Medium-Term Effects of a Rise in VAT on Standard of Living and Inequality: a Microsimulation Approach

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Abstract – A rise in VAT has both direct and delayed effects on standard of living and inequality. Such a rise translates into an increase in prices that same year. Earnings and other types of income are partly adjusted subsequently. The scales for social security benefits and direct taxes are also index-linked to inflation. This work offers an *ex-ante* evaluation of these mechanisms using the INES microsimulation model. Three years after a three-point rise in the standard rate of VAT, the standard of living, adjusted for VAT and spending on rent, would be 0.6% lower in real terms, on average, than if there had been no rise. This delayed effect equates to 45% of the initial effect. The poorest 10% of people suffer a relative fall in their adjusted standard of living three times greater than the rest of the population.

JEL Classification: H23, H24, H31, I32
Keywords: VAT, inflation, consumption, inequality, poverty, microsimulation

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The authors would like to thank Didier Blanchet, Béatrice Boutchenik, Clément Carbonnier, Chantal Cases, Maëlle Fontaine, Laurence Rioux, Sébastien Roux, Jean-Luc Tavernier, Xavier Timbeau and Lionel Wilner for their comments and careful proofreading, as well as the team from the DREES Redistribution & Evaluation Unit, participants at INSEE's DSDS and D2E seminars and at the DREES seminar and finally two anonymous reviewers.
Received in March 2019, accepted in February 2020. Translated from the original version *"Effets de moyen terme d'une hausse de TVA sur le niveau de vie et les inégalités : une approche par microsimulation"*

Citation: André, M. & Biotteau, A.-L. (2021). Medium-Term Effects of a Rise in VAT on Standard of Living and Inequality: a Microsimulation Approach. *Economie et Statistique / Economics and Statistics*, 522-523, 5–21. https://doi.org/10.24187/ecostat.2021.522d.2037

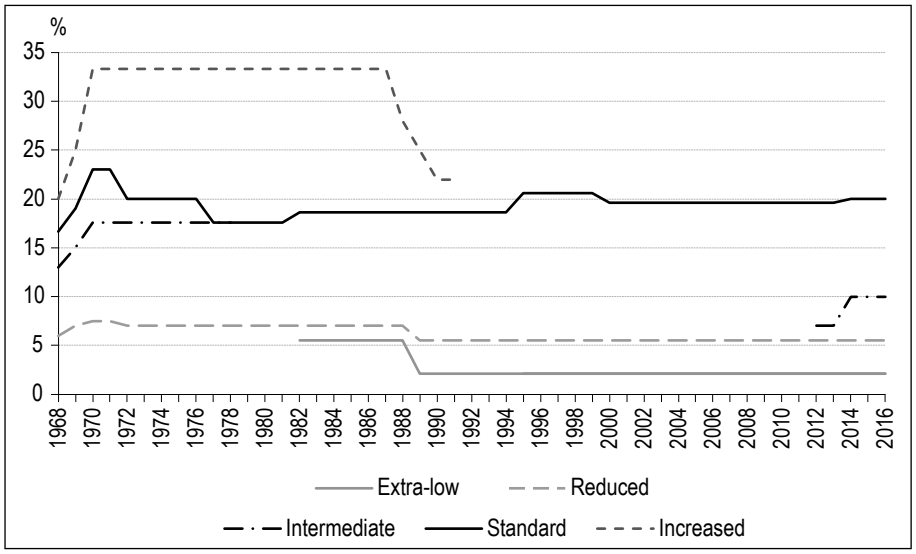
In France, the public debate on taxes is strewn with recurring subjects, one of the most symbolic being the income tax. However, over the last thirty years, the budgetary significance of this tax has reduced: its share in total social security and tax levies fell from 12% in 1981 to less than 7% at the start of the 2000s (André & Guillot, 2014), and has hovered between 6% and 7% ever since. This reduction has been accompanied by a switch from tax revenue towards two social contributions (the CSG, *Contribution Sociale Généralisée* – created in 1990 and the CRDS, *Contribution au Remboursement de la Dette Sociale* – created in 1996, aimed to reduce social security debt) accounting for a rise in the share of social security and tax levies, from 3% in 1996 to 10% in 2016 and even 13% in 2018, following the reform to switch part of the funding for social welfare from social security contributions to the CSG. But in fact, tax revenue depends largely on indirect consumption tax, principally Value Added Tax (VAT). VAT revenue alone represents about 16% of total social security and tax levies, with this proportion remaining stable since the 1990s. Unlike income tax, for which only 45% of tax households were liable in 2016, VAT is a tax paid by the entire population of consumers, including tourists and foreigners living in France.

This tax, which is central to tax revenues, was created by Maurice Lauré and first introduced in France in 1954. Since then, its structure has evolved on numerous occasions, owing to changes in the rates paid, tax bases and number of separate rates (see Figure I for the history of VAT rates since 1968). The latest change to date was introduced on 1st January 2014, having been passed in 2012 within the context of the Draft Finance Bill, raising the intermediate rate from 7% to 10% and the standard rate from 19.6% to 20%.[1] The standard rate applies to products and services not subject to any other specific taxes, i.e. the majority of goods and services. In the European Union, this standard rate differs by country: in 2016, it ranged from 17% (in Luxembourg) to 27% (in Hungary), standing between 20% and 23% in most Member States. Total tax revenue derived from VAT also differs, representing an average of 6.8% of GDP in OECD countries in 2016, varying from 0% in the USA – where there is strictly speaking no VAT but local retail sales taxes instead – to 9.4% in New Zealand. In Germany or in France, it represents 6.9% of GDP.

Furthermore, in the last decade, "Social VAT" plans, meaning a rise in VAT rates with revenue being allocated to social welfare, have fuelled debate about tax-benefit reforms (Besson's report, 2007; Fève *et al*., 2010; Carbonnier, 2012). The European institutions are seeking, then, to standardise Member States' VAT structures, notably by regulating the number of separate rates and setting minimum standard and reduced rates. However, standardisation of rates by means of European regulations is incomplete and the Court of Justice of the European Union regularly issues rulings on the matter to clarify the application of Council directives (*Conseil des prélèvements obligatoires* – CPO, 2015). Lastly, recent rises in VAT in Europe show

1. The expected additional revenue was estimated to be €5.2 billion. See the Finance Bill for 2014 (2013).

Figure I – **History of VAT rates in Metropolitan France**



Sources: Gilles & Fauvin (1996) for the years 1968-1995.

this to be a mechanism that is frequently used in times of budget consolidation (Gautier & Lalliard, 2013).

A change to the structure of VAT has budget consequences and an effect on household purchasing power. The redistributive nature of the tax-benefit system is assured both by levies (direct and indirect taxes and social security contributions) and by welfare benefits (family allowances, housing benefits, statutory minimum allowances, etc.). But the disposable income used by INSEE for studies on inequality and redistribution, is not measured net of indirect taxes such as VAT, and therefore is not well suited to assess their redistributive effects.[2]

Recent literature, however, has documented the redistributive effects of indirect taxes, both in the short term (Boutchenik, 2015) and the long term, i.e. over the lifecycle (Georges-Kot, 2015). In cross-section, VAT is regressive, with a burden-to-income ratio (i.e. amount of tax paid in proportion to disposable income) of over 12% for households in the bottom 10% of the standard of living distribution, compared with 5% for those in the top 10% (Boutchenik, 2015), primarily because the savings rate increases with income (Garbinti & Lamarche, 2014). When studying income over the entire lifecycle, regressivity would be less pronounced, as savings are a form of deferred consumption, thus resulting in payment of VAT.

