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### Behavioral Economics and Monetary Policy

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# Behavioral Economics and Monetary Policy

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The aim of this paper is to review the results of the existing literature on the relationships between behavioral economics and monetary policy. The description illustrates how the behavioral insights has been so far used in explaining how non-standard agent choices can shape in general the macro performances and specifically the monetary policy effects. In general the behavioral assumptions seem to be used to build up more robust and/or alternative micro foundations for explaining price and wage stickiness, as well as financial unbalances, in order to justify active monetary policies for stabilization purposes

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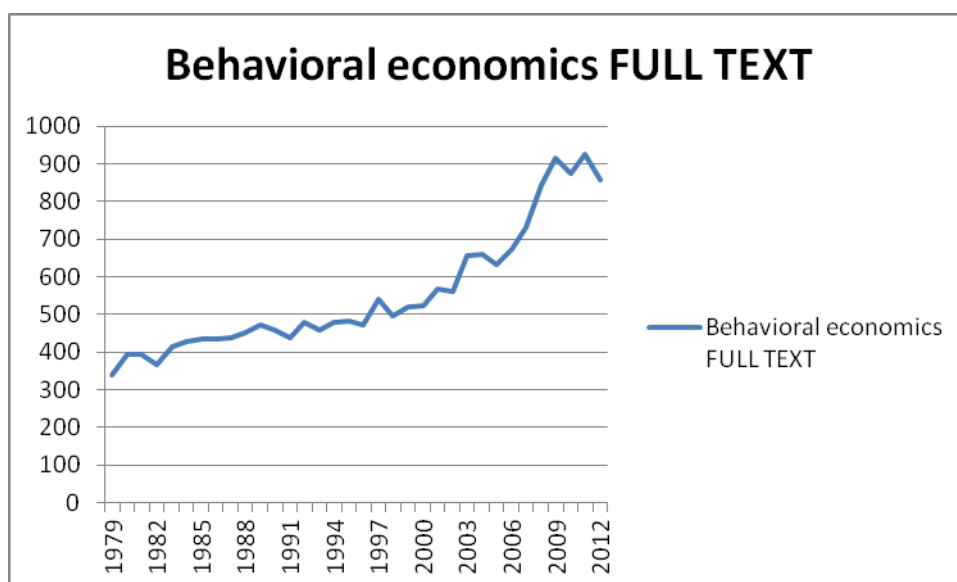
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## 1.Introduction

By using the words of *Advances in Behavioral Economics*: “Behavioral economics uses facts, models and methods from neighboring sciences to establish descriptively accurate findings about human cognitive ability and social interaction and to explore implications of these findings for economic behavior”. Research on this subject started in 1970’s and today substantial influence is reached in Finance<sup>1</sup>. Behavioral Economics (BE) calls into questions the typical assumptions of standard Economics: individuals are not perfectly rational, selfish and willful. There are substantial differences also in the methodology: experiments and laboratory proofs are abundant, such as links to the psychological and neurological literature<sup>2</sup>.

Since the first seminal paper written by Kahneman and Tversky<sup>3</sup> in 1979, studies on the subject of Behavioral Economics have been growing steadily in the literature. Indeed, the graph below shows the number of papers present in JSTOR archives for every year since 1979.



How can new behavioral assumptions change our knowledge on macroeconomics and economic policy design? More specifically the aim of this paper is to review the results of the existing literature on the relationships between behavioral economics and monetary policy. The discovery of a possible role of behavioral assumptions in monetary policy design can be particularly useful in a moment in which the reflections on monetary policy are in a state of flux.

The evolution of both the economics and the political economy of monetary policy in the last three decades – first the Great Moderation and then the Financial Crisis – is a story of two

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<sup>1</sup> Shiller (2003).

<sup>2</sup> Fudenberg (2006).

<sup>3</sup> Kahneman and Tversky (1979).

intertwined tales: on the one side the tale of how to govern money and interest rates in the short run; on the other side the tale of how to design in a longer horizon the monetary architectures<sup>4</sup>.

