

THE PROGRESSIVITY OF VALUE ADDED TAX IN A LIFETIME PERSPECTIVE.

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Introduction

The incidence of taxation takes a lot of forms in an economy, as it can be levied on earned income, on property of individuals or entities, on production costs or sales of goods and services, and the level of each taxation form can be adjusted to serve the government's fiscal policies. The tax revenues serve principally two objectives for the governments. The first addresses the government's dependency on taxation in order to ensure its essential revenues to finance its expenses. Consequentially, most countries have developed a combination of income and consumption taxes, as their revenue basis. Moreover, tax revenues can support economic growth and development purposes, and hence create the right environment for the expansion of the private sector to flourish. The second objective has a redistributing purpose, which serves the principals of a social welfare state and it helps to reduce inequality based on income and wealth differences among the agents. This role is commonly down to income tax, which progresses as the income increases, and with the combination of social services, the government can achieve its redistribution goals.

Taxation can be implemented on many economic activities and the different taxes can be classified by the base of the tax, for example social security contributions or property. From all those existing forms, taxation on income and profits and on consumption represent the two tax sources with highest revenues (34% and 31% respectively). Consumption taxes, widely spoken, refer to taxes on general consumption (goods and services), which consist of the value-added tax (VAT), (general) sales taxes, and taxes on specific goods and services, such as excise taxes, customs and insurance premiums. Over time, consumption taxes have gradually gained support on OECD countries, as they have a good track of raising revenues even in developing countries with weak tax administrations. The most significant tax on general consumption is VAT, which has become the largest revenue source and the most popular tax as it accounts, on average, for 20.2% out of 20.8% of total consumption tax revenue. Specifically, Michael Keen and Ben Lockwood (2006) argue that the VAT is a "money machine", to the extent that countries with a VAT seem to raise more money than those without; and that the VAT revenues counterbalance the losses from other forms of taxation.

However, many economists heavily criticize the VAT for its regressive nature. That is to say, many studies have argued that VAT burdens relatively more the lower-income households. As it is the opposite from an income tax, VAT's liability only takes account the amount of consumption spent. However, there are studies that favor VAT as they find a less negative effect for the low-income households. Markedly, Metcalf and Caspersen (1994) compute the average tax rate for households throughout their lifetime. Their findings suggest a less regressive and even a slightly progressive VAT.

In this theoretical master thesis, we look through a household's lifetime as Metcalf and Caspersen (1994) did. We focus on their analysis and findings: we point out how some simplifying assumptions might change their results. Therefore, we construct different models for two precious variables which the authors overlooked in their model. These variables are intergenerational transfers (bequests) and social services. Finally, we analyze these models and conclude upon VAT's progressivity in many different events.

Literature review

After the introduction of VAT in 20th century, there is a plethora of economists that tried to identify its distributional impact to the economy. As it is relatively important in most governments' budget, it can also influence the progressivity of the whole tax system. With this in mind, they try to investigate the relationship between income and VAT's burden in an attempt to conclude if an indirect tax is enough egalitarian as a direct tax.

Many economists analyzed VAT incidence within a country's economy. For instance, Leahy et al. (2011) investigate the distributional effects of a flat rate VAT in Ireland. Having data from a large number of households in 2004-5, they focus on tax liability across income deciles, household size and composition. They compute the VAT burden as a proportion of weekly disposable income for each income group. They conclude that just like a VAT, the implementation of any flat rate tax, "would, also disproportionately hit the poorest households". Markedly, the households with 6 persons or with one adult and children are the most affected by VAT burden and at the same time, it falls mostly on younger people. They argue that the zero or reduced VAT rates do not address the regressivity; however without them the picture would have been worse. Finally, they suggest that the government's position and the poorest households will be better off if the zero and lower VAT rate will be replaced by "benefits and tax credits" for the latter.

Other economists focus their attention on countries in European Union; an area characterized by variety, diversity, and rich data. Among them, O'Donoghue et al. (2004) try to estimate the distributional effect of excise taxes for 12 European countries as they use the EUROMOD micro-simulation model. In general, they find that VAT as a percentage of disposable income and the rest of indirect taxes are regressive or "negatively redistributive" in all countries. Although, there are different intensities considering VAT's progressivity between the countries, the VAT burden are proportionally larger towards the lower-income households. Conversely, VAT is commonly considered to be on the 4th place as the most important distributive tool. However, the authors state that there is an important difference when the VAT's distributional effect is being analyzed. In case of VAT as percentage of total expenditure, its burden "rose slightly" as the income raises, making VAT a slightly progressive tax or at least less regressive. The main reason behind this

observation is