But to the best of our knowledge, the medium-term distributive effects of a rise in VAT have not yet been investigated, effects which, on the face of it, are ambiguous since the short-term regressive effect is followed by medium-term adjustment mechanisms. The first repercussions from a rise in VAT rates are on consumer prices, entailing, on the one hand, a rise in the amount of VAT paid and, on the other, an increase in inflation. This general price rise is subsequently accompanied by an adjustment in earnings, particularly at the bottom of the wage distribution, and in the scales for social security benefits and direct taxes because they are index-linked. These delayed effects pass through three main channels:

- Wage adjustments, due on the one hand to the annual increase in the national minimum wage (SMIC, *Salaire minimum interprofessionnel de croissance*) which is directly linked to inflation, and its knock-on effect on higher wages, and on the other, to wage negotiations;

- Adjustment in tax-benefit scales and in some income replacement benefits, based on statutory or usual criteria for indexing them to inflation;

- The time lags caused by French legislation, since tax paid in year *N*+1 relates to income received in year *N* and some benefits and allowances received in year *N*+2 are also means-tested on the basis of income received in year *N*.

Consequently, the impact of a change in VAT rates will not be the same for all households, since this impact depends on the composition of their disposable income and their position in the distribution of standard of living. The short-term anti-redistributive effect might thus be partly counterbalanced by some medium-term redistributive effects.

The objective of this paper is to quantify the direct effects as well as some of the delayed effects caused by the adjustment in income and index-linking of tax-benefit scales to the inflation shock, following a rise in VAT. We use the INES[3] microsimulation model, based on data representative of the resident population of Metropolitan France in 2016 and, in particular, its indirect taxation module, which allows imputation of consumer spending in the ERFS (*Enquête sur les revenus fiscaux et sociaux*, a household income and tax survey) derived from the 2011 Household budget survey (*Enquête Budget de famille,* BDF) and simulation of rises in VAT (André *et al*., 2016).

This paper first reviews the short- and medium-term effects that, in theory, are expected from a rise in VAT. We present the literature on the transmission of VAT increases to prices and on the resulting adjustment in wages and income, as well as the legislation regarding the French tax-benefit system and index-linking of the related scales. The second section focuses on the microsimulation methodology, the data used and our main assumptions. An assessment of the effects of a rise in VAT on the main components of household disposable income and standard of living and on the main indicators of inequality is given in the third section; a sensitivity analysis of the results to the assumptions is available in the Online Appendices.[4]

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2. See André et al. *(2017). In National Accounts, indirect taxation is included in prices and therefore taken into account when measuring the purchasing power of gross disposable income.*

3. The INES model simulates the effects of French tax-benefit legislation; for detailed documentation, see https://www.insee.fr/fr/information/2021951

4. Link to the Online Appendices at the end of the paper.

1. Effects of a Rise in VAT are A Priori Ambiguous

1.1. The Regressive Nature of VAT in Cross-Section

VAT, relative to income, is anti-redistributive: the VAT burden-to-income ratio decreases with standard of living. While estimates of VAT burden-to-income ratio by decile differ slightly depending on the data used, calculation methods and years taken into consideration, the finding is always the same: the poorest individuals devote a greater proportion of their income to VAT than the most affluent.

Forgeot & Starzec (2003) estimate a VAT burden-to-income ratio (VAT paid relative to gross disposable income – i.e. before tax deductions) of 8.1% for the poorest 10% of the population and 3.4% for the most affluent 10%, whilst Trannoy & Ruiz (2008) conclude that the burden-to-income ratios are 11.5% and 5.9%, respectively.[5] Based on similar data and method to those we use but for a different year, the CPO estimated that, on average in 2015, the poorest 10% of the population allocated 12.5% of their disposable income to VAT, compared with 4.7% for the most affluent 10% (Boutchenik, 2015). We estimate a VAT burden-to-income ratio (relative to disposable income) of 13.1% in 2016 for the poorest 10% of the population and 7.4% for the most affluent 10%. In cross-section, VAT therefore contributes to less progressivity in the tax-benefit system (see André & Biotteau, 2019a, for a breakdown of standard of living adjusted for VAT and spending on rent).

1.2. Transmission of a Rise in VAT to Prices

A rise in indirect taxation, particularly VAT, proportionate to the value of goods and services excluding tax (known as an *ad valorem* tax) affects consumer prices. Depending on the retailers' behaviour as regards price adjustments, a change in indirect taxation often has a significant effect on prices.

The transmission rate of a rise in VAT to prices, measured as the price rise observed (controlling for other sources of price changes) relative to the "automatic" price rise in the case of full transmission is calculated as being between 70% and 80% on average (Carare & Danninger, 2008; Gautier & Lalliard, 2013). Gautier & Lalliard (2013) thus estimate that the creation in 2012 of the intermediate rate of 7% for certain products (compared with a reduced rate of 5.5%) had a transmission rate of 75% to consumer prices. They forecast that, in 2014, the increase in the intermediate rate from 7% to 10% and in the standard rate from 19.6% to 20% would have a transmission rate of 70% to 80%. For the rise in the standard rate of VAT from 18.6% to 20.6% in August 1995, they estimate a transmission to prices of 80%. This is in line with Carbonnier's (2008) estimates for subcategories of goods: the average transmission rate was estimated to be 53% for manufactured goods and 86% for unskilled-labour-intensive goods.

The empirical literature also reveals the relative rapidity of these adjustment mechanisms. The speed of transmission to prices is estimated at about three to four months (Carbonnier, 2008) for recent changes to VAT rates in France and Europe, with the majority of price adjustments being made during the month in which the rate change occurs (Gautier & Lalliard, 2013).

1.3. Medium-Term Effects: Adjustment of Income and Tax-Benefit Scales to Inflation, Countering the Short-Term Anti-Redistributive Effect

Following a rise in VAT rates and its partial transmission to prices, the rise in the general price level leads to delayed effects over several years on income but also on the allowances and benefits received and the taxes paid by households.

An inflation shock in year *N*, due to a rise in VAT, spreads in year *N* and subsequent years, to wages, other income and transfers, and to deductions via the following transmission channels:

- The increase in the minimum wage (SMIC) in year *N*+1;
- Wage negotiations and adjustment in primary income in year *N*+1;
- The index-linking of tax-benefit scales between year *N* and year *N*+2.

1.3.1. Adjustment in Wages and Some Sources of Income

The first channel is the increase in the minimum wage, which takes place as of 1st January of year

5. Although both studies are conducted on the basis of the 2001 Household budget survey, *the variation in burden-to-income ratios can be explained by the different methods used. In the first study, Forgeot & Starzec (2003) calculate VAT down to a detailed level of the Classification of Individual Consumption by Purpose (COICOP), including spending on maintenance work, regarded as investment in accordance with the National Accounts concepts but still subject to VAT. In the second study, Trannoy & Ruiz (2008) calculate VAT at a more aggregate level of the consumption classification and, above all, they calibrate the data on consumption (excluding spending on maintenance work) to National Accounts data to obtain effects of simulated reforms that are consistent in terms of financial amounts.*

N+1. The SMIC is index-linked to a component of inflation and on the basis of half of the increase in the purchasing power of the gross hourly wage for blue collar employees (*Salaire horaire brut des ouvriers et employés*), as measured in year *N*.

This rise automatically spreads throughout the wage scale and by means of collective wage agreements at industry sector level: negotiations allow adjustment of sector-specific minimum wages to conform with the SMIC level, in turn leading to a gradual knock-on effect on higher wages, so as to maintain wage hierarchies (Groupe d'experts sur le Smic, 2015; Fougère *et al*., 2016). Koubi & Lhommeau (2007) show that, over the 2000-2005 period, these effects on wages of an increase in the SMIC apply to wages up to 1.5 times the SMIC and therefore to the average wage (Cette *et al*., 2011). Moreover, these effects are greater when considered over a 12-month period rather than a quarter (Koubi & Lhommeau, 2007; Avouyi-Dovi *et al.*, 2010; Cette *et al*., 2011).

Inflation can also pass through directly to wages due to wage negotiations at sector, company or individual level. These negotiations most often take place at the end of year *N* or start of year *N*+1, and the majority of them translate into a change in wages at the start of year *N*+1 (about 50% of wage changes occurred in the first quarter during the 1998-2005 period; see Avouyi-Dovi *et al*., 2010; Le Bihan *et al*., 2012; Fougère *et al*., 2016). This second channel can explain how inflation affects wages above the level of 1.5 times the SMIC.

