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How the real estate and business cycles affect the households' propensity to consume

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ABSTRACT

How do shocks in the households' housing and financial wealth affect their consumption? To answer this question we examine the results of previous researches and build our analysis by using the data on the balance sheet and consumption of 18 countries of the Euro area from 2006 to 2020. We estimate the MPC for different categories of goods by durability through the multiple linear regression model and explain how the Covid-19 pandemic affected it. We find that the MPCs out of housing wealth fall in the range of 4.5-4.82 cents, while the MPCs out of financial wealth range from 2.84 to 3.34 cents. The addition of the financial wealth to regression, though, lowers sensibly the value of the MPC, due to the correlation between the two of 0.41. We also show that the sluggishness of consumption's adaptation affects importantly the timing of people's response to wealth shocks and then the MPC itself.

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INTRODUCTION

Shocks in the general economy, and in particular in the housing market, sensibly affect the households' housing and financial wealth. Despite every single family is affected in a different way, at the aggregate level families tend to adjust their consumption in front of unanticipated wealth shocks of both of the natures. Many researchers have studied the topic for its politic and social importance, running tests to observe the phenomena and developing theories to explain them. A basic example that we will deepen later on is represented by the sluggishness of consumption theory that some have developed to explain why the consumption may react to wealth shocks with a temporal lag. The business cycle is strictly linked to the wealth sphere of individuals because the status of the economy, that depends on factors that space from the wellness of the labor market to the inflation and to strength of the financial markets affect the nominal and real value of the assets on the households' balance sheet and they possibilities to accumulate wealth. In the latter case we refer mainly to the wage that people can expect to earn from their work. For this reason, it's not only important to study the marginal propensity to consume with respect to housing and financial wealth changes that derive from the shock in the respective markets but it's also necessary to examine the fundamentals of the shocks and their dig to find the macroeconomic origins of the shocks in wider economy and the business cycle. Until now there have been some episodes that caught the academic attention and turned to be useful to analyze the MPC; the most cited events are the Great recession of 2008-2009 due to the subprime crisis and the most recent crisis of 2020 due to the Coronavirus pandemic, that we are still fighting. From the comparison of these two events we notice that the consumption can react in different ways to wealth shocks in different contexts. For example, despite the consumption dropped during both of the crisis, the housing wealth showed opposite behaviors. The main consequence of the pandemic in the real estate market was a sharp drop in the housing demand. As it happened during the 2008-09 crisis, in front of a drop of the demand home prices should fall but, as the Case-Shiller Composite Home Price Index shows, this time they didn't.

During the subprime mortgage crisis the index fell sharply 30% from March 2007 to May 2009 while during the Covid-19 pandemic rose 16% from February 2020 to April 2021 (latest record available)¹. The reasons of the opposite behavior are that this time the shock came from both the demand and the supply sides: together with the demand, also the offer sensibly lowered too and the central banks promptly adjusted the interest rates trying to sustain the economy. Indeed, even home sellers became less willing to sell in the wake of the pandemic: in April an additional 25% of homes got delisted from 2019 and the new listings were down 40% in confront to the previous year. The general consequence of these complex dynamics was a noticeable drop of the home sales, in particular in April and May where the sales arrived to their lowest levels since the 2008-09 crisis but it was not followed by a drop in the home prices, with a subsequent rebound in the summer. So, is it correct to say that the consumption reacts directly to the housing wealth effect or it just shows a correlation with it that is justified by other fundamental factors? We will discuss the theories developed by the past literature to logically explain the consumption's reaction to wealth and income effects. In addition, in the third section of the thesis, the one where we analyze the results of our own test, we will see that the housing wealth appears to have a correlation coefficient 0.41 with the net disposable income of households and that the consumption seems to react more to the latter than the first. In this paper we analyze the dynamics of the real estate cycle within the greater economic cycle and how, through the variation of the housing and financial wealth and of the net disposable income, they affect the families' marginal propensity to consumption of both durable and non-durable goods.

In the first chapter we introduce the housing and the business cycles and see why they are important for the analysis of families' consumption and anticipate the main findings on the reaction of consumption to the wealth shocks. In the second chapter we analyze the theories that past researchers have developed to explain the behavior of the marginal propensity to consume and compare their respective results and in the third chapter we

¹ Source: ECB, Economic bulletin, 2021.

explain how we set up our test the results we obtained. Subsequently we end with the conclusions. Different authors that we cite in this paper developed and tested their thesis on different geographical samples and at different geographical level. For example, some took the universe of the USA and its counties as single statistical units in order to highlight the internal cross-sectional heterogeneity of the MPC due variable determinants like the household's leverage ratio and her net worth level (MRS, 2018), while others chose a sample of countries (among which the entire USA) from all around the world to run a country-level analysis (Slacalek, 2009). Because of a lack of county-level data, for our analysis we used annual data on the aggregate values of the variables, covering the period from 2006 to 2020, on a sample of 18 countries of the Euro area, in particular: Germany, France, Italy, Austria, Belgium, Denmark, Greece, Luxembourg, the Netherlands, Norway, Poland, Sweden, the United Kingdom, Finland, Ireland, Spain, Switzerland and Portugal. Some dataset was missing some values, so we had to integrate them with manual research online.

1) The context: the housing and business cycles and the consumption

1.1) The housing market cycle as a part of the business cycle

1.1.1) The social relevance of the housing market

The housing market cycle, a subset of the real estate cycle that includes also the commercial buildings, represents the pattern identified in the household dwellings' prices and, because of its relevance in the economy, it affects the business cycle through multiple channels.

The particular nature of the housing market cycle may affect its timing course with respect to the wider business cycle, that is commonly expected to last around seven to ten years, despite it is not always the case. The particular characteristics of its nature are mainly its size and function. The aggregate value of the European housing market over the last ten years has grown of 35% to 25.5 millions of millions of euros² on the side of the dwellings only and it represent a fundamental pillar of the European economy.

Second, houses perform a fundamental function of stability in people's lives, being the place where to establish and realize themselves. Without a proper home it's very challenging for many people to find a decent job and it's easier to access many forms of public services, like health care. Having a stable house is a fundamental requirement for building up and developing a family because it's the main source of safety. In addition, having a house makes it way easier to be integrated in the society and create cultural and social ties. The importance of the house as an asset can be observed even in the average household's balance sheet: housing expenses make up a good part of the families' expenses and, as Table 1 shows for our sample of countries, the non-financial assets, intended as the sum of the value of dwellings and other buildings, land and inventory, have been counting from about 44% to even 85% of the household's total assets. Then, a variation in the households' total wealth caused by a variation in house prices or rent

² Data source: Reporting institutional sector Households, non-profit institutions serving households, Closing balance sheet, Counterpart area World (all entities), Counterpart institutional

price and mortgages interest rates can have a significant impact on factors like demand (of houses and not) and inflation. An additional point is that rents are a significant component of the harmonized consumer price index (HCPI) and then need to be closely monitored for the price stability; in 2018 rents weighted for 8% of the total index (ECB).

This makes us understand the strong link between the housing market and the economic development of a country, and consequently the course of the business cycle.

Table 1: Country-level households' non-financial assets as a percentage of their total assets.

The table illustrates the percentage of financial assets that households held since 2006 to 2020. The results are calculated as the ratio between the value of the financial assets and the sum of financial and non-financial assets. The values range from 33.26 to 83.06, making it clear that from country to country people hold the two asset classes in different quantities.

Country	2006	2008	2010	2012	2014	2016	2018	2020
Norway	61.14%	65.72%	63.41%	64.95%	62.86%	62.55%	62.45%	65.18%
Austria	68.13%	72.15%	70.07%	70.87%	70.50%	70.46%	70.68%	69.45%
Luxembourg	66.97%	74.65%	70.05%	72.13%	67.32%	64.91%	64.91%	60.36%
Portugal	73.92%	74.27%	75.89%	75.14%	75.20%	76.42%	76.26%	76.88%
Denmark	38.29%	43.10%	33.26%	34.58%	33.59%	35.64%	39.48%	41.46%
Finland	67.85%	78.60%	74.41%	75.63%	73.14%	72.07%	73.51%	63.56%
France	80.03%	79.94%	79.22%	78.63%	77.18%	75.66%	77.32%	75.84%
Germany	74.51%	75.36%	73.90%	74.21%	73.10%	72.76%	73.60%	73.85%
Ireland	63.59%	65.73%	61.90%	54.54%	44.72%	45.94%	44.27%	44.50%
Italy	79.74%	82.55%	83.06%	82.44%	79.55%	76.32%	75.51%	71.79%

sector Total economy, Dwellings (gross), Current price, Euro. Source: ESA2010 - Eurostat Quarterly Financial and Non-Financial Sector Accounts, European Central Bank.

Spain	70.97%	71.14%	71.85%	71.06%	70.57%	71.57%	72.33%	72.71%
Netherlands	64.62%	63.51%	60.24%	53.49%	48.58%	46.22%	49.50%	43.15%
Sweden	45.44%	46.15%	44.90%	46.28%	40.88%	41.55%	42.42%	37.50%
UK	63.56%	65.56%	65.30%	66.39%	67.00%	66.67%	65.82%	64.98%
Switzerland	60.54%	58.00%	52.90%	52.03%	51.45%	53.12%	54.11%	53.92%
Belgium	67.98%	75.66%	71.06%	73.14%	69.33%	66.92%	65.92%	62.37%
Greece	77.79%	80.53%	81.03%	80.43%	77.60%	75.45%	73.66%	68.03%

Notes: in chapter 2 we explain how we computed the aggregate value of the non-financial assets.

1.1.2) The dynamics of the economic and of the housing market cycles

A cycle is identified as the fluctuation of some selected economic aggregates along their long-term trend (Zelazowski, 2017). Given the complexity of the housing market and the paramount difference in the behavior of multiple factors like the price elasticity of the demand and of the supply, it's possible (and proper) to distinguish between two different housing market cycles:

- 1- The demand cycle, a cycle more strongly correlated with the economic stage because it's determined by the development in the demand. Its average duration is of 4 to 5 years.
- 2- The supply cycle, led by the movements on the supply side, it's less correlated with the general trend of the economic situation. It has a longer average duration of about 10 years (Zelazowski, 2017).

