Indirect taxation, tax revenue, purchasing power and well-being: how are they linked?

The December 2017 issue of Conjoncture in France analysed the effects on purchasing power of some of the tax measures voted in the Finance Bill (PLF) and the Social Security Financing Bill (PLFSS) for 2017 and 2018, including the indirect taxation of tobacco and energy products.[1] This Focus looks again at the way these effects were calculated and interpreted, and how they differ from the effects on tax revenue. Although *Conjoncture in France* is not proposing a tax revenue forecast, it is useful to show how sometimes fiscal effects do not coincide with standard of living effects, and the way in which they are evaluated in national accounting.

Effect on purchasing power

In *Conjoncture in France*, household purchasing power is forecast from the ratio of the forecast of households' nominal gross disposable income to the forecast of price levels. This is a complex procedure, but for our purposes it is similar to the forecast of a Laspeyres price index. This takes as a reference the structure of consumption on date t and shows how much the cost of this basket of goods increases with a shift from date t to date t'. Let $(p_{1,t},\dots p_{n,t})$ and $(p_{1,t+1},\dots p_{n,t+1})$ denote the price vectors of n goods on the two dates and $(q_{1,t},\dots q_{n,t})$ the quantities consumed on date t. The price index for date $t+1$ is written:

$$\frac{\sum_{i=1,n} q_{i,t}\, p_{i,t+1}}{\sum_{t=1,n} q_{i,t}\, p_{i,t}}$$

Let us look at an indirect tax measure that affects the price of good 1, increasing its price by $\Delta p_1 = p_{1,t+1} - p_{1,t}$. Expressed as a %, the price growth between t and $t+1$ will be:

$$100.\frac{q_{1,t}\, p_{1,t}\cdot\left(\dfrac{p_{1,t+1}-p_{1,t}}{p_{1,t}}\right)}{\sum_{i=1,n} q_{i,t}\, p_{i,t}} = 100.\lambda_{1,t}\,\frac{\Delta p_1}{p_{1,t}}$$

where $\lambda_{1,t}$ is the initial share of good 1 in the total household budget and $\Delta p_1 / \Delta p_{1,t}$ the relative change in its price between the two dates. If the former is 2% and the latter around 15%, the rise in the index between the two dates will be 0.3% and the loss of purchasing power will therefore be –0.3%, all other things being equal. These figures correspond approximately to the share of tobacco consumption in the household budget and to the assumption of an increase that was adopted in the December *Conjoncture in France*. There was also the addition of 0.2 points as a result of the rise in energy taxation.

One of the limitations of this calculation is that it disregards the fact that price variations lead to a reallocation of consumption which can limit the loss of well-being: this is what is called a substitution effect. However, we can show that this has only a second-order effect on purchasing power. A simple case is where consumption evolves in inverse proportion to price, i.e. a price elasticity of demand equal to –1. Under this assumption, the 15% rise in the price of good 1 brings its consumption down by 15% in volume. Consumption will therefore remain the same in value, as will the consumption of the other goods in value and volume. To take this substitution effect into account, we could weight price rises according to the consumption structure after rather than before the price rise. This is what is done in another type of index, the Paasche index, where the variation is written:

$$100.\frac{q_{1,t+1}p_{1,t}\cdot\left(\dfrac{p_{1,t+1}-p_{1,t}}{p_{1,t}}\right)}{\sum_{i=1,n} q_{i,t+1}p_{i,t}} = 100.\lambda_{1,t+1}\,\frac{\Delta p_1}{p_{1,t}}$$

We can see that this time, as a result of the 15% drop in the volume of q_1, the 15% price rise is multiplied by a new, lower coefficient $\lambda_{1,t+1}$, equal to about 2% x (1–15%) = 1.7%. The Paasche index therefore gives a loss of purchasing power or "monetary" well-being of 1.7% x 15% = 0.255%.

1. *Conjoncture in France* simulated all the measures planned in the PLF and PLFSS. The Box on pages 95-96 focused on measures relating to taxes and social contributions, in particular the switch between social contributions and the Generalised Social Contribution (CSG), and described the sub-annual calendar effects. It did not cover measures relating to benefits or direct compensation for the increase in CSG for civil servants, but these were taken into account in the forecast of total household resources.

As expected, this decline is less pronounced than that produced by the Laspeyres index. It is very similar in scale, however, despite using a fairly strong elasticity. In addition, what is produced by the Paasche index this time is a lower bound of the loss of monetary well-being. For example, if the rise in the price of a good is such that it results in its being given up completely, the Paasche index would tell us that there is no drop in purchasing power or well-being since the subsequent weighting of this good would be zero, which is obviously not acceptable.

To deal with these substitution effects better, there is a more rigorous type of theoretical index (Magnien & Pougnard, 2000; Sillard, 2017), a "constant-utility index", which measures by how much the nominal income must increase in order for the satisfaction level to remain unchanged when prices go from p_t to p_{t+1}. Its value will generally lie between those of the Laspeyres and Paasche indices but it can only be calculated if household preferences are perfectly known. This is the reason why we can be satisfied with an approximation by the Laspeyres or the Paasche indices, with results that ultimately are not very different, even when the variation in price is fairly large.[2]

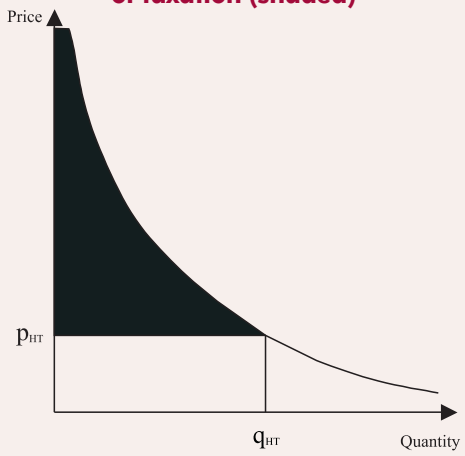
The effect on tax revenue

Although it has only a second-order effect on calculating loss of purchasing power, taking the behavioural reaction into account has a significant impact on tax revenue. Let us keep the example of a price elasticity of –1. In this case, the drop in consumed volume entirely offsets the increase in tax revenue per unit consumed. The reduction in household consumption and the resulting loss of activity for producers does not give rise to any additional tax revenue, nor to any other gains elsewhere in the economy since the other consumptions are stable both in value and volume.