It should be noted that these effects of the spread of inflation to wages may depend on the economic cycle at the time of the wage negotiations. During a period of growth, wages have a greater probability of being increased, whereas rises will be more limited during a period of stagnation or recession. The spread effects may also depend on the cause of the inflation shock. An impact on energy prices or a rise in indirect taxation may increase business costs and lead to companies reducing their margins. This may ultimately translate into more limited wage increases.

Other sources of income that we regard as primary income, notably unemployment benefits and retirement pensions, are also index-linked, at least partly, to inflation or its components. Since 2016, basic retirement pensions and some supplementary pensions (for non-tenured public servants and most of the self-employed) are revalued on the 1st of October, following the average annual change in consumer prices, excluding tobacco, based on the last twelve monthly price indices (from August of year *N*-1 to July of year *N*). Public sector supplementary pensions (RAFP, implemented since 2005) are increased on a more discretionary basis, whereas those for private sector employees (AGIRC-ARRCO scheme) are index-linked to the inflation measurement, less one point.

The main source of income for the unemployed is the unemployment benefit known as ARE (*Allocation de retour à l'emploi*). It has three components: the fixed part of the daily benefit, the baseline daily wage and the minimum daily benefit, which are, in principle, revalued once a year at the decision of the UNEDIC board (the body in charge of managing the compulsory unemployment insurance system) which publishes the adjustment factor as of 1st July each year. Although this factor is the result of negotiations between the social partners and is often a rounded number (1% or 1.5% for example), the level of inflation is an element in the negotiations.

1.3.2. Tax-Benefit Scales are Index-Linked

Adjustments in the scales for benefits and deductions are indexed to the inflation rate for the current year or preceding years. Since 2016, the majority of social security benefits have been revalued as of 1st April, according to the average annual change in consumer prices, excluding tobacco, calculated on the basis of the last twelve monthly indices available in February (from February of year *N*-1 to January of year *N*). This is the case for the monthly basis for the calculation of family allowances (BMAF), and for various benefits (the RSA – means-tested minimum income; PA – a work-based benefit; the ASS – a special allowance for the unemployed; ASPA – an allowance for the elderly; and ASI – an invalidity benefit). Since 2014, some of the parameters for housing benefits have been adjusted as of 1st October, based on the year-on-year change in the most recent reference index for rent (IRL), i.e. for the second quarter.

In addition, under French legislation, income tax was paid up until 2018 one year after actually receiving the related income.[6] The tax scales applicable in year *N* for income in year *N*-1 (the lower thresholds for the different tax bands, minimum and maximum amounts for the flat-rate 10% deduction for business expenses, income caps for determining rebates, flat rate amounts

6. As from 1st January 2019, this time lag has been eliminated as part of the introduction of a contemporaneous tax payment system known as "deduction at source".

for rebates, etc.) are adjusted for projected inflation in year *N*-1, established around September of year *N*-1.[7]

Lastly, some means-tested social security benefits are determined on the basis of income received two years before. The corresponding upper limits on income for means-testing purposes are therefore uniformly adjusted as of 1st January of year *N*, according to the average annual change in consumer prices, excluding tobacco, in year *N*-2. This is the case for means-tested family allowances and benefits (birth allowance and basic allowance of PAJE – the early childhood benefit scheme – and family allowances since 1st July 2015) as well as housing benefits.

2. Method: a Microsimulation Approach Matching Consumption and Tax-Benefit Data

This paper aims to assess both the regressive direct effects of VAT and certain delayed effects associated with the adjustment in income and the index-linking of tax-benefit scales, which may partly compensate for them. We are seeking to remove the ambiguity surrounding the medium-term effects of a rise in VAT on household standard of living and inequality. Although our work is set within a specific medium-term framework, notably without wage-price spiral and with unchanged consumer behaviour, this is, to our knowledge, a completely new approach.

The assessment of the redistributive effects of a rise in VAT rates over three years is based on a specific use of the INES microsimulation model and its indirect taxation module (see André & Biotteau, 2019a, for an introduction to the model and André *et al.*, 2016, for the full methodology regarding the module). We thus propose an innovative methodology to quantify certain delayed effects that are not usually taken into account in the literature.

2.1. Imputation of Consumer Spending and Simulation of VAT

The consumption dataset used as the basis for calculating the VAT paid by households, is the INSEE's 2011 Household budget survey (BDF). These data are matched with National Accounts data (NA) and calibrated to make up for the underestimation of certain consumption items in the survey and so that they conform to the structure and consumption levels for the year being simulated, 2016. The disposable income derived from the BDF survey is also matched by standard of living decile with simulated disposable income, through the INES model, to keep a savings rate and burden-to-income ratios that are consistent after matching consumption and so as to be representative of disposable income for the simulated year.[8] This two-fold correction is indeed necessary in so far as we calculate and then impute fractions of consumption, as a function of disposable income, to 247 consumption items in the COICOP classification (Level 4).[9]

The imputation of the average structure of consumption (as a percentage of disposable income) to households in the INES sample is done by stratum. The three variables used to define these strata are: the standard of living decile; household type (five types: single, single-parent family, couple without children, couple with children and composite household); and housing occupancy status (two types: outright owner, owner paying mortgage or tenant). To ensure the strata are sufficiently large, certain strata are grouped together.[10] Imputation involves 71 strata.

Annual consumption amounts for each item are then recalculated based on each household's disposable income. Although households in the same stratum may have the same consumption structure and savings rate, they do not necessarily have the same levels of spending, which are directly dependent on household income.

Lastly, the amounts of VAT paid are calculated on the basis of the annual consumption amounts for each of the 247 items available in the COICOP classification, according to the following formula:

$$VAT = consumption \times \frac{\tau}{1+\tau}$$

where *consumption* is the total consumer spending in euros, including tax, and τ the VAT rate applicable to the consumption item considered.

Total imputed consumer spending stands at nearly €907 billion for 2016 and the simulated VAT totals amount to €97 billion (Table 1). Bearing in mind differences in coverage, these amounts are consistent with NA data. According to NA, in 2016, final individual consumption expenditure of all households (excluding sole

7. The Government occasionally decides to "freeze" the income tax scale. We adopt a similar convention to other INSEE studies of the reforms' effects (André et al.*, 2017), i.e. the usual situation is the one where this scale is adjusted according to inflation.*

8. Disposable income is not matched with gross disposable income as calculated by National Accounts, owing to concepts that are hard to reconcile. Moreover, using simulated microeconomic data allows for finer matching, by standard of living decile.

9. Classification of Individual Consumption by Purpose.

10. This concerns composite households, which only constitute a single stratum, and single-parent families, which are only defined on standard of living decile (André et al.*, 2016).*

Table 1 – **Proportion of consumer spending and VAT amounts simulated in INES by type of VAT rate in 2016**

VAT rates	Consumer spending (including VAT)		VAT amounts paid	
	Million€	%	Million€	%
Standard (20%)	473,543	52.2	78,924	81.1
Intermediate (10%)	120,381	13.3	10,944	11.3
Reduced (5.5%)	139,655	15.4	7,281	7.5
Super-reduced (2.1%)	5,430	0.6	112	0.1
Exemptions	167,697	18.5		
Total	906,705	100.0	97,260	100.0

Notes: Consumer spending on goods and services exempt from VAT consists of spending on rent, deposits and certain charges; medical consultations and services; parking; postal services; gambling; education and insurance services.
Reading Note: A total of €97 billion of VAT is simulated in the INES indirect taxation module. Standard-rate VAT accounts for over 80%.
Sources and Coverage: INSEE, *ERFS2014* converted to 2016 values, *BDF 2011* converted to 2016 values; INSEE-DREES, INES model and indirect taxation module. Metropolitan France, people living in "ordinary" households whose income is positive or nil and the reference person is not a student.

traders) amounts to €1,165 billion.[11] In the INES model, consumer spending is simulated for Metropolitan France for a coverage of so-called "ordinary" households (i.e. excluding people living in collective dwellings – e.g. retirement homes) whose income is positive or nil and whose reference person is not a student, and excludes sole traders. It thus covers 78% of the individual consumption calculated by NA. Moreover, as final individual consumption expenditure of households represents 67% of total final consumer spending (€1,741 billion), the proportion of VAT paid by households can be expected to be close to two thirds of total VAT (€154 billion in 2016, base 2014, semi-definitive data), as confirmed by our simulations.

