The surplus-value rate and the structure of the tax system

Ferran Sancho
Department of Economics and Barcelona School of Economics
Universitat Autònoma de Barcelona
08193-Bellaterra, Spain
ferran.sancho@uab.cat
ORCID ID: 0000-0002-6200-116X

Abstract: We explore the relationship between the tax system and the surplus-value rate. Since government policy directly conditions the economic environment, any variations in the tax rates will affect disposable income. This, in turn, translates to consumption adjustments that give rise to changes in the surplus-value rate. For the evaluation of changes from the baseline figure, we argue that the correct data set needs to be more comprehensive than the input-output and national accounts data. The reason is that they do not include, in a coherent and integrated manner, all the tax flows taking place in the economy. A Social Accounting Matrix (SAM), however, does include all the tax flows affecting households (indirect taxes on consumption, direct taxes on income, and personal labour taxes). Therefore, the SAM provides the basis for counter-factual calculations of the surplus-value rate that a standard input-output table, for example, cannot provide. We illustrate the possibilities of the analysis using a recent SAM of Spain.

Keywords: Surplus-value rate, Social Accounting Matrix, Taxation and consumption, Policy indicators.

JEL codes: B51, C54, H22

I. Introduction

The surplus-value (or exploitation) rate is a central concept in Marxian economics. In a quantitative sense, it measures the extent of the implicit unequal exchange for labour that occurs in the production of commodities (Roemer, 1985). In a theoretical and more profound sense, it attempts to provide a platform for a general critique of the capitalist organisation of society. Whether or not this broad goal is achieved has been object of debate. Cohen (1979) claims that since exploitation is based on the labour theory of value and this theory turns out to be unsound, the concept of exploitation becomes irrelevant. Cohen's position is that labour itself does not produce value; instead, labour produces objects that have value. Thus, it is the appropriation of part of the value in the object that gives rise to exploitation. Value, in Cohen's view, is market value not labour value and this displaces appropriation to market mechanisms rather than to any inherent unequal exchange of labour of the way indicated by Roemer. We agree with Cohen (and many other authors) that the labour theory of value does not provide a basis for the determination of market values, or prices, but we disagree regarding the alleged lack of usefulness of the determination of labour values. Firstly, labour values can in fact be quantitively determined and they provide an adequate accounting for total congealed labour (Morishima, 1973, ch. 1; Miller and Blair, 2009, ch. 6; Vegara, 1979, ch. 3). Secondly, the labour value accounting proves to be useful in elucidating properties of the dynamics of capitalism (Vegara, 1977; Vegara, 1979, ch. 8).

Roemer (1985), in turn, concludes that exploitation theory does not provide the needed basis for a sensible critique of the evils of capitalism. From a purely theoretical economics perspective, exploitation of labour is not special since all basic commodities can be seen to be equally exploited (Vegara 1979, ch. 3). Similarly, Roemer also argues that the inequality of access to the ownership of means of production is not correctly measured by the rate of exploitation. Finally, outside economics proper, and according to Roemer domination and alienation have little to do with actual exploitation mechanism—even if they are key societal issues.

Be as it may, the numerical value of the surplus-value rate at a given moment yields information on a piece of the state of socioeconomic affairs that is worth knowing, if only from the descriptive perspective that a numerical estimate provides. There have been, surprisingly, fewer than expected attempts to empirically evaluate the surplus-value rate. We report some of them. Wolff (1975) used input-output data for Puerto Rico and evaluated the surplus-value rate at 0.97 (for 1948) and 0.92 (for 1963). His methodological approach is based on using input-output data in current prices, transforming them into value (i.e., labour value) using a proportionality scheme and then using the transformed data to calculate the rate of surplus-value. In a later paper with broader objectives, Wolff (1979) uses again input-output data to estimate the surplus-value rate for the US economy in four years (19–47, 58, 63, 67). He finds values of the rate slightly above 1 in all four cases. The same author updates and expands his data in Wolff (1986), also for the US economy but now for six years that include the previous four plus 1972 and 1976. The average rate of surplus-value turns out to be 0.99 with the lowest value of 0.75 (in 1976) and the highest one of 1.08 (in 1963).

