ACTUAL AND PERCEIVED INFLATION

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ABSTRACT

The concept of inflation perceived by consumers came in the recent debate on inflation since it may affect consumer behaviour even if the perception was completely wrong. A misperception of inflation occurs particularly when households tend to label incorrectly inflation what really is a reduction in their disposable income, as in declining or stagnant economies and during public budget consolidation processes. Also a cash changeover may alter the perception of price changes. Nevertheless, even in a perfect perception framework, each consumer evaluates the inflation rate taking into account only his own consumption basket and the dynamics of the particular prices he pays. Hence, perceived inflation may differ systematically from the official one calculated by the statistical agencies, that necessarily make use of a common basket of consumption and the average market price of each product. The official inflation rate may be either beyond or below the average individual inflation rate in accordance with the sign of the covariance between individual budget shares and the corresponding price changes. Since economic theory suggests that the latter sign is positive under price discrimination, inflation faced by consumers is often higher than the official one. As far as the perceived inflation is strictly related to the cost of living, an aggregation fallacy may bias downward the estimation of official consumer price indices. At variance, just under price discrimination, firms tend to perceive an inflation rate very close to the official one, or even smaller. The arguments above provide a number of testable consequences.

KEYWORDS: Aggregation fallacy, Inflation measurement, Perceived inflation, Price discrimination.
J.E.L. CLASSIFICATION: D43, D82, E31

One sees great things from the valley,
only small things from the peak.
Gilbert K. Chesterton

1. Introduction [*]

The concept of inflation perceived by consumers came in the recent debate on inflation and on the measurement of official consumer price indices. For instance, the Schultze and Mackie Report (2002) devotes many pages to the issues of public understanding and credibility of official price indices.

Inflation perceived by consumers may differ from that measured by statistical agencies in many cases. Occasionally consumers are simply mistaken. More often consumers are not wrong, but rather take into account only the prices directly paid by themselves and their own expenditure pattern. Thus, the perceived inflation rate may differ systematically from the official one calculated by the statistical agencies, who necessarily make use of the average market price of each product and an average consumption basket.

In any case, even if the inflation perceived by consumers was completely irrational, it should be taken into consideration in interpreting and forecasting households' expenditure. For instance, according to the European Central Bank (2003, section I.4), the large discrepancy between actual and perceived inflation occurred in Europe during the cash changeover contributed to slow down households consumption in 2002.

Virtually every price index implicitly assumes that different consumers pay almost the same price for the same product, with purely random deviations, in accordance with the outdated law of one price. The main aim of this paper is to analyse the consequences of rejecting the latter assumption in measuring inflation, in accordance with the theory of price discrimination.

The next section surveys the major reasons why the consumers may be mistaken about actual inflation rate, particularly including the confusion between genuine inflation, on the one side, and illusory purchasing power reduction due to changes in disposable income and quality improvement of products, on the other. Also the same section makes some reference to the recent increase of perceived inflation associated to the cash changeover in the European Union.

The third paragraph analyses another source of discrepancy between the official data and the individual perception of price changes, that is the aggregation fallacy that depends crucially on price dispersion. In particular, a straightforward and unpleasant consequence of

removing the assumption that everybody pays the same price for the same product is that it is even possible that all the consumers face inflation rates either higher or lower than the average official one. Furthermore, section 3.1 points out that the average inflation rate perceived by the households is likely to exceed the official figures when firms succeed in discriminating among the consumers, charging higher prices to those having higher willingness to pay. In this analytical framework, official inflation rate can be interpreted as the average price change ideally measured in a market without price discrimination.

The fourth section touches upon the topic of price dispersion, focussing on the role of market power of firms and the case of imperfect information of consumers, discussed in section 4.1. It implies that, in compiling and analysing price indices, the statistical agencies should take into consideration also the competitive framework, information available to the consumers and the costs they incur in searching for the less expensive outlets. Section 4.2 argues that, discriminating firms tend to perceive an inflation rate very close to or even below the official one, at variance with consumers. Thus, the perceptions of consumers may differ systematically from those of firms, possibly affecting negatively the dynamics of the aggregate demand.

Few conclusive remarks close the paper. In particular, section 5 provide some hints to interpret the official figures on inflation correctly, also in order to reconcile data provided by statistical agencies with the public understanding of inflation. In addition, the final section provides a number of testable predictions of relating the discrepancy between actual and perceived inflation to price discrimination and market structure.

