Taxation of corporate profits, inflation and income distribution in France, 1914-1926.

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Still preliminary, comments welcome

Abstract

This paper studies the impact of World War I on the macroeconomic distribution of income and particularly on profits using an up to now neglected source : the archives on the tax on extraordinary war profits created during the war, which give firm-level details on accounting procedures and taxation methods. It suggests that the joint development of this tax (which was the first in France on business profits) and of accounting methods (especially for the measure of fiscal depreciation allowances) are very likely to have produced an overall over-taxation of profits, although the effects varied heavily among industries.

Key words : capital levy, excess profits, accounting procedures, depreciation, administration building, war industries

JEL codes : N14, N24, N44, H25, H32, G38, E62, E65

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The impact of World War I on the distribution of income and particularly on profits is a central issue to understand the economics of the 1920s and the contemporary birth of macroeconomics, in a context of distributive conflicts, sharp variations in the levels of both prices and production, and changing State intervention on the economy[1]. In all countries participating the war (and some others), an important part of the public opinion considered that "big business" and "speculators" benefited greatly from the war, particularly by being able to raise prices in a situation of shortage. It asked for a taxation of war profits as permitting to counterbalance the losses of war victims, and also to facilitate their compensation. In answer, many governments imposed special taxes on "extraordinary" profits for the war period (Stamp, 1918).

The income distribution issue entered the historiography because of the its likely impact on the political struggles over taxation and workers' rights that followed the war in the context of a soviet challenge to capitalism, struggles that frequently ended up in increased inflation or right-wing *coups*. Theoretical arguments were specified : increased monopoly power (towards consumers or employees), caused either by restrictions on foreign trade or by government intervention, worked in favour of higher profits; so did the reduction of real debt thanks to inflation ; on the other hand, prices controls and increased labour costs (caused by labour scarcity) went in the opposite direction, so that the question is mostly an empirical one.

In Germany, the effects of war on income distribution are still the subject of a long standing debate. Kocka (1984) and Hardach (1977a), on the one side, emphasized wage reductions and examples of (mostly armaments) manufacturers high profits to argue for the use of war as a capitalists' tool for pressuring labour. On the other side, Borchardt and more recently Ritschl (2005) at the macroeconomic level, and Baten and Schulz (2005) on a sample of firms argued that except for a few cases, profits suffered similarly to wages during the war. In the United-Kingdom, Feinstein showed at the macroeconomic level that profits increased in real terms during the war, a result confirmed at the microeconomic level by Arnold. Nevertheless, profits net from the tax on war profits are likely to have remained around pre-war level (Stamp, 1932a & b; Arnold, 1999).

[1] A previous, quite different, version of that paper was presented to seminars at Delta, the French Treasury, to the "taxation" conference (Paris, 2001), to the second summer school of the European historical economics society on "Growth and distribution" (Gröningen), and to the Oxford Conference of the European historical economics society (2001). We thank their participants, R. Altschuller, M. Bordo, G. Hubbard, H. Rockoff and especially S. Broadberry and A. Ritschl for helpful comments. All errors are due to the co-author.

France had a freer war economy than Germany but suffered the war much more than the United-Kingdom and probably than Germany (Hautcoeur, 2005). Hardach (1977b) and Coomans (1988) argued that profits had increased, at least in big firms, but Caron & Bouvier (1980) suggested that profit increases had probably remained limited to a small number of firms. No precise quantitative study of the subject is available, because national accounts are very insufficient for the war period (until 1921 at least), especially data on wages and profits. Actually, some archival material is available, which would maybe allow a study similar to that of Baten & Schulz (see below). Given the decline in GDP, however, it is possible that the profit share in total income increased, but unlikely that the total profits did so : average real GDP during the war was around 75% of its 1913 level, so that, supposing a "normal" one third profit share before the war, an increase of that share up to 44% was necessary only to maintain total profits to their pre-war real level (0,33/0,75 = 0,44). An enormous increase indeed in historical perspective, and a short-lived one if we accept the estimate that the share of profits in 1919 was back to its pre-war level (Piketty, 2001, p.703).

The aim of this paper is different : not so much to demonstrate that profits didn't increase substantially, than to show that the tax was much heavier than what any likely increase in profits would have justified, so that it probably represented a capital levy rather than a tax on profits. Actually, only post-war inflation allowed the tax not to lead to a big drop in investment and an increase in failures.

The paper is organized as follows : section 1 relates the creation of the extraordinary tax on profits and gives its essential characteristics. Section 2 estimates its impact at a macro level. Section 3 proposes an estimate of some effects of the tax at a micro level.

1. The tax on war profits

a. Creation of the tax

There was no tax on profits before the war in France. Whereas in Great Britain the Income Tax was running for many years, in France it was only voted in 1914 after an important debate. Furthermore it was not applied because of the war until 1917.

The "extraordinary tax on extraordinary war profits" which was adopted on July 1st, 1916 was then the first tax on industrial and commercial profits. It was unanimously approved in Parliament in spite of the war-long government preference for borrowing, because it appeared as the best response to the claims about confiscation, requisition and revision of war contracts that were arising in the public opinion. Political motives appear to have dominated the public finance reasons in the creation of the tax (Grotard, 1996 : 260-64) [2].

[2] This point was discussed a few years later by Faivre-Reuille (1920) who pretended that public finance aspects dominated. The debates and public opinion during the period before approval seems nevertheless to favor the political thesis (see e.g. Taboureux, 1919 ; Proux, 1924, p. 158). Stamp (1918) considers that in most countries, public finance reasons dominated. On war profit taxes in the U.K. and the U.S. see Shulz (1937), Seligman (1931) and Stamp (1932).