In the tradition the two tales are told separately, where the academic scholars preferred to focus essentially on the first perspective while only the central bankers and partially the policymakers were also sensible to the engineering of the monetary settings. The big innovation in the modern monetary policy was the progressive merger of the analysis of the macroeconomic effects of the public choices in the monetary games played day by day (monetary policy) with the study of the structural features that characterized both the monetary players - governments and central bankers - as well as the rules and institutions of the monetary games that shape goals and incentives of the players (central bankers and other economic agents).

But now, after the Financial Crisis, the scenario is changing. It is evident that the pillars of the monetary action must be reconsidered. But how should that been done? Is it possible to maintain the benefits of the mainstream paradigm based on monetary stability, but also reconsidering the role of both economic stabilization and financial stability?

Here the interest in exploring the potential of the behavioral insights comes in. In this paper we present how the behavioral insights has been so far used in explaining how non-standard agent's choices can shape in general the macro performances and specifically the monetary policy effects. In fact it is worth nothing that usually the articles which can be related directly or indirectly to monetary policy issues are part of the overall macroeconomics literature, with references to long standing debates on consumption, inter-temporal substitution, role of price and wage stickiness and so on. In general the behavioral assumptions seem to be used to build up more robust micro foundations for explaining price and wage stickiness as well as financial unbalances, in order to justify active monetary policies for stabilization purposes.

The paper is organized as follows. Section Two presents a synthetic taxonomy of the behavioral assumptions used in macroeconomic models. Then Sections Three, Four and Five describe the relationships between behavioral economics on the one side and aggregate supply, aggregate demand and the overall macro equilibrium respectively on the other side. Section Six is focused on a specific model of behavioral economics and the monetary policy transmission mechanism. Section Seven concludes, summing up the main results of the review.

## 2. Behavioral Economics: Principles

How non- standard behaviors can affect the economic choices? Borrowing from Hirshleifer (2008) it is possible to classify different psychological biases that can impair the standard assumptions of rationality.

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<sup>4</sup> Eijffinger and Masciandaro (2014).

### a) Loss Aversion and Loss Salience

*Loss aversion* is an individual psychological feature that can be expanded to the society. In general, loss aversion is the distaste for losses as measured relative to an arbitrary reference point: it is also called *negativity bias*. Socially, people care more about financial losses rather than financial gains of others: we can call it *loss salience*. Loss aversion and loss salience probably derive from more fundamental sources, such as the tendency to make dichotomous evaluations as a cognitive short-cut. Moreover, loss salience can be related to the appeal of Value-at-Risk methodology for risk management, which focuses on “maximum possible loss” as a risk measure. Loss aversion is treated by Santoro et al.<sup>5</sup> and Bhaskar<sup>6</sup>.

### b) Fairness and Reciprocity Norms

Inconsistent norms of behavior coexist within people’s mind, supported by strong feelings: Reciprocity; Equality; Charity.

From equality comes the progressive taxation principle; from charity and equality attention spurs toward groups that are performing poorly. From equality, the thirst for vengeance against perceived wrongdoers can go too far, imposing heavy social costs such as “jackpot” litigation wards against corporate businesses. From equality and scapegoating comes the distaste for “economic intermediation”, not recognizing value for it. The concept of *fairness* is treated by Akerlof, Dickens and Perry<sup>7</sup>, Ball and Moffitt<sup>8</sup> and Clark, Laxton and Rose<sup>9</sup>.

### c) Overconfidence

A natural mistake is to extend the can-do attitude of personal life to the societal level: it is much harder to make good decisions on behalf of millions of interacting strangers with diverse preferences and information. For this reason, markets represent the accumulation of creative solutions to problems. The concept of overconfidence is treated by Peon et al.<sup>10</sup>

In addition, it is useful to mention the *lack of self control*, used in Benton et al.<sup>11</sup>, the introduction of the important concept of “reference level” in consumption by Akerlof, Dickens and Perry<sup>12</sup> and the *heuristic decision mechanism* by De Grauwe<sup>13</sup>. Given the overall classification, which behavioral assumptions has been applied in addressing macroeconomic issues?

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<sup>5</sup> Santoro et al. (2014).

<sup>6</sup> Bhaskar (1990).