2. Some reasons to misperceive inflation

There are a number of cases in which households tend to be mistaken about inflation, generally overestimating actual price changes. For instance, in fast growing economies, such as in many developing countries, consumers tend to compare the higher prices of better quality goods, purchased currently, to low prices of cheap and shoddy goods, purchased formerly. Of course, this is simply a price difference, completely unrelated to inflation, but consumers may still regard it as inflation, behaving consequently.

A misperception of inflation also may occur in declining or stagnant economies, when the general conditions of consumers undoubtedly worsen, and households often name wrongly inflation their reducing purchasing power. Also in transition countries, during the

privatisation process, many services previously available for free are provided by the market costly, hence the consumers face a loss in their own overall capacity to spend. Generally, the latter is compensated, or even overcompensated, by the concurrent reduction of taxes, the growth of income and the improvement in the quality of good and services. Nevertheless, many consumers may still perceive a general and persistent price growth, that they name improperly inflation.[1] The same may happen during the process of public budget consolidation, when consumers face rising income taxes, duties, levies, social contribution, etc., that they tend to regard as inflation, at variance with the opinion of economists and statisticians. Consumers' capacity to spend is also reduced during financial crises because of capital losses, the fast rising interests to be paid on mortgage and loans, etc.

Occasional misperception of price changes can also occur in connection with exceptional events, such as a change in national currency. For instance, European consumers overestimated inflation after the euro cash changeover in 2002. The main reasons were the occasional dynamics of prices for some out of pocket expenditures; the generalised adjustment of prices, fostered by the "menu costs" in which the firms had to incur anyway during a cash changeover; the approximate rules of conversion between old national currencies and the euro adopted by the consumers.[2]

3. Individual and aggregate inflation

Pooling of data on prices often is necessary to have a sufficient number of observations, in order to make statistical inferences with confidence. Nevertheless, the aggregation may result in a loss of explanatory power of aggregated indices, in particular if the market is highly segmented, and prices actually paid by each household for the same good are very dispersed. The latter is a further source of discrepancy between the official data and the individual perception of price changes, strictly resembling the aggregation bias likely to occur when microeconomic relationships are estimated from aggregate data, already pointed out by Theil (1954).

Let consider N households purchasing K products. Each good or service is defined as a perfectly homogeneous article of trade obeying to a weak version of the low of one price, that is the percentage price changes are the same in every transaction. From the viewpoint of each i-th household, the inflation rate P_i may be measured as the growth rate of a fixed basis price index,[3] taking into account the quantities of each good j purchased, say $q_{i,j}$, and the

corresponding percentage price change, say $p_{i,j}$, that may differ among the households, because generally they do not purchase either in the same outlets or at the same conditions. Thus, the inflation rate actually faced, and possibly perceived, by the i-th household is

$$P_i = \sum_j q_{i,j} p_{i,j} \qquad [1]$$

where the budget shares $q_{i,j}$ are normalised so that $\sum_j q_{i,j} = 1$. More generally, the weights $q_{i,j}$ could be the parameters of a cost of living index.

At variance, official statistical agencies estimate the inflation rate P^O by using necessarily a common set of quantities, say q_{*j}, that ideally represents the basket of goods and services purchased by a "representative" household, and the corresponding average market price changes, say $p_{*j} = \sum_i w_{i,j} p_{i,j}$, where the weights $w_{i,j}$ are such that $\sum_i w_{i,j} = 1$.[4] Thus it reads

$$P^O = \sum_j q_{*j} p_{*j} \qquad [2]$$

The individual inflation rates [1] and the official estimator [2] make up a system of N+1 linear equations (one for each household plus [2]) that include N×K unknown quantities, i.e. the individual price changes $p_{i,j}$. Thus, for any arbitrary set of $q_{i,j}$, P_i, q_{*j}, $w_{i,j}$ and P^O, the latter equations are satisfied at least by one set of individual price changes $p_{i,j}$, as far as $N \times K \geq N+1$, that for N>K reduces simply to K > 1. In principle, under price dispersion, disregarding the economic acceptability of the solution, $N \times (K - 1) - 1$ prices could be set arbitrarily and, in particular, whatever official inflation rate could be perfectly consistent with individual inflation rates P_i all larger or smaller than P^O.