The law which created the tax defined general principles for its application more than a complete and detailed taxation procedure. At first the tax on war profits taxed every person who had a commercial enterprise –even briefly– during the period from the beginning of the war until the end of June, 1920. It means notably that farmers were not concerned by this tax, a point which would prove very unpopular.

The law put a tax on "supplementary" profits caused by the war, that is to say on the difference between the profits made during the conflict and the "normal profits during the peace time" (usually defined as the average of the profits made in the three fiscal years preceding the war). Four months after the promulgation of the law, the tax-payer had to send his first declaration concerning the war profits made from August 1914 to December 1915. Then, for each fiscal year, he had to fill a tax declaration before April of the following year. The simplicity of this obligation must be pointed out : the tax-payer only had to declare the amounts of the normal profit, of the profit made during the year and the supplementary profit resulting. No precision was asked about how he calculated the profit declared.

In each *département*, an administrative commission studied the declaration. It was allowed to ask for accounting records of the tax-payers, and decided, using that information, it issued a tax roll, based either on the profit declared or on its own evaluation of the taxable profit. At this point, the tax-payer was allowed to appeal to the Superior Commission of war profits which decided the amount of the tax as a last resort[3].

The 1916 law fixed the taxation rate at 50% of all supplementary profits. In fact, this rate only applied to the first two years (1914-1915), since on December 31st, 1916, a new law brought the rate to 60% for any supplementary profit in excess of 500,000 francs (a rate that applied to 1916 profits), and on December 31st, 1917, a final law raised the normal rate to 60% and that above 500,000 francs to 80% [4].

The law was very evasive about the way the taxable amount should be calculated. It recommended to keep pre-war firm-specific accounting methods. Nothing was specified about depreciation allowances, except for exceptional depreciation resulting from the war, which were defined as follows : "supplementary depreciation allowances required either by the exceptional depreciation of the material resulting from the extension of the daily work time, or by the fact of special fittings or expenditures made with a view to war furniture". These depreciations were to be re-estimated definitively for the last period of taxation, since the law allows for a revision.

The law incorporated two protections for taxpayers : first, the payment of half of the tax asked for (by the issuing of rolls) could be delayed until the end of the taxation period (that would be, in practice, June, 1920). This would protect taxpayers for excess payments since the yearly payments had to be made without considering compensations between profits and losses in different years, a compensation that

[3] A final appeal to the Conseil d'Etat was possible, but it was little used and had little impact on the taxation process (Hautcoeur, 2005).

[4] These rates were similar to those applied in Great Britain (Stamp, 1932, p. 146ss).

would be organised at the end of the taxation period[5]. Second protection : the appeal to the Superior commission delayed the payment until its decision was imposed.

b. Amount raised by the tax

For the reasons we just mentioned (delay on half the payment, delay in the case of appeal), payments during the war were limited (below 700 million francs). This led some historians to consider that the tax had little impact[6]. They frequently neglected that its final return was important. When the collection of the tax was stopped in March, 1940, 15 billion francs in total had been collected (to compare to a GDP of 51 billions in 1913 and 105 billions in 1919 in current francs)[7].

Nevertheless, that amount must be examined with caution since its actual importance depends as much of its timing as on the global nominal amount, especially during that inflationary period. The collection process was long (23 years in total, 12 with non-negligible amounts). Annual payments reached a maximum in the years 1920 and 1921, and they were still significant in 1924 (graph 1).

In order to understand these late payments, we may consider several elements : first, the delay in rolls' issues, which resulted from administrative disorganisation which disappeared quite rapidly after the war : the rolls issued before December, 1919, represented only 20% of the total, but the proportion rose to 70% two years later (graph 2). A second reason for the delay in tax collection is the time-lag between the rolls' issue and the payment (two years on average). Until June, 1920, it resulted partly from the legal deferment of the payment of half issued rolls. Nevertheless, that payment of the first half of already issued rolls alone would have represented around 700 millions more than what had been paid at the end of 1919. A last reason was the delay resulting from the appeals of firms to the Superior Commission, not a surprising behaviour in an inflationary period[8]. Actually, the number of appeals was high as soon as 1917, and increased after 1921. Since, from December 1918 on, the incentives to appeal were sharply reduced by the legislator, these appeals cannot be explained by the mere desire to delay the payment, and probably correspond mostly to actual conflicts on the calculation of the tax amount.

In spite of these delays, amounts collected increased rapidly from 1920, thanks to the increase of issued rolls, to the payment of the second half on previously issued rolls, and to the growing efficiency of the collection procedure. The proportion of the final total return that had already been collected increased from 9% in December 1919 to 52% at the end of 1921 (63% of already issued rolls at that date). After that date, the remaining amounts were collected much more slowly because of the number of firms calling on

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[5] The choice of initial non-compensation was probably done in order to simplify the administrative work and to evitate any payment by the State before the end of the war.

[6] For Hardach (1977, p. 102), "The tax on war profits only affected a small part of the effective profits." For other references, see Grotard (1996, p.272).

[7] Global statistics on the tax return were published in various issues of *Bulletin de Statistiques et Législations Comparées*.

[8] Expected inflation may have been a reason. Excess taxation was probably a more important one : these appeals led to significant tax relieves totalling 4 billion (on a total of 19 billion of issued rolls). Unfortunately, we don't know the time distribution of these relieves, which appear neither in published statistics nor in archival sources before December 1924.

the Superior Commission and because of the importance of the tax relieves (which were superior to the new rolls' issues after 1925, see graph 1).

Before comparing these amounts to macroeconomic variables, one must take into account two elements that decrease the actual weight of the tax. The first one is the possibility that had been given to pay the tax using government debt, namely 4% or 5% recently issued "rentes" (law of october 1917). The rentes were valued at par, which was always superior to their market value because of inflationary expectations. Consequently, firms adopted largely this profitable mode of payment, until it was suppressed in March, 1924. At that date, 63% of payments had been paid in rentes, representing more than 7 billion francs.

