Behavioural macroeconomics and the aggregate supply puzzle

by

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May 2004

Abstract

The paper provides a short and simplified overview of important deviations from the economic man assumption that have been documented in research by cognitive psychologists and experimental economists. After the overview, I proceed to look at one specific topic within macroeconomics – the short run aggregate supply schedule – and discuss whether theories based on behavioural assumptions might perhaps resolve weaknesses in the more traditional approach.

Over the past decades, proper microfoundations have been a basic requirement within macroeconomic research. The model should be based on optimizing behaviour. While most economists would acknowledge that in the real world, human beings often make errors and behave irrationally, it has been a common view that incorporating such behaviour in economic theories would not be a fruitful approach. Irrationality and errors have often been thought to be unsystematic and unpredictable. Moreover, there has been a concern that if one were to allow deviations from the common behavioural assumptions – the economic man, motivated by self-interest and capable of rational decision-making - it might end up in a situation where researchers introduce the form of irrational behaviour that they found appropriate in each specific case. Then one would be able "to explain anything", but without really explaining anything at all, because all the explanations would hinge on ad hoc behavioural assumptions.

This view, however, has been challenged by an increasing body of research showing that the deviations of human behaviour from the economic man assumption are not unsystematic and unpredictable. Rather, research by cognitive psychologists and experimental economists have documented a number of features related to the thinking and decision-making of human beings where they differ systematically from the economic man. Thus, building economic theories based on well-documented aspects of human behaviour should no longer be criticized for being ad hoc.

In this paper I shall provide a short overview of important deviations from the economic man assumption that have been documented in this line of research. The overview will not do justice to the complexity of the field; rather, I shall categorize and simplify. Interested readers would be well advised to go further in the study of this highly

interesting field. After the overview, I proceed to look at one specific topic within macroeconomics – the short run aggregate supply schedule – and discuss whether theories based on behavioural assumptions might perhaps resolve weaknesses in the more traditional approach.

The rest of the paper is organised as follows. In section 2, I provide a brief overview of important deviations from the economic man assumption that have been established in research by cognitive psychologists and experimental economists. Section 3 proceeds to discuss a specific application, referred to as the aggregate supply puzzle. Section 4 concludes.

2.   Behavioural deviations from the economic man assumption[1]

Most deviations from the economic man assumption can be grouped in one of three categories, depending on whether they relate to preferences, biases in judgment, or to the notion that human behaviour can be seen as the result of maximisation of a stable preference function.

2.1   Preferences that deviate from the economic man assumption

Traditionally, economic models have been based on the self-interest hypothesis that assumes that human beings are only motivated by their material self-interest. A large body of research has documented a number of systematic deviations from this.

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[1] This part of the paper draws heavily on Rabin (1998 and 2003), Bowles (1998), Fehr and Schmidt (2002) and Akerlof (2002).

Social preferences imply that agents' utility also depends on how much other players receive. This may take several different forms

- altruism (utility is increasing in the well-being of others)

- relative income and envy (utility is increasing in the income relative to others)

- inequity aversion (agents dislike inequality, even if favourable to themselves)

Intention-based reciprocity implies that agents care about the intentions of other players, and not only the distributional consequences. Thus, agents often

- return "good with good" (e.g. they cooperate if others cooperate), and they

- return "bad with bad" – experiments show that many agents are willing to take revenge on what they view as unfair behaviour, even if it is costly to themselves

Social preferences and reciprocity can be viewed as two related types of concerns for **fairness**. Human beings do care about whether a situation is fair, both when it comes to the outcome and the process, and this may affect their behaviour in important ways.

Reference based preferences imply that agents' utility depend not only on the current situation, but also on the current situation relative to a reference level, often given by recent history. The two main forms are

- loss aversion: people are more averse to losses relative to their reference level than they are attracted to the same-sized gains

- diminishing sensitivity: the marginal change in perceived well-being is greater for changes that are close to reference level

Loss aversion is a key part of **prospect** theory (Kahneman and Tversky, 1979), and gives rise to the **endowment effect**, which describes the feature that once a person possesses a good, he values it more.