Despite the exact relationship between the economic cycle and the housing market cycle is not well identified, past researchers have been able to figure out the main communication channels between these two distinct phenomena. The first channel is represented by the incentives that better economic conditions give households to invest

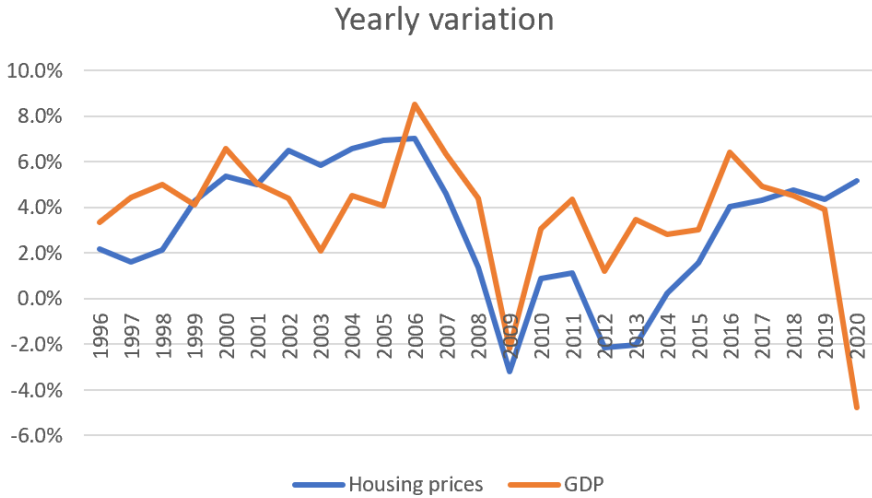
in their house in order to improve their standard of living; this way the housing demand rises and is often sustained by cheap mortgages. The second channel is represented by the monetary policy; like other asset prices, houses are interest rate-sensitive and react to changes in the economic policy, so activating a transmission mechanism of the monetary policy stimulus to the economy. Indeed, a lower interest rate entails a lower financing cost that households must bear to borrow money from the bank, incentivizing them to invest in the real estate. The third channel is more subtle and will be our focus later on in this paper: households often use their dwelling as a collateral for bank loans to access liquidity to increase their consumption. In this sense, higher housing prices increase the value of households' dwellings and affect the aggregate consumption through a more valuable collateral. This process works even inversely when houses depreciate and because the value of the collateral diminishes, families are forced to cut on their consumption, usually starting from non-essential goods.

Despite what just said, as mentioned before the exact relationship between economic cycle and housing market cycle is not clear. An emblematic case of their dubious link is the behavior of housing prices within the worldwide economic context during the Covid-19 pandemic of 2020 with respect to the pattern of the past years. Indeed, as shown in Figure 1, over the past years on average the house prices have followed the path of the GDP while in 2020 they behaved in literally opposite ways: while the GDP fell by 4.8% due to the economic shutdown, the housing prices index provided by the OECD rose by 5.2% from 118.6 to 124.8. The reason why housing prices didn't fall is that not only the demand fell diminishing its pressure on the price but even the supply did, balancing the outcome. For example, due to sellers' health concerns, in the US in April 2020 an additional 25% of homes got delisted from 2019 and the new listings were down 40% in confront to the previous year. This is an example that matches the theory of Kucharska-Stasiak et Al. (2012) on the relationship between the business cycle and the housing market cycle: they argue that these two doesn't have to be closely related: some of their phases can match and develop the same way but, since the housing industry is only a subset of the

economy, the first might be subject to additional forces that drive differently other phases of the economy. The behavior of the forces can bring also to different lengths.

Figure 1: Yearly variation of the housing prices index and GDP in the Euro area (19), 1996-2020

The chart below represents the relationship between the housing prices and the GDP in the Euro Area. Until 2019 they have moved in the same direction but in 2020 they moved in opposite ways: while the housing prices rose 5.8% since 2019, the GDP dropped by over 4%.



Source: -GDP: Gross domestic product (GDP), from: data.oecd.org

-House prices: Housing prices, from data.oecd.org

An interesting feature of the macro-economic and housing data that according to Morris et Al. (2005) should be taken into account when working with it is that it would be proper to distinguish between housing on one side and non-residential buildings and machines and equipment on the other side mainly for three reasons. The first two reasons, more

related to the identity of these two sets of assets are that these are built using different technologies and that they have different objectives, since the possible goods that can be produced inside a residential house are not going to be marketed. The third reason, fundamentally statistical is that residential and non-residential investment' cycles show different dynamics. Indeed, while residential investments lead the business cycle, non-residential investments lag it. In particular, the main findings of Morris et Al. (2005) are that GDP, residential and non-residential investments and consumption are strongly positively correlated and that the volatility (intended as the percentage standard deviation) of residential investments is twice the non-residential's one. Other contributions from the literature (e.g. Green, 1997) demonstrate even that, in particular, residential investment predicts or causes the GDP while the non-residential investment doesn't cause it but it's caused by it. According to Green, residential investment is rather a predictor than a cause of the GDP because otherwise the implausible argument that non-residential investment brings no contribution to the gross domestic product should be accepted. He thinks that residential investment is a good predictor of GDP because it reflects the households' behavior based on future expectations, on the base of the assumption that households will increase its investments in dwellings only if they expect the future to be good enough to do it. Though, some forces exogenous to the housing cycle like the favorable income tax policy of residential investment could cause economic movement. Indeed, residential property tax treatments like the capital gains tax exemption or the accelerated depreciation incentivize people to invest into residential properties. This phenomenon would bring over a period of several year benefits in terms of work to the real estate businesses, with well-paid jobs that then would contribute to the general GDP of the economy.

The fact that residential and non-residential investments exhibit different levels of volatility, as mentioned above, may be expected to affect sensibly the results on any statistical analysis but we'll show later that our outcome and those of other researchers results to be unaffected by this feature. In particular, through a regression we'll compute the marginal propensity to consume (MPC) out of housing wealth for the three main

categories of goods consumption (durables, non-durables and services) along with the analysis of others of its potential determinants like the unemployment rate, the total financial assets and the leverage ratio.

1.2) The influence of the wealth shocks on the household's consumption

1.2.1) Preliminary considerations on the consumption's behavior

Understanding the dynamics of consumption has always been a policy makers' concern in order to decide on macroeconomic maneuvers consciously but this has always been a hotly debated topic because of its both social and economic nature that make it a complex phenomenon to understand and because of the lack of reliable and updated data on the household balance sheet breakdown. As we will discuss in the next chapter, these two factors have led researchers to reach conflicting results on some aspects of the topic.

To this end, many studies have been conducted until now following mainly two methods, the method of the simple regression model (e.g. Mian, Rao and Sufi, 2013) and the method of the direct survey questions (e.g. Christelis et Al., 2019) where people are asked how they would change their consumption in case of a wealth shock. Both of the methods have pros and cons. The simple linear regression model is a scientific approach that affords us to analyze multiple countries at the same time and to manipulate big datasets but it returns average values that miss some important qualitative aspects while the method of the direct survey enables analysts to capture the country-level heterogeneities that can occur in some variables' behavior but it's a highly laborious method, above all if the analysis is supposed to cover multiple countries. In this paper we're going to recall the contributions brought by researchers that used both of the strategies and we're going to compare their findings.

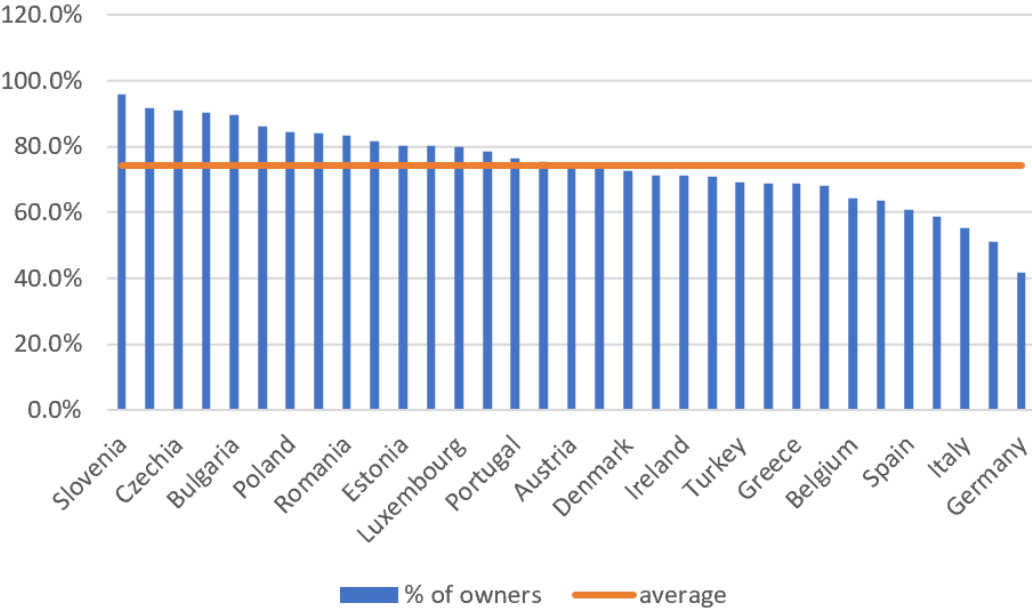
Talking about net worth shock, intended as the variation of the net assets in the household's balance sheet, it's possible to split the potential determinants of the consumptions into three classes: financial assets (stocks and bonds), non-financial assets (dwellings, land, machinery and equipment) and other macroeconomic variables (e.g. net disposable income, unemployment rate, interest rate and others). Among all the variables two in particular have caught the academic and political attention because of their relevance, the *housing wealth effect* and the *financial wealth effect* on consumption, that can be measured in terms of marginal propensity to consume out of housing wealth ($MPC = \frac{\delta C}{\delta HW}$) and out of financial wealth ($MPC = \frac{\delta C}{\delta FW}$) respectively. Despite the results on both of the MPCs are mixed, we're sure that the MPC out of housing wealth is significantly positive and in the range of 4 to 10 cents of consumption per dollar of housing wealth. The results on the financial wealth effect are more uncertain all we'll analyze them more deeply in the next chapter. An analyst of the ECB (ECB, 2003) points out two main causes of the heterogeneity of the results. Firstly, a reason of the cross-sectional heterogeneity is that it's possible that not all of the households are affected the same way by a rise or a drop in the housing prices. Since some families occupy or rent their own houses while others are potential buyers or tenants and the price/rent is generally aligned with the current local market prices, in front of housing price swings they are affected according to their position: landlords and homeowners will unambiguously benefit from a house price rise while potential buyers and tenants will be unambiguously damaged. Because of this redistribution of wealth, the housing wealth effect is ambiguous and its country-level average value depends, also, on the proportion of house owners in the country. Unfortunately, as Figure 2 shows, the proportion of homeowners varies a lot from country to country in Europe in a range of 41-96% and with an average of 74.8%; this would make the results of the MPC out of total wealth less reliable than it could be generally expected since the aggregate effect is the result of a compensation between opposite reactions. It's generally thought that the higher the proportion of homeowners, the stronger the consumption will react to a change in house prices because the positive wealth and substitution effects of higher housing prices on the

final consumption is expected to be greater than the negative income effect due to higher rents.

Secondly, a reason of the MPC out of total wealth's temporal heterogeneity is that the final effect of the housing wealth shock on household consumption depends on the source of the shock because different combinations of factors have different effects on consumers' behavior. For example, if the cause of the price rise is a lower interest rate, landlords and owner-occupiers will benefit because their housing wealth will increase, but on the potential buyers' side they won't be damaged because the negative effect of higher prices is more or less offset by a lower financing cost. From this example it's clear that, despite a few researchers do it, it would be fundamental to analyze the nature of the shock's source.