In order to take into account that element, we take a 63% of every yearly payment from 1918 until March, 1924, and adjust it by the relative price of the 4% rente (the one which maximizes the gap between par and market value and then the gain for the taxpayer)[9]. The actual importance of the tax decreases thanks to that calculation from 15 to something less than 12.5 billion (graph 3).

2. A macroeconomic evaluation of the tax.

We try below to have a first look at weight of the tax by comparing the amount that it raised to some macroeconomic variables. We also try to consider what change in the distribution of national income would have justified the that weight[10].

The actual importance of the tax

In order to measure the impact of the tax, we can compare the amounts it raised with other macroeconomic variables. The actual weight for firms may be measured in various ways. A synthetic measure is the sum of all payments in constant pre-war francs (graph 3). The total reaches 3.7 billion, which can be compared to pre-war value-added by private non-agricultural firms of 24.9 billion (or 15%). This is a huge tax. Nevertheless, since it is actually spread over many years, one may better look at the yearly weight of the tax either by the share of private agricultural firms' profits or by that of their value-added that the payment of the tax required. Both measures give the same picture (graph 4). The weight of the tax can be summarized as the payment by the firms of 13 "points of value added" (the sum of the yearly payments, which relate to various years), half of which concentrated in the years 1920-1922. During these few years, the tax certainly had an impact on firms' behaviour, since it represented a substantial share of their profits. It probably caused both a decrease in investment and an increase in the debt of the firms.

[9] The price of that rente fluctuated between 60 and 85 during that period. We could suppose that the proportion of all payments made in rentes varied with its price, which would still decrease slightly the amount paid. But this is of second order magnitude.

[10] Most macro-economic data used here are from Villa (1994).

Symetrically, the tax had an impact on public finances. As we already noted, that impact was limited during the war. It increased sharply afterwards, the payments in the peak years 1920 and 1921 representing almost 15% of all budgetary receipts, which may have had some macroeconomic impact, especially during the 1921 crisis which it likely worsened.

Although this impact is far from negligible, it is much lower to what would have happened without the delays in the issuing of rolls and in payments, and most of all without inflation. Actually, the interpretation of the tax is made much difficult by the various delays its payment encountered and by the inflationary context. We must distinguish between the impact that the tax would have had if there had been delays neither in the rolls issuing process nor in the payments, to its impact if the delay had been limited to the payments, and to the actual impact. With the exception of questions of timing (it is not equivalent to pay heavy taxes during a good or a bad year), the differences between these three measures results mostly from inflation.

Scenario A corresponds to the tax as the left of the Parliament wanted it to be raised : every year, the rolls corresponding to the extraordinary profits of the previous year should be issued, and the payment should follow immediately[11]. Since we don't have any information on the actual distribution among years of taxed profits, let's spread them among the war years proportionately to the increase in the price index relative to 1913 (we will argue below that nominal profits were actually taxed, and not real ones, so that this hypothesis corresponds to constant real profits throughout the war[12]). These hypotheses lead us to the following results : even though the total nominal payments remain at the same level (12.3 billion, corrected for the payment in *rentes*[13]), such non-delayed payments would have led to a much higher real payment, which we evaluate as a minimum to 5 billion pre-war gold francs, some 50% more than the actual delayed payment (table). This demonstrates that the delays in payments decreased substantially the real weight of the tax. The difference would be even higher if we calculated an actualised value of the total tax paid, something we don't do here[14].

Scenario B makes the same calculation with only one different hypothesis : it supposes that inflation had no impact on the tax : taxed profits were real (i.e. not affected by inflation), and payments were made in real terms. In that case, the total amount of payments (either 12.3 billion, corrected for payment in *rentes*, or, more likely here, 15 billion, since the payment in *rentes* would not prove profitable without some inflation affecting the prices of *rentes*) is measured in pre-war gold francs, and the weight of the tax is much superior to our previous measures (15 / 24.9 = 60% of pre-war value added by non-agricultural firms). This scenario tells us that if delays in payment helped the firms to pay the tax, inflation was much more helpful. Actually, one may wonder how the firms might have paid the tax under

[11] A small variation from scenario A would suppose that the tax was paid at the moment the roll was issued. The result would be something that of scenario A and the actual tax weight

[12] Making them proportional to GDP would change little.

[13] This correction lowers the impact of our scenario, since the price of *rentes* decreased more after the war, so that a payment in *rentes* during the war would have be less defavourable to the Treasury.

[14] As in the case for payment in rentes, there would probably be a dimension of double counting if we at the same time considered the impact of inflation on the depreciation of late payments and added a lower impact of *rentes* prices (which result from inflation) or an actualization with high interest rates (wich also result from inflation). Our calculation minimized this impact but makes sure there is no such double counting.

a British-style deflation policy, a result that confirms some of our previous thought experiments (Bordo & Hautcoeur, 2003).

The increase in profits justifying the tax : real or nominal ?

One may suppose that such a tax would not have been asked for so vigorously nor passed without a significant move of the wages-profits ratio in favour of profits. This move could result from the transformation of the economy during the war : shortages, reinforcement of local monopolies because of worsening communications and transport conditions, which allowed firms to rise their prices. Now, in a tax system based on accounting profits, the rise in taxed profits may result either from an actual increase in real profits (measured in constant value) or from a nominal increase in profits resulting form inflation. Let's try to appreciate what the was the profit increase corresponding to the amount collected by the tax. We will consider two polar cases, supposing first that the taxed increase in profits corresponded to an increase in real profits, second that the increase was purely nominal.