<sup>7</sup> Akerlof, Dickens and Perry (1996).

<sup>8</sup> Ball and Moffitt (2001).

<sup>9</sup> Clark, Laxton and Rose (1996).

<sup>10</sup> Peon et al. (2015).

<sup>11</sup> Benton et al. (2007).

<sup>12</sup> Akerlof, Dickens and Perry (2000).

<sup>13</sup> De Grauwe (2012).

### 3. Aggregate Supply and Behavioral Economics

It has been claimed<sup>14</sup> that the main contributions of the BE to monetary policy's debate are focused on the Phillips Curve. Behavioral Economics refines the understanding of the Phillips Curve in two ways: first, better models of the inflation process will improve forecasts and clarify limitations on what monetary policy can achieve. Secondly, the theoretical underpinnings of the Phillips Curve are important in understanding what the CB should do, i.e. how to interpret its mandate assessing welfare costs of fluctuations in output and inflation.

As part of the Nobel Lecture in 2001, Akerlof states his vision of the research in BE as a tool to bring back day-by-day behavior in economic analysis<sup>15</sup>. Indeed, he recognizes that his effort consists mainly in “.. the development of behavioral economics in the original spirit of JM Keynes' General Theory (1936)”, after the New Classical approach cancelled the analysis of human behavior to simplify the approach. Behavioral economics can have an impact on several themes, mainly although not exclusively related to the labor market economics.

Behavioral Economics can also be helpful in explaining the inconsistencies showed by the New Keynesian (NK) framework<sup>16</sup>. Janet Yellen<sup>17</sup> underlines that Behavioral macro can be useful in extending the framework, providing new justification for price and wage rigidity and also incorporating additional departures from the frictionless benchmark, such as: decisions based on rules of thumb, with few salient details involved in the decision to reduce the cognitive effort; individual behaviors affected by reliance on nominal frames of reference and by consideration such as envy, fairness, social norms and social status.

The short-run Phillips Curve is reproduced by Mankiw and Reis<sup>18</sup> using a macro model with sticky information, justified on behavioral ground. The resulting Curve is downward sloping and is consistent with inflation persistence and costly disinflation.

Zooming on the long-run Phillips Curve, there is an open and interesting debate on it. Indeed although there is wide acceptance of long-run Curve verticality, some behavioral models raise the possibility that steady-state unemployment might depend on the inflation rate.

For example, Akerlof et al.<sup>19</sup> developed a model with a concept of money illusion, implying a relation between inflation and change in the natural level of unemployment. A second example from the same authors<sup>20</sup> derives downward nominal wage rigidity from the concept of fairness in labor markets.

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<sup>14</sup> Yellen (2007).

<sup>15</sup> Akerlof (2002).

<sup>16</sup> Mankiw (2001).

<sup>17</sup> Yellen (2007).

<sup>18</sup> Mankiw and Reis (2002).

<sup>19</sup> Akerlof, Dickens and Perry (2000).

<sup>20</sup> Akerlof, Dickens and Perry (1996).

In sum, behavioral considerations thus point to the possibility of a long-run trade-off between inflation and unemployment at very low inflation rates.

Other insights on the possible relationships between behavioral insights and the Phillips Curve are as follows:

1. Clark et al.<sup>21</sup> explains that norms governing the pay increases that are deemed *fair* may result in a short-run Phillips Curve that is convex rather than linear. The non-linearity is due to the fact that even with high unemployment rates, firms are unwilling to treat workers in ways they consider unfair - that is, either by cutting nominal wages or by raising nominal wages by less than workers think they should receive - causing inflation to bottom out as unemployment rises.
2. Ball and Moffitt<sup>22</sup> use the concept of *historically rooted fairness* to build an augmented empirical Phillips Curve. Specifically, productivity growth can create a gap of adjustment respect to wage growth: gap related to fairness and slower changes. The explanation is clearer if we think about the 1990's US economy: positive productivity growth impact negatively price inflation, without changing wage inflation in the short run. In this context, the inflation-unemployment trade-off improves for a while. Consequently, the empirical Phillips Curve is augmented with the difference between current productivity growth and past real-wage growth.

