Hedonic indexes and GDP estimate in the USA

Abstract

About one-fifth of the USA GDP is estimated by the *Bureau of Economic Analysis* through the use of *hedonic indexes* of prices, built to process the prices of *heterogeneous* goods - and services -, that is the prices of goods whose *characteristics* change over time. Prices of characteristics of good are estimated through the use of regression functions and an *implicit price* is built for the heterogeneous good that substitutes the *market price* within the GDP deflation procedure. This substitution is not built to take into account the quantitative changes of the *technological* characteristics of a heterogeneous good; on the contrary, it is built to assign a different price from the market price, to the estimated utility that the final buyer could enjoy. (Seskin, Smith, 2011; BEA, 2011b). The aim of this paper is to highlight a theoretical issue concerning the idea of the *value* of goods and services implicit in this methodology, since the price of goods would not be properly identified through the market price. On the contrary, in economic theory, either *Austrian school* or *classic*, market price has to be explained to understand the mechanism of its determination; but it doesn't have to be modified so that it can quantify the real value of the good.

Key words: Hedonic price; Quality adjusted index; Market price; Exchange value.

1 Introduction to the hedonic evaluation for the USA GDP

In the United States of America (USA) the *Bureau of Economic Analysis* (BEA), Department of Commerce, estimates the GDP on the grounds of raw data on the final sales of goods provided by the *Bureau of the Census*. To establish which has been the change of GDP for a given year, BEA estimates the price changes of some type of goods processing price indexes through a particular methodology that uses so called *hedonic functions*.

According to the theorists of such a method, "a hedonic function is a relation between prices of varieties or models of heterogeneous goods – or services – and the quantities of characteristics contained in them" (Triplett, 2004). For a *heterogeneous good* is meant any good which can be on the market with different characteristics from one year to another (or not on the market, in the case of goods whose value has to be estimated, like rents of owner-occupied buildings)[1].

Currently[2], the hedonic evaluation is applied to determine the price indexes for 10 merchandise categories (BEA, 2011a). Their percent weight over the total GDP of the United States is shown in Table 1.

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[1]   For an introduction to this methodology see: BCE (2004).
[2]   See: BEA (2001a), p. 74.

Table 1: GDP and hedonic components

	2005		2006		2007		2008	
	Dollars	% of GDP	Dollars	% of GDP	Dollars	% of GDP	Dollars	% of GDP
Gross Domestic Product	12.638	*100,00%*	13.399	*100,00%*	14.078	*100,00%*	14.441	*100,00%*
Billions of dollars								
Computers and peripheral equipment	132,7	*1,05%*	141,7	*1,06%*	144,6	*1,03%*	141,5	*0,98%*
Software	119,7	*0,95%*	124,1	*0,93%*	130,9	*0,93%*	142,1	*0,98%*
Structures	766,3	*6,06%*	791,0	*5,90%*	731,4	*5,20%*	636,1	*4,40%*
Telecommunications	14,3	*0,11%*	18,5	*0,14%*	19,7	*0,14%*	20,3	*0,14%*
Photocopiers	1,4	*0,01%*	1,3	*0,01%*	1,2	*0,01%*	1,7	*0,01%*
Audio & Video	60,9	*0,48%*	64,8	*0,48%*	66,0	*0,47%*	66,7	*0,46%*
Apparel	259,0	*2,05%*	270,5	*2,02%*	280,5	*1,99%*	276,5	*1,91%*
Household appliances	6,2	*0,05%*	6,5	*0,05%*	6,6	*0,05%*	6,4	*0,04%*
Rent	1309,2	*10,36%*	1394,4	*10,41%*	1455,4	*10,34%*	1517,1	*10,51%*
Education writing equipment	3,2	*0,03%*	3,2	*0,02%*	3,2	*0,02%*	3,2	*0,02%*
Total hedonic components	2.672,9	*21,15%*	2.816,0	*21,02%*	2.839,5	*20,17%*	2.811,6	*19,47%*

Source: Bureau of Economic Analysis. Original data processing

The categories of goods, which can be considered with high technological content in a broad sense (*Computers and peripheral equipment*, *Software*, *Telecommunications*, *Photocopiers*, *Audio & Video*), reach, summed together, only the 13,23% of all the hedonically valued goods (and they weight only the 2,57% of the GDP). The hedonic evaluation, then, is not implemented directly for reasons tied up to the technological development of goods[3] but it is done, instead, when we want to assign a price to a determined good or service which is considered not anymore on the market, so that it might be used as a term of comparison for the currently present good, which is made up by the same features, contained only in different amounts (Shapiro, Aizcorbe, 2010). Then a regression function is used to generate an *implicit price* for the good currently on the market, that will be not only *quantitatively* but also *theoretically* different from the market price[4].