Suppose then, first, that the increase in profits that were taxed was real (not purely nominal). For the tax amount to reach 15 billion, the taxable extraordinary profits must reach around 25 billion (supposing a mean taxation rate of 60%). Since the extraordinary profits taxed are the difference between the war years' profits (Π_t) and the mean of 1911-1913 profits (that we will index here as Π_{1913}) valued at war years' prices (p_t), our hypothesis that only real increases in profits were taxed means that :

$$\sum_{t=\text{august 1914}}^{\text{June 1920}} \left(\Pi_t - p_t \Pi_{1913}\right) = 25$$

From this hypothesis, we can calculate the total value of profits during the war period to reach almost exactly 75 billion.

What change in the profit rate corresponds to such a level of war period profits ? If we consider π_t as the profit rate and VA_t as the value added in taxable firms, both in year t, the profit rate must solve the following equation :

$$\sum_{t=\text{august 1914}}^{\text{June 1920}} \pi_t \, VA_t = 75$$

If we consider pre-war profits and value added in private non-agricultural firms to be correctly approximated by gross firms' savings and value added (EBE and PIBEe series in Villa' retrospective national accounts), the profit rate was 17% of value-added before the war (and corresponding firms' value-added represented 24.9 billion in 1913, almost 50% of GDP). If we suppose that the share of non-agricultural firms in GDP is stable during the war[15], we can calculate that the profit rate π_t that is necessary in order for profits during the taxed period to reach 75 billion, must rise to 27%, which means

[15] It is difficult to figure out the evolution of the relative size of the private non-agricultural sector during the war. On the one hand, the public sector increased thanks to the mobilization of millions of soldiers. On the other hand, agriculture suffered much more than industry.

that the profit share in value-added must rise by more than 50% (from 17 to 27%), an enormous and unlikely increase indeed (see table 1 for the calculations).

Now, let us turn to the case of a purely nominal increase in profits. Suppose that the profit rate remained stable and value added moved along the same path as mentioned above. Now, what we look at are the solutions of the following equations :

$$\sum_{t=\text{august 1914}}^{\text{June 1920}} (\Pi_t - \Pi_{1913}) = 25 \quad \text{and} \quad \sum_{t=\text{august 1914}}^{\text{June 1920}} \pi_t \, VA_t = \sum_{t=\text{august 1914}}^{\text{June 1920}} \Pi_t$$

The value of war period profits that corresponds to the first equation is 48 billion. The solution to the second equation is almost exactly 17%, which means that a purely nominal increase in profits, with no change in the aggregate profit rate is entirely compatible with the huge amount of tax that was raised (table 1). We may remark that 48 billion is also almost exactly the amount of cumulated profits during the war period as estimated by retrospective national accounting, which suggest that the second hypothesis is the correct one : profits increases that were taxed were probably entirely "paper" profits, that is purely nominal increases in profits compared to the pre-war period.

We can close this rapid examination of the macro-aspects of the tax on war profits with the following conclusions :

- The total return of the tax was important (even corrected for inflation and for the payment in depreciated *rentes*), and would be justified only by a very significant rise of the share of profits in total value added by private firms.

- The tax payments are concentrated in a few years around 1921, so that their macro-economic impact may have been important during these years.

- There was a large delay in the rolls issue and also one between rolls issue and payments. Both contributed to alleviate the weight of the tax for firms and to worsen the situation of the Treasury, but only to a small extent.

- Inflation had a larger impact, decreasing substantially the actual weight of the tax.

- There are strong reasons to think that the tax was paid on purely nominal increases in profits, not on real increases.

3. Micro-economic evaluation of the weight of the tax.

The previous part showed that the amount of the tax collected was compatible either with a substantial rise of the share of profits in total value-added by firms or with a purely nominal increase in profits. But we had to recognize that the data available doesn't permit to conclude on the effective weight of the tax at the macro-level (although there is a clear suspicion that mostly nominal profits were taxed).

In a companion paper (Hautcoeur, 2005), we examine in more detail how the tax administration worked and progressively imposed accounting rules and profits evaluation methods that led to the taxation of nominal profits and to extremely upward biased estimations of profits. That paper is based on the detailed examination of individual firms' taxation files (around 4000 files) that are kept at the Archival records of the Superior commission on war profits, conserved at the Ministry of Finance[16].

Here, we use the same source in a different way, and try to compare the administrative evaluation of profits with a market evaluation. This should allow us to present a microeconomic evaluation of the impact of the tax.

Before turning to the methodology we use, one must present the limitations of the source we use. Considering mainly the cases for which appeal was made to the Superior commission[17], it exagerates the conflictual aspect of the payment of the tax while the numerous cases of rapid or no payment disappear. More, the firms which benefited from a generous estimation by the tax administration didn't appeal for a new decision of the Superior commission, so the files conserved induce us to overestimate the tax payments. Last, but not least, the firms appearing in this source are frequently the most important, because large firms were at the center of the public discussion on war profits and were probably subject to more detailed examination by the tax administration; they are also more able to pay good lawyers and lobby the administration in order to obtain some decrease of their tax liability.

The close examination of the files concerning a few firms gives a first idea of the validity of the explanations we are looking at. This is although only a preliminary analysis before a larger and more systematic study. We chose large firms (although of quite different sizes) because their files contained frequently more detailed accounts of the negociations with the administration, and because we needed them to be quoted at the Paris Stock-exchange in order to make the estimation of the effective weight of the tax we will present below. The firms we chose up to now are almost all direct furnishers of the armies. Although we will have to include firms from purely civilian industries in order to compare the effects of war and taxation in both cases, this first set allows us to discuss the alleged enormous war-related profits of this period. The sample includes firms from siderurgy, machinery and shipbuildings (Ateliers et chantiers de la Loire, Chantiers et ateliers de Saint Nazaire), and from chemicals (L'Air Liquide, Le Ripolin).

a. The method

We will here present a method that permits a microeconomic evaluation of the weight of the tax in a limited number of cases, but concerning the most important firms in the economy : those listed on the

[16] The archives of the Ministry of finance are quoted as SAEF in references below.