Moseley (1988) revises Wolff's results arguing the necessity to distinguish between productive and unproductive capital. Moseley's numerical results are clearly above Wolff's. Moseley's average surplus-value rate for the period 1947–1976 is 1.58 with a minimum value of 1.35 in 1948 and a maximum of 1.73 in 1965. His calculations, unlike those of Wolff, are not based on input-output data. Instead, he uses time series records from the US National Income and Product Accounts data. In doing so, however, he omits the necessary transformation of market value data into labour value data to adequately account for the correct definition of the surplus-value rate in terms of labour values. His indicators, therefore, do not actually measure the surplus-value rate as it was initially conceived by Marx.

More recently, Qi (2018) reports the surplus-value rate for the Chinese economy using aggregate monetary magnitudes extracted from this country's National Accounts. If we omit the estimated rates for the period 1956–77 and focus on the calculated rates from 1978 to 2015, the reported values oscillate around 2. Once again, Qi uses market value data instead of labour value data to approximate the true value of the surplus-value rate. Freitas (2021) also uses National Accounts data to calculate annual time series figures for the surplus-value rate for Brazil between 1996 and 2016. Similar to the approach of Qi, the used data is "money" data, as the author explains, or current market value data in the standard terminology. Calculated values oscillate close to and around 2.5. In both studies, the transformation problem between market and labour values is overstepped, and the calculated indicators—as with Moseley's values—do not correspond with the canonical definition of the surplus-value rate as first proposed by Marx. This discrepancy does not mean that this type of calculation is wrong or uninteresting. They are neither wrong nor uninteresting but, simply stated, they measure something related to but different than the surplus-value rate.

Notice that calculations based on input-output data (Wolff, 1975, 1979, 1985) seem to yield numerical values smaller that calculations based on aggregate market value data (Moseley, 1988; Qi, 2018; Freitas, 2021) which may be an empirically based clue that the transformation problem matters. Regarding this issue, Rieu (2008, 2009) discusses the so-called "new interpretation" of the theory of value as posited by, among others, Foley (1982) as a justification for using market value data, instead of labour value data, for the calculation of the surplus-value rate. If prices and labour values happen to be proportional, then indeed there is no difference in using either of them for the calculations and the transformation problem would not be an issue. This proportionality, however, cannot happen in general. Prices systematically deviate from labour values, and they do so in a non-proportional way as Vegara (1979: ch. 3) and later Sotirchos and Stamatis (1999) demonstrate. Hence, the translation of market value magnitudes to labour values assuming, for instance, that prices are proportional to values is not correct[1]. Only in the very especial case that all the sectoral organic compositions of capital were identical, prices and values would be strictly proportional (Morishima, 1973, ch. 7). Unfortunately, this especial case is very unlikely to be observed empirically.

Thus, we are back to the two distinct and separate accounting systems of market values and labour values and the framework for calculating the rate of surplus value, as originally defined, happens to be rooted in the second of these accounting systems. Results obtained from the first accounting system based on aggregate magnitudes at market prices are also interesting and without a doubt valuable to know as descriptive of the underlying

[1] In their calculations Shaikh and Tonak (1994, ch. 4, page 79) assume the even stronger assumption that prices are in fact equal to labour values.

economic situation. However, they do not correspond to the surplus-value rate as it was initially introduced.

Whatever the virtues (or flaws) of the aforementioned calculations regarding the surplus-value rate, they only capture a descriptive snapshot of the prevailing socioeconomic status quo as it is reflected in the compiled statistical data. This is adequate but somewhat limited in reach. The current status quo is just the one that ended up materializing among the many possible alternative states. Imagine, for example, that the government in use of its political attributions modifies its tax recipe. In response, the economy would adjust, and a new state would come into being. Since there is a wide range of possible alternative tax recipes, a new state could be attained for each one of them. Each of these hypothetical states would give rise to an alternative database similar in structure to the data collected in the known statu-quo.

In terms of data availability, the most comprehensive accounting tool that reflects the prevalent flows of an economic state is the Social Accounting Matrix, or SAM for short. SAMs integrate input-output and national accounts data in a balanced way. SAMs were first developed by Stone (1962) and have become the database of choice for multisectoral modelling (Pyatt and Round, 1985). Olsen (2011), in turn, discusses the accounting modifications and re-classifications that, if implemented, would yield a SAM with a Marxian flavour.