The possible implications for the monetary policy conduct are at least twofold. First of all, the consequences of the new findings for the long-run target for inflation are somehow controversial. On the one side they seem to suggest that inflation have to be especially low, since it appears to reduce reported happiness, on the ground of individuals that decide basing on nominal targets<sup>23</sup>. However, there are hints that call for positive inflation to avoid deflationary risks. Indeed, in the two distinct situations when workers ignore inflation until is salient when bargaining for wage and in presence of downward nominal wage rigidity, there is a deflationary risk.

Secondly, the research addressed the topic of output stabilization. As it is already well known, it has been claimed that <sup>24</sup> output stabilization gives very tiny welfare-enhancements, labeling it as a secondary macroeconomic priority. On the opposite side, others <sup>25</sup> view output stabilization as stabilization in a New Keynesian framework, where price and wage rigidity create a condition in which steady-state employment and output are inefficiently low.

The behavioral assumptions can support the second view, using also empirical work (Debelle and Laxton<sup>26</sup>, and Yellen and Akerlof<sup>27</sup>).

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<sup>21</sup> Clark, Laxton and Rose (1996).

<sup>22</sup> Ball and Moffitt (2001).

<sup>23</sup> For example, see Di Tella and MacCulloch (2006).

<sup>24</sup> Lucas (1987, 2003)

<sup>25</sup> Galí, Gertler and Lopez-Salido (2007).

<sup>26</sup> Debelle and Laxton (1997).

<sup>27</sup> Yellen and Akerlof (2006).

## 4. Aggregate Demand and Behavioral Economics

Looking at the aggregate demand side, behavioral economics has been used to explain inter-temporal saving choices and credit market phenomena.

### 4.1 Behavioral Economics and Savings

Benton et al. (2007) use behavioral framework to shed light on the excess of uncollateralized borrowing and the lack of savings for low-to-moderate incomes in the US. The paper is an empirical work on low-to-moderate income families in Boston, US. American households have been saving less and borrowing more in the last 20 years. Usually the reasons for saving and borrowing are thought to be the effect of optimal decision-making processes. The authors sustain that the standard view is not particularly effective in accounting for empirical facts on saving and credit behavior. In their study personal financial decisions are at times suboptimal, where it means out of line with an individual's long-run self-interest: therefore there is a non-standard short-run/long-run trade-off in borrowing and saving decisions.

Standard economic theory on saving and borrowing is based on the principle of consumption smoothing: over the life cycle, individuals prefer to consume the same amount every period. This principle implies that people borrows generally in early life, then repay and save, lastly retiring using money saved in the middle of life. The standard vision implies that there is an exponential discount of future costs and benefits.

But in real world, consumption smoothing doesn't work: usually consumption is not smooth, but follows income through the life-cycle. The evidence comes from welfare recipients, regular wage earners and more. Further evidence on the sub-optimality of financial choices comes from the data on credit counseling, a growing industry both in absolute value and in a growth perspective: there is growing conscience of difficulties in following good borrowing and credit patterns.

The policy implications of the standard setting are crystal clear: optimal decisions cannot be changed by policymakers, that at most can intervene in shaping better information in credit markets. Financial education can increase savings for young people, but the evidence on later life attainment is not clear-cut in favor of an overall positive effect for individuals. Thus information is certainly important for financial decisions but probably not sufficient to explain why individuals frequently make suboptimal decisions.

Behavioral economics takes a different approach, because doesn't relate suboptimal financial outcomes to informational issues, but to failures of individuals to discount exponentially: the differential discounting represent a *self-control problem*. In simple words, self-control problems make immediate payoffs bigger in size respect to long-term decisions: individuals tend to overestimate future costs and to underestimate future benefits.



Self-control is closely linked to procrastination, in the sense that they are originated by the same mechanism. There are differences in the way of coping with lack of self-control/procrastination issues: *sophisticated individuals* will like commitment devices, as they know the mechanism of future deviation; *unsophisticated individuals* will not recognize the need for them. It is necessary also to distinguish self-control issues from overall impatience: the latter refers to the degree to which individuals care about consumption differences across any two periods.