2.2. Microsimulation of a Rise in VAT: Effects over Three Years

Microsimulation uses the INES microsimulation model developed jointly by INSEE and DREES (the statistical department of the French Ministry of Health and Social Affairs). Based on a sample representative of the resident population of Metropolitan France, this model simulates the various benefits and allowances to which each household is entitled, and the taxes and social contributions they have to pay. It is based on the ERFS, which combines socio-demographic data from the Labour Force Survey, and administrative data from the French national family allowance fund (CNAF), the national pensions fund (CNAV), the farmers and agricultural workers fund (CCMSA), as well as details from the income declarations made to the tax office to calculate income tax. In order to have three consecutive years of revenue to simulate French tax-benefit legislation, the ERFS is aged by two years, through margin calibration and individual change in income.

For this study, we use the 2014 ERFS to simulate 2016 legislation, based on revenue from 2014 to 2016. The INES model is static in the sense that individual professional or demographic trajectories are fixed and only the weight given to individuals may vary from year to year. However, it provides a three-year sequence, thus allowing the potential delayed effects of a rise in VAT to be taken into account. It provides a large number of individual variables on an annual basis to allow precise simulation of household standard of living and tax-benefit reforms. Matching with consumption data also allows *ex-ante* assessment of various indirect tax reform scenarios, including for VAT.

More specifically, we consider three situations, or "fictional" years, which we compare with the reference year, 2016:

- 2016 is year *N* of the inflation shock: the rise in VAT took place in 2016 (as of 1st January);
- 2016 is year *N*+1 of the shock: the rise in VAT took place in 2015;
- 2016 is year *N*+2 of the shock: the rise in VAT took place in 2014.

So, the years for which we simulate a rise in VAT are compared with reference year 2016, corresponding to the simulation of the legislation actually in force in 2016. This involves a slight dependence of yearly results on simulated legislation but to a negligible extent, owing to the difference calculation method. To be more precise, the effects subsequently shown are marginal effects, net of effects measured in preceding years. Effect *N* is thus the difference between the simulated situation in the year of the shock and the baseline situation; the *N*+1 effect is the difference between the counterfactual situation one year after the shock and the simulated situation the year of the shock; and lastly, the *N*+2 effect is the difference between the situation two years after the shock and the

11. Semi-definitive data, base 2014.

simulated situation one year after the shock. The total effect at the end of the three years equates to the sum of these annual marginal effects.[12]

The rise in VAT rates and the associated inflation shock are taken into account through their effect on the amount of VAT paid, income, tax-benefit scales and spending on rent (see Box). In the context of this study, we in fact use the concept of what is termed "adjusted disposable income", defined as disposable income less VAT and spending on rent. The adjusted standard of living is the adjusted household disposable income divided by the number of consumption units (referred to as CU hereafter, with 1 unit for the first adult in the household, 0.5 for other individuals aged 14 or over, and 0.3 for children aged under 14).

2.3. Main Simulation and Transmission Assumptions

We adopt a specific medium-term framework that does not take into account all the effects of adjustment in behaviour or macroeconomic ramifications (see below and Online Appendix C1). We also make assumptions about transmission of the rise in VAT to prices and of inflation to wages and other income (see below and Online Appendix C2).

2.3.1. Simulation Assumptions

The estimations are based on unchanged consumption behaviour (in terms of quantity consumed), in the course of the year of change in VAT rates and the two following years.

We assume that inflation as measured in February of year *N* incorporates the shock and that all the

12. This method enables reasoning other things being equal, since we are interested in the same population and same legislation. It also makes it possible to calculate total effects by adding together the marginal effects in each year. Another approach might consist of simulating an inflation shock in 2014, then measuring the consequences of it on inequality in standard of living in 2014, 2015 and 2016. However, this method would be unsuitable: over a three-year period, changes occur in legislation, demographic factors and the economic climate, which would then become confused with the effects of the simulated rise in VAT.

Box – **Simulation of a Rise in VAT over Three Years**

If 2016 is the year of the shock, year *N*, VAT rates are increased on 1st January of that year. Under the assumption made regarding transmission of VAT to prices, consumer spending and prices including tax are adjusted and the VAT amounts are recalculated, but consumer behaviour is assumed to remain unchanged in the face of the rise in prices (see André & Biotteau, 2019a, Appendix 3, for formal calculation details). We also deduce the related inflation shock. Then, during year *N*, the amounts for most social security benefits (RSA, PA, ASPA, ASI and AAH – means-tested minimum income, work-based benefit, special allowance for the elderly, invalidity benefit and special allowance for disabled adults, respectively, and allowances calculated as a percentage of the monthly basis for family allowances, BMAF, or housing benefits) are revalued as of the first of April or first of October, according to inflation measurements over the last twelve months, in accordance with the date and statutory criteria for their re-indexation. The inflation shock, on the other hand, has no contemporaneous effect on income before redistribution (earnings, income from assets or income replacement benefits, including retirement pensions and unemployment benefits), nor on other tax-benefit scales (income tax and means-testing conditions for certain benefits). Subsequently, the corresponding effect in this first year will be classed as a year *N* effect.

If 2016 is year *N*+1 after the shock, it is just as if the rise in the VAT rates took place in 2015. In 2016, earnings, income replacement benefits or income from assets (notably income from property) increase, in € at current prices, according to their estimated sensitivity to price level, specific to each type of income (see Online Appendix C2). This leads to a rise in social security contributions and social charges based on contemporaneous income. Alongside the adjustment of property income of owner households, spending on rent by tenant households is increased according to the same criterion, to account for transfers of income between the different households or institutions. Also in *N*+1, the tax scales (parameters for income tax paid in 2016 on income received in 2015) are raised in accordance with the usual criteria for re-indexing to inflation in year (including the shock, therefore) which generates a fall in income tax (as 2015 income has not yet been adjusted). In contrast, for means-tested benefits that are paid based on income received two years earlier, neither the income caps under the 2016 legislation nor the income taken into account are changed by the inflation shock of 2015. Subsequently, the corresponding effect in this year will be classed as a year *N*+1 effect.

If 2016 is year *N*+2 after the shock, the rise in VAT is then assumed to have taken place in 2014. The corresponding effect is subsequently called a year *N*+2 effect. An impact on income tax can be observed: the rise in current income in 2015 (*N*+1), following the inflation shock of 2014 (*N*), without any additional adjustment to the scales, translates into a rise in tax calculated in 2016 (year *N*+2) on the basis of the current income in 2015 (which offsets the fall in income tax that occurred in year *N*+1). In year *N*+2 there is also the additional effect on means-tested benefits (except for RSA and ASPA, for which means-testing is done on a quarterly basis). In fact, there is a two-year delay for the inflationary adjustment to the parameters for certain means-tested benefits. The rise in VAT has no other effect in year *N*+2, due to the absence of any delayed effect of inflation on income beyond a year and the assumed absence of any medium-term effect of wages on prices (wage-price spiral). So, income, tax-benefit scales and prices do not react again to the shock. We also assume that consumer behaviour remains unchanged. A three-year timespan, starting from 1st of January of year *N* seems reasonable in order to estimate the effects studied. Strictly speaking, it would be best to have a fourth year of income. However, the INES model is, by design, restricted to three years of income.

benefits and allowances concerned are consequently increased as from the year of change in the VAT rates. However, transmission of the rise in VAT to prices is assumed incomplete.

Another assumption is that the effect of the inflation shock on wages and income is deferred to year *N*+1. This delay may be explained by the different transmission channels (see Online Appendix C2). We also assume that the inflation shock in year *N* has no effect on wage dynamics in year *N*+2 or beyond. In addition, we assume the absence of an "inflationary spiral": the rise in wages in year *N*+1 does not lead to a new rise in prices in year *N*+1 or subsequent years. Consequently, there is no additional inflation shock in years *N*+1 and *N*+2.