[17] We don't know the origine of this source but we noticed that the files concerned only firms which delayed the payment of issued rolls for three reasons according to the law : an appeal to the Superior Commission (law of December 1918), a procedure of tax refund in case of losses during the taxable period (law of June 1920) or because they had invested their war profits before the 1st of Januar 1919 in fixed assets to improve or extend their firm(law of June 1920).

Stock-exchange. It is based on financial theory and allows to calculate the profits as they are evaluated on the financial markets.

Until now, most historical micro-economic studies were based on accounting data, which proved quite insufficient when trying to evaluate profits, because of the variations of accounting methods (between firms or accross time), of hidden profits for tax purpose, and of the absence of any correction for inflation[18]. When they try to overcome these problems, they reintegrate all the depreciation and reserves they find in the profits, considering the result as more satisfactory than the published balance-sheets destinated to hide the true results to shareholders or creditors (Bouvier, Furet & Gillet, 1965). In some cases, they can use "corrected" balance-sheet data that have been subjected to the acceptation of tax authorities and then less likely to hide profits (Baten & Schulz, 2005). This could be a solution in France since the war profit tax's archives provide us with such corrected balance sheet[19]. Nevertheless, the complexity of each individual firm's file (often rather a box) made it impossible on a large scale. Also, the absence of any profit taxation before the war makes it impossible to extend the comparison to a "normal" earlier period.

In an opposite view, we try to avoid any use of accounting data by using financial data available for listed companies. Their advantages are the following : all operations on the paid capital or long term debts are clearly defined and known, the firm has no power to modify their amount since they are measured by the market. Furthermore, the value of a firm's securities on the stock market gives the best estimate possible, including the value of retained earnings which is so difficult to evaluate using the balance sheet.

Our method consists in measuring the variation of a firm's value, and in evaluating the value of retained earnings by deducting the value of other sources of finance. It relies upon financial theory by supposing that the capitalization of a firm's securities on the Stock-exchange furnishes a non-biased estimate of the firm's value. The capitalization includes the value of all assets of the firm (from fixed to intangible assets, monopolistic rents, know-how, etc) evaluated by their joined profitability. The evolution of a firm's value can be analysed as follows : depreciation of existing assets, purchase of new assets and depreciation of these now assets. The purchases of new assets may be financed by stock or bond issues or by retained earnings. If we suppose that every financial operation is affected to the purchase of new assets and that in the long term the value of these assets is never very different from their purchase price (corrected for depreciation and inflation)[20], we can write :

$$E = V_n - V_1 (1 - d_1 + p_1) - \sum_{t=1}^{n} (D_t + K_t + N_t) (1 - d_t + p_t)$$

[18] For examples of such studies, *cf*. Grangé (1943), Marquis (1948), M. Lévy-Leboyer (1980).
[19] And on a large sample, although a biased one since it includes only those firms that appeal the ordinary commissions decisions.
[20] What means that Tobin's q is near from one.

where E is the value of retained earnings during the period from 1 to n, V_t the value of the firm (the capitalization of its securities) at date t, D_t, and K_t the amounts of debt and stock issues at date t, and finally d_t and p_t respectively the depreciation rate of assets and the variation of their prices between date t and n.

Since it is based on the comparison of the capitalization of a firm's securities at two dates, this method is not adequate for the measure of retained earnings on short period and must be used with some caution. Short term variations of the Stock-exchange quotations could move capitalization away from the value of any particular firm, what would give aberrant estimates of retained earnings. But in the long term, we can reasonably think that this method allows a better estimate of accumulated profits than does the comparison of balance sheets with the limits we presented above[21].

That method should enable us to estimate whether the rise of the firms profits corresponded to what the amount taxed suggests. We only have to compare the market estimation of retained earnings (E) to the profits evaluated by the tax administration minus dividends and taxes, or :

$$C = \Sigma(Bt - \delta t - \tau t)\ (1 - dt + pt)$$

where Bt is the amount of profits of year t as evaluated by the tax administration, δt the dividend payments of year t and τt the amount of taxes (extraordinary tax on war profit and normal income tax) paid during year t.

b. Individual examples

We applied that method to a few examples chosen in the firms whose files were examined above, for the period between June 1913 and June 1920. We chose these dates because they correspond to the period covered by the extraordinary tax, and also considering the fluctuations of stock market prices. June 1913 is before the first anticipations of war, and June 1920 is, like June 1913, a period of a maximum in stock prices.

It is difficult to measure the effective weight of taxation during that period. First, all firms in our sample appealed to the Superior commission. In many cases, they didn't pay before June 1920 the total amount of the tax they will have to pay in total (or they paid some more than what they should have paid). So we can hesitate between an estimation based on the tax already paid, the tax already decided and the tax that will finally be paid, a difficulty reinforced by the choice of the actualisation rate in the last cases (the estimation of the firm's value is made on the market, and includes only the information available). The same is true for the measure of profits by the tax administration, since it is modified during the discussions with the firm.

[21] For a more detailed description of this method, a discussion of the main problems it rises and sensibility analysis of its results on different periods, see Hautcoeur (1993).

Finally, we had to complete the amount raised by the extraordinary tax with that collected by the income tax on profits. The problem is that we have no information on the assessment of that tax. We supposed the taxable income was the same as for the extraordinary tax. Since the rate of the income tax is relatively low (8%, and only from 1918 onwards), we don't think that this problem can modify significantly the result.