The importance of self-control problems for financial decision making has been highlighted in aggregate models built around consumers with self-control problems address well empirical facts on saving and borrowing (Laibson<sup>28</sup> and Choi et al.<sup>29</sup>).

## 4.2 Behavioral Economics and Credit

The banking sector is a key part of the transmission mechanism of monetary policy. A behavioral framework<sup>30</sup> can be used to offer an explanation on how credit booms are fueled by the banking sector, through *excessive optimism (overconfidence)*.

The framework takes suggestions from the existing seminal literature on behavioral credit cycles, which is represented by: a) Keen (2011): a monetary macro model of the financial instability hypothesis, stated by Minsky<sup>31</sup>; b) Rotheli (2012): a model of oligopolistic bank competition where just a minority of bounded rational banks are enough to aggravate the credit cycle; c) Boz and Mendoza (2014): a model that analyzes the effects of financial innovation and overconfidence to amplify the credit cycle.

The model from Peon et al. (2015) consists in a banking sector, in which two risk-neutral banks compete in Cournot fashion by setting the volume of loans with a Monti-Klein<sup>32</sup> approach to oligopoly. There are no agency problems between shareholders and managers, and no information asymmetries. Among other features, there is a lack of interbank market and bankruptcy; consumers are modeled as high-quality and low-quality agents, depending on the probabilities of repayment. One of the two banks is overconfident, namely overestimate the probabilities of success by low-quality borrowers. After seeing that the presence of one biased bank creates a boom of credit to low-quality borrowers, *herding behavior* comes in, assuming that now the banks can play a game in which they observe their competitors estimated probabilities and then decide to play *rational* or *biased*, leaving aside their true nature.

A relevant role is related to limits to arbitrage in credit markets. In general, in retail credit markets there would be no rationale for private banks to correct mispricing. From a microeconomic

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<sup>28</sup> Laibson (1997).

<sup>29</sup> Choi et al. (2004).

<sup>30</sup> Peon et al. (2015).

<sup>31</sup> Minsky (1982), (1992).

<sup>32</sup> Klein (1971) and Monti (1972).

perspective, there is no way to offset credit allocation in the retail market, so the only balance can be done at a macroeconomic level. From the latter perspective, hedging is difficult since in a booming market it means that the arbitrageur should be willing to miss potential gains and consequently losing market share. Moreover, commercial banks have no incentives to put higher interest rate on deposits to curb loan emission, since they would lose profits.

A general consequence of the whole thought is that bank-based financial systems are less likely to be informatively efficient than market-based systems, i.e. a standard result can be obtained applying the new behavioral assumptions.

## 5. Macroeconomic Equilibrium and Behavioral Economics

Behavioral economics can be used to speculate on the overall drivers of the business cycles. On this respect it is efficient to follow a systematic analysis<sup>33</sup> of the wide impact of behavioral economics on macroeconomics, covering all together the broad themes, such as consumption, supply-side topics and savings. The most interesting aspects for the monetary policy conduct seems to be the supply-side ones and topics related to news and asset price changes. The discussion essentially starts from the New Keynesian (NK) framework.

As we already noted in Section Two, the standard NK supply (Phillips) curve can consistently incorporate behavioral assumptions, using them as novel justifications for price and/or wage stickiness. Behavioral considerations can enrich the analysis of expectations, as well as of the effects of social conventions in explaining labor market dynamics.

An important channel through which both dimensions work is the replacement of inflation expectations in the supply curve with expressions that depend on lagged inflation and/or output gap terms, which generate persistent responses to shocks. Respect to this issue, there are seven different approaches presented by Holden and Driscoll (2014). Moreover, there are several authors that treat the issue, while Duffy<sup>34</sup> offered a good survey to look at experimental evidence on expectations formation in a macroeconomic context.

In general the contributions to the effects of behavioral insights on the way labor markets are modeled reflect mainly the Akerlof/Yellen statement: behavioral economics helps to ground downward nominal wage rigidity.