In using the SAM structure, we can distinguish between the available compiled SAM and the counterfactual ones that could be assembled under a different policy scenario. As a matter of fact, it is possible to show that for any parameter scenario there will be a corresponding counterfactual SAM with the same structure and balanced properties of the initially given empirical SAM (Lima et al, 2017). Needless to say, in each of these counterfactual SAMs, we would have all the data that is needed to calculate the surplus-value rate. The same calculation technique used for the status quo data can also be used in any counterfactual scenario. This opens an important door that allows us to glimpse the consequences that follow government decisions on tax policies from a non-neoclassical perspective. Therefore, we could estimate how tax policies would likely affect the surplus-value rate and this, in turn, takes us beyond purely descriptive results. It offers us an effective way to estimate prospective results in response to policy changes.

The rest of the text is organized as follows. In Section 2 we outline a simple but novel accounting procedure to estimate, at first approximation, the role played by tax instruments in the determination of the surplus-value rate. For this purpose, the availability of a SAM is essential since the type of statistical information on tax flows that is needed is not available in the input-output tables. The practical use of an empirical SAM is therefore an innovation within the field of heterodox economics and offers us a promising path in terms of its potential. Section 3 reports some of the simulation results obtained and verifies the connective economic logic between tax rates and the rate of surplus value. In Section 4 we conclude discussing possibilities and limitations.

II. Methodology

Economic data that represent the circular flow of income in a certain period is most thoroughly depicted in a Social Accounting Matrix. In a SAM we have data on transactions between production sectors (input-output flows), data connecting income generation to expenditure (from value-added to final demand), data on fiscal instruments (taxes and public spending), and data on trade (imports and exports). We organize all this data in a square matrix of dimension $N \times N$ that has the property that the addition of all the entries in row j coincides with the addition of all the entries in its j column. In budget terms, for each item in N total expenditure outlays matches with total income. The size of number N lists the available disaggregation of the compiled data including—in the standard denomination commonly used in the National Income and Product Accounts—Production sectors, Households (Workers), Primary factors (Value-added), Savings and Investment, Government activities, and the Foreign sector.

With this in mind, we start from the aggregate equality for Households between income generation and income disposition typical of the National Accounts. From the income perspective, in a modern economy Households receive most of their income from two main sources. Labour income, mainly, and other sources of income which include a variety of flows such as rents, interests, distributed pure profits, capital services retribution, etc. For simplicity, we will refer to this aggregate as "capital" income. Finally, Households also receive transfers from the Government as unemployment payments, pensions, etc.

Turning to the expenditure side, Households use their income to finance their current consumption, they also save a portion of their income to finance future consumption, and they pay their tax bill. The tax bill includes direct taxes on taxable income, indirect taxes on consumption and personal labour taxes.

We represent this macroeconomic income/expenditure accounting structure thus:

$$w \cdot L + r \cdot K + T = C + S + I + V + P \tag{1}$$

where we use the following notation:

w: wage rate
r: capital compensation
L: Labour used in the period
K: Capital used in the period
T: government transfers
C: Consumption
S: Savings
I: Direct income tax collections
V: Indirect consumption tax collections
P: Personal labour tax collections

For instance, from the economic data in the SAM of Spain for 2015 we find (in millions of euros):

$$w \cdot L + r \cdot K + T = 410.583 + 453.464 + 170.583 = 1034.630$$

$$C + S + I + V + P = 538.086 + 270.387 + 117.488 + 67.657 + 41.012 = 1034.630$$

In expression (1) the key variable for the calculation of the rate of surplus value is consumption *C*. From a Marxian perspective, *C* is the necessary consumption for the reproduction of the labour capacity that fuels production given the current economic statu-quo. But since the accounting identity (1) must always hold, changes in fiscal variables will necessarily have a direct impact on the value *C* of the feasible consumption level. If C changes in response to possible changes in the fiscal policy variables, the surplus-value rate will accordingly change to reflect the new policies but always within the restrictions imposed by the structure of the accounting identity (1). Let us try to unveil how.