Several of the features above have been fruitfully explored in recent macroeconomic research. Ljungqvist and Uhlig (2000) show that if utility functions exhibit the "catching up with the Joneses" – feature, so that if others consume more today, our representative consumer will experience a higher marginal utility from an additional unit of consumption in the future, optimal tax policy is pro-cyclical. The idea is that in booms caused by a positive productivity shock, consumption will be higher than the socially efficient level (the economy is "overheated"), as consumers do not take into account the negative externality on others. Thus, in booms, taxes should be raised to dampen the "overheating" of the economy. Fuhrer (2000) shows that including habit formation, in the sense of consumers' utility depending in part on current consumption relative to past consumption, improves the empirical relevance of standard models for monetary policy.

The effects listed above all clearly deviate from the common assumptions within economics. However, it is less clear that one should view them as irrational. First, one can argue that preferences cannot be irrational – rationality should involve optimization for given preferences, but the preferences themselves should be above scrutiny.

A second argument against viewing the effects above as irrational is that some of them may in fact be rather helpful to the individual. Reciprocity is a case in point; the fact that an agent may take revenge even if it is costly for him to do so, may prevent other agents from taking actions that harm the former agent in the first place. Fehr, Gächter and Kirchsteiger (1997) provide experimental evidence that reciprocity may contribute to the enforcement of contracts and thus improve gains from trade. On the other hand, in other situations, preferences as described above may lead to behaviour that is disadvantageous to the individual that undertakes it.

2.2   *Biases in judgment*

In the standard approach, agents treat information in a rational manner. Information may be imperfect, perhaps because it is costly to obtain, but the information that is available is treated in an optimal way. Yet a lot of research documents how agents often take a **heuristic approach to complex situations**, where they simplify so that the situation is easier to grasp. In most cases, this is rather useful, but occasionally it involves systematic and severe errors. There are several related types of errors.

- **"law of small numbers".** Many studies have shown that people have a strong tendency to view a small sample as much more representative of the underlying population than what is reasonable. In other words, people will over-infer from a short sequence of observations.

- **memorable evidence overweighed** – when there are several pieces of information, partly conflicting, agents have a tendency to put more weight on information that is more memorable and salient.
- **"base-rate neglect"** – agents neglect prior information about the underlying distribution, and give too much credence to random observations

Other research has documented the existence of a **confirmatory bias**, referring to the feature that when people have formed a hypothesis, they are reluctant to give it up. Subsequent evidence is viewed in light of the existing beliefs, and often interpreted as supporting the existing beliefs. Strikingly, experiments have shown that in situations where two groups have been given different information, and thus have different opinions, when they are given new evidence, both groups interpret the new evidence as strengthening their own opinion.

A further important deviation from the rational treatment of information is the **framing effect** – that two logically equivalent statements of a problem lead decision-makers to choose different options. This feature is well-known to marketing personnel – it is not a coincidence that firms give discounts to some age groups, as retirees, children, students, etc, rather than charge an additional fee for the other age groups.

2.3   Do agents maximise a stable preference function?

Other research shows a number of features that are inconsistent with the view that agents maximise a stable preference function.

- **hyperbolic discounting** - In the traditional approach, individuals discount at a constant rate, so that the difference between today and tomorrow is proportionally the same as the difference between one year, and one year and one day. Yet studies show, not surprisingly, that individuals are much less patient in their choice between today and tomorrow than when it comes to choices advanced further in the future.

- **"isolation error"** – agents view choices as separate events, without taking into consideration the effect on the overall outcome. One consequence is that agents are averse to small-scale risk, even if the risk as to the total wealth is negligible.