More complex ways to include behavioral economics into macroeconomic models are represented by Akerlof, Dickens and Perry<sup>35</sup>, where nominal wage cuts are deemed unfair, and by Akerlof, Dickens and Perry<sup>36</sup>, where worker's effort depend on his relative wage respect to a reference level.

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<sup>33</sup> Driscoll and Holden (2014).

<sup>34</sup> Duffy (2012).

<sup>35</sup> Akerlof, Dickens and Perry (1996).

While the detailed assumptions are different in the two models, the basic policy conclusion is essentially the same: a tight monetary policy may have a permanent negative effect on the economy by pushing output down to a low equilibrium level. This conclusion is consistent with the analysis of Ball<sup>37</sup>, who compares the monetary policy of North American and European countries in the 1980s and 1990s, concluding that tighter monetary policy in several European countries lead to long-lasting higher unemployment.

Further behavioral insights can generate models in which there are multiple equilibria, even though in very different settings. For instance, Bhaskar (1990) generated multiple equilibria modelling wage bargaining with the principle of loss aversion: people care much more about being paid less than being paid more than the other workers. Multiple equilibria can be also generated by wage rigidity caused by fairness considerations, and given their existence then beliefs and sentiment can orientate which equilibrium prevails.

Finally facts from business cycles cannot be explained by current mainstream economics: output gap is non-normally distributed<sup>38</sup>; the same is true for the output growth rate<sup>39</sup>. The mainstream DSGE economics tries to offer an explanation assuming that exogenous shocks are non-normally distributed. Within the imperfect information paradigm one more explanation is the *statistical learning hypothesis*<sup>40</sup>, which requires complex cognitive skills for agents.

De Grauwe<sup>41</sup> develops a behavioral macroeconomic model in which there are endogenously generated “animal spirits”. This is possible through decision mechanisms that are not fully rational, instead based on heuristics.

The model is a standard aggregate demand-aggregate supply, coupled with a Taylor Rule. Agents do not use rational expectations, while they use simple heuristic rules to forecast the future, with an adaptive learning mechanism that give more weight to the “fittest” - most performing- rule.

More specifically, demand side is a standard one, with the output gap specified and with habit formation - i.e. presence of lagged output in the demand equation. New Keynesian Phillips Curve is the supply side equation, defined through the Calvo pricing rule and lagged inflation. The Taylor Rule has lagged interest rate for smoothing and target rate at zero for convenience.

There are two types of heuristic rules for forecasting: fundamentalist and extrapolative. The fundamentalist rules forecast output gap based on steady-state output gap, while extrapolative rules forecast output gap with previous year's output gap. Respect to inflation forecasts, fundamentalist rule believes in the inflation target set by the central bank (CB), while extrapolators set the inflation target for the future as the previous time inflation target.

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<sup>36</sup> Akerlof, Dickens and Perry (2000).

<sup>37</sup> Ball (1999).

<sup>38</sup> See Fagiolo et al. (2009) on US data.

<sup>39</sup> See Fagiolo et al. (2008),(2009) on data of most of OECD countries.

<sup>40</sup> Sargent (1993), Branch and Evans (2009).

<sup>41</sup> De Grauwe (2012).

The rules are bottom-up designed: they require only agents to use the information they know, while do not require to understand the whole picture. The concept of agent rationality is essentially related to agents that continuously evaluate their forecast performances. The market output gap is defined as a weighted average of the two forecasts. The weights change based on the discrete choice theory. On top of that the rules are not micro founded.

Introducing shocks, the projections of the output gap follows the so called “animal spirits”, shifting between optimistic projections and pessimistic ones. The output gap is tied to the evolution of agents’ fractions who extrapolate a positive or negative output gap. The model generates waves of optimism and pessimism based on the series of exogenous shocks they receive and the response of the agents, through this “search for the truth” mechanism. At the same time, there are inflation cycles created by the usual mechanism of prevalence between extrapolators and fundamentalists.

The results show that inflation has a non-linear behavior once the output gap parameter grows: inflation variability declines for low positive values of output gap parameters, while start increasing for greater values above a threshold. The punchline is that some output stabilization is good, since it lowers the mechanism of booms and busts through decreased variability in output gap.