Total savings S is a proportion of the net income level once the fiscal bill is fully paid:

$$\alpha = \frac{S}{w \cdot L + r \cdot K - I - V - P} \tag{2}$$

Notice that we exclude government transfers T since they are either in-kind transfers or correspond to basic income transfers out of which little or no savings are possible. From expression (2) we write total savings as:

$$S = \alpha \cdot (w \cdot L + r \cdot K - I - V - P) \tag{3}$$

The personal labour tax rate is calculated as:

$$t_P = \frac{P}{w \cdot L} \tag{4}$$

with total tax payments P as a function of the tax rate and taxable labour income:

$$P = t_P \cdot \left[w \cdot L \right] \tag{5}$$

The income tax payments, in turn, are levied at a tax rate t_I defined by:

$$t_I = \frac{I}{w \cdot (1 - t_P) \cdot L + r \cdot K} \tag{6}$$

Observe that the income tax rate defined in expression (6) does not include the payments for the personal labour tax since they turn out to be exempt in the (Spanish) legislation to avoid double taxation. Hence, personal labour tax payments are netted out from the income tax base. Total income tax payments can be calculated as:

$$I = t_I \cdot \left[w \cdot (1 - t_P) \cdot L + r \cdot K \right] \tag{7}$$

Finally, the indirect tax rate on consumption is calculated from:

$$t_C = \frac{V}{C} \tag{8}$$

with total indirect tax receipts being:

$$V = t_C \cdot C \tag{9}$$

By substituting (3), (5), (7) and (9) into expression (1) we can eliminate *S*, *I*, *V*, and *P* and obtain, with some algebra, an equivalent but simpler accounting expression. The reduced expression contains the level of affordable aggregate consumption along with labour and capital incomes and government transfers, which we consider fully exogenous as a policy variable:

$$\begin{aligned} & w \cdot L + r \cdot K + T = \\ & = C \cdot \left(1 + t_V \cdot (1-\alpha)\right) + \\ & + \left(\alpha \cdot (1-t_P) \cdot (1-t_I) + t_I + t_P \cdot (1-t_I)\right) \cdot w \cdot L + \\ & + \left(\alpha \cdot (1-t_I) + t_I\right) \cdot r \cdot K \end{aligned} \tag{10}$$

Rearranging terms:

$$\begin{aligned} & C \cdot \left(1 + t_V \cdot (1-\alpha)\right) = \\ & = \left[1 - \left(\alpha \cdot (1-t_P) \cdot (1-t_I) + t_I + t_P \cdot (1-t_I)\right)\right] \cdot w \cdot L + \\ & + \left[1 - \left(\alpha \cdot (1-t_I) + t_I\right)\right] \cdot r \cdot K + T \end{aligned} \tag{11}$$

Alternatively:

$$C = w_u \cdot L + r_u \cdot K + T \cdot \left(1 + t_V \cdot (1-\alpha)\right)^{-1} \tag{12}$$

In expression (12) the variables w_u and r_u capture what we term the "usable" levels of labour and capital retributions that eventually allow to finance consumption expenditures *C*:

$$\begin{aligned} & w_u = w \cdot \left[1 - \left(\alpha \cdot (1-t_P) \cdot (1-t_I) + t_I + t_P \cdot (1-t_I)\right)\right] \cdot \left(1 + t_V \cdot (1-\alpha)\right)^{-1} \\ & r_u = r \cdot \left[1 - \left(\alpha \cdot (1-t_I) + t_I\right)\right] \cdot \left(1 + t_V \cdot (1-\alpha)\right)^{-1} \end{aligned} \tag{13}$$

Observe that by construction $w_u < w$ and $r_u < r$ and thus we can envision the detracting role on expendable income by origin that the taxation system plays. Note also that due to the presence of a positive personal labour tax t_P, the usable level of labour income is necessarily lower than that of capital $w_u < r_u$.

In the accounting expressions (12) and (13) we have made explicit the mechanisms through which fiscal parameters intervene in the determination of affordable consumption *C*. Any change in any of these fiscal parameters will therefore influence the usable levels of income and as a result the affordable consumption level *C* available to Households will scale up or down.

The surplus-value or exploitation rate *e* is defined[2] as the ratio of surplus labour *SL* over necessary labour *NL*:

$$e = \frac{SL}{NL} \tag{14}$$

Surplus labour is the difference between supplied labour and the "value" of labour that fuels its supply. In Marxian economics, value is defined always as labour value. Labour value is the total labour incorporated in the delivery of one unit of a good for final uses. Therefore, in Marxian terms both *SL* and *NL* are defined and measured in terms of labour value.