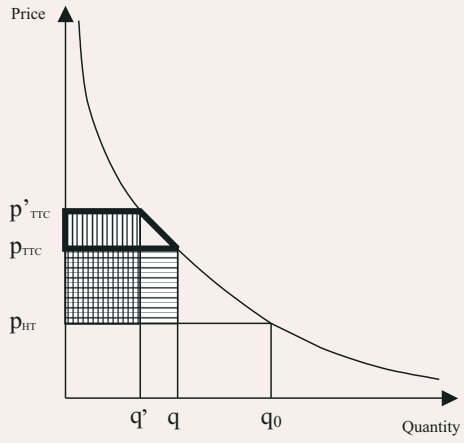
This phenomenon of uncompensated loss is what the economic theory of taxation describes as "deadweight loss", associated with the distortions that it induces in behaviour. The graphs below show the usual example given in microeconomics textbooks. The consumer's "monetary" well-being is measured by what is called his surplus, which is the difference between what he pays for the good being considered and the sum of what he would be prepared to pay for each unit consumed. The surplus is positive because the first units consumed are valued more than the last, even though the same price is paid. This surplus is represented by the dotted area on the left-hand graph, where taxation is absent. The graph on the right shows the effect of taxation and of a variation in its level in a shift from price p_{TTC} to price p'_{TTC}. The difference between prices including VAT and prices excluding VAT shifts the amount consumed to the left, from value q_0 to values q and q'. The two hatched rectangles represent tax revenue, with horizontal hatching for revenue associated with price p_{TTC} and vertical hatching for revenue associated with price p'_{TTC}. A comparison of these two rectangles shows the compensation phenomenon between the effect of rate (increase in height) and reduction of the tax base (narrowing of the base). Here, compensation is total, and there is therefore no gain in tax revenue. Nonetheless, there is a reduction in consumer surplus, represented by the area with the thick border: it is this variation that is approximated by the Laspeyres index.

2. The *ex post* weighting used for the national accounts is the Laspeyres method for volumes and the Paasche method for prices. Over the long run, the choice of one or other method can result in significant differences, as the base prices or volumes gradually age. However, this problem can be solved by using the chaining technique: whether in terms of volumes or prices, weightings are updated every year and it is these annual indices with year-on-year weightings which are chained to calculate the national accounting aggregates.

1 - Consumer surplus in the absence of taxation (shaded)



2 - Variation in surplus and tax revenue for two levels of taxation



In practice, the rate and base effects do not cancel each other out. We might think that the latter would predominate, with a "Laffer effect" according to which increasing the tax rate decreases revenue. In a more realistic example where price elasticity is between zero and –1, the drop in consumption by volume does not fully make up for the price rise, hence an increase in spending on tobacco in value compensated by decreases in value and in volume for the consumption of other goods or for savings. The net effect on tax revenue will correspond to the difference between increased revenue from tobacco and the decline in indirect tax revenue from other goods. A more comprehensive analysis should also take into account the reaction of producers and distributors, depending on whether or not they make up for the tax increase by squeezing their margins. There is also the question of illegal imports and trade which enable the consumer to avoid the increase in taxation.

From purchasing power to well-being: other effects to take into account

There are still other effects that determine whether a true analysis is possible in terms of consumer well-being, but they are outside the conceptual framework of national accounting.

Firstly, national accounting reasons on the basis of aggregates. It therefore best reflects the loss of standard of living or of well-being by the average consumer. However, consumption patterns vary from one household to another and not all are affected in the same way by a given price rise. This is particularly true for tobacco which some households do not consume at all, and it is also the case for diesel as it affects rural households. Calculating differentiated impacts is possible, for example by using the price index with tobacco excluded or the customised price index simulator available on the INSEE website. However, it is nevertheless still essential to have information on the average individual.

Secondly, national accounting does not only take market effects into account. In the case of environmental taxation, it does not include greenhouse gas emissions associated with the rise in the carbon component nor the health benefits of less pollution in the air. Similarly, in the case of tobacco, a price rise is certainly disadvantageous for consumers in the short term, but the aim is to improve their well-being in the long term, by improving their health. In fact this is the main aim of these policies, more so than looking to achieve additional tax revenue. It can also be argued that, once they have overcome their addiction, former smokers no longer experience any desire for tobacco since their consumption q1 has now fallen to zero, and the income that they have released increases the possibility that they will consume other goods, such that their well-being is also improved. However, quantifying this effect would involve including an endogenous preference distortion assumption over time.

Quantifying all these benefits is the motivation for the search for indicators to complement the aggregates used in the national accounts, following on from the Stiglitz-Sen-Fitoussi report. However, this is beyond the aims of Conjoncture in France: here we focus on short-term developments, and on monetary exchanges specific to national accounting, valuing goods according to current preferences, as revealed by current prices and consumer behaviour. ■

Bibliography

Magnien F. and **Pougnard J.** (2000), "Les indices à utilité constante: une référence pour mesurer l'évolution des prix", *Économie et Statistique*, n° 335, p. 81-94.
Sillard P. (2017), "Les indices de prix à la consommation", *Document de travail*, INSEE n° F1706.