Lastly, owing to the static nature of the model, the inflation shock does not give rise to macroeconomic effects such as potential recessive effects on employment.

2.3.2. Transmission Assumptions

In order to estimate the delayed effects of a rise in VAT, it is necessary to introduce a dynamic dimension, firstly to the transmission of the VAT rise to prices and inflation, and then to the spread of inflation to wages and other income. The effect of a rise in VAT on the general price level is calculated based on the relative weight of consumption taxed at the amended VAT rates in the consumer price index, with an assumed rate of transmission to prices of 80%. The elasticity of hourly wages to prices is calculated using augmented Phillips equations, linking wage growth rate negatively to the unemployment rate (level and variation) and positively to inflation, by hourly wage decile. There is a lag in the adjustment of hourly wages to prices, no contemporaneous effect of inflation on wages is observed and the effects do not last beyond *N*+1. Furthermore, price elasticity of hourly wages in *N*+1 decreases with the hourly wage level: unitary at the bottom of the distribution and becoming not significantly different from 0 in the top 20% of the hourly wage distribution (see Online Appendix C2).

Income replacement benefits are indexed in *N*+1 according to the usual or statutory rules on revaluation (see Online Appendix C1 on the adjustment of wages and certain income). The elasticity of other income to prices is calibrated. In the case of income from assets, only income from property and incidental income (mostly income from rental of furnished accommodation) react with unitary elasticity to a rise in prices; other forms of income from assets are assumed not to react. Lastly, self-employment income is assumed to adjust, with elasticity of 0.5 in *N*+1, except for farm income (see Online Appendix C2).

3. In the Medium Term, a Rise in VAT Slightly Increases Inequality in Standard of Living and Poverty

We present the results of a central scenario, representing a 3-point increase only in the standard rate of VAT, increasing it from 20% to 23%, with a rate of transmission to prices equal to $\alpha = 0.8$, which generates a rise in inflation by an additional 1.07 points.

We compare adjusted disposable income (defined as total income before redistribution, less direct and indirect deductions and spending on rent, plus social security benefits) and its components in the baseline situation, without any increase in VAT, and in the situation with a rise in VAT, over a three-year period. We then detail the annual effects on average adjusted income and review the adjustment mechanisms and their timing. Lastly, we present the heterogeneity of the effects, along the adjusted standard of living distribution,[13] and the change in the main inequality indicators.

To test the sensitivity of results to changes in VAT rise or to assumptions, we simulate several VAT rise scenarios of varying scale and composition, combining the assumptions on elasticity of income to prices and on transmission of the rise in VAT to the general price level. We analyse the main differences with the central scenario in Online Appendix C4.

3.1. Annual Effects and Total Medium-Term Effect on Adjusted Disposable Income and its Components

Under the assumptions in the central scenario, the effects on total adjusted disposable income and its components are given in Table 2. The rise in VAT would generate a tax revenue surplus of €11.7 billion in the first year in Metropolitan France (within the scope of "ordinary" households).[14] Income and scales for tax-benefit transfers would then adjust to inflation, partly that same year and then in the following years.

13. See André & Biotteau (2019b) for results by usual standard of living distribution (i.e. disposable income – income before redistribution, plus social security benefits and minus direct tax – by CU, without taking into account indirect taxes and spending on rent).

14. The assumption of less than full transmission to prices is based on a value of coefficient α of less than 1. This corresponds to a non-null impact hypothesis for businesses, i.e. the price net of tax may be adjusted downwards (see André & Biotteau, 2019a).

Table 2 – **Annual effects and total medium-term effect of a 3-point rise in the standard rate of VAT on components of adjusted household disposable income**

In € billion

	In year *N*	In year *N*+1	In year r *N*+2	Total
Income before redistribution (A)	0.0	6.7	0.0	6.7
Wages	0.0	3.5	0.0	3.5
Retirement pensions	0.0	2.2	0.0	2.2
Unemployment benefits	0.0	0.2	0.0	0.2
Other income (i)	0.0	0.7	0.0	0.7
Deductions (B)	11.7	-0.8	1.1	12.1
Direct tax	0.0	-1.1	1.1	0.0
Social security contributions	0.0	0.1	0.0	0.1
Other social contributions (CSG/CRDS)	0.0	0.2	0.0	0.2
Value added tax	11.7	0.0	0.0	11.7
Benefits (C)	0.6	0.3	0.2	1.1
Family allowances & benefits	0.2	0.1	0.1	0.3
Housing benefits	0.1	0.2	0.1	0.3
Statutory minimum allowances & PA (employment incentive)	0.4	0.1	0.0	0.4
Spending on rent (D)	0.0	0.7	0.0	0.7
Adjusted disposable income (A - B + C - D)	-11.1	7.1	-0.9	-5.0

(i) invalidity pensions, investment income and annuities, income from property and incidental income, foreign income, and marketable securities.
Notes: Effects in year *N*, *N*+1 and *N*+2 are marginal effects, net of effects measured in the preceding years. Year *N* effect is the difference between the simulated situation in the year of the shock and the baseline situation; the *N*+1 effect is the difference between the counterfactual situation one year after the shock and the simulated situation in the year of the shock, and the *N*+2 effect is the difference between the situation two years after the shock and the simulated situation one year after the shock. The total effect at the end of the three years is the sum of these annual marginal effects.
Reading Note: in total, after three years, household disposable income falls by €5.0 billion in real terms, resulting from a total increase of €6.7 billion in income before redistribution and of €1.1 billion in social security benefits, and a total loss of €12.1 billion related to direct and indirect taxes and of €0.7 billion from the rise in spending on rent.
Sources and Coverage: See Table 1.

In total, after three years, once these delayed effects are taken into account, adjusted household disposable income would be €5.0 billion less in real terms than it would have been without the rise in VAT. Therefore, the medium-term delayed effects make up for about 55% of the initial impact suffered by households.

Income before redistribution[15] is ultimately €6.7 billion higher (the rise occurring in *N*+1, due to adjustment in income). That same year, tenants' spending on rent increases with inflation by €0.7 billion, which increases owners' income from property. The total income tax effect is neutral because although the effects in *N*+1 and *N*+2 each amount to more than €1 billion, they cancel each other out. Lastly, in total, social security benefits increase by €1.1 billion, i.e. 9% of the initial impact of €11.7 billion on disposable income.

3.2. Breakdown of Average Effects on Adjusted Standard of Living and its Components, by Year

In Tables 3 and 4, we present the average effects per year of the rise in VAT simulated in the central scenario, on each of the adjusted standard of living components. We review the effect, in percentage terms and in amounts, on each component and their contribution to the total effect on adjusted standard of living.

At the end of the three-year sequence, the rise in VAT leads to a 0.6% fall in the average adjusted standard of living in real terms, i.e. about €114 a year (per CU). This fall can be explained mainly by the rise in indirect taxes, namely VAT. VAT increases by 12%, or an average of €269 per CU per year and contributes the most to the fall in standard of living (-1.4 percentage points,[16] Table 4). There is very little variation in other direct deductions in total. There is little change in social security benefits (+1.7% or €24 per CU per year on average) and this does not make up for the fall in standard of living.

Several dynamics explain this total medium-term effect on adjusted standard of living. Firstly, the biggest real term deterioration in standard of living is in year *N* of the shock. Indeed, VAT increases whereas nominal primary income has not yet been adjusted. Looking at social security

15. In this study, income before redistribution, constituting the primary income, includes all wages and salaries, self-employment income and income from assets but also alimonies, invalidity pensions, unemployment benefits, retirement pensions and life annuities. This outline corresponds to the income declared to the tax authorities to calculate income tax. These are magnitudes included within primary income and therefore not simulated by the INES model.

16. The initial rise in the standard rate is of 3 points (from 20% to 23%), i.e. a rise of about 12% if the transmission rate to prices including tax is 80%. VAT, on average representing 11% of adjusted standard of living, counted negatively (cf. Table 1), contributes a fall of -1.4 percentage points in standard of living.