Which are the implications for the monetary policy action? Confirming a result of the mainstream DSGE framework, higher value for the parameter for inflation in the Taylor Rule improves the trade-off, since a more strong reaction to inflation – i.e. higher central banker conservativeness - lower the variability in inflation by reducing the probability that extrapolators go away from inflation target. The NK approach still holds.

## 6. Behavioral Economics and Monetary Policy

In the previous Sections it has been stressed that the effects on monetary policy in assuming behavioral way of thinking can be drawn only in a indirect and/or implicit way. But behavioral economics can be used to explain the monetary policy mechanism<sup>42</sup>, with a model which aims at reproducing a theoretical mechanism –grounded in behavioral and experimental evidence - that can explain asymmetries in the monetary transmission.

The data show that monetary policy changes are likely to have asymmetric impact on output and inflation during different stages of business cycle. The standard literature explains those empirical facts differently: a) Peersman and Smets<sup>43</sup> suggests that financial accelerator theory may explain why the effects of money on output are stronger in contractions; b) Ball and Mankiw<sup>44</sup> use a convex aggregate supply curve that belongs to Keynesian tradition; this feature retains the

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<sup>42</sup> Santoro et al. (2014).

<sup>43</sup> Peersman and Smets (2005).

<sup>44</sup> Ball and Mankiw (1994).

property to be steeper for price levels above expected prices, so that it ensures a stronger reaction of output in contraction.

In the model of Santoro et al. (2014) prospect theory<sup>45</sup> is applied: reference-dependent preferences are linked to loss aversion, such that losses in consumption utility resonate more than gains.

The adopted approach is a general equilibrium one, with two main mechanisms in place: first, during contractions, changes in the real interest rates exert stronger impact on output through an increase in the elasticity of inter-temporal substitution between current and future consumption. For instance, during contractions the IS schedule displays higher elasticity of current consumption to the real interest rate. Secondly, loss averse preferences in a general equilibrium setting implies a state-dependent marginal rate of substitution between consumption and leisure that can be related to firms' real marginal cost, so that equilibrium in the labor market holds. The aggregate supply function is convex due to the assumption of *menu costs*. In addition, the labor supply schedule – which is assumed to be convex by parameter choice – retains the key property of being flatter below the reference point due to loss aversion, so that real wages feature downward stickiness in contractions. To be clearer, a contraction in labor demand induces a smaller drop in wage, and at the same time a larger drop in employment (and this is not related to asymmetric wage-setting frictions affecting the labor market).

In conclusion, during contractions the aggregate supply (NKPC) shows a lower elasticity of inflation to output deviations.

The overall impact of monetary policy on inflation during an contraction depends on the magnitude of these two opposite effects: on one side, an expansive monetary policy (during contractions) spurs higher production and consumption today, increasing inflation; on the other side, a flatter aggregate supply curve means that the output deviation has less effect on inflation than in a standard model.

In this context, there is one theme on monetary policy, applied to two different situations. The general principle is the asymmetry of monetary policy effects depending on the phase of the cycle: the model predicts stronger – i.e. deeper and steeper – output responses when monetary policy is restrictive, as compared with expansive policy actions, while inflation displays nearly symmetric responses to monetary shocks. This principle applies both in case of a single distortion economy and in case of two distortions economy. The two distortions are standard nominal rigidities in price setting and *external habits in consumption*.

In the first case, the general one, we consider that the presence of nominal rigidities would not per se be a problem for the monetary authority. Indeed under these circumstances, the rate of inflation may be fully stabilized and the output gap closed regardless of the sign of the technology shock occurred, even if policy response necessarily changes between contractions and expansions.

In the second case with external habits in consumption, although the optimal policy is no more feasible, the monetary policy is still state-dependent and it imposes the policymaker to attach

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<sup>45</sup> Kahneman and Tversky (1979).

greater importance to the consumption externality during contractions as compared with expansions. Indeed, *external consumption habits* imply that one household does not take into account the impact of their consumption on the utility of others. As shown by Leith et al.<sup>46</sup>, in this context one monetary policy tool cannot simultaneously ensure that output is at its efficient level and inflation is eliminated. Therefore, monetary policy faces an explicit trade-off when seeking to minimize the joint effect of the two distortions. In other words the policymaker faces unusual trade-offs, weighing the distortions stemming from price rigidity with the one induced by external habits in consumption.