Figure 2: Percentage of owner-occupiers out of total occupiers (homeowners plus tenants) in 2019

Below we see the percentage of the population for the 18 countries that owns a house. Given that the proportion of homeowners varies a lot from country to country in Europe in a range of 41-96% and with an average of 74.8%; this would make the results of the MPC out of total wealth less reliable than it could be generally expected since the aggregate effect is the result of a compensation between opposite reactions.



Source: <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>

Furtherly, Guerrieri and Mendicino (GM, 2018) mention that some past literature highlights that the MPC ranges between 4-5 cents for the Anglo-Saxon countries while it's almost imperceptible for the most developed countries, for example the European ones, arguing that the reason of such a discrepancy is the lack of adequately standardized data among different countries that makes very difficult the cross-sectional comparison.

The research until now has deeply investigated the ways how a shock in the housing wealth affects the household consumption and three main channels have been identified.

The first channel is the direct “wealth effect”, intended as the variation of total wealth due to the variation in the value of the housing assets; as saw before, in some countries housing assets make up a significant part of the families’ total assets, in these cases a small variation of the house prices can bring an important wealth effect. The second channel is represented by the indirect effect coming from the feedback effect from the non-tradable employment sector, suggested by Mian, Rao e Sufi (MRS, 2013) according to which the in the hardest-hit areas by the housing price shock, the decline in consumption is so dramatic that it affects disproportionately the non-tradable employment sector, generating a knock-on effect that furtherly incentives the consumption decline. The last but not least important channel through which house prices affect the household’s final consumption choice is the collateral they can use to borrow money from the bank. Indeed, often people use their house or other properties as a collateral to loans to access credit to increase their consumption and investments. Thus, higher house prices mean a more valuable collateral, that reduces the cost of financing (the interest rate applied to the loan). A lower cost of financing makes people more inclined to borrow higher amounts of money and their net (of interests to be paid) disposable income is greater, these circumstances will bring them to increase their consumption and/or investments. The same kind of process works even inversely. When house prices fall the collateral is less valuable so less money can be borrowed and the higher interest will deteriorate the net disposable income. To survive in such circumstances people must cut on their investments and consumption because of the credit constraints.

1.2.2) The main results on the consumption response to wealth shocks

Despite researchers have considered more or less variables for their analysis, generally they have obtained similar results, finding close relationships between the consumption response and multiple variables. The MPC results to fall in the range of 4-7 cents for a dollar of housing wealth. An economy shall be capable to smoothen consumption over all the temporal shocks through what is called the “consumption insurance”. Consumption insurance is a risk-sharing mechanism for which citizens and/or the government of a

country can borrow and lend money through the international credit market in order to stabilize the national aggregate consumption. If this mechanism was properly managed and efficient, consumption wouldn't respond to wealth shocks but, as MRS (2013) notice, the elasticity of consumption with respect to housing net worth shock of countries is between 0.6 and 0.8, rejecting the full-risk sharing hypothesis. In particular, King (1994) shows that in presence of uninsurable income and wealth risk and of credit constrained households, the value of the MPC out of total wealth is positively correlated with the total wealth level; this source of heterogeneity entails that the distribution of losses across the economy affects the average MPC of the country.

Researchers have by the time uncovered the complexity of the household's consumption response to a wealth shock under multiple aspects. The first source of complexity, very difficult for the mathematical models to capture, is in the asymmetry of the consumption response to a positive versus negative wealth shock. Indeed, Christelis et Al. (2019) run a direct-survey social experiment in Poland asking people how they would change their consumption in front of a housing wealth shock of 10% of their house value and it emerges that among homeowners the average MPC for a positive shock is 4.7% and 2.1% for a negative shock. In addition, they reveal that over 90% of the interviewed homeowners wouldn't react to either a positive or negative housing wealth shock. Despite they run the experiment only in Poland, it seems reasonable to us to assume that this behavior can be extended more or less intensively to all the European (and not) countries; this is an important fact that the classical regression-based analysis can't capture. The second factor that mathematical models haven't taken into account until now is the proportion of owner-occupiers with respect to tenants.

Different levels of MPC out of housing wealth have been found for the different classes of consumption based on the durability; coherently, the durable goods have a higher MPC than the non-durable goods, since their consumption is the first to be cut in front of a wealth shock. The indebtedness level, measured as the Loan to value ratio $\left(\frac{\text{value of the mortgage}}{\text{value of the house to buy}}\right)$, and the income level, turn out to be significant determinants

and sources of heterogeneity of the consumption response. MRS (2013) and Christelis (2009) show that for a given decline in the home value, geographical areas with a high leverage ratio and a low income face a larger drop in home equity limits and a lower ability to refinance into lower interest rates due to larger drops in the credit score. In addition, Christelis et. Al (2019) find a negative correlation between MPC out of total wealth and cash-on-hand, consistently with models based on precautionary savings and liquidity constraint. Last but not least, the same guys with their direct survey questions find a source of heterogeneity of the MPC with respect in the age: moving from the youngest toward the oldest people the correlation between the two is positive for positive shocks, growing into the range of 2 to 6%, while they don't find a statistically significant correlation in case of negative wealth shocks.

2) Development of the hypothesis

2.1) Academic analysis

In the sub-section 2.1 we're going through the academic analysis of the results that the research on the marginal propensity to consume has reached until now. Before jumping to the final results, we discuss a few important aspects that have fundamental importance in the analysis setup, like the failure of the consumption-risk sharing theory, that is usually at the basis of many models, and the uncovering of the consumption sluggishness, that can significantly contribute to the interpretation of the final results stating that people tend to adjust their behavior lately to the macroeconomic shocks. Later on, we'll see that this last theory was the basis for someone to hypothesize the existence of even two distinct MPC, one immediate (related to a time distance of one single quarter) and the other eventual (relative to a few years of distance).

2.1.1) The earliest research

Researchers started studying the wealth effect on households' consumption already at the end of 90s'. For example, Cochrane (1991) starts with one of the first tests for the hypothesis of perfect consumption insurance against idiosyncratic income and wealth shocks, by using a cross-sectional regression of the consumption growth rate on a wide range of variables that are exogenous to it. He finds that consumption is not fully insured against long illness and involuntary job loss. Regarding the punctual estimation of the MPC, Benjamin, Chinloy and Jud (2002) find an MPC out of housing wealth and out of financial wealth of 7.9 cents and 2.3 cents respectively. As we'll document later, while at that time the MPC from housing wealth was found to be higher than the one for financial wealth, during the last fifteen years it seems to be the opposite. The reason is probably the fact that the image of the typical household's balance sheet has deeply changed in twenty years consequently affecting also the dynamics of the wealth shocks effects on the consumption. As BCJ state, in the 2000s in the USA the typical family used to hold more

than 75% of its financial wealth in restricted-access pension, retirement and insurance accounts. The median available financial wealth in unrestricted accounts, including stocks, bonds, certificates of deposits, cash and mutual funds was less than 5000\$ in 1998. More than one-third of the families had practically no unrestricted financial assets and even among the wealthier families the financial wealth was concentrated in the top percentiles. Bertaut (1998) notices that of those families in the 1992 with over \$60,000 in liquid assets, almost half possessed no stocks or mutual funds. Within this picture, most of people wouldn't suffer wealth shocks because of the stock markets' turbulence, since their assets are concentrated in their house and in insurance accounts. Instead, they would still have an important exposition to the housing market, since the house is an asset that all households naturally own. Today people instead are more exposed to the financial markets because they have a lower risk aversion and invest higher stakes of wealth in the risky financial assets. There are probably two main causes to this change in propensity over time. The first is the fact that families' investments value in both financial and real goods has grown in value, returning them a higher capital to dispose of. Secondly, people of today are more educated, many of them can interpret complex content of financial news in the journals and dispose of professional financial advisors, even for free. This should lead them to increase their participation in the markets.

2.1.2) Relevant aspects

2.1.2.1) The failure of the consumption risk-sharing theory

According to the consumption-risk sharing theory, citizens can smoothen their consumption over the time by insuring it against shocks in wealth and income or by separating the consumption from them. Then, with a full consumption insurance the consumption shouldn't respond to wealth and income shocks. Because of the heterogeneous distribution of the MPC with respect to factors like the income and the leverage, the ability of an economy to share consumption risk across households and/or

internationally is important because it influences how the entire population of the country responds to the shocks. A clear example is reported by MRS (2018): if higher leverage in the economy concentrates the losses on debtors and if more leveraged households have a higher MPC, then the overall effects of wealth and income shocks in the economy may be amplified, if the government and the citizens don't manage to mitigate the individual agents' risk.

In an open economy the consumption-risk sharing can be achieved by holding foreign assets and selling them to utilize the gain or by exploiting their income streams to support the consumption in the case of a negative shock. When the degree of consumption-risk sharing at the international level is high, one country can smoothen the consumption through several channels, the two that are mainly applied by countries are the following:

1- The capital market channel (cross ownership), where the government and agents can buy and hold foreign productive assets to diversify their assets' risks and then sell them to exploit the obtained gain to offset the wealth or income shock;

2- The credit market channel, where the government and the citizens borrow and lend money according to the wealth and income shocks (Corbett and Maulana, 2010);

Some agent-level mechanisms that in the reality contribute to enhancement of the consumption risk sharing are unemployment and insurance schemes, social government programs, while other examples of country-level mechanisms could be charities, disaster relief programs and direct foreign help. The share of the shocks that is not dampened by these two mechanisms is defined "unsmoothed".

The necessary conditions for these mechanisms to be implemented are complete financial markets and the presence of public institutions that make optimal allocation decisions. Unfortunately, these are not sufficient conditions for consumption-risk sharing to be fully implemented. Indeed, despite these mechanisms would perfectly work in the theory, the full consumption-risk sharing is very far from the reality; many studies have demonstrated that the aggregate consumption reacts to country-level wealth and income shocks. For

example, MRS (2013) attempt to test the hypothesis of full consumption-risk sharing hypothesis during the subprime crisis from 2006 to 2009 by estimating the elasticity of consumption with respect to housing wealth β in the following equation:

$$\text{Eq. 1: } \delta \log C^i = \alpha + \beta * \delta \log NFA^i + \gamma \log FA + \epsilon^i$$

where δ and γ are meant as the percentage changes, C_i is the consumption growth of the country i , NFA^i ³ is the housing (that is, non-financial) net worth shock and FA^i is the financial net worth shock of the country i . If the full-consumption risk sharing assumption was true, β would be equal to zero, meaning that the wealth shocks don't influence the households' consumption. He finds a statistically significant elasticity of the consumption with respect to the housing wealth of 0.63, that unambiguously rejects the consumption-risk sharing hypothesis. Similar results of different magnitudes that confirm the thesis were reached by Attanasio and Davis (1996) and a multitude of other researchers. The consequence of the failure of the consumption-risk sharing hypothesis is that consumption reacts to wealth and income shocks, and then we can proceed with further analysis to understand the magnitude and the origins of the changes.