The economic theory, in fact, maintains that *market price* is also a *relative price* and not only an *absolute price* (Schumpeter, 1990) and its change indirectly modifies the prices of other goods. In addition, in *economic theory of value*, either in *Austrian school* (exchange value that quantifies use value; Schumpeter, 1972) or in *classic school* (exchange value as a cost of production; Schumpeter, 1990; Landreth, Colander, 1996; Agnati, 2001), market price is a quantification whom determination has to be explained and not modified so that value of good can be expressed in a coherent way through the market price. For a practical explanation, we consider two examples. For the material goods, in the *Household appliances* category, the price recalculation is performed by computing a regression function which includes among the regressors also the "*brand*" (Liegey, 2003). Then the consumption choices made by buyers are considered to argue the necessity of the price recalculation in alternative to the market price actually paid. The regression function does not consider just technologic features and it concerns, actually, also a feature that can be regarded as already considered in the decision-making process that contributed to determine the market price. As concern the services, on the contrary, for the heading *Rent*, that taken alone weighs the 10,51% of GDP, the reason of the hedonic treatment is traced back to the different utility implicit in the rents of the buildings enjoyed by tenants (BEA, 2011a), since the rented

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[3]   For this purpose there are already in use the *quality adjusted indexes*.

[4]   For a *classic* version of the question of market price as *absolute* price see: Marx (1989, vol. III); instead, for the market prices mathematically determined as *relative* prices see: Walras (2006); for a *modern* version related to the *determination of the market price* as a relative and not absolute price, see: Samuelson (1993).

dwellings are improved over the years. That is, the rent paid on the market is recalculated since it would refer to a dwelling qualitatively different from the previous (same) dwelling (Stewart, Reed, 1999). In this case, then, the *measurement* of the *good characteristics* is not modified; the rent, in fact, is the *price of the tenancy service* and not the *price of the dwelling*, and the characteristics of the dwelling should be evaluated separately so that the value of good might be measured through a different weighting[5].

2 Some hints to the underlying theoretical problems

The current implementation of the hedonic evaluation of prices for heterogeneous goods and services, in our opinion, is grounded, therefore, contemporarily on two thesis.

1.   There is a need to estimate the change intervened regarding the goods characteristics, regardless what is done in the market through the *price*.

2.   The market evaluation occurs anyway properly through the *price*, even though its measure needs to be modified..

Clearly, these two issues are strictly twisted and both connected to the *theory of value* of goods. However, whereas the first focuses on the hypothesis that the modification of goods and services included in the estimate of final production is not properly evaluated by the market through the price, the second one denies this problem considering it only of quantitative nature. In our opinion, then, the hedonic evaluation poses a problem of a *qualitative* nature to which, however, it provides a *quantitative* solution. If through the first thesis, then, it is introduced an indirect critique[6] to the economic theory, denying the adequacy of the market price as *measurement* of the exchange value or of the utility of a good, through the second thesis, instead, there is the implicit acceptance of the form of *price* as a means to express the value of a good, implementing just a *quantitative* modification of the market price, ascribed to those particular goods and to the others for comparison.

The more direct *consequence* of this implementation, widespread in the USA, concerns the international comparisons which are not homogeneous and should be considered not only as a quantitative and theoretical problem, but also as an issue that might affect directly the economic policies of different countries.

3 References

[5]   In the work of Irving Fisher (1930-2006, p. 768) *the value of capital is the capitalized or discounted income*. For the heading *Rent*, then, the increase of the capital value of the dwelling is already included in the market price of the rent, that should constitute the income to be capitalized or discounted and not the income capitalized or discounted.

[6]   The theoretical critique is indirect since it is not the aim of the hedonic evaluation; the remarks traced down, in fact, tend to support a *technical* approach regarding the opportunity to estimate the prices of heterogeneous goods through a regression function that takes properly into account the changes into the characteristics, to be expressed through index numbers.

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