Fortunately, the examples we examine give a non-ambiguous result whatever the hypotheses used on all the points mentioned above. The main results are summarised in table 1.

Table 1 Comparison between tax and financial evaluations of retained profits

	L'Air Liquide	Le Ripolin	Ateliers de la Loire	Ateliers de Saint Nazaire
1. Initial value	122 479 731	46 069 237	86 124 275	78 799 863
2. Taxable profits	38 391 565	11 529 869	86 726 827	39 683 449
3. Dividends	18 392 700	13 013 908	19 502 201	21 089 527
4. Taxes	8 488 994	646 360	5 711 517	6 237 666
5. Securities issues	51 576 086	3 580 809	54 313 948	19 779 344
6. Final value	153 350 000	25 000 000	110 266 667	65 360 000
7. Retained earnings through market	-20 705 817	-24 650 046	-30 171 556	-33 219 207
8. Retained earnings through tax	11 509 871	-2 130 399	61 513 109	12 356 256
9. Profits through market	6 175 877	-10 989 778	-4 957 838	-5 892 014

Initial and final values are the market capitalizations of the firm's securities in June, 1913 (1914 for Le Ripolin) and June, 1920. Taxable profits are profits evaluated by the tax administration. Dividends are dividends paid to all shares. Taxes are amount actually already paid for the tax on extraordinary profits and for the income tax during the period. Retained earnings through the market is the market evaluation of retained earnings. It is calculated as (7) = (6) – (1) – (5). Retained earnings through tax is the amount of retained earnings calculated using the tax data. It is calculated as (8) = (2) - (3) - (4). Profits through the market are calculated as (9) = (7) + (3) + (4).
All the amounts are actualised and after depreciation, in 1920 francs (see text). We consider all flows in the year in which they took place effectively. For initial and final years, only helf of the total profits and dividends are counted when we don't know their distribution in the year. In 1913 and the first semester of 1914, we consider only accounting profits.

As the table shows, the cumulated retained earnings of the four firms for which we had all the information needed are negative for the period mentioned. For three firms out of four, the total of the profits estimated by the market is negative, what means that the decrease of the value of the assets is greater than the amounts of joined dividends and taxes. These firms would not have had enough profits to keep their initial value even if they had retained all their profits without paying dividends or taxes. The tax was imposed to firms losing money, so all were overburdened by the mere fact that they paid taxes. And the fact is that they paid much taxes.

Only l'Air Liquide made some money, although it paid in dividends and taxes much more than its profits. Taxes represent in our estimate 137% of total profits. This difficult situation will restored by numerous and important stock issues that allow the firm to keep growing.

The cases of the three other firms are also quite different from each other. Le Ripolin made much money before the war, and the tax administration recognized that its profits didn't rise much during the war : it paid taxes only for the years 1918 and 1919. But as it distributed growing dividends, its retained earnings are negative, both from the point of view of the administration and of the market. And the market

estimate shows that all dividends were pure inflationary illusion, and that the firm didn't take effective depreciation into account.

The Ateliers et chantiers de la Loire and the Chantiers et ateliers de Saint Nazaire tell another story. They worked for the army during the war, so they maintained their activity more easily than other industries, and made high apparent profits. The Ateliers de la Loire afforded to rise their market value by important debt issues. But, probably because depreciation were prohibited by the tax administration in spite of the very capital-intensive nature of this industry, market estimates of retained earnings and profits are highly negative, so that the payment of heavy taxes worsen the decrease of the firm's value.

c. A broader view

Our first intention was to make a systematic study of all quoted firms for which a file was opened at the Superior commission (it seems that it is the case of a large majority of them), what means about 300 firms for the official Paris Stock-exchange. Since it is so difficult to collect individual data, we will try in this paragraph to use our method to make a broad evaluation at the level of the listed firms.

Stock market data actually allow us to make a first evaluation. Total market capitalization of the shares of French firms listed on all stock exchanges in France increased very little (from 27.5 to 29.3 billion francs) in nominal terms, although the number of listed shares rose (from 588 to 626 on the official Paris market) (Bozio). If one concentrates on the Paris official *Bourse* (around 80% of the total, and much better known), one observes that this results is verified for all classes of firms (table 2A). If one selects randomly one hundred firms that were listed and for which prices were quoted both in 1913 and 1920[22], the result is slightly different since their market value increases by almost 25% (table 2B). In both cases, if one takes into account inflation (the retail price index had increased to 444 in December 1920 on a 1913 basis), capitalization decreased a lot. If one considers that a correction for the actualisation rate of future profits should be made (considering that profits discounted at the higher discount rate of 1920 are underestimated compared to profits discounted at the lower 1913 rate[23]), the results remains a considerable decrease in real terms.

[22] That selection created a bias since many listed shares were not actually quoted in 1920. But since it is likely that those which price were quoted performed better than the remaining ones, this bias makes an *overestimation* of the growth of the capitalization more likely than the opposite. This will reinforce our conclusion.

[23] This correction should be made with caution since it has shaky theoretical bases, at the least since profits are not determined exogenously from the actualisation rate.