Consider now an input-output economy (Leontief, 1986; Miller and Blair, 2009) with *n* production sectors and goods. Let *A* be the ($n\times n$) productive[3] technology matrix and ℓ' be the ($1\times n$) row vector of direct technical labour coefficients for this economy. The labour values ($1\times n$) row vector λ' incorporates all the direct and indirect labour necessary to produce and deliver units of final demand (Morishima, 1973, ch. 1; Vegara, 1979, ch. 3; Miller & Blair 2009, ch. 6):

$$\lambda' = \ell' + \lambda' \cdot A \tag{15}$$

Provided the technology matrix *A* is productive, we can non-negatively solve for vector λ' and obtain:

[2] Morishima (1973) shows that there are three common definitions for the exploitation rate in Marxian economics and he also shows they are all equivalent.
[3] See Nikaido (1972), chapter 3, for the definition of technical productiveness.

$$\lambda' = \ell' \cdot (I - A)^{-1} \tag{16}$$

Equation (16) explains how labour values can be calculated within the framework of an economy with an input-output production structure. It is not the basis, however, of a theory of price formation for commodities since it does not provide the foundation for the determination of market exchange values (Vegara, 1979; Sotirchos and Stamatis, 1999). In what follows, to be specific, when we refer to "value" we implicitly mean labour value as accounted in (16).

Total consumption C is the aggregation of the consumptions of the n goods. Let B be the (n×1) column vector of sectoral consumptions as reported in the data in the baseline SAM. Then for a fixed set of prices[4] and from the data the following aggregation holds:

$$C = \sum_{j=1}^{n} B_j \tag{17}$$

Define the (n×1) column vector β of consumptions per unit of labour as:

$$\beta = (\beta_j) = (B_j / L) \tag{18}$$

The vector product $\lambda' \cdot \beta$ measures the labour value of the consumptions that yield one unit of labour, or necessary labour NL, whereas $1 - \lambda' \cdot \beta$ measures surplus labour SL over necessary labour. Therefore, the surplus-value rate e per unit of delivered labour is:

$$e = \frac{SL}{NL} = \frac{1 - \lambda' \cdot \beta}{\lambda' \cdot \beta} \tag{19}$$

All the required information to calculate the benchmark e is therefore contained in the SAM database. The available technology (A, ℓ') is all that is required to obtain the labour values λ' whereas the current socioeconomic conditions define affordable consumption expenditures C and because of (17) and (18) we can derive the associated base unitary consumptions β.

[4] We can always choose units so that all prices are 1 and do not have to make them explicit for aggregation purposes.

The level of aggregate consumption C depends, on the other hand, on the tax rates as expressed in equations (12) and (13). Policy shifts in the tax rates will therefore change C up or down and this will translate as well in the scaling up or down of vector β affecting, in turn, the surplus-value rate e. Therefore, the calculation of the counterfactuals requires some additional modelling assumption regarding consumption behaviour. Let us assume that consumption behaviour follows a Leontief consumption function with strict complementarity defined by positive shares α_j:

$$C = \underset{j=1,2,\ldots,n}{Min} \left\{ \frac{B_j}{\alpha_j} \right\} \tag{20}$$

We can now appreciate the transmission mechanism at work. Any tax policy induced change over aggregate C will give rise to scaling changes in sectoral consumption levels B_j through the behavioural rule in equation (20). The same scaling will translate through (18) into the vector components in β and finally will affect the surplus-value rate calculation from (19).

III. Results

We illustrate using data from a Social Accounting Matrix of Spain for 2015. This SAM was built using the input-output framework, the national accounts identities, and the tax summaries published by the "Instituto Nacional de Estadística" of Spain. It includes the input-output data as a subset, incorporates all the tax categories and their distribution among accounts of the SAM, and satisfies all the well-known national accounts identities. The SAM for Spain contemplates a disaggregation of 30 production sectors, 2 primary factors, 6 tax categories, and 5 final demand items. Descriptive details of the accounts in this SAM appear in Annex 1. It is an standard SAM that follows the European national products and income accounts methodology.

In Table 1 we enumerate some relevant benchmark values extracted from the 2015 SAM data for Spain. Notice first than more than half of the unitary labour and capital retributions get detracted because of the action of the tax system falling on earned incomes. This tax-induced reduction in disposable income acts to contract affordable consumption level C and in turn impacts on the surplus-value rate e. The estimated surplus-value rate for the 2015 data is 1.186, slightly above 1. Observe that this rate is quite close to the rates estimated by Wolff (1975, 1979, 1986) using input-output data as well.