- **transition rule** - the immediate effect of a change is viewed as a reliable indicator of the permanent impact. Thus, agents underestimate the effect of adaptation.

- **choice under uncertainty**. Agents do not evaluate uncertain projects in an appropriate statistical manner. Very low probability events are often neglected, low probability events are overweighted, while high-probability events are underweighted.

- **Endogenous preferences** – in many situations, the preferences of the people concerned are affected in surprising ways. For example, studies show that paying people for a task that they might willingly do, might reduce their motivation for the task. Specifically, among individuals strongly motivated to donate blood, an offer of financial reward has been shown to reduce the likelihood that they actually donate blood.

How important are these deviations from the rational man approach? This is a question where research is still lagging behind, even if some advances have been done (see Akerlof, 2002, for an overview). One topic which has received considerable attention recently is hyperbolic discounting, which seems to be key to understanding the saving behaviour of many households. Laibson, Repetto, and Tobacman (2003) argue that consumers appear to be of two minds; their large, voluntary, primarily illiquid retirement accumulations are consistent with a discount rate of 5 percent, while their frequent credit card borrowing is consistent with a discount rate of 18 percent.

Taken to the extreme, hyperbolic discounting implies that agents are unable to undertake costly actions today, even if the future gain greatly exceeds the immediate costs. In such cases, one approach taken in some research is to explicitly distinguish between the utility function that individuals maximize (which thus determines their actions) and the utility function that represents their "true welfare". Hyperbolic discounting thus gives a rationale for institutional mechanisms that facilitate commitment to a saving behaviour more consistent with individuals "true welfare", e.g.

- tax policies subsidizing saving through pensions and penalizing early withdrawals
- legal constraints on credit markets, and on using future labour income as collateral, so as to prevent or reduce over-consumption.

Another topic that has received considerable attention is fairness, in particular in relation to nominal wage rigidity. Considerable survey evidence document that both managers and workers view nominal wage cuts as unfair, even if the same real wage outcome realised through price increases at constant nominal wages would be viewed as fair.

Akerlof, Dickens and Perry (1996) show how such fairness considerations may lead to excess unemployment at low rates of inflation, where changes in relative wages require nominal reduction of wages in some firms.

A common argument among proponents of the economic man assumption is that agents learn from their errors, so that their behaviour becomes closer to that predicted by the economic man assumption. This feature is documented in a recent study of sportscards transactions (List, 2004), where it is shown that inexperienced consumers' exhibit the endowment effect predicted by prospect theory, while consumers with intense market experience behave largely in accordance with neoclassical predictions (i.e. the economic man assumption). While it seems clear that agents with massive experience do a large part of the transactions undertaken in the economy, one should also note that many important decisions, like buying a house and changing workplace, are taken by agents that don't make these decisions frequently. In a study of the Boston housing market, Genesove and Mayer (2001) show that potential sellers who were facing a considerable loss, asked for higher prices than otherwise identical sellers who had bought at a lower price, i.e. consistent with the loss aversion hypothesis. Asking for higher prices led to higher prices for the houses that were sold, but also reduced the likelihood that a house was actually sold. Furthermore, there is also considerable documentation that in many cases even the behaviour of "professionals" deviate from the standard economic man assumptions, see e.g. Schleifer (2000).

3. The aggregate supply puzzle

The last decade there has been considerable research on an unsolved puzzle in macroeconomics, namely that the standard theoretical model of aggregate supply is inconsistent with evidence. In this section I shall briefly explain the problem, then I discuss various attempts to solve it.