Table 3 – **Annual effects and total medium-term effect of a 3-point rise in the standard rate of VAT on components of the average adjusted standard of living**

	Effect in € by consumption unit				Effect in %			
	In year *N*	In year *N*+1	In year *N*+2	Total	In year *N*	In year *N*+1	In year *N*+2	Total
Nominal primary income (A)	0	155	0	156	0.0	0.6	0.0	0.6
Deductions (B)	269	-18	26	277	4.6	-0.3	0.4	4.8
Direct tax	0	-25	25	1	0.0	-1.2	1.3	0.0
Social Security contributions	0	3	0	3	0.0	0.5	0.0	0.5
Other social contributions (CSG/CRDS)	0	4	0	4	0.0	0.4	0.0	0.4
Value added tax	269	0	0	269	12.1	0.0	0.0	12.1
Benefits (C)	13	7	4	24	0.9	0.5	0.3	1.7
Family allowances & benefits	4	1	2	7	0.6	0.2	0.4	1.2
Housing benefits	1	4	2	8	0.4	1.2	0.5	2.1
Statutory minimum allowances & PA employment incentive	8	2	0	10	1.5	0.3	0.0	1.8
Spending on rent (D)	0	17	0	17	0.0	1.1	0.0	1.1
Adjusted standard of living (A - B + C - D)	-256	163	-22	-114	-1.3	0.8	-0.1	-0.6

Notes: See Table 2.
Reading Note: Social security benefits increase by an average of €13 per CU in the year of the shock (i.e. a rise of 0.9%), then by an additional €7 the following year (i.e.+0.5%) and by a further €4 in the third year (i.e. +0.3%). In total, three years after the rise in VAT, following adjustment mechanisms, benefits therefore increase by an average of 1.7%, or €24 per CU.
Sources and Coverage: See Table 1.

Table 4 – **Contribution to the annual effects and total medium-term effect by average adjusted standard of living component**

	Contribution to the total effect (in percentage points)			
	In year *N*	In year *N*+1	In year *N*+2	Total
Nominal primary income (A)	0.0	0.8	0.0	0.8
Deductions (B)	-1.4	0.1	-0.1	-1.4
Benefits (C)	0.1	0.0	0.0	0.1
Spending on rent (D)	0.0	-0.1	0.0	-0.1
Adjusted standard of living (A + B + C+ D)	-1.3	0.8	-0.1	-0.6

Notes: See Table 2.
Reading Note: In the first year, standard of living falls by 1.3%. There is a contribution of -1.4 percentage points from the rise in VAT and of 0.1 percentage point from the rise in social security benefits.
Sources and Coverage: See Table 1.

benefits, the mechanisms for adjusting them are at work for three quarters of the year, from April onwards, through the amounts paid as family benefits and statutory minimum allowances (RSA, PA, ASPA, ASI and AAH – cf. 1.3.2.) and for a quarter of the year, from October onwards, through housing benefits. The statutory minimum allowances and PA therefore adjust more (+1.5%) than housing benefits (+0.4%). This 0.9% rise in benefits represents an average of €13 per CU per year. In year *N* of the shock, adjusted standard of living falls by 1.3% (or about €260 per CU per year), i.e. a loss of -1.4 points linked to the rise in VAT and a gain of +0.1 following the increase in benefits.

The following year, in *N*+1, the dynamics of the medium-term effects come into play, leading to a rebound in standard of living of about 0.8%, or €160 per CU per year, almost entirely brought about by the adjustment in income. As not all wages adjust to the same proportion and given that not all income is indexed to inflation, primary income increases by an average of 0.6%, or about €155 per CU per year. However, this causes a rise in social security contributions and taxes (+€7 per CU per year, on average). But income tax decreases slightly owing to the one-year time lag between income tax return and collection of that tax: while the scales in *N*+1 (defining tax bands, in particular) are indexed to the inflation rate of the previous year, therefore to the shock, the income taken into account is also that of year *N* and has not yet been adjusted. This results in a slight increase in standard of living of about €25 per CU per year, on average. The effect of increases in the amounts for social security benefits can still be seen in *N*+1, in particular for housing benefits, which increase by 1.2%. However, as benefits have a limited weight in the average standard of living, they do not contribute to its rise. Lastly, spending

on rent adjusts in *N*+1, as does income from property and incidental income: these sources of income represent a partial redistribution within households between owners and tenants.[17] They increase by 1.1%, that is, the same magnitude as the inflation shock, and lower the average standard of living by -0.1 point.

Lastly, in *N*+2, the additional effects are reduced and are associated largely with lags in indexation. Income tax increases slightly, as it is calculated on the previous year's income, now adjusted, without the scales being indexed to additional inflation again. Social security benefits also increase slightly (+0.3%) because the ceilings for means-tested benefits are indexed to the inflation shock, but the incomes taken into account are not yet index-linked. In the third year after the rise in VAT and the impact on prices, the standard of living falls marginally by 0.1% in real terms (or about €20 per CU per year), with the rise in deductions prevailing (contribution of -0.1 point, compared with other components' null contribution).

3.3. The Heterogeneity of Effects and Redistribution

We now analyse the effects differentiated by position on the adjusted standard of living scale. The mechanisms for adjusting income and tax-benefit scales as well as the rise in indirect taxes can, indeed, work in different ways, depending on the structure of household income or household consumption. Detailed results by adjusted standard of living component and by year are shown in André & Biotteau (2019a).

3.3.1. Total Effect along the Adjusted Standard of Living Distribution

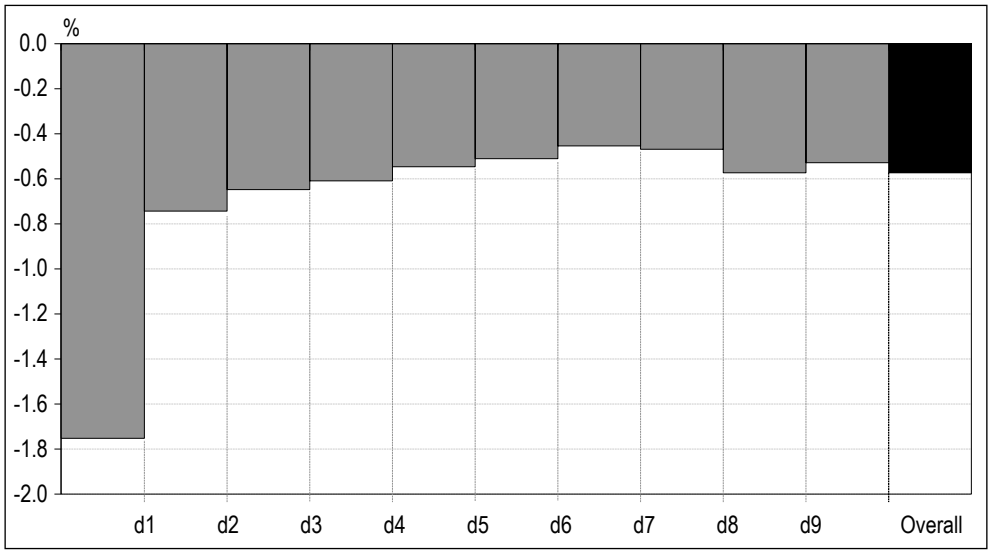
VAT rises and their consequences lead to a fall in adjusted standard of living for the entire population. However, this fall is more pronounced for the poorest 10%: their adjusted standard of living falls by 1.8% compared with a maximum fall of 0.7% for the rest of the population (Figure II).

However, although the standard of living for households as a whole falls and in similar proportions for most of them, the contributions made by income before redistribution, direct and indirect levies, social security benefits and spending on rent differ noticeably according to adjusted standard of living.