[Table 1 around here]

We now consider alternative tax rates and reconstruct the counterfactual data set. Each of the three major tax categories that affect disposable income sees its tax rate reduced a 10 percent. In Table 2 we report the subsequent implications of these three simulations in response to the adopted changes in the tax rates.

The first result is the positive relationship between the reduction in tax rates and the reduction in the exploitation rate. As more income is liberated from the budget constraint (12), the level of affordable consumption would increase (first row of Table 2) and so would the consumption coefficients β per unit of labour, which would all scale up. Consequently, the value of the socially necessary labour would increase whereas surplus labour per hour would fall. This would lower, in all scenarios, the surplus-value rates in relation to the initial benchmark rate.

Since the 10 percent reduction in tax rates is, admittedly, somewhat arbitrary, we relativize the induced changes using an elasticity indicator (last row of Table 2). This allows us to see that a 1% change in a tax rate affecting disposable income through equation (12), would quantitatively impact the system in different ways. The elasticity weight for the income tax rate is close to twice the elasticity value for the consumption tax and almost three times that of the personal labour tax. Accordingly, the greater the elasticity, the larger the reduction in the surplus-value rate from the benchmark value.

We also observe that, in general and as expression (13) captures, usable wage and usable capital retribution would also increase as we lower the tax rates. The increased availability of usable income after a tax reduction gives us another way of looking at how consumption expenditures are financed as a function of the origins of income and the tax structure.

[Table 2 around here]

IV. Concluding remarks

Regardless of whether the rate of surplus-value is a central element in Marxian economics, it is clear that at a minimum an approximation to the rate is calculable using the data regularly published by statistical agencies. This calculation can be done using the conventional definition of the rate, which uses labour values, without any need to resort to calculations based on market value data. As we have seen, the numerical estimates based on market values differ considerably from the estimates based on labour values. In other words, the transformation problem between prices and labour values seems to matter.

There is, however, an operational advantage that justifies the use of calculations based on aggregate market values. To wit, national accounting data is published annually and relatively quickly. In contrast, the elaboration of the data that appears in the input-output framework requires a substantially longer assembly period. These delays limit the usability of the input-output data. It is also common that annual series of input-output data are not available. These difficulties complicate the compilation of Social Accounting Matrices and make the use of annual market value data more attractive, even when the calculations do not conform to the conventional definition of the surplus-value rate. Related estimates are, in our opinion, better than no estimates.

Another conclusion that should be commented on has to do with the ability of economic modelling to estimate rates of surplus value in scenarios different from the baseline scenario reflected in the data. In models built upon the data integrated in a SAM, it turns out it is straightforward to estimate the rate of surplus-value in response to changes in the economic environment. We have seen, using in our case a simple accounting procedure, some of the possible implications of broad changes in fiscal policy. Let us recall that mainstream economics uses (without apology) welfare indicators based on utility calculations for policy evaluation, even when utility calculations are quite abstract and, we may argue, somewhat ethereal. Given this observation, there is no compelling reason not to use the surplus-value rate as an additional economic indicator. By giving prominence to the dynamics of the unequal exchange of labour that the rate captures, we broaden the visualisation of the effects of policy changes and enrich the conclusions.

Finally, we should comment some of the limitations of the proposed approach. On the demand side, the type of behaviour used to calculate consumption adjustments is perhaps a bit simple. When using a Leontief consumption function, changes in aggregate disposable income yield proportional (homothetic) changes in all sectoral consumptions. In other words, the adjustments of all sectoral consumptions follow a linear pattern, regardless of the type of good in question. This is acceptable, as a first approximation, for the evaluation of small-scale changes. Larger-scale changes would possibly need a different procedural adjustment in consumption levels to capture potential non-linearities. One way of improvement could be to define a new criterion that introduces the importance or necessity of the different consumptions but that, at the same time, retains the practical functionality of a Leontief-type structure without excessively increasing the implementation costs of the modelling. One avenue to explore could be a Stone-Geary demand system with minimal consumptions (Geary 1950, Stone 1954) but subsumed within a Leontief structure to maintain operational simplicity.