The standard aggregate supply schedule, used in many textbooks and in much macroeconomic research, is based on the forward-looking overlapping contract models of Taylor (1980) and Calvo (1983). In the Taylor model, firms are divided into two groups, and for each group, wages are set for two periods. Wage setting is staggered, so that group 1 set wages in odd periods, and group 2 in even periods. x_t denotes the log wage set in period t. When wages are set in period t, wage setters relate their wage to the wage set by the other group in the previous period (which is still in effect in period t), and to the wage they expect the other group to set in the next period, $E_t x_{t+1}$. In addition, wage setting depends on the activity level of the economy, so that in periods with a positive output gap, i.e. log output y_t above the natural level y*, wages are higher than they would otherwise have been.

$$(1) \qquad x_t = \tfrac{1}{2}\,(x_{t-1} + E_t x_{t+1}) + \gamma(y_t - y^*) \qquad\qquad \gamma > 0$$

Firms set prices as a markup over marginal costs, assumed to be equal to wages (assuming constant returns to scale with labour as the only input). Thus, the aggregate price level in period t is equal to the average wage level in period t, i.e. the average of the

11

wage set in the previous and the current period (plus a constant markup neglected for simplicity)

(2) $p_t = \frac{1}{2}(x_t + x_{t-1})$.

Defining the rate of inflation as $\pi_t = p_t - p_{t-1}$, straightforward manipulation of (1) and (2) gives us

(3) $\pi_t = E_t\pi_{t+1} + \gamma(y_t + y_{t-1} - 2y^*)$.

Equation (3) looks like a standard Phillips-curve, well-known from a lot of empirical research, where inflation depends on expected inflation and the output gap (the latter captures the effect of unemployment, as a positive output gap is associated with low unemployment, and thus involves higher inflation). However, it is nevertheless inconsistent with evidence on several important aspects.

First, while (3) can explain that data exhibits autocorrelation in inflation, as this follows immediately from autocorrelation in the driving variable output y_t, there is no direct effect of π_{t-1} in (3). The absence of the lagged inflation term in (3) implies that there is no persistence in inflation except for the effect via output; inconsistent with evidence as shown by Fuhrer and Moore (1995) and Rudd and Whelan (2003).

Secondly, and more strikingly, (3) implies that inflation is expected to go down in a boom – according to (3) it is when $y_t - y^* > 0$, that $\pi_t > E_t\pi_{t+1}$. This feature is inconsistent with evidence supporting the NAIRU, that inflation increases when output is high relative to the natural level (and unemployment correspondingly low). This is the

main point of Ball (1994), who shows that the standard aggregate supply model as given by (3) implies that a credible disinflation should involve a boom, yet he provides evidence that disinflations usually are associated with a recession.

Thirdly, and perhaps more profoundly, (3) is inconsistent with the idea that the effect of contractionary monetary policy is a reduction in output, and a delayed negative effect on inflation (Mankiw, 2001). While one might argue that Ball's evidence could be put aside based on the notion that the disinflations where not credible, Mankiw emphasises that when the monetary contraction is already undertaken – the interest rate is increased – credibility is no longer an issue. Given that the most observers expect an interest rate hike to lead to lower inflation, we must have $E_t\pi_{t+1} < \pi_t$, thus the effect on output according to (3) should positive. Yet a positive output effect of an interest rate increase is the opposite of what most economists and central bankers think.

Thus, the standard aggregate supply schedule, though theoretically appealing, is inconsistent with much evidence and also with how economists and practitioners view the economy. How should one proceed to reconcile theory and evidence? Many different solutions have been proposed. One obvious solution is to return to the idea of adaptive expectations – replacing $E_t\pi_{t+1}$ with lagged inflation in (3) solves most of the inconsistencies with evidence. However, adaptive expectations in its most primitive form – where agents make systematic errors without thinking - is not very attractive from a theoretical point of view. Furthermore, as documented by Ball (2000), the hypothesis that inflation is persistent because agents always expect it to be persistent is not consistent with evidence from the Gold standard period, when US inflation was not persistent.

Another possibility is a hybrid model, where some agents are forward-looking and other agents are backward-looking (Gali & Gertler, 1999). While this model clearly has attractive elements, it has also been heavily criticised as being inconsistent with evidence; specifically, the forward-looking part is said to be empirically invalid (Rudd & Whelan, 2003; see a response by Gali et al, 2003; Bårdsen et al, 2002).