It is worth noticing that the conditions for such aggregation fallacy arises are very mild. For instance, the law of one price could hold for every product but only N+1 exceptions, because price dispersion concerns a single good plus one more article of trade, or only few households, provided that the discriminated prices are at least N+1 as well.

On the other hand, if firms are assumed to charge to every consumer exactly the same price changes p_{*j}, according to a weak version of the law of one price, the system [1] and [2] admits a solution only if at least N−K+1 equations are not independent, that is the individual inflation rates cannot be set arbitrarily, regardless to P^O.

3.1. Price discrimination and individual inflation

In the system of equations [1] and [2] the condition for every individual inflation rate being higher than the official one is that the largest budget shares are associated exactly to the largest price changes. Let β be an overall measure of the latter association, such that $\beta > 0$ corresponds to a positive relationship between price changes and budget shares, and $\beta = 0$ stands for lack of association.

It is worth noticing that the condition $\beta > 0$ is all but a pure academic oddity. In particular, it holds when firms increase their profits by discriminating among consumers, exploiting the higher willingness to pay of some of them. In doing so, the firms capture a fraction of the so-called consumer surplus, that is the difference between the market price and what each consumers would be disposed to pay.

Varian (1989) and Stole (2004) review various price discrimination strategies and discuss their consequences. In general, profit maximising firms charge higher prices to the relatively inelastic segments of the demand, and a lower (and even negligible) price to marginal demand. Furthermore, firms are assumed to follow the same rule when they have to adjust prices over time. Price discrimination may be either inter-personal, i.e. applied to various groups of customers in accordance with their different willingness to pay, or intra-personal, i.e. concerning different units of a good purchased by the same consumer. Both cases are relevant in analysing the sign of β.

In the particular case of perfect (first degree) discrimination, firms succeed in charging to every consumer exactly the highest price he is disposed to pay for each single unit of good. Since the amount of each good destined to satisfy basic needs can hardly be compressed, price elasticity is near null for the largest budget share of low and middle income households. At variance, the demand for an amount of goods exceeding the basic needs is arguably more elastic to price. Thus, for each household, discriminating firms are supposed to charge higher price changes exactly to the largest budget share for every class of products, making the hypothesis $\beta > 0$ very likely. In addition, under perfect price discrimination, richest consumers possibly bear smaller price changes than the poor.

If firms are unable to distinguish perfectly among the consumers, nevertheless can have recourse to the so-called second degree (or implicit) price discrimination, charging prices declining with the quantity purchased. The rationale for such strategy is that consumers purchasing smaller amounts of goods mainly satisfy their own basic needs, that are relatively inelastic to prices, while big spenders are more reacting to price changes. Thus, households

bear larger price changes exactly on the larger share of their budget devoted to each class of product. Even under second degree discrimination, it is likely that $\beta > 0$ and the poorest consumers are at a disadvantage as well.

Finally, often firms change prices according to some observable characteristic of consumers, such as age, professional status or location, implementing the so called third degree price discrimination. Nevertheless, optimal price strategy still follows the rule of charging more to consumers with possibly inelastic demand, so that $\beta > 0$ probably holds.

As a consequence, under price discrimination, the perceived rate of inflation is expected to exceed the official one, while it tends to follow the average inflation in fairly competitive markets, where discrimination can be only transitory.[5] Also, the parameter β provides a broad measure of the effect of price discrimination (corresponding to the consumer surplus captured by firms), while the official inflation rate P^O measures how much the prices would change on average in a competitive market without price discrimination. Furthermore, the gap between perceived and actual inflation is expected to widen when discrimination intensifies, and to reduce when market transparency improves.

It is worth noticing that, under price discrimination, the average price of a class of products could reduce even if the price charged to the large majority of households raises. For instance, a telecommunication company could discount per minute calling fees charging higher monthly fixed cost at the same time. In such cases, a discrepancy between actual inflation and that perceived by low income consumers is apparent.

As a matter of fact, price discrimination is very frequent in consumer product market. In many discrimination strategies prices reduce with the quantity purchased. For instance, a two-part tariff sets a large fixed fee to access to the service and a relatively small fee to purchase one more unit of it. The latter practice is very common in network services, including many public utilities, such as telecommunication, electricity, water supply, sewage and waste collection, etc. Sometimes, discriminating firms offer very low fees for services seldom used by the customer, such as intercontinental calls and special info services advertised by many telecommunication companies.[6] Also airline companies charge to the same customer higher prices for the flights that he should have purchased anyway, while special offers typically concern additional flights which are not strictly necessary.[7] Many outlets provide discounts or facilities only for purchases exceeding some given threshold, for instance advertising that “the third item is for free”.