The poorest 10% people see their adjusted standard of living fall by an average of €86 (Table 5), which is largely explained by the rise in VAT (-€158 per CU). The 10% most affluent experience an average fall in standard of living of €273. The average fall in standard of living for median households is about €88. All households experience a fall in the first year (-€119 in the bottom 10%, -€231 between the fourth and fifth deciles and -€495 in the top 10%) and make up for some of their loss in the second year (+€28 for the bottom 10% and +€309 for the top 10% of the population). In the third year, there are

17. There is indeed a transfer between tenant and owner households but this is not neutral. In fact, households in the sample that receive income from property are not necessarily private landlords to whom the tenants pay rent, and the tenants in the sample may also pay rent to institutional, public or private landlords.

Figure II – **Total medium-term effect of a 3-point rise in the standard rate of VAT on the average adjusted standard of living, by adjusted standard of living**



Reading Note: Following a 3-point rise in the standard rate of VAT, the adjusted standard of living for the poorest 10% of the population falls by nearly 1.8%.
Sources and Coverage: See Table 1.

Table 5 – **Annual effects and total medium-term effect of a 3-point rise in the standard rate of VAT on the average adjusted standard of living, by adjusted standard of living**

In € per CU

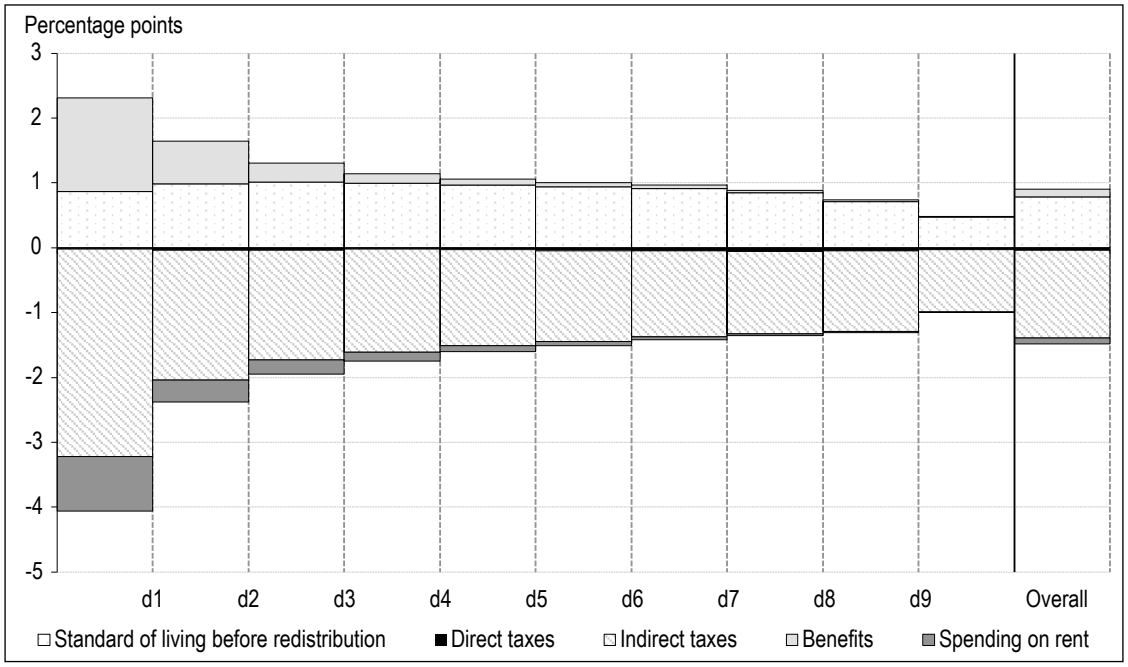
	In year *N*	In year *N*+1	In year *N*+2	Total
<d1	-119	28	5	-86
d1 to d2	-146	74	5	-67
d2 to d3	-178	104	-1	-75
d3 to d4	-208	126	-3	-84
d4 to d5	-231	152	-9	-88
d5 to d6	-254	181	-22	-94
d6 to d7	-274	208	-30	-96
d7 to d8	-304	223	-34	-114
d8 to d9	-363	239	-45	-169
>d9	-495	309	-87	-273
Overall	-256	163	-22	-114

Notes: See Table 2.
Reading Note: The standard of living for the poorest 10% of people falls by an average of €119 the year of the rise in VAT, then increases by €28 and again by €5 in the following two years, thus constituting an overall average fall in standard of living of €86.
Sources and Coverage: See Table 1.

nil or negligible gains for the 50% least well off of the population, whereas losses increase with standard of living for the 50% the most affluent (Table 5 and Figure II).

The extent to which the various adjusted standard of living components contribute to its overall fall differ by standard of living (Figure III). VAT and spending on rent contribute the most to the fall in standard of living for the 20% of the population who are least well-off (by -3.2 points and -0.8 points respectively for the poorest 10% and by -2.0 points and -0.3 points respectively for the next 10%), as they carry relatively more weight. Conversely, the index-linking of benefits also has a decisive influence for these least well-off 20% of people (contribution of +1.4 points and +0.7 points respectively). For those higher in the standard of living distribution, this index-linking does not make up much for the fall in standard of living, due to the decreasing influence of benefits on their standard of living. Lastly, the contribution of primary income follows a bell-shaped distribution according to standard of living. Adjustment in income is less favourable for people with

Figure III – **Breakdown of the total medium-term effect of a 3-point rise in the standard rate of VAT on the average adjusted standard of living, by adjusted standard of living**



Reading Note: Following a 3-point rise in the standard rate of VAT, indirect taxes contribute a fall of -3.2 percentage points in the adjusted standard of living for the poorest 10% of the population, while benefits contribute a rise of +1.4 points.
Sources and Coverage: See Table 1.

the highest standard of living, owing to less index-linking for the highest wages and the higher proportion of income from assets, which adjusts less than wages to the rise in prices.

There are multiple mechanisms explaining the overall negative effect for the poorest 10% of the population. Firstly, the rise in spending on rent plays a major role: by design, people with the lowest adjusted standard of living are those with the lowest disposable income, paying significant amounts of VAT and with high rent costs. Additionally, their primary income does not fully adjust as it is partly made up of unemployment benefits (18% of primary income compared with an average of 3% for the population as a whole) and supplementary pensions for private sector employees. These two components are not fully indexed to the rise in prices. Similarly, not all employees in this population category are necessarily paid the minimum wage. Income before redistribution therefore only increases by an average of 0.8% for an inflation shock of 1.1%. In addition, even if 100% of the adjusted disposable income consists of benefits (see André & Biotteau, 2019a), means-testing of RSA and PA includes housing benefits and family allowances. This partly limits the effects of index-linking due to high marginal tax rates in this part of the distribution of income. Therefore, for the poorest 10%, the indexing of benefits does not totally make up for the rise in VAT and spending on rent.

Lastly, households with the lowest adjusted standard of living devote a larger proportion of their adjusted disposable income to VAT (27% compared with an average of 11%). Taking into account their entire consumer spending, the average savings rates for the poorest 30% of the population are negative (see André *et al.*, 2016). The significant negative effect therefore persists despite all the indexing and adjustment mechanisms. It depends partly on consumption behaviour, differentiated by standard of living.

3.3.2. Effects on Inequality Indicators

Three years after a 3-point rise in the standard rate of VAT, the rise in indirect taxes, associated with the dynamics of income and tax-benefit scales, contributes to a slight increase in inequality in adjusted standard of living. Table 6 shows the effects for the central scenario.

All inequality and poverty indicators increase in the year of the rise in VAT, as this has the strongest effect on the poorest in the first year. Then they ultimately increase to a lesser degree in the medium term, owing to the delayed effects more or less favourable depending on standard of living. The d9/d1 inter-decile ratio increases slightly in the medium term (+0.3%) as the delayed effects largely compensate for the initial effect. In the same way, the initial rise of +0.4% in the Gini index and rise of +0.3% in the poverty rate goes to +0.2% at the end of the three years analysed, under the assumptions made for the central scenario and the wage adjustment.[18] The p95/p5 inter-percentile ratio increases in a slightly more significant way in the first year (+1.3%) and in the medium term (+1.0%), as the delayed effects only partly compensate for the initial effects. The poverty gap increases more in the medium term than in the short term (+1.4%, or 0.4 points), due to the fall in standard of living for the poorest 10% of the population.