2.1.2.2) Sluggishness of consumption growth - based on quarterly data analysis

Some researchers that worked with quarterly data have noticed a substantial sluggishness in the aggregate consumption growth, meant as the tendency of the consumption growth to inherit some memory (habit) from its past values. Though, this sluggishness was just slightly detected in the household-level (unit level) consumption growth. In particular, Havranek, Rusnak, and Sokolova (2017) measure the persistence of the aggregate

³ X_i is computed as the change of the housing assets value from time (t-1) to t over the total assets value at time (t-1)

consumption growth through the “habit formation coefficient” variable, that they estimate for many countries in multiple continents to be on average 0.6, while Guerrieri and Mendicino (GM, 2018) estimate it to be 0.7 on average among the five largest countries in the Euro Area (i.e., Spain, France, the Netherlands, Italy and Germany). We shall remind that the phenomenon of sluggishness was identified only using quarterly data, that reflects a high-frequency detection. Indeed, coherently with their thesis, the latter authors express the regression function of the consumption growth in the form of an AR(1) process as:

$$\text{Eq. 2:} \quad \delta \log C_t = \mu + (1 - \pi) * \delta \log C_{t-1} + \epsilon_t$$

where $(1 - \pi)$ is the fraction of households that hasn't updated their knowledge about the macroeconomic developments. ϵ_t , the household' consumption growth at time t ($\delta C_t = \epsilon_t$), is decomposable into the wealth shocks ∂W_t , of which β represents the MPC, and a vector of control variables Z_t :

$$\text{Eq. 3:} \quad \epsilon_t = \beta \partial W_t + \gamma Z_t$$

Two potential theories have been tested to solve this puzzle. The first theory argues that people consolidate some consumption habits that persist even with macroeconomic shocks. The second theory, that seems to explain most of the aggregate consumption growth behavior, states that households would adjust their consumption right away to any kind of relevant shock but, while they monitor their personal financial situation constantly, they update their knowledge of the macroeconomic scenario only randomly, consequently creating “sticky” macroeconomic expectations and updating their consumption behavior with a temporal lag. Their consumption choices are coherent with

their last update of the macroeconomic scenario but it may not be in line with the current one and, the less frequently they update their macroeconomic knowledge, the higher is the level of sluggishness in the aggregate consumption growth. Then, a person with “sticky expectations” uses the same decision rules that are optimal for a “frictionless” consumer (the consumer that is always up to date) but it differs from the latter because his perception of the current state of the world is out of date.

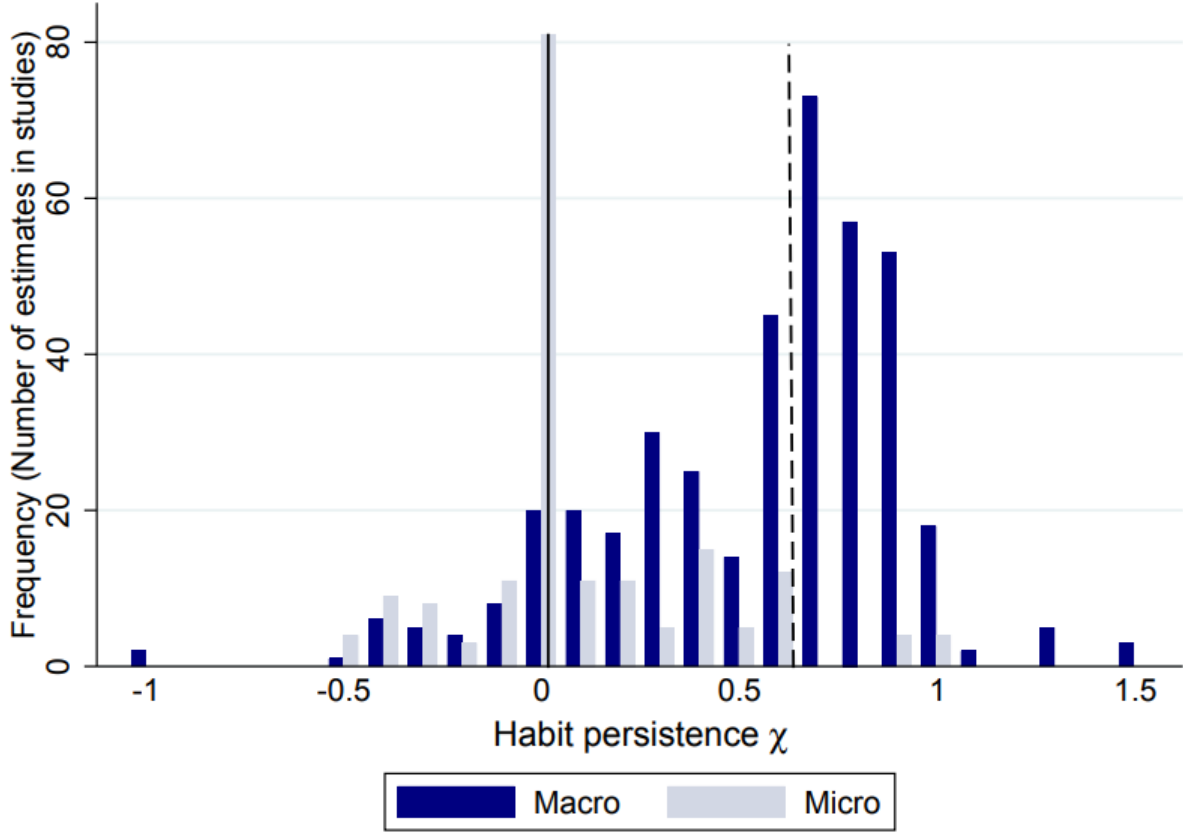
This assumption has two implications:

- 1- Households formulate their expectations on the aggregate state today on the base of the last macroeconomic data they viewed;
- 2- Households unconsciously assume that their knowledge of the macroeconomy reflects the current state of the world.

A certain degree of sluggishness in consumption increases its level of predictability, in terms of R^2 . As the Figure 3 shows, roughly speaking the R^2 of the aggregate consumption growth has been estimated around 0.3 while the R^2 of the household-level spending growth is around 0.003, very close to the 0.

Figure 3: Histogram of estimates of habit persistence in macro (aggregate-level) and micro (households-level) studies.

As we see in the picture, the estimated habit persistence for the macro picture is around 0.6 while the estimated one for the micro picture is very close to zero. This witnesses that we would probably get different results from the regressions of the two different variables because they behave in different ways.



Source: Carroll et Al. (2018), Sticky expectations and consumption dynamics

At the level of individual households, high-frequency consumption growth data (e.g., quarterly data) show little predictability. Carroll et Al. (2018) compute the utility cost of stickiness to evaluate the utility penalty caused by occasionally update. They find out that roughly people at their birth would be willing to pay one two-thousandth of the income

they would earn in their entire life to be punctually and fully updated on the macroeconomic state for the rest of their lives. This seems a low price, given the relevance and the magnitude of the wealth shocks. As the same researchers mention, next to the sluggishness theory Campbell and Mankiw (1989) propose the theory according to which the predictability of the aggregate consumption growth is enhanced by the fact that some people are used to spend their whole income, and the income is more easily predictable. Nevertheless, their study shows that the aggregate income growth is mostly explained by the correlation with the lagged consumption growth; only a very small part is explained by the aggregate income growth.

On the basis of the theory of the consumption sluggishness, GM (2018) compute two different MPCs: one that is immediate (next quarter) and the other that is eventual (after some years) by using in a first place the estimation of the stickiness of consumption for each of the five largest countries, that ranges from 0.49 to 0.88, and then their average. In both of the analyses the results for the immediate and the eventual MPC are near to 0.5 and 3 cents per euro respectively.

2.1.3) Technical results

In this section we're going to analyze the results that the different authors have obtained in their researches over the last fifteen years on the topic of the marginal propensity to consume. It was observed that a country sees a deeper decline in housing wealth in two alternative cases: a bigger drop of house prices and when homeowners are more levered. A factor that can explain the behavior of both the variables is the housing supply elasticity. Saiz (2010) developed an index to measure the ease with which houses of a metropolitan area could be expanded on the basis of some geographical qualities: flat terrains without many water bodies (i.g. sea or lake) are those where it's easier to build houses and consequently the housing supply elasticity is higher. On the other hand, hilly terrains that have many obstacles make it more difficult to expand the offer when needed, reducing

sensibly the local housing supply elasticity. It is not by chance that areas with a lower supply elasticity experienced, above all during the Great Recession of 2007-2009, the most intense house price movements. At this point, a lower housing supply elasticity translates into higher house prices, increasing the value of the house as a collateral and then encouraging people to borrow more money from the bank. Despite because of the lack of data on the housing supply elasticity we weren't able to statistically analyze the relationship between the two phenomena among the Euro Area countries of our example, given the relevance of the topic and of the results, for illustrative purposes we want to examine the results of the analysis that MRS run on the counties of the US for the period of the Great Recession from 2006 to 2009, assuming that the logic of the results is generally valid also for the Euro Area countries. As Table 2 shows, at the first two rows there's a significant, despite low, correlation between the housing supply elasticity and the change in housing wealth, probably led by the mechanism mentioned right before. In addition, at the row 8 we see that cities with a lower housing supply elasticity have a higher net worth per capita. Despite they seem to have also a higher income per capita (row 7), the insignificant correlation between the supply elasticity and the change in wage growth (row 3) unveils that there was not a permanent shock in the income. An interesting point is the absence of significant correlation between the housing supply elasticity and the local exposure to the construction industry dynamics. According to MRS, while this result could seem easy to read, it instead needs a careful interpretation because it's actually the sum of two opposite forces. Indeed, while the housing supply elasticity and the expansion of the construction industry would be actually positively correlated, this relationship is neutralized by the fact that low supply elasticity translates the demand into higher prices. Higher prices incentive people to invest on their already existing property, stimulating the construction industry. The sum of the two opposite forces is expected to be near the zero.

Table 2: Housing supply elasticity as a source of variation in the US.

The table below reports the main results that Mian, Rao and Sufi (2018) obtained on the elasticity. There's a significant, despite low, correlation between the housing supply elasticity and the change in housing wealth. The insignificant correlation between the supply elasticity and the change in wage growth unveils that there was not a permanent shock in the income. Last but not least, there is not a significant correlation between the housing supply elasticity and the local exposure to the construction industry dynamics.

		Housing supply elasticity	Constant	N	R^2
1	Housing net worth shock	0.046**	-0.174**	540	0.190
2	Change in home value, \$000	27.795**	-95.740**	540	0.284
3	Change in wage growth	-0.002	-0.010	540	0.002
4	Employment share in construction	0.002	0.122**	540	0.003
5	Construction employment growth	0.005	0.940**	540	0.000
6	Population growth	0.012*	0.018	540	0.026
7	Income per households	-5.378**	69.392**	540	0.080
8	Net worth per household	-88.389**	674.620**	540	0.083

Source: Mian, Rao, Sufi (2018), Household balance sheets, consumption and the economic slump.