Bundling is another common tool of price discrimination. In this case the firms offer a

fixed basket of two ore more products for a given price, making the consumer to spend more for something that is almost pointless for him, but looks very inexpensive, compared to the main product included in the bundle. Typical cases of such strategy are the software sold in bundling with most computers; the "three for two" offers in many supermarkets; the "family package" discounts for children on flights and on accompanying adults in amusement parks; the all inclusive holidays; also many banks set to zero the duties on cash deposits for those who buy bonds, insurance or other financial assets from the same bank.

More generally, firms adopt even sophisticated non-linear pricing rules to capture consumer surplus. In fact, when a firm works beyond its break-even point and bears very low marginal costs, may set descending prices for additional purchases of the same customer increasing its profits as well. For instance, many telecommunication companies advertise as larger discounts as the longer lasts the call; some hotels offer reducing rates for longer stays; almost every outlet increases discount rates as the larger is the total expenditure of each customer; etc.

4. Price discrimination and inflation measurement

The Schultze and Mackie Report (2002, ch 8) regard price dispersion as a relevant problem in compiling a reliable consumer price index, possibly tailored for specific groups of consumers. Indeed, price indices for different social groups, estimated taking into account only the differences in consumer baskets, do not show very large divergence in face of the overall inflation rate, just because it is assumed that each group pay almost the same prices.[8] For any given covariance structure between $q_{i,j}$ and $p_{i,j}$ generating $\beta \neq 0$, the divergence between the official aggregate price indices and individual perception of price changes widens as the consumption baskets are quite dissimilar and the prices are very dispersed around their market average. Nevertheless, only the former case has been extensively analysed,[9] while the issue of price dispersion has received only a minor attention in the literature on measuring inflation.[10]

Price dispersion may depend on differences in costs or in products quality,[11] but it may hold for perfectly homogeneous goods as well. The traditional explanations for the failure of the law of one price, intensely studied in international economics,[12] rely on transportation costs, cultural differences and different local product requirements, but price dispersion is relevant also in advanced market economies and within the same region or even the same

city.[13] Reitman (1991) also analyses the case of dispersion, and implicit price discrimination, determined by heterogeneous preferences of consumers for queuing up.

Actually, price discrimination is acknowledged as one of the major causes for price dispersion. What is more, discriminating strategies also shape the distribution of prices and, under fairly reasonable assumptions,[14] also the distribution of price changes. This fact possibly generates an aggregation bias, also if inflation rate is estimated from the data collected among the firms.

In fact, let consider the average price change of the j-th product

$$f_{*j} = \sum_m s_{m,j} f_{m,j} \qquad [3]$$

where the summation is across the M market segments, each characterised by the market share $s_{m,j}$, normalised such that $\sum_m s_{m,j} = 1$, and $f_{m,j} = \sum_i z_{i,j,m} p_{i,j}$, with $\sum_i z_{i,j,m} = 1$, is a weighted average of the price changes charged to the households belonging to the m-th market segment of the j-th product. It is worth noticing that $f_{*j} = p_{*j}$ holds only if the weights $w_{i,j}$ used to define p_{*j} reproduce exactly the actual distribution of market prices. In the latter case, official agencies would measure exactly the same inflation rate faced by firms.

At sharp variance with the case of consumers, it can be argued that price discrimination makes the correlation, say β^F, between the segments' weight $s_{m,j}$ and the related price changes negligible, or even negative, for each product. For instance, when a monopolist discriminates among the consumers, it is well known that he maximises his profit by charging to each demand segment a price p such that

$$p = \frac{\eta}{\eta - 1} c \qquad [4]$$

where $\eta = -\frac{dq}{dp}\frac{p}{q}$ is the price elasticity of the demand evaluated for the quantity of good q corresponding to the overall demand segment paying a price up to p,[15] and c is the marginal cost of production, assumed to be the same for every segment. From [4] the cumulated distribution of prices is proportional to

$$q = -\frac{dq}{dp}(p - c) \qquad [5]$$

If the monopolist face a linear demand curve, $\frac{dq}{dp} = \delta < 0$ and hence the related frequency distribution function of p is flat.