By way of comparison, the variants presented in Fontaine & Sicsic (2018), show that a 3% reduction in the base rate of RSA (i.e. a monthly fall of about €16) entails stability in the poverty threshold and rate and in the Gini index, as well as a 0.01 point rise in the inter-decile ratio and 0.4 point rise in the poverty gap.

Furthermore, comparing the year *N* effect and the total effect also allows identifying the

18. In the alternative simulations shown in Online Appendix C4 (and detailed in André & Biotteau, 2019a), these indicators may increase even more if the rise in VAT is more significant and especially if there is a greater and more uniform adjustment in wages according to wage level.

Table 6 – **Annual effects and total medium-term effect of a 3-point rise in the standard rate of VAT on the main indicators of inequality in adjusted standard of living**

	In year *N*		In year *N*+1		In year *N*+2		Total effect	
	Points	%	Points	%	Points	%	Points	%
d9/d1 inter-decile ratio	0.03	0.6	0.00	0.0	-0.01	-0.3	0.01	0.3
p95/p5	0.10	1.3	0.01	0.1	-0.02	-0.3	0.08	1.0
Gini index	0.001	0.4	-0.000	-0.1	-0.000	-0.1	0.001	0.2
Poverty rate	0.1	0.3	0.0	0.0	-0.0	-0.1	0.0	0.2
Poverty gap	0.1	0.5	0.2	0.9	0.0	0.0	0.4	1.4

Notes: See Table 2.
Reading Note: Following a 3-point rise in the standard rate of VAT, the inter-decile ratio increases by 0.03 point in the first year (or +0.6%), stabilises in the second year before falling by 0.01 point in the third year (i.e. -0.3%). In total, it increases by 0.01 point (+0.3%).
Sources and Coverage: See Table 1.

role of the delayed effects. For instance, the p95/p5 inter-percentile ratio reduces very slightly between year *N* and the total effect, as the marked rise in the first year (linked to a clearly more pronounced drop in p5 than in p95, due to the greater increase in VAT paid, relatively speaking, by the least well-off) is not much compensated for in the following two years. The poverty gap changes more noticeably in the medium term (+1.4%) than in the first year (+0.5%), as its increase is accentuated in the second year (the median adjusted standard of living for poor people increases less than the poverty threshold, as the effects of the increase in income and social security benefits are limited by the rise in spending on rent) and is only very partially compensated for in the third year. So, even though the overall delayed effects are favourable to households as a whole, the poorest remain the poorest and are more affected, relatively speaking, by the rise in VAT and increased spending on rent.

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The results of this study help inform public debate and supplement existing work on the consequences of rises in VAT by taking into account both direct and medium-term delayed effects: the short-term anti-redistributive effects are partly counterbalanced by these delayed effects. In the medium term, a rise in VAT slightly increases inequality in standard of living and poverty.

In the central scenario, three years after a three-point rise in the standard rate of VAT, the average standard of living, adjusted for VAT and spending on rent, is 0.6% lower than it would have been in the absence of said rise in VAT. This fall represents about 45% of the direct short-term effect; in other words, the medium-term delayed effects make up for about 55% of the initial impact suffered by households. Depending on the assumptions made on the sensitivity of income to inflation and on the transmission of the VAT to prices, this fall in the average standard of living ranges between 0.3% and 0.8%, or a reduction in standard of living in the medium term of between €70 and €155.

There is little difference in this loss of adjusted disposable income by initial standard of living: it is between 0.5% and 0.6% for 90% of the population (above the lowest adjusted standard of living decile). But it is mainly linked to the rise in VAT and, to a lesser extent to spending on rent (which increases with inflation), for the poorest households; it is more related to insufficient adjustment of income before redistribution for the most affluent households. The poorest 10% stand out, as the relative fall in their standard of living is more than twice that of the rest of the population.

In the medium term, a rise in VAT, combined with the dynamics of income and tax-benefit scales, slightly increases inequality in adjusted standard of living and poverty. The magnitude of the impact depends partly on the indicator used. All inequality and poverty indicators increase in the year of the rise in VAT. In the case of the inter-decile ratio (d9/d1), the Gini index and poverty rate, this initial effect is then almost entirely offset by the indirect effects and the indicators are ultimately almost stable. The p95/p5 inter-percentile ratio increases more significantly in the medium term, with little compensation for the first-year rise. Only the poverty gap increases more in the medium term than in the short term, which is a consequence of the fall in standard of living of the 10% of people on the lowest income, for whom the indexing of benefits does not fully make up for the rise in VAT.

The effects on poverty and inequality presented in this study do not include any potential public spending made possible by the extra tax revenue. Redistributive changes in transfers such as increased benefits or targeted lower deductions would have opposite effects.

Nor do these estimates take account of credit constraints, which may differ depending on standard of living; now in the first year, a rise in VAT has a greater effect, relatively speaking, on the standard of living of households with a modest income. Owing to time lags between the means taken into account and payment of certain benefits, the adjustment period for standard of living can extend to up to two years after the rise in VAT for the lowest income households.

Generally, these results are due to the mechanisms of transmission to income and tax-benefit scales, based on the indexing rules and wage adjustment mechanisms. They are therefore specific to the characteristics of the French tax-benefit system. In their absence, the unequal first round effects would only be more persistent in the medium term. In the context of an income tax deducted at source and where benefits are paid based on contemporaneous income or with a reduced time lag, the total medium-term results would be identical, with the only changes being in terms of the time frame for effects between years *N*, *N*+1 and *N*+2.

Additionally, these results are based on specific assumptions, drawn from earlier work on transmission of VAT rises to prices and on the adjustment of income to inflation, and are dependent on the INES microsimulation model. They cannot be applied to other, even apparently, similar situations. So, any cut in VAT, such as the "sit-down restaurant VAT rate" for example, or concerning other specific products, cannot be assessed based on these results. The same applies for an overall cut in the standard rate or in other rate types: the effect of reduced rates are not symmetrical to the rise-related effects assessed here. In particular, given downward wage rigidity, the asymmetry in VAT cuts and rises partly results from these differences in the transmission of inflation shocks to wages. This asymmetry has been documented by Benzarti *et al.* (2017) on the basis of European data, empirically showing that prices are adjusted three to four times more following a rise in VAT than after a cut. Other rigidity mechanisms may limit downward transmission: Benzarti & Carloni (2017) thus show that the reduction in VAT for sit-down restaurants mainly benefited restaurant owners and had no notable effect on prices.

Nor can the analysis be applied to the rise in excise duty on tobacco that was introduced in 2018. While similar in principle, this rise in indirect taxation of consumer goods is nevertheless different as regards these effects, primarily because tobacco prices are excluded from the official measure of inflation and therefore from statutory adjustment criteria. Moreover, it is unlikely that wage negotiations consider this rise concerning a particular type of goods. Similarly, any rise in VAT for a specific sector or particular goods will have different effects from those presented in this study, particularly in the absence of any notable effect on inflation and therefore adjustment in income and benefits.

On the other hand, the method presented in this paper might be applied to a scenario in which the intermediate rate is aligned to the standard rate, i.e. a ten-point rise in the former. However, it must be remembered that our assumptions do not include any adaptation in consumer behaviour, which might be more pronounced in the event of the doubling of the intermediate rate. The estimated effects on total adjusted disposable income might therefore be even greater, while estimated effects on the distribution of this income and on inequality might be even smaller, considering that the most affluent households have more margin for manoeuvre to adjust their consumption and thus soften the effect of the rise in VAT.

A natural extension to this study might therefore be to introduce a range of behavioural assumptions, in which consumers would alter their consumption depending on the products under consideration. Other areas for expansion might consist in strengthening the macroeconomic assumptions, notably by including a wage-price spiral or by introducing an additional level of variability in the scenarios through transmission rates of the rise in VAT differentiated by product type and VAT rate (Carbonnier, 2008). □

Link to Online Appendices: https://www.insee.fr/en/statistiques/fichier/5347210/ES-522-523_Andre-Biotteau_Online_Appendices.pdf

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