Notes: The analysis was run at the county level in the US using the variation of the variables from 2006 to 2009.

MRS (2013) and Christelis (2009) show that, disjointly, a lower income and a higher leverage ratio are associated with a higher MPC. Regarding the lower income, people with a higher salary have a greater excess of money after subtracting all the monthly expenses, so that they have a greater bearing to absorb the shocks without having to cut back on consumption. The rationale of the LTV ratio instead must be researched into the relevance

of the credit constraints. Indeed, if borrowers are required to keep a certain level of wealth in order to guarantee the loan and the house value drops, they'll need to compensate the shock with their savings and by cutting back on consumption. In addition, MRS (2018) point out that for a given decline in the home value, households with a high leverage ratio and a lower income experience a lower ability to refinance into lower interest rates due to larger drops in the credit score.

While the researchers agree that the value of the MPC with respect to housing wealth falls in the range of 4 to 7 cents per euro, they seem to have conflicting opinions on the significance of the MPC with respect to the financial wealth (meant as the sum of the stock and bonds owned by the households).

MRS obtain a non-statistically significant elasticity of consumption growth with respect to the financial net worth shock with a high standard error. They don't exclude that it may be due to the lack of high-quality data on the direct holdings of financial assets of the households but they confirm their result mentioning that even Zhou and Carroll (2012), with much better data at the aggregate level find almost no effects of financial assets changes on the consumption. On the other side, GM find that the financial wealth effect is not only significant but even larger than the housing wealth effect. The averages of the MPC out of financial wealth result to be near 0.7 and 4.5 cents per euro, respectively in the short, and medium run while the averages of the MPC out of housing wealth are 0.5 and 2.4 cents per euro. Despite this remarkable discrepancy, GM follow saying that both financial and housing wealth effects are very heterogeneous among the different Euro Area countries of the sample, sometimes being statistically significant and some others not. In the chapter 3 we'll see that our results are more similar to the GM' ones. To facilitate the understanding, in Table 3 we report the main results on the MPCs from the two researches we that we adopted as the main point of reference: the first of Mian, Rao and Sufi (2018) and the second of Guerrieri and Mendicino (2018).

From the first section of the Table 3 we see the strong correlation between a change in the housing wealth and a change in consumption that MRS found. An MPC of 5.4 cents

means that if the home value fell of 100.000,00€, the house owner would reduce its spending by 5.400€. In addition, they regress the consumption on the squared housing wealth change to verify the presence of non-linear correlation with the latter. The hypothesis is confirmed by a statistically strong positive coefficient of 0.432, meaning that the MPC is larger for lower variations in the home value but it diminishes as the decline in home value increases. While the unemployment rate (in the table represented by all the items regarding the "employment share") seem to don't have an explanatory capability, the income per household and the net worth per household seem to do it. The variables of the model overall seem to have a discrete explanatory capability, recording an R^2 of almost 0.4.

GM (lower section of the Table 3) compute both the immediate and the eventual MPCs for the biggest countries in the Euro area, with and without the assumption of sluggishness mentioned before. The results vary a lot from country to country; in particular, a noteworthy observation is that Germany is the only country that records always negative MPCs, both for wealth, financial assets and housing assets. Though, none of the coefficients is statistically significant. Even the Netherlands don't have a significant MPC in the whole series, meaning that for these two countries the wealth effect is not very clear. Instead, Spain, Italy and France always show highly significant coefficients. While the immediate MPC out of total wealth doesn't change in the restricted version ($X = 0.7$) in confront to the unrestricted one ($X = 0$), remaining equal to 0.54, the MPCs for both the financial wealth and the housing wealth are slightly lower under the sluggishness restriction. This means that because of the inertia of some habits, people adjust the consumption in a lower measure. In addition, it's important to notice that the eventual MPCs are higher than the immediate MPCs, meaning that people don't fully adjust their consumption as soon as the wealth shock happens, but they do it gradually. This discovery entails that the wealth effect is slow but long-lasting over the time. In general, from the table we can see also that the MPCs out of financial wealth (0.7 for the mean of the immediate, 4.49 for the mean of eventual one) are higher than the MPCs out

of housing wealth (respectively 0.47 and 2.42), meaning that people react more markedly to shocks in their financial assets.

We think that we can fairly align the results of MRS on MPC out of housing wealth with the GM's eventual ones. Their results are more or less close, since they get coefficients of 5.4 cents and 3.42 cents, respectively.

Table 3: Main results on the MPC from the MRS (2018) and GM (2018) analysis.

Type of MPC	Restricted	Unrestricted	Method	Sample	Period
Mian, Rao and Sufi (2018)					
Housing	-	5.4 cents	SLRM, A. data	All counties of the U.S.	2006-2009
Financial	-	-			
Net worth		3 cents			
Guerrieri and Mendicino (2018)					
Housing	Im: 0.45 cents Ev: 3.13 cents	Im: 0.47 cents Ev: 3.42 cents	SLRM, Q. data	All EA countries	1991-2017
Financial	Im: 0.75 Ev: 3.57	Im: 0.70 Ev: 4.49			
Total wealth	Im: 0.54 Ev: 2.59	Im: 0.54 Ev: 3.14			
Slacalek (2009)					
Total wealth	Im: 1.81 Ev: 4.51	Im: 2.33 cents Ev: 6.69	SLRM, Q. data	16 countries worldwide	1975-2009
Financial	-	Ev: 5.25			
Housing	-	Ev: 0.46			
Carroll, Slacalek, Tokuoka (2014)					
Total wealth	-	1.5	SLRM, Q. data	15 countries of the EA	1997-2012
Financial	-	3.1			
Housing	-	-			

Notes: “Im” stays for Immediate MPC while “Ev” stays for Eventual MPC. SLRM is the abbreviation for Simple Linear Regression Model. “Q. data” and “A. data” stay for quarterly and annual data respectively.

Another interesting feature for the analysis of the MPC is the asymmetry of the consumption response to a positive versus negative wealth shock, of which Christelis et Al. (2019) talk about in the research they conduct in Poland by using the direct survey question method. Indeed, among homeowners the average MPC for a positive shock is 4.7 cents and 2.1 cents for a negative shock. In addition, they discover that over 90% of the interviewed homeowners wouldn't react to either a positive or negative housing wealth shock. This asymmetry may be due to financial market frictions, for example the limited ability to increase the mortgages: if people cannot borrow additional money to increase their consumption, they probably won't react to house price increases. On the other hand, they still can reduce their consumption in response to negative house price shocks. This reasoning implies that it's permissible to expect the MPC to be larger for negative housing wealth shocks than for positive housing wealth shocks. In front of questions (with non-mutually exclusive answers) on how they would react to the housing wealth shock, of the respondents reporting a positive consumption change, the majority (65%) said they would finance it by drawing from their savings or exploiting their current income, 26% said that they would increase their mortgage by exploiting the higher value of their house as a collateral and 20% answered that they would sell their house to profit from the higher price. Of those reporting a negative consumption change in response to a negative housing wealth shock, instead, the majority (55%) said that they would increase their savings, the 51% would clear some of the debts and 21% answered that the money left after satisfying the consumption needs would be invested on improving the house.

Christelis is also the only researcher we have found that analyses the relationship between the MPC and the households age and the level of cash-on-hand meant as the sum of the household income and their net financial assets. The results are that the level of cash-on-hand is negatively correlated with the MPC from a positive housing wealth shock, in particular below median cash-on-hand the MPC is between 5 and 10%, while in the top percentiles it is close to zero, meaning that there's almost no adjust in the consumption. On the other hand, they don't find a clear relationship between cash-on-hand and the MPC from a negative housing shock. They justify the negative correlation

between the level of cash-on-hand and the MPC by explaining that people that possess less cash are more likely to sell their house to cash in after a price rise, compared with those that have more cash ready to use. Talking about the age, they found that for positive shocks the relationship between the age and the MPC is positive rising in the range of 2-6%, meaning that older people are more sensitive to wealth shocks than younger people, while, again, they couldn't find a statistically significant relationship with the MPC from a negative housing wealth shock.

3) Our analysis

In this part of the paper we are going to explain our analysis and compare our results with researchers' ones that we discussed in the previous chapter. This chapter is composed of two parts. In the first part we are going to explain how we collected and elaborated the raw data while in the second part we display and comment the results. For the test, we used the RStudio software to run a regression on country-level annual data, covering the period from 2006 to 2020 on 18 countries of the Euro area.

3.1) Data definition and method used

For our analysis we used annual data on the aggregate values of the variables, covering the period from 2006 to 2020, on a sample of 18 countries of the Euro area, in particular: Germany, France, Italy, Austria, Belgium, Denmark, Greece, Luxembourg, the Netherlands, Norway, Poland, Sweden, the United Kingdom, Finland, Ireland, Spain, Switzerland and Portugal. Some dataset was missing some values so we had to integrate them with manual research online.

For the consumption data we used the Eurostat website⁴, where we were able to find data on the consumption of different categories of goods on the base of their durability. We selected the categories of durable goods, non-durable goods and services. To extrapolate data on the household's balance sheet breakdown we used as a main source the OECD.Stat website. From there we took the financial balance sheet⁵ that contains the financial assets and all the liabilities (financial and not) and, exploiting the dataset on the household aggregate net worth that the Credit Suisse bank publishes in its Global Wealth

⁴ Consumption data: <https://ec.europa.eu/eurostat/web/national-accounts/data/database>

⁵ Household country-level financial balance sheet:
https://stats.oecd.org/Index.aspx?DataSetCode=QASA_7HH#

Report yearly⁶, we computed the aggregate non-financial assets value through the formula below. All the values were expressed in the USD currency.

$$\text{Non financial assets} = \text{Net worth} - (\text{financial assets} - \text{total liabilities})$$

Unfortunately, due to lack of available data on a more accurate breakdown of the household holdings it was not possible for us to distinguish the housing assets from the remaining non-financial assets, that are the land and the inventory but we'll see later that even by using the aggregate value of the non-financial assets we obtain significant results. In order to get rid of the inflation effect, we deflated all the absolute values by using the CPI index for each country available on the OECD website⁷. To circumvent the problem of the skewed distribution, instead of computing the variation of the absolute value, we preferred to work with the variation of the log of the deflated values.

Last but not least, on the Oecd.Stat website we managed to find also the remaining data like the leverage ratio⁸ and the unemployment rate⁹. The leverage ratio is expressed as the ratio between the outstanding household's debt and his net available income. By multiplying the inverse of the leverage ratio by the aggregate amount of households' total liabilities obtained from the financial balance sheet, we got the aggregate net disposable income.