Furthermore, when a number of oligopolistic firms compete on the same market, a Nash symmetric equilibrium implies that each firm earns the same profit, say r, thus it reads

$$(p–c)\, q = r \qquad [6]$$

that is

$$q = \frac{r}{(p-c)} \qquad [7]$$

Thus the frequency distribution of prices turns out to be a downward sloped function of (p–c).

4.1. Price distribution in a model with imperfect information

Similar results stem from models with imperfect information. In particular, in the seminal article by Stigler (1961) and in the models popularised by Salop and Stiglitz (1977) and Varian (1980), price dispersion and implicit discrimination arise since the consumers are imperfectly informed on the prices set by different sellers and meet positive costs in visiting more than one outlet searching for the best prices. In order to explain the misperception of inflation occurred during the euro changeover, Mastrobuoni and Dziuda (2005) just had recourse to a model in which consumers are imperfectly informed.

Varian (1980) demonstrated that price dispersion is consistent with the optimal strategy of competing firms, setting their prices in order to capture the demand coming both from informed consumers, disposed to pay only the lowest price on the market, and from uninformed consumers, having an higher reservation price. The resulting cumulative distribution of prices, say F(p), characterises a symmetrical Nash equilibrium, that is a situation in which no firm has an incentive to change its strategy.[16]

Of course, fully informed consumers always succeed in paying the lowest price on the market, say p^m, which provides the less expensive firm with the profit

$$\pi_s(p) = (p - c)(I + U) - k \qquad [8]$$

where c is the marginal (fixed) cost of production; I is the quantity of product demanded by fully informed consumers (the so called “shoppers”); U is the fraction 1/n of the demand coming from uninformed consumers who, in any case visit randomly one of the n firms; and k is a fixed production cost. In order to concentrate on the effects of consumer information, every firm is assumed to bear the same production costs c and k. The probability that a firm sets the lowest price, so that it gains $\pi(p^m)$, equals the probability that n-1 other firms charge higher prices, that is $(1 – F(p))^{n-1}$. At variance with shoppers, uninformed consumers meet

positive search costs, so that they are disposed to pay a price p, higher than p^m, in order to save on the overall purchasing cost. Of course, a firm setting p instead of p^m makes only the profit

$$\pi_o(p) = (p - c)U - k \qquad [9]$$

arguably smaller than $\pi_s(p)$, with probability $(1 - (1 - F(p))^{n-1})$.

Since in the long run free entry of competitors ensures that profits are null at every price, in equilibrium the two price strategies must be equivalent, so that it reads

$$\pi_s(p)\,(1 - F(p))^{n-1} + \pi_o(p)\,(1 - (1 - F(p))^{n-1}) = 0 \qquad [10]$$

The latter condition is sufficient to define the optimal cumulative distribution of prices F(p). In fact, [8], [9] and [10] imply that

$$F(p) = 1 - \left(\frac{\pi_o(p)}{\pi_o(p) - \pi_s(p)}\right)^{\frac{1}{n-1}} = 1 - \left(\frac{k}{(p-c)I} - \frac{U}{I}\right)^{\frac{1}{n-1}} \qquad [11]$$

Differencing F(p) with respect to p gives

$$f(p) = \frac{1}{n-1}\frac{k}{(p-c)^2 I}\left(\frac{k}{(p-c)I} - \frac{U}{I}\right)^{\frac{2-n}{n-1}} \qquad [12]$$

If the number of competitors n is large enough, $f(p) \cong \frac{1}{n-1}\frac{k}{(p-c)(k - U(p-c))}$ is a U-shaped function of p.[17] As a consequence, market prices tend to polarise respectively toward either a very low or very high level.

Anderson and de Palma (2003) removed the assumption of free entry of competitors, allowing for a positive profit, and demonstrated that the resulting optimal frequency distribution of prices is downward sloped, as in the oligopolistic model sketched above. Thus, individual prices set by firms and market shares would be negatively correlated.

4.2. Some unpleasant implications of price discrimination

As claimed above, the distribution of price changes is U-shaped in the Varian's (1980) model and flat or even downward sloped in monopositic or oligopolistic markets. If an inflationary shock hits a price discriminating industry, it can be argued that a rational firm would distribute the price changes according to the same strategy adopted to set the price levels, that is the consumers with higher willingness to pay are charged with higher extra prices, thus the resulting distribution of percentage price changes strictly resembles the price

distribution. It implies that, when the latter is U-shaped, symmetrical or flat the covariance between market shares and price changes is null and $\beta^F = 0$. Thus, the price changes possibly estimated by each firm would approximately coincide with the official data. Furthermore, if the price distribution is a downward sloped function of prices, as in the oligopolistic case, $\beta^F<0$ and the firms tend to perceive price changes lower than the official inflation rate.