Table 2. Market capitalization of listed French firms' shares

A. Capitalization of the biggest listed shares					
Biggests capitalizations	1913	1920	1913-1920 performance		
			nominal	Real	real corr.
20 shares	10 461 644 704	10 091 245 470	-4%	-77%	-67%
50 shares	14 005 454 918	15 060 827 780	8%	-75%	-63%
100 shares	16 868 401 923	18 545 065 380	10%	-74%	-62%
200 shares	19 666 323 132	21 654 655 079	10%	-74%	-62%
300 shares	20 999 673 403	22 925 555 339	9%	-74%	-63%

B. Total capitalization of a selection of 100 listed firms					
	1913	1920	1913-1920 performance		
			nominal	Real	real corr.
100 firms	8 010 044 999	9 981 315 834	25%	-71%	-57%

Part A gives the capitalization of shares listed on the Official Paris market, grouped by decreasing size (e.g. the 20 shares with highest capitalization in 1913 totalise 10.46 billion francs). Part B gives the capitalization at both dates for 100 firms for which data are available on both dates and that were selected randomly among firms for which these data were available (see text). Variations are measured first in nominal terms, then in real term (using the retail price index of 424 in Dec. 1920), then in real term with a correction for the rise of the yield on the 3% perpetual government *rente* from 3.53% to 5.13% from Dec. 1913 to Dec. 1920, that is a multiplication of the 1920 capitalization by a factor 1.45 (5.13/3.53). Source : our calculations for the capitalization. Price indices and *rente* prices from SGF.

These capitalization data suggest profits did not rise during the war enough for firms to invest and increase their earning capacity, quite the contrary. One solution could be that huge dividends were paid immediately. Data on dividends are better than those on market capitalization. Incomplete aggregate data at the country level suggest they decreased during the war, even in nominal terms (table 3). In real terms, they actually reached a very low level in 1918. Shareholders did not benefit from the decrease in interests payments, which was actually smaller since firms issued bonds during the war, maybe because of low or negative interest rates.

Table 3. Dividends paid by French firms

In nominal terms (million francs)												
	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921
shares	1113	1203	1261	1396	1252	865	1112		173			3508
bonds	1059	1101	1272	1303	1242	1121	1285		1418			2497
In real terms (million 1913 francs)												
shares	1234	1211	1242	1396	1252	727	830		84			1124
bonds	1174	1108	1253	1303	1242	942	959		685			800

Total dividends on shares and interests on bonds paid by French firms, from fiscal sources. Annuaire statistique de la France, 1932, p. 144*

Dividend paid by listed firms are available on an industry basis (table 4). They show indeed that some industries did very well during the war. Not surprisingly, chemicals and shipping were able to pay higher real dividends than in peacetime (at least than in 1913), which may nevertheless be interpreted as a risk premium (in both cases : see the drop of chemicals dividends in 1918-1920); so were, more surprisingly, department stores, which may have irritated the public opinion. But engineering, iron and

steel, and shipyards, which certainly benefited from the armaments boom, did better than the average but worse than before the war.

Table 4. Dividends paid by listed firms, by industry

	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
Total	91	87	93	100	68	63	70	65	57	50	46
Banks	85	80	88	100	60	50	59	51	44	40	40
div.imm	87	79	94	100	64	54	48	51	41	38	32
Iron & Steel	103	101	108	100	77	65	67	61	65	50	47
Engineering	82	78	88	100	83	80	87	76	76	66	65
Shipyards	118	107	109	100	70	75	84	76	61	49	32
Quarrie	67	65	92	100	37	31	44	71	69	69	69
Chemicals	89	85	96	100	82	101	117	103	77	74	50
Tramways	95	93	93	100	65	48	44	38	29	29	22
Shipping	123	118	112	100	48	119	173	200	196	176	157
Gas	122	117	116	100	47	34	8	3	2	7	19
Electricity	88	92	96	100	61	59	60	58	52	52	44
Dpt Stores	103	90	101	100	92	93	98	118	97	72	60
Food	85	85	96	100	67	63	61	52	50	56	72
Docks	110	100	95	100	72	63	55	44	34	23	16
Diverse	81	85	87	100	57	61	73	67	56	51	42
Price level	90	99	102	100	100	119	134	160	207	259	357

Real dividends paid on firms listed on the Paris official stock exchange. Based on Denuc (1934) corrected for inflation using the price index in the last line. The great railways are excluded (since their prices were heavily regulated). Their inclusion would worsen the evolution.
Note that these are gross dividends. The tax on dividends was raised from 4% to 5% in 1916.
Source : Denuc (1934).

Conclusion

The contemporary protests against unmerited enrichment of any firms during the war caused the creation of an extraordinary tax on profits made during the war. Some observers considered that this tax had insufficient results because of a timorous application by a new administration and of the capacity of firms to hide profits. The qualitative and quantitative evidence we presented above shows that the firms were probably quite heavily taxed, and that the amount that were collected by the tax may have had some negative influence on their investment at the beginning of the 1920s.

This tax faces a paradox, reflecting the situation of the French government facing inflation. On the one hand, the administration refused to correct firms' balances for inflation, which led to enormous paper profits which didn't correspond to any actual increase in profitability. On the other hand, once the taxable amount is imposed, firms needed more inflation in order to decrease the weight of that levy. This made everybody unhappy : the firms as taxpayers, and the State as tax recipient, who received less than what it expected. The balance was nevertheless in favour of the State. As we shown, the actual weight of the tax was probably heavier than that justified by actual increases in profits, which most likely were localised and limited. Firms had then to contribute to the war effort not by giving back their extraordinary war

profits, but by paying part of their profits, and probably sometimes part of their capital. In that sense, the tax on war profits was probably an unexpected example of a successful capital levy.