The method that we used for our analysis is the one of the multi-linear regression model. Specifically, we run the test on multiple types of expression that include additional variables. In the first, the simplest, equation (Eq. 1) we regressed the change of

⁶ Global Wealth Report 2020, Credit Suisse: <https://www.credit-suisse.com/about-us/en/reports-research/global-wealth-report.html>

⁷ CPI indices: <https://data.oecd.org/price/inflation-cpi.htm>

⁸ Leverage ratio: <https://data.oecd.org/hha/household-debt.htm>

⁹ Unemployment rate: <https://data.oecd.org/unemp/unemployment-rate.htm>

consumption only on the housing wealth shock¹⁰ to isolate its influence on the consumption behavior. In the Equation 2 we add to the Equation 1 the leverage effect through two components, the leverage variable and the leverage that multiplies the housing wealth effect. Finally, in Equation 3 we add, to the previous variables, a vector $X_{(it)}$ of other variables. These variables, in the country-level scale, are the households' net disposable income, the financial wealth shock¹¹, total wealth shock (meant as the shock of all the assets, financial and not) and the unemployment rate.

$$\text{Eq.1} \quad \delta \ln C_{(ijt)} = a + b \delta \ln HW_{(it)} + \gamma_i + \gamma_t + \epsilon_{(ijt)}$$

$$\text{Eq.2} \quad \delta \ln C_{(ijt)} = a + b_1 \delta \ln HW_{(it)} + b_2 \text{lev}_{(it)} + b_3 (\delta \ln HW_{(it)} * \text{lev}_{(it)}) + \gamma_i + \gamma_t + \epsilon_{(ijt)}$$

$$\text{Eq.3} \quad \delta \ln C_{(ijt)} = a + b_1 \delta \ln HW_{(it)} + b_2 \text{lev}_{(it)} + b_3 (\delta \ln HW_{(it)} * \text{lev}_{(it)}) + c * X_{(it)} + \gamma_i + \gamma_t + \epsilon_{(ijt)}$$

3.2) Analysis of our results

In the second part of the chapter we are going to analyze the results of the test that we run on a sample of 269 observations. In Table N we reported the basic statistics of the variables, among which mean, standard deviation and the 25th and 75th percentiles. It's particularly interesting the fact that the average leverage, expressed as the ratio of the

¹⁰ Housing wealth shock: $HWshock = \ln C_t - \ln C_{(t-1)}$

¹¹ Financial wealth shock: $FWshock = \ln FW_t - \ln FW_{(t-1)}$

Table 4: Basic statistics of the variables expressed, mainly, in absolute values.

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Unemployment_rate, %	269	8.20	4.73	2.55	5.00	9.10	27.49
Total_Consumption, \$	269	396.32	433.96	10.42	116.37	605.42	1,711.83
Durables, \$	269	35.88	43.59	1.03	9.80	43.24	201.00
Non-durables, \$	269	112.10	118.62	3.80	33.71	178.26	474.05
Services, \$	269	213.64	235.78	4.71	60.55	351.56	899.93
housing_wealth, \$	269	3,367.38	3,039.61	20.83	280.04	6,039.73	9,956.91
Disposable_income, \$	269	27.85	187.49	0.13	1.26	7.65	1,606.74
Financial_assets, \$	269	5,494.73	41,992.66	10.27	97.26	1,171.85	416,821.20
Leverage	269	141.53	61.99	23.23	91.19	179.82	334.74
Debt, \$	269	6,528.08	48,120.36	16.39	172.09	897.54	415,062.70
Net_worth, \$	269	3,450.72	3,099.35	14.71	187.24	6,266.85	11,078.88

Notes:

- The “\$” symbol means that the value is expressed in absolute terms, in thousands of millions;
- The unemployment rate is expressed as a percentage of unemployed people¹² as a percentage of the labor force;
- The leverage is expressed as the ratio of the household debt and of the net disposable income.

¹² The unemployed are people of working age who are without work, are available for work, and have taken specific steps to find work.

debt and net available income, is 141, very high, and that its standard deviation is just 0.5 times the ratio, very low in confront to the other items. This means that it is very common among households to take on a relevant amount of debt with respect to their income. In addition, we can see that the mean is lower than value of the 25th percentile, indicating that the distribution of the values is concentrated on the bottom of the range. Obviously, the standard deviations for the asset items are very high, since they depend mainly on the financial conditions of the households. Now we jump to the analysis of the regression results, documented in the Tables 5, 6, 7 and 8. With respect to the dummy variables, for space problems we kept only those that showed a statistical significance. For example, for the dummy variable “Year” we kept only the years of 2008, 2009 and 2020, that have shown to be different from the others and to which we can give an economic interpretation. Despite in the tables we report just the names of the variables for simplicity, we work with the variation from time t to time $(t - 1)$ of the logarithms.

We find a significant MPC out of housing wealth for all the consumption items. The MPC for the total consumption, the durables (Table 6), the non-durables (Table 7) and the services are respectively 4.74, 4.59, 4.63 and 4.82 cents; all of them fall in the range of 4 to 10 cents found in the past research. Despite we would expect the MPC for the durables to be higher than the others, since this category of goods should be the first to be cut in case of wealth or income shock, in our results the MPC for the durables is instead lower. We think that this discrepancy with the theory is probably due to the inaccuracy of the data, above all for the asset items, that is very difficult to collect and then find and to the fact that maybe, as we saw in the section about the Coronavirus, the consumption reacts more to the income shocks rather than the housing wealth shocks. In the third column of the tables we see that even the disposable income has always a significant, despite low, explanatory power, with a coefficient that falls in the range of about 2-3 cents; the coefficient is higher for the durables rather than the non-durables, making it clear that when households face a liquidity positive/negative shock they tend to keep the essential goods consumption stable and adjust the expense for non-durable goods. In particular, we notice that when we introduce the disposable income variable in the

<i>Dependent variable: Total Consumption</i>			
(1)	(2)	(3)	
Housing Wealth	0.474*** (0.024)	0.533*** (0.025)	0.006 (0.105)
Net Worth			0.572*** (0.099)
Financial Assets			0.284* (0.069)
Disposable Income			0.182** (0.074)
Leverage		-0.179** (0.093)	-0.165** (0.100)
(Leverage*Housing Wealth)		-0.241*** (0.040)	-0.203** (0.063)
Unemployment Rate			-0.135 (0.082)
Constant	-0.026 (7.756)	10.267 (7.484)	9.922 (6.774)
Observations	267	267	267
R ²	0.632	0.684	0.741
Time fixed effects	Yes	Yes	Yes
Country fixed effects	No	No	No

Note:

*p<0.1; **p<0.05; ***p<0.01

regression the coefficient of the housing wealth decreases a lot, most of times becoming even lower than the disposable income coefficient. We find out that this phenomenon is

<i>Dependent variable: Durables</i>			
	(1)	(2)	(3)
Housing Wealth	0.459*** (0.029)	0.507*** (0.030)	0.322** (0.136)
Financial Assets			0.334** (0.083)
Net Worth			0.572*** (0.099)
Disposable Income			0.278*** (0.092)
Leverage		-0.402*** (0.112)	-0.347** (0.119)
(Leverage*Housing Wealth)		-0.259*** (0.040)	-0.171*** (0.063)
Unemployment Rate			-0.406** (0.098)
Constant	-2.926 (9.203)	7.024 (9.068)	11.715 (8.157)
Observations	267	267	267
R ²	0.531	0.580	0.669
Time fixed effects	Yes	Yes	Yes
Country fixed effects	No	No	No

Note:

*p<0.1; **p<0.05; ***p<0.01

justified by the coefficient of 0.41 and is coherent with the discover of Hanspal et Al. (2020): the consumption responds more intensively to the income shocks rather than housing wealth shocks. Even the financial assets have an explanatory power for the variation of consumption, with a coefficient that varies from 2.84 to 3.34 cents. The

Dependent variable: Non-durable Goods

	(1)	(2)	(3)
Housing Wealth	0.473*** (0.022)	0.516*** (0.024)	0.213** (0.106)
Financial Assets			0.286** (0.064)
Net Worth			0.239** (0.095)
Disposable Income			0.258*** (0.072)
Leverage		-0.015 (0.087)	-0.270*** (0.093)
(Leverage*Housing Wealth)		-0.206*** (0.038)	-0.157*** (0.040)
Unemployment Rate			-0.009 (0.076)
Constant	-0.608 (7.154)	6.750 (7.037)	9.448 (6.328)
Observations	267	267	267
R ²	0.668	0.704	0.767
Time fixed effects	Yes	Yes	Yes
Country fixed effects	No	No	No

Note:

*p<0.1; **p<0.05; ***p<0.01

coefficients are very close to those found by Guerrieri and Mendicino for the Immediate and the Eventual MPC, of 3.57 and 4.59 cents respectively and confirm us that even a variation in the value of stocks, bonds and mutual funds can induce people to adjust their consumption. An important role is covered by the leverage. Its negative coefficient falls in

Dependent variable: Services

	(1)	(2)	(3)
Housing Wealth	0.482*** (0.025)	0.553*** (0.025)	0.256* (0.109)
Financial Assets			0.317*** (0.067)
Net Worth			0.325*** (0.099)
Disposable Income			0.281*** (0.074)
Leverage		-0.191** (0.094)	-0.159* (0.096)
(Leverage*Housing Wealth)		-0.273*** (0.041)	-0.204*** (0.042)
Unemployment Rate			-0.125 (0.079)
Constant	-0.980 (7.976)	11.523 (7.566)	15.489** (6.556)
Observations	267	267	267
R ²	0.626	0.690	0.773
Time fixed effects	Yes	Yes	Yes
Country fixed effects	No	No	No

Note:

*p<0.1; ** p<0.05; *** p<0.01

the range of -0.405 and -0.015 but its magnitude is reduced when the vector X of additional variables is included in the regression, probably because of the correlation with some these variables. An interesting point is that the coefficient of the leverage for the durables is 5 times higher the one for the non-durables, jumping from -0.085 to -0.402. On the base of what we have seen until now we feel confident to conclude that the variable

that explains the different allocation of households' resources in the different categories of goods by durability is the leverage rather than the housing wealth.

The unemployment rate results to be significant only for the category of the durable goods. This makes sense to us since there are many financial aids provided by the government and other organizations for the unemployed people to sustain their expenses for food and other primary goods. Though, these programs are generally not provided for goods like relative to travel and leisure, that fall in the durables category and then when a person loses her job she probably will cut the consumption in this category. The joint effect of the two different behaviors is null on the macro category of total consumption, coherent with the result reported by Mian, Rao and Sufi (2018). Last but not least, we find useful hints even in the results of the dummy variables. From the results it turns out that the time variable has an influence on the regression results, for all of the types of goods, meaning that from year to year the consumption may have behaved differently. The most evident examples that comes to the mind that could explain such a result are the years 2008 and 2009 with the subprime crisis and 2020 with the Covid-19 pandemic. On the other side, there seems not to be any relevant country fixed effect meaning that, more or less, all the countries showed the same consumption behavior. Our model seems to explain well the behavior of the consumption, with R^2 s that vary fall in the range of 0.669-0.773.