Strictly in analogy with the case of consumers, the average price changes faced in each industry may lay indifferently all above or below the official inflation rate. In fact, the equations [3], toghether with [2], form a system of M+1 linear equations including M×K individual prices, leaving M×(K–1)–1 degrees of freedom for a solution, for whatever combination of f_{*j} and P^O.

Furthermore, putting together the equations [1], [2] and [3], it turns out that N×K individual prices should satisfy N+K+1 linear equations, reducing the degrees of freedom of the system to N×(K–1)–K–1. For a number of products large enough, it implies that more than a single solution exists as far as K>1, that is P_i, f_{*j} and P^O must be reciprocally consistent only when the number of products is unreasonably small. As a consequence, a discrepancy between the opinions of consumers, firms and statistical agencies is very likely.

What is more, the perceptions of consumers and firms are expected to diverge dramatically compared to P^O. In particular, under price discrimination, even if firms tend to raise their prices at a pace quite similar to the official inflation rate, households are inclined to consider that price increases too large yet compared to their nominal income, possibly reducing their consumption expenditure. Thus firms could face an unexpected drop of demand. Furthermore, wages negotiated taking into account official inflation rate would not preserve the real purchasing power faced and perceived by households, even if wage dynamics is perfectly consistent with the pricing policy possibly agreed with the firms. Hence, sustainability and credibility of income policies could be at stake if the agreements do not consider a reduction of price discrimination as well.[18] Finally, a reduction in market power should reduce the gap between official inflation, on the one side, and the price changes perceived by firms and consumers, on the other, even if the official estimate is not expected to change conformingly.

5. Conclusive remarks

The discrepancy between official inflation and the price changes perceived by

consumers is usually related to possible misperception of the actual dynamics of prices. At variance, consumers could be perfectly aware of actual price changes, but they still would compile price indices completely different from the official one. The different viewpoints of consumers and statistical agencies do not depend mainly on the composition of the reference consumption basket, as it is often argued, but rather on the prices taken into account in compiling the indices.

As a matter of fact, actual consumer price indices rely on the assumption that everybody pays almost the same price for the same product and, what is more, the deviations from the law of one price are completely unrelated to the consumer's purchasing decisions. Under the latter hypothesis, it makes sense to compile elementary indices of the average price for every product and to synthesise them by using whatever aggregation formula. Nevertheless, this procedure would be flawed by an aggregation fallacy if the prices actually paid by each consumer depend on the composition of his own expenditure. More specifically, it is straightforward to show that the official price indices would underestimate the price changes reported by consumers if their budget shares are positively correlated to the corresponding price increases.

Everyday experience and the economic debate during the past 50 years show that prices are dispersed around their market average. Furthermore, the theory of price setting, dating back to the first decades of the past century, suggests that firms tend to discriminate among the consumers, charging higher prices to those having higher willingness to pay. In order to maximise profits, firms tend to charge larger price changes to less elastic segments of demand. For low and medium income households, the latter segments also correspond to the largest part of their budget, bound to satisfy their basic needs. Thus, it is likely that prices and budget shares are positively correlated. If this is the case, it is straightforward to show that actual price indices underestimate the average price changes faced by each consumer, at sharp variance with the conclusion of the Boskin Report (1996). Furthermore, it could be argued that the actual official inflation rate measures how much the average price change would be if price discrimination did not occur. By the way, if this is the case, official figures would tend to underestimate, or even neglect, the advantages for consumers of pro-competitive policies.

Unexpectedly, official figures are arguably almost consistent with the viewpoint of firms, that, just under price discrimination, likely tend to underestimate inflation. In particular, it implies that actual figures may underestimate the dynamics of the cost of living but are still suitable to study the transmission of inflation shocks from production to final retailers. In any case, the divergence between the opinions of firms and consumers could

depress consumption.