A third possible explanation is based on a variation of the preferences of the agents (Fuhrer and Moore, 1995). However, as shown by Holden and Driscoll (2003), this approach has dubious micro foundations, as it requires that agents care about the wage others had in the past.

The limited success of the more standard approaches has led to a number of suggestions based on behavioural models. Several of these approaches emphasise the limits to the information that is available to the agents, and the limits to the ways they use this information.

Ball (2000) suggests a model where agents use univariate forecasts, i.e. agents' forecasts are based solely on lagged inflation behaviour. In contrast to the standard adaptive expectations assumption, this model allows agents' forecasts to depend on the stochastic properties of the variable. In time periods when inflation has not been persistent (as during the Gold standard), agents do not predict it to be persistent in the future. On the other hand, in the post-war period when inflation was persistent, agents expected it to continue being so. Thus, this approach has the virtue that it explains data for both time periods. However, while Ball provides important new light on the inflation persistence problem by bringing attention to inflation behaviour in the Gold standard

period, a problem with his approach is the failure to explain why agents should neglect other information than past inflation behaviour.

Another proposal is the "Sticky information" approach by Mankiw and Reis (2002), based on the assumption that agents update their information at intervals. This is a simple and attractive model that captures the notion that agents do not take all information into account immediately. However, this model also involves problematic assumptions. Most importantly, perhaps, the consistency of the theoretical model with empirical evidence is based on the highly problematic assumption that firms change prices without updating information – an assumption inconsistent with a lot of evidence on the pricing behaviour of firms.

A third approach, suggested by Woodford (2003) and Amato and Shin (2003), is based on the idea that there are limits to agents' ability of absorbing information. In these papers it is shown theoretically that noisy subjective perceptions by individual agents lead to greater uncertainty about higher-order expectations (i.e. what one agent expects other to expect about his expectations concerning their expectations, etc). One consequence of this feature is that inflation may be highly persistent. While this approach seems very promising, the models used so far are rather complex, and it is thus difficult to evaluate to what extent they succeed in providing a satisfactory theoretical framework for the available evidence.

A fourth approach, suggested by Driscoll and Holden (2003), is that inflation persistence is a consequence of coordination problems under multiple equilibria. Following Bhaskar (1990), Driscoll and Holden assume that workers are concerned about fair treatment, in the sense that they care disproportionately more about being paid less

than other workers than they do about being paid more than other workers. When incorporated into a standard wage bargaining model, the fair treatment assumption causes a continuum of rational expectations equilibria, in the form of a range of wage growth rates for which each wage setter will aim for the same wage growth as set by the others.

Driscoll and Holden argue that wage setters' past behaviour may work as an equilibrium selection device: among all the actions consistent with a possible equilibrium, agents expect other agents to play as they have played in the past. This focus on past actions can thus rationalize adaptive expectations, and therefore inertia in inflation, as a self-fulfilling prophecy. Evidence on US post-war inflation is consistent with the formulation of Driscoll and Holden.

As this brief literature survey on the aggregate supply puzzle has documented, behavioural assumptions have provided new and interesting approaches to an important and difficult problem within macroeconomics. Yet it is fair to say that one has not yet come further when it comes to arriving at a broadly accepted framework. As behavioural assumptions open up new possibilities, it becomes even more important to be able to distinguish empirically between them, and so far, little work has been done it that direction.

4.   Concluding remarks

In mainstream economics, the economic man hypothesis has been maintained in part to avoid the mushrooming of explanations and theories based on ad hoc behavioural assumptions. However, there is now sufficient evidence on important aspects of human behaviour that a number of deviations from the economic man hypothesis should no

longer be viewed as ad hoc. In several parts of macroeconomics, theories based on broader behavioural assumptions seem highly promising. Yet it remains to be seen how far-reaching the changes will be.

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