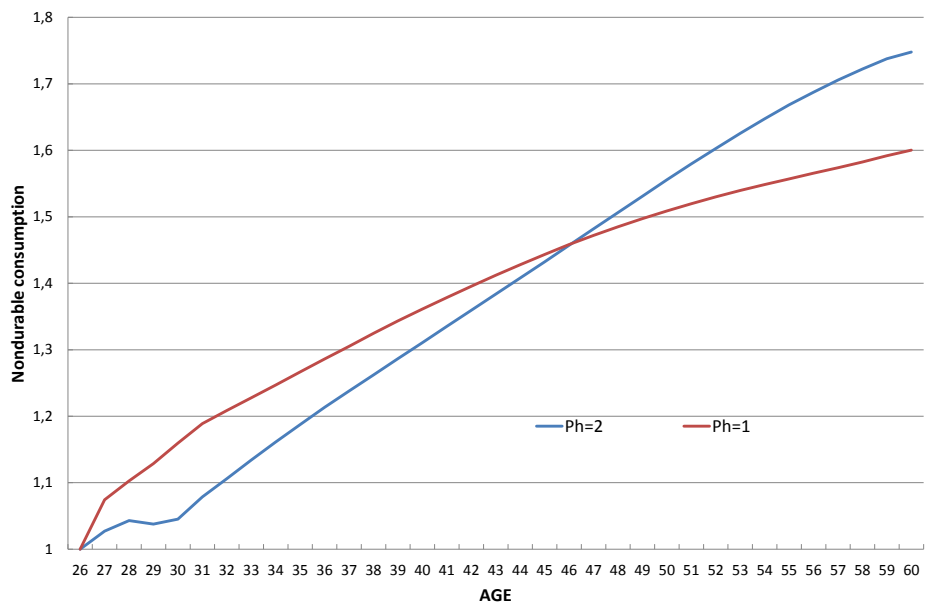


Figure E.4: Nondurable consumption by age: ph=2 vs ph=1



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Andrea Neri

Bank of Italy, Rome, Italy; email: andrea.neri@bancaditalia.it

Concetta Rondinelli (corresponding author)

Bank of Italy, Nuffield College, University of Oxford; email: concetta.rondinelli@bancaditalia.it

Filippo Scoccianti

Bank of Italy, Rome, Italy; email: filippo.scoccianti@bancaditalia.it

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Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

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