On the supply side, the accounting procedure does not provide any transmission mechanism on production levels and, consequently, disposable income is blind to the changes in labour and capital incomes that would result from a change in taxation. For instance, a reduction in taxes would also improve, up to a certain point, disposable income through an increase in the demand for labour necessary to accommodate the higher levels of production incentivized by the tax reduction. In this sense, our calculation offers a first approximation of the first-round effects of tax policies on the surplus-value rate. The capturing of second and third round effects requires additional modelling, which is certainly possible using input-output analysis, linear SAM models and non-linear general equilibrium models.

Regarding data, SAMs with the alternative flavour described in Olsen (2011) are, unfortunately, lacking. The distinction between productive and unproductive labour, to mention just one case, would first require a disaggregation of input-output labour data in the value-added sub-matrix distinguishing their differential contribution to the production activities in each sector. In turn, and for the coherence of the input-output accounts, a second distinction should also be made in the final demand sub-matrix between the consumptions of workers who provide productive and unproductive labour. Sadly, this type of information will not be available unless there is dramatic change in the priorities of the statistical agencies charged with the responsibility of compiling socioeconomic data.

The trade-off, as mentioned above, is to choose between accessible and usable data for calculations that bring us closer to unveiling a magnitude of interest, or else resign ourselves to not having any calculations given the immense difficulty to access ideal information. We choose, in our case, to be pragmatic and advocate the use and exploitation of the data as it is currently available and published.

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Note on the contributor

Ferran Sancho is Professor of Economics at the Department of Economics, Universitat Autònoma de Barcelona, Spain, and an affiliate of the Barcelona School of Economics.

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Table 1: Benchmark data for 2015 (Millions of euros when applicable)	
Consumption	538.086
Income tax receipts	117.488
Consumption tax receipts	67.657
Personal labour tax receipts	41.012
Aggregate income tax rate	0.143
Aggregate consumption tax	0.126
Aggregate personal labour tax rate	0.099
Usable wage rate (in % of *w*)	0.415
Usable capital retribution (in % of *r*)	0.461
Surplus labour (per unit of labour time)	0.547
Necessary labour (per unit of labour time)	0.457
Surplus-value rate	1.186

Source: SAM 2015 of Spain and our model calculations

Table 2: 10% reduction in tax rates (Millions of euros when applicable)	**benchmark**	**income tax**	**consumption tax**	**personal labour tax**
Consumption	538.086	544.398	541.746	539.975
Income tax receipts	117.488	105.739	117.488	118.074
Consumption tax receipts	67.657	67.657	61.305	67.894
Personal labour tax receipts	41.012	41.012	41.012	36.911
Usable wage rate (in % of *w*)	0.415	0.421	0.417	0.419
Usable capital retribution (in % of *r*)	0.461	0.468	0.463	0.461
Surplus labour (per unit of labour time)	0.547	0.537	0.539	0.541
Necessary labour (per unit of labour time)	0.457	0.462	0.460	0.459
Surplus-value rate *e*	1.186	1.161	1.172	1.179
Elasticity of *e* to tax rate changes	---	0.214	0.125	0.065

Source: SAM 2015 of Spain and our model calculations

Annex 1

Sectors

1. Agriculture
2. Mining
3. Foodstuffs
4. Leather and textiles
5. Wood and paper products
6. Coke and petroleum
7. Chemical products
8. Metal products
9. Electronic, electric, and precision products
10. Machinery and vehicles
11. Other manufactures
12. Repairs and maintenance
13. Electricity and gas
14. Water
15. Recycling
16. Construction
17. Wholesale retail
18. Transportation
19. Telecommunications
20. Hostelry
21. Entertainment
22. Financial services
23. Real estate services
24. Professional services
25. Commercial services
26. Public services
27. Education
28. Health services
29. Recreational services
30. Personal services

Factors

1. Labour -- *L*
2. Capital -- *K*

Taxes

1. Indirect taxes on production activities
2. Indirect taxes on selected products
3. Indirect taxes on consumption (value-added tax) -- *V*
4. Social security payments by employers
5. Social security payments by employees -- *P*
6. Income and wealth taxes -- *I*

Final demands

1. Private consumption by Households -- *C*
2. Public consumption by Government

3. Gross capital accumulation
4. Exports to the European Union
5. Exports to the Rest of the World