The fact that the consumption rather reacts to the net disposable income than to the wealth, makes it reasonable to recall the importance of the liquidity constraints to the households' consumption. Liquidity constraints are some limits to the available liquidity to the consumer, that then can't consume as many goods as he wants, and one of the main sources that contribute to determine its level is the individual monthly income deriving from the person's stable job. Some researchers have questioned the impact of the liquidity constraints on the consumers' behavior and, in particular, Hayashi (1985) notices that the level of liquidity available influences the consumption reaction to liquidity shocks: richer individuals (with more liquidity available) generally face lower liquidity constraints

and then have to adjust less the consumption when their liquidity lowers, while poorer people have less room to cover their finance their consumption and then even the slightest liquidity erosions force them to cut on the consumption.

Flavin (1981) test the random walk hypotesis for households' consumption assuming that the net disposable income follows an ARMA process, comparing the results with the PIH (permanent income hypothesis) according to which individuals tend to spend money at a level consistent with their expected long-term average net disposable income, intending the "expected long-term income" as the level of net disposable income as the income that househodls can safely spend. An interesting characteristic of his research is that he uses the unemployment rate as a proxy for the proportion of population subject to liquidity constraints.

Flavin finds that the magnitude of the consumption shock in front of a change in liquidity is much higher that what the PIH would suggest, defining this phenomenon as "excess sensitivity of liquidity to the current income". In particular, the estimate of the MPC out of the transitory income is deeply affected in both statistical significance and magnitude by the introduction of the liquidity constraints' proxy in the regression model, meaning that the liquidity constraints play an important role in explaining the excessive sensitivity of consumption to the current income. Indeed, when he estimates the excess sensitivity of non-durables alone the coefficient is statistically significant and equal to 3.7 cents while, when he introduces the unemployment rate in the model, the coefficient falls to 1.8 cents and becomes insignificant.

3.3) The Covid-19 pandemic effects

In this section of the paper we analyze how the Covid-19 pandemic has affected the general economy and the households' spending propensity during the year of 2020. Due to the recency of the pandemic, there's a lack of numerical data on the specific MPCs after the Covid outbreak but we found useful researches that describe how the consumption was affected by the virus.

3.3.1) General considerations

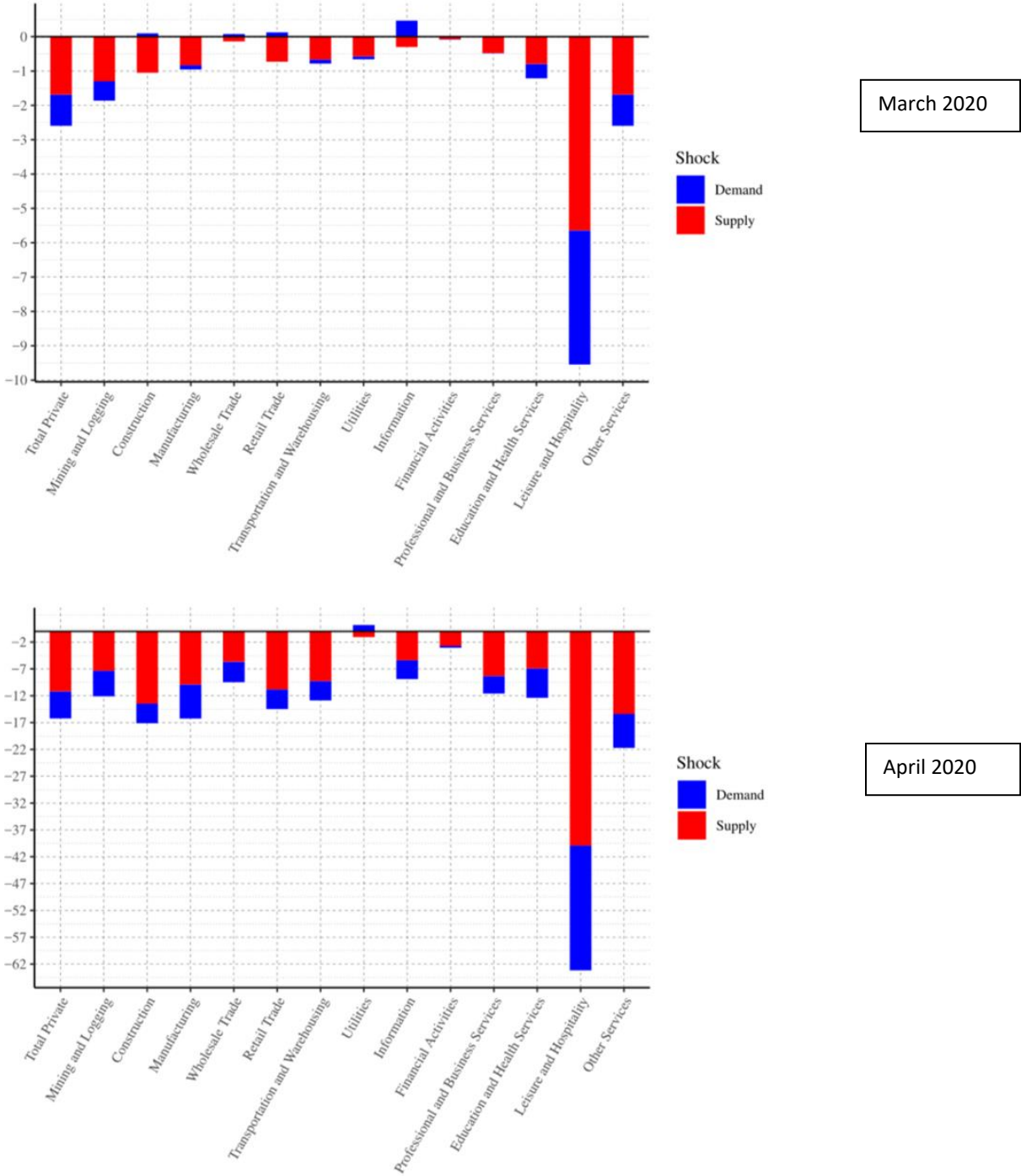
As Baker et Al. (2020) show, the Covid-19 caused a large output contraction, of which a good part was induced by the high uncertainty in the economy about the future. An important channel through which the pandemic affected the economy is represented by the businesses. Indeed, the pandemic forced many manufacturing companies to shut down their business because of the worldwide imposed lockdown, bringing to massive cuts in the expenses for innovation, employees and management training and research and development. Because the outcome of investments can be seen mostly after some time, we expect the factors that we just mentioned to have affected the economy not only in 2020 but even in the medium-long run. The irreversible nature of this kind of investments makes them very sensible to the uncertainty of the future since managers will be less prone to invest money if they can't predict the future circumstances.

It's important to understand if the shock comes from the supply side or from the demand side. This is useful even for macroeconomic policy purposes, since policymakers must know what kind of financial aids are needed and where to address them in the economy, that is to private households or to the businesses. The Coronavirus forced the policymakers to introduce several restrictions on both movements and business activities in order to limit the spread of the virus, then it looks clear that the shock comes from both the sides of the market. Many businesses, mostly those that require a frequent physical contact like the vast majority of businesses in the catering industry (for example bars, pubs and restaurants) and in the tourism sector were forced to close and couldn't offer their product anymore, bringing a sharp decline in the supply. On the other side, people

couldn't go out to practice many of the leisure activities and several kinds of products were more difficult to find given the shutdown. This, combined with the uncertainty in the evolution of the virus, caused a drop in the demand affecting, in different measures, all the sectors. For this reason, many researchers agree on the fact that the pandemic and the mitigating measures combine features of the "supply" and "demand" shocks. Brinca et Al provide two charts on the shock decomposition for the months of March and April 2020, we report them below in the Figure 4¹³. The first things that catch the eye are that the sector that suffered the highest drop is Leisure and Hospitality and the fact that this sector is the one where the proportions of the supply and the demand shocks are mostly equal. Indeed, the general prohibitions to travel caused a deep shock on both the sides. From the comparison of the charts of March and April we see that in general, in the very beginning the shock came more markedly from the supply side, while the demand kept adjusting furtherly even in April. This behavior has some exceptions, like the Leisure and hospitality sector. This phenomenon would fit the "sluggishness of consumption" theory we introduced before according to which a significant enough portion of people doesn't update her knowledge of the ongoing macroeconomic state, adjusting only subsequently the private consumption. While most of the sectors experienced a negative demand shock, as the charts show, a few saw a positive demand change. For example, because many people started working from home, the demand for technological equipment raised a lot during the pandemic. This suggests that it's true that the demand in some industries sharply fell but on the other side this drop was offset by the rise in other industries because people have changed their needs and consequently their consumption habits too. In addition, even the expansion of many firms online contributed to offset the reduction of the physical shopping. We'll discuss deeper this topic later in the chapter dedicated to the effects the Covid had on the consumers behavior.

¹³ Brinca et Al (2020): They estimate and decompose the shock by using data on the hours worked and the wages to estimate the labor demand and supply shocks. The logic assumption at the base is that if hours and wages move in the same direction, it's more probable that the shock comes from the demand. If they move in opposite directions, probably the shock comes from the supply.

Figure 4: Shock decomposition for March and April 2020. The sum of the red and blue bars is the percentage point change in the growth rate of hours worked relative to its historical average



Source: Brinca et Al (2020), Decomposing demand and supply shocks during COVID-19.

3.3.2) The impact on the households' behavior

On the private segment of the economy, the Covid-19 caused a sensible wealth shock and a change in the macroeconomic expectations, that together led families to drastically reduce their consumption. From the answers the respondents gave to a Survey of the Bundesbank in May 2020, it transpires that 40% of them suffered income or financial losses. On average, they expected their monthly income to fall by 64€ in the following 12 months. However, the distribution of the expected change is far from homogeneous: 40% of the respondents expected the income to fall on average by 500€ per month, 8% expected it to remain the same and 52% of them expected it to increase by roughly 290€ per month. The fact that half of the respondents expected a raise is another proof that some industries benefited from the pandemic conditions. The most obvious example of industry that has been boosted during 2020 that could justify the raise in the income of such a big percentage of people is the tech sector, driven (also) by the new smart-working tendency.