## 7. Conclusion

Behavioral economics is not fully considered into macroeconomics, while there are hints that it is useful to understand many concepts and to prove empirical facts.

Respect to the supply side, behavioral insights give three contributions. First, a model grounded in behavioral economics reproduce the short-run Phillips Curve, adding to the debate the empirical consistency with inflation persistence and costly disinflation. Second, on fairness ground, the short-run Phillips Curve is convex rather than linear. Third, behavioral insights introduce a possible explanation for a long-run Phillips Curve.

All these points underlines two consequences for monetary policy: the importance of low, but positive inflation to avoid deflationary risks, without reducing reported happiness for consumers; a call for a bigger role for output stabilization.

Respect to the demand side, behavioral insights give two contributions. First, there are empirical results that links self-control problems to excess of borrowing and lack of saving for low-to-moderate income households. Second, overconfident banks can explain how credit booms are fueled by the banking sector.

These points have important consequences for the transmission of monetary policy and financial crises.

Respect to the macro economy by far, behavioral insights give three contributions. First, there are several contributions that substantiate price and wage stickiness. Second, the principle of loss aversion applied to wage bargaining can create models with multiple equilibria for the overall economy. Third, an heuristic decision making process used by agents conduces to explain empirical data.

All these points have two consequences for monetary policy: a too low inflation can harm long-term welfare according to the long-run Phillips Curve; a stronger policy reaction to inflation improves the trade-off between inflation and output gap.

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<sup>46</sup> Leith et al. (2012).

A specific model that introduces loss aversion in consumption has consequences for monetary policy. The overall impact of monetary policy on inflation during a contraction depends on the magnitude of two opposite effects: on one side, an expansive monetary policy (during contractions) spurs higher production and consumption today, increasing inflation; on the other side, a flatter aggregate supply curve means that the output deviation has less effect on inflation than in a standard model. Moreover, the only presence of nominal rigidities assure an optimal monetary policy, while adding *external habits* in consumption impose a not-optimal monetary policy.

Overall, the contributions are diverse and the policy conclusions do not converge to one clear monetary policy. Further steps are needed to unify the framework of analysis and weight the different behavioral insights and their importance for monetary policy.





| Articles                   | BE mechanism                      | BE on supply curve                                  | BE on demand curve           | Formal model | Micro Foundations    | Monetary Policy                                                                                                                               |
|----------------------------|-----------------------------------|-----------------------------------------------------|------------------------------|--------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| De Grauwe (2012)           | Heuristic decision-making process | Yes: inflation expectations                         | Yes: output gap expectations | yes          | no                   | Taylor Rule with positive, but low parameter on output gap                                                                                    |
| Yellen (2007)              | Survey                            | not applicable                                      | not applicable               | no           | no                   | Taylor Rule with output stabilization may rise welfare, acting on the "Long run" Phillips Curve                                               |
| Akerlof (2002)             | Survey                            | not applicable                                      | not applicable               | no           | no                   | Not directly stated, but very similar to Yellen(2007)                                                                                         |
| Benton et al. (2007)       | Self-control                      | not applicable                                      | not applicable               | no           | no                   | The financial system is riskier than thought due to psychological mechanisms                                                                  |
| Peon et al. (2015)         | Overconfidence                    | not applicable                                      | not applicable               | yes          | yes (no Gen. Equil.) | Bank-based financial systems are less likely to be informatively efficient than market-based systems (basically because of herding behaviors) |
| Driscoll and Holden (2014) | Survey                            | not applicable                                      | not applicable               | no*          | no                   | Taylor Rule with output stabilization may rise welfare, acting on the "Long run" Phillips Curve                                               |
| Santoro et al. (2014)      | Loss Aversion                     | yes: flatter labor-supply curve during contractions | no                           | yes          | yes                  | The CB faces a non-trivial trade-off between output gap stabilization and inflation stabilization. There are 2 different cases                |

## 8. References

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