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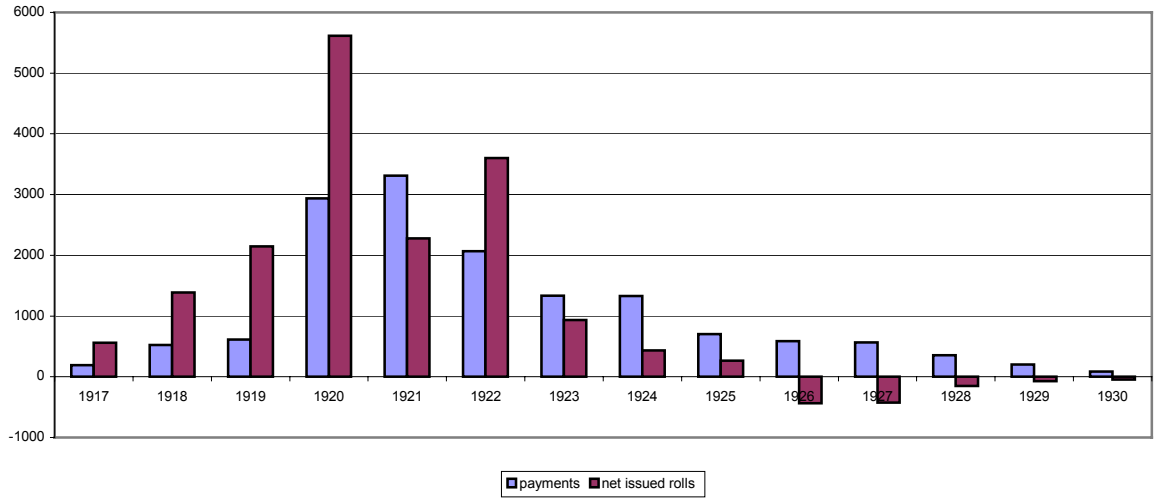
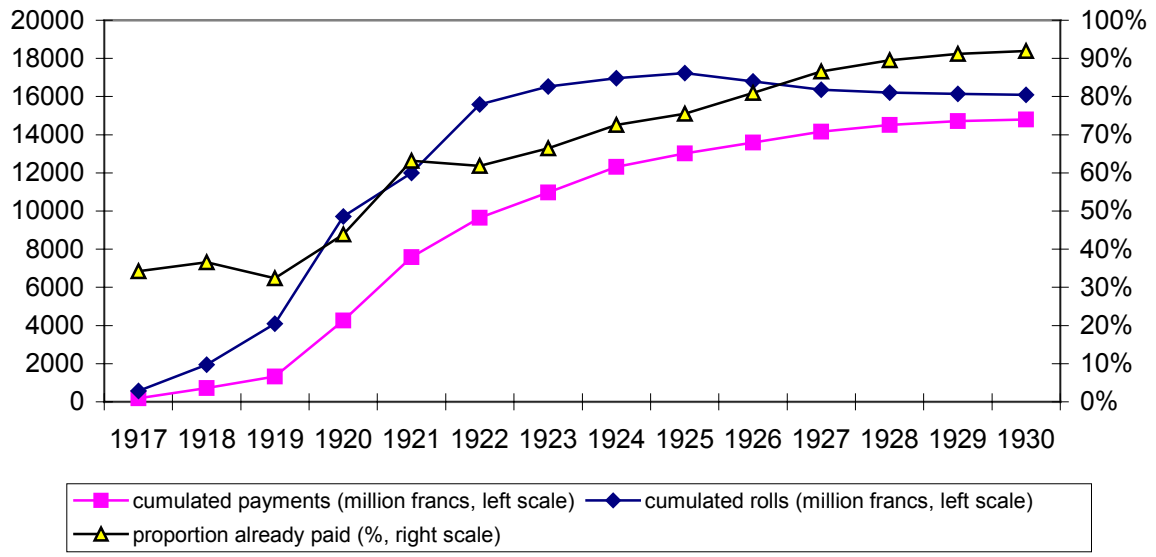
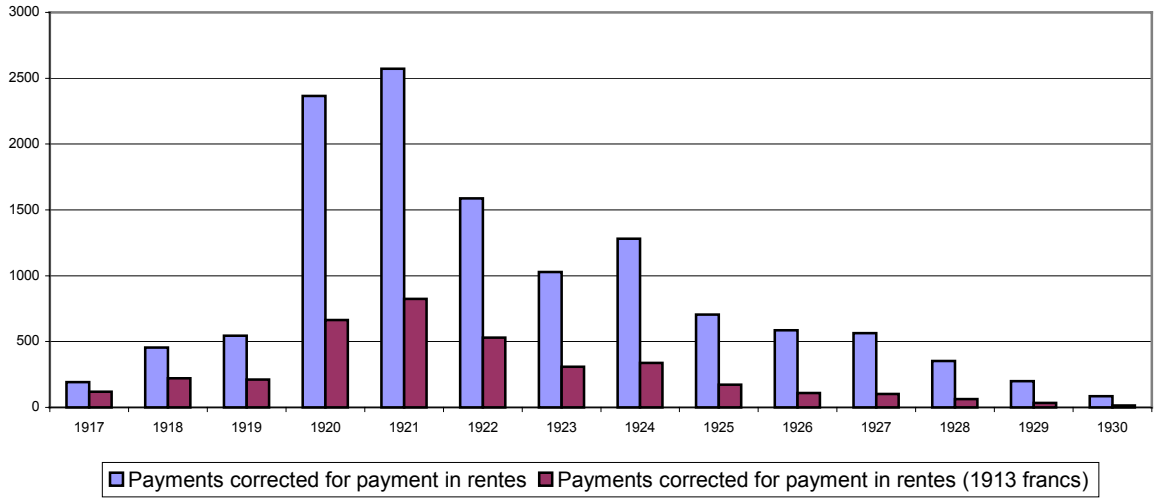
Graph 1 Tax on supplementary war profits. Net issued rolls and payments (millions current francs)



Graph 2 Tax on supplementary war profits. Cumulated rolls and payments



Graph 3 Tax on supplementary war profits. Payments corrected for payments in rentes and for inflation (millions of either current or constant 1913 francs)



Graph 4 Tax payments compared to gross profits by private non-agricultural firms and to these firms' value added