Hanspal et Al (2020) interviewed 8000 households in April in the US to investigate the wealth and income shocks caused by the pandemic. Despite the stock market had already partially recovered at the time, it was still down 20% in confront to the pre-crisis levels. They found that the income shock and the wealth shock experienced opposite trends among different demographic groups. While the financial wealth shock was higher for those families that were wealthier before the crisis, the income shock was instead lower for them, and higher for less wealthy people. This may be due to the fact as people dispose of more wealth, they can afford to increase their stake in the market, consequently rising their exposure. In particular, they notice that wealth losses are higher in the retirement accounts than in the non-retirement ones. This may be due to the fact that people nowadays are prone to invest part of their monthly wage in a complementary pension plan to compensate for the lower standard pension they expect to receive once retired, increasing their exposure to the market risk. In addition, they observe that on the age scale, the wealth loss is more pronounced in the range of 25-44, reflecting the fact that people start investing their money seriously when they're around 25 and then they

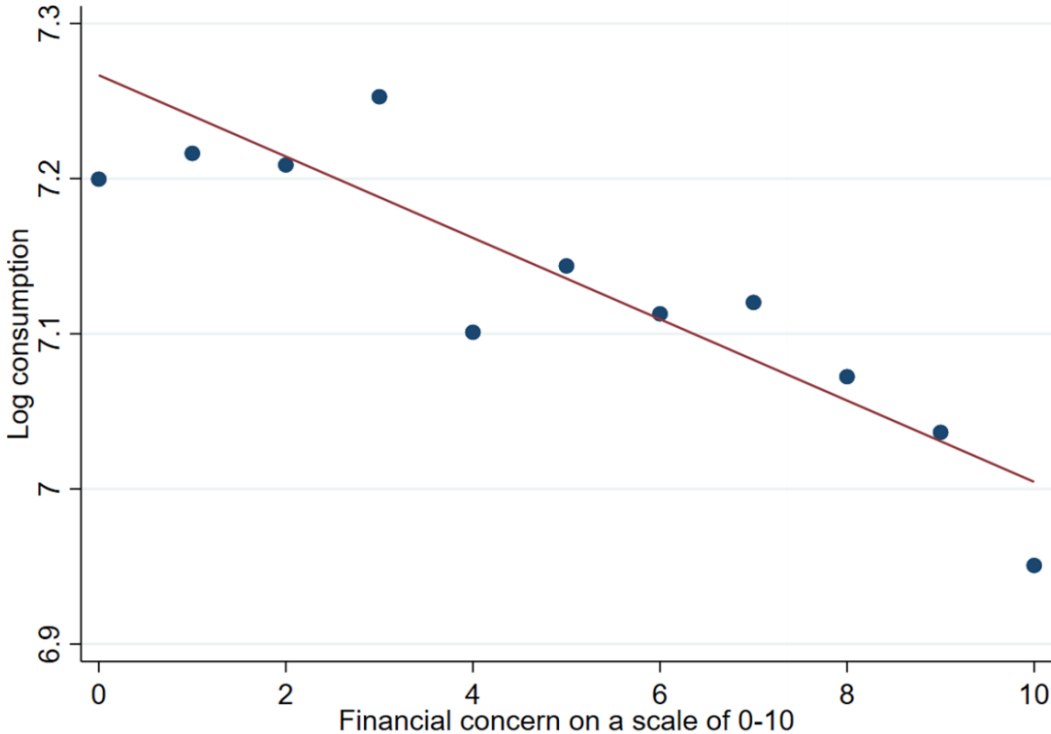
adjust their portfolio according to their age and life expectations: younger people tend to have more risky portfolios than older people and then suffer more during the financial turbulences.

To the results found on the wealth shocks we can associate the observations that other academics wrote on the aggregate consumption behavior and draw some conclusions, checking if the findings are coherent with the theories we developed in the first part of chapter two.

Christelis et Al. (2021) develop a model for the analysis of the consumption behavior based on the consumers' confidence about the current and future financial situation, explaining that financial concerns are negatively correlated with consumption for multiple reasons, since they depend on the magnitude of the income and wealth shocks, the access to liquidity, the current income and the accumulated wealth, implying that less wealthy people are less able to absorb the shock coming from the shutdown. To prove that we can analyze the wealth effects on consumption through the channel of financial concern, we report in Figure 5 the plot of the financial concern variable (on a scale of 0-10) and the log of consumption. The negativity and the significance of the correlation between the two variables is evident, meaning that those people that were more worried during 2020 consumed less. Christelis et Al. consolidate our theory, reporting (in the Figure 6 of their paper) that households that suffered the highest income and wealth shocks are the same that expected the greater consumption adjustment for the entire 2020.

Figure 5: Household concern about the consequences of the Covid-19 pandemic and its effect on consumption during the year 2020.

From the graph it's visible that the consumption is negatively correlated with the level of people's financial concern: the more people worry about their future financials, the more they tend to save in order to face financial distraesses.



Source: Christelis et Al. (2021), 31st may 2021, Research Bulletin No. 84: How has the Covid-19 crisis affected different households' consumption in the euro area?

Notes: The X axis represents an index that Christelis et Al. used to measure the concern level: 0 is the minimum and means "not worried at all" while 10 is the maximum and means "extremely worried".

The expectation on the future income is driven by the expectation on the probability of remaining unemployed because of the business shutdown, on the base of the sector of activity and on the possibility of working from home. The forecasts about the variables just described are affected by a varying degree of uncertainty about, for example, the duration of the crisis and of the future Covid-19 waves. Despite Christelis et Al. (2021) find that groups of people by average show different degrees for the concerns about both their wealth and health, they eventually conclude that the consumption response is mainly driven by their financial concerns rather than the health ones. With the new survey they show that the countries with a higher number of people reporting high and/or extremely concern for their family's financial situation are the same that during the first wave of Covid-19 registered the highest numbers of positive cases and where the restrictions on the people's movement and on the economic activity were the tightest, implying that these countries should be those whose consumption reacted the most to the wealth shock during the pandemic. Furtherly, Christelis et Al show that the financial concerns were not evenly distributed among the population. Younger people demonstrated higher concerns compared with those older than 65 years, that for the major part retired, are insured against income shocks. In addition, households with a lower income and/or liquidity constraints (intended as the obligation of paying monthly installments for a debt or a rent, for example) showed a higher concern for their finances, implying that they adjusted more the consumption. These last two statements are in line with the finding of Hanspal et Al (2020) according to which the association of expected spending and shocks is stronger for income shocks than for wealth shocks; that is, for younger people and people with a lower income and/or a higher debt. In addition, Hanspal et Al (2020) show that larger income and wealth losses are associated with a higher expected debt at the end of the year. A higher debt induces a higher financial concern and then a higher expected consumption decline. As we will see later, even from our test it emerges a clear and negative relationship between the leverage and the consumption.

An interesting point regards the role of the unemployment rate. Despite in our test and in the analysis of the past literature we didn't find a significant correlation between the consumption shock and the unemployment rate change, in 2020 this correlation would apparently seem to exist. In June 2020 the unemployment rate in the Euro area reached the peak of 8.7% from the 7.4 of June 2019. It would be logic to say that such a sudden and even more importantly unexpected rise in unemployment could be in part responsible for the consumption change. In particular, the unemployment rate was slightly higher for females that not by chance demonstrated a higher financial concern than males in the Christelis' survey.

Like Byrne et Al (2020) suggest, the Covid-19 affected the consumer spending mainly through three channels:

1) The opportunity to spend: the cautionary restrictions on movements and activities drastically reduced the opportunities that families used to have to spend. If superior external forces prohibit households to spend even in the case they wanted to, the marginal propensity to consume must be carefully examined because it could not be as meaningful as it usually would be in other circumstances. For example, while the entire consumption's drop in 2008-2009 was due to the change in wealth, during the pandemic in 2020 only a part (despite big) is caused by the same factor. Though, the MPC wouldn't be capable of capturing this important feature.

2) The willingness to spend: the pandemic lead people to reduce their consumption. Despite a good part of the change was justified by the necessity of saving more for the future because of the uncertainty, many also decided to restrict their activities in order to avoid getting infected. This is another example of the heterogeneity of reasons that drove the consumption change in 2020; not all of them are attributable to a change in wealth. Despite that, we'll see later that the main reason why people reduced their consumption is financial in nature, not healthy.

3) Precautionary savings: the uncertainty caused by personal financial and macroeconomic instability pushes households to increase their saving rate.

All the three channels are interconnected. One of the main causes of the severe shock in the non-financial wealth was the decline in the labor market. In Europe, in the first half of 2020 the labor force declined by about 5 million individuals.

Last but not least, we think it's important to remark that despite at the end of the day the aggregate consumption sensibly declined in 2020, its dynamics are influenced by a new set of consumer needs that developed thank to the new stay-at-home daily routine. Indeed, for example, many people were forced to buy technological equipment for the smart working and sustain medical expenses for the covid treatment regardless of how the pandemic was affecting their wealth and income.

CONCLUSIONS

In this paper we analyzed the relationship between the business cycle and the housing market cycle and examined what effect housing and financial wealth have on the households' consumption. At the beginning we saw that the house is an important asset to families, both for its social function and on the balance sheet, since it represents from 44 to 85% of the total assets in the Euro Area. The housing and the business cycles are strictly correlated, despite they may exhibit different durations; in addition, there's an open hot debate on the exact relationship between the two. Despite until 2019 the GDP and the housing prices have generally always showed a positive correlation, during the Covid-19 pandemic they behaved in opposite ways.

With respect to the marginal propensity to consume, researchers generally agree, with some exceptions, that the MPC out of housing wealth falls in the range of 4-10 cents, while they get mixed results on the MPC out of financial wealth. We find an MPC out of housing wealth of 4.59-4.82 cents and a MPC out of financial wealth of 2.84 to 3.34 cents. Two proposed reasons of this heterogeneity of the MPC out of housing wealth are that, firstly, home owners and tenants are affected in opposite ways by the housing price movements, then the MPC depends on the proportion of home owners in the country; secondly, the final effect on the consumption depends on the source of the shock because different combinations of factors have different effects on consumers' behavior.

We examine two theories essential for the interpretation of the MPC. In the first one we discuss the failure of the consumption risk-sharing theory: MRS (2018) found an elasticity of consumption with respect to the housing wealth of 0.63, providing an additional proof that the consumption effectively reacts to wealth shocks. In the second we discuss the existence of aggregate consumption's sluggishness, with a coefficient of about 0.7 estimated by GM (2018), this implies that the simple MPC doesn't reflect the true wealth effect because the consumption tends to lag its response to wealth shocks due to sticky macroeconomic expectations. The same behavior is not detected in the agent-level consumption though.

From our analysis we find that the MPCs out of housing wealth for the different categories of goods fall in the range of 4.59-4.82, in line with other researchers' results, while the MPCs out of financial wealth is of 2.84 to 3.34 cents. Interesting is the income effect on consumption. Its coefficient is of 2-3 cents and it's higher for durables rather than for non-durables, meaning that people first adjust the consumption of non-essential goods in front of an income shock. In particular, the income shock seems to have a higher explanatory power than the housing wealth shock because the first lowers the latter's coefficients due to their correlation of 0.41 when introduced in the analysis. This means that people react more to income shocks rather than to housing wealth shocks. According to MRS (2018)'s results, we find that the unemployment rate doesn't weigh significantly in the consumption's behavior explanation, except for the durable goods category. Last but not least, we find that consumption has shown a particular behavior in the years of 2008, 2009 and 2020, coming almost always with a negative coefficient that means that in those years the consumption shock was more pronounced than usual.

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