If statistical agencies had to take into serious consideration the arguments above, should revise completely the actual system of price collection and index compilation. In principle, different prices should be collected for every relevant demand segment, possibly within the same household. In addition, different price indices should be compiled for various consumer categories, which hardly coincide with traditional social groups, since economic theory suggests that price discrimination relates more to demand elasticity, information and search costs, rather than to location, professional status, age, etc. What is more, fully considering intra-personal price discrimination requires collecting prices from households, rather than from outlets. Finally, such price indices should be aggregated by using a suitable system of weights, which are hardly available. Last, but not least, the suitable estimation strategy would be exceptionally costly and time demanding.

In addition, relating the discrepancy between actual and perceived inflation to price discrimination and market structure bears a number of predictions that hopefully can be tested empirically by using a direct measure of inflation perceived by consumers, as the one provided by the surveys carried out in the framework of the "Harmonised Project" of the European Commission (1997). First of all, the discrepancy should be positive and larger for low income households, whose expenditure is less elastic to prices and hence is much more liable to price discrimination. Secondly, the gap should widen when the market power of firms raises, and when their price strategies get more aggressive, while it should reduce when market efficiency improves, particularly during public information campaigns and as a consequence of pro-competitive measures. Paradoxically, when pro-competitive policies are enforced, perceived inflation would decrease while official inflation would not. In other words, the size of discrepancy should be a good proxy for the reduction of consumer surplus. If and in so far as larger price dispersion signals fiercer discrimination, dispersion should be associated also to a widening discrepancy between actual and perceived inflation. Furthermore, inflation perceived by consumers may permanently exceed (or even stay below) the official inflation rate, without any sign of convergence. At variance, if firms distribute their prices optimally in order to discriminate among consumers, it could be argued that inflation rate possibly estimated by firms would be almost consistent with official data. Furthermore, the divergence between inflation perceived by consumers and firms could depress aggregate consumption. It is worth noticing that most of the previous evidences characterised what actually happened just after the cash changeover in Europe.

Footnotes

(*) The opinions reported in this paper are those of the author and do not involve the institutions he is affiliated to under any respect. The author is grateful to all those who were so kind to read, discuss and comment on a preliminary draft of this paper. Of course, the usual disclaimer about remaining mistakes applies.

[1] Koen and De Masi (1997) discuss the dynamics of prices in transition countries.

[2] For a thoroughly analysis of this topic see ISAE (2002 and 2003), European Central Bank (2005) and the references cited therein.

[3] It is worth noticing that a fixed basis index can be also considered a feasible linear approximation of any other price index (see the technical note in Schultze and Mackie, 2002, ch. 2). In addition, the weights $w_{i,j}$ may take into account the different initial price levels.

[4] In order to estimate the average price of each product, Dalton et al. (1998) provide a number of reasons to prefer the geometric mean to the arithmetic average. In particular, Eurostat (2001) strongly supports such computation rule in compiling the European harmonised index of consumer prices.

[5] See Locay and Rodriguez (1992) and Levine (2002) for some examples of short run price discrimination in competitive markets without barriers to the entry of new firms.

[6] See Koski and Kretschmer (2004) among the others.

[7] See Alderighi et al. (2004) for a recent analysis of the European airline market.

[8] For such unexpected and disappointing evidence, see Hageman (1982) and Garner et al. (1996), among the others.

[9] See the Schultze and Mackie Report (2002, ch 8) and the references cited therein.

[10] See Reinsdorf (1994) for an exception.

[11] See Anderson and de Palma (2001).

[12] The topic was surveyed by Rogoff (1996).

[13] See Engel and Rogers (1996) and Parsley and Wei (1996).

[14] Arguably, firms adopt the same strategy in setting prices and in adjusting them over time.

[15] Of course price discrimination does not make sense if the demand elasticity is exactly the same in every market segment.

[16] It is possible to demonstrate that a firm has no advantage in setting the same price of another. In fact, by offering a price slightly lower it would surely capture additional demand and earn higher profits, while increasing the price a little bit it would lose only few customers and would widen unit profit on the remaining customers.

[17] The function f(p) tends to infinity if p tends either to c (which is the minimum remunerative price in the short run) or to $c + \frac{k}{U}$. It reaches its (unique) minimum for p = $c + \frac{k}{2U}$, that is just amid the previous extrema.

[18] Notably, this conjecture pairs off the claim of Blanchard and Giavazzi (2003) that labour market deregulation and wage moderation is inefficient if product market continues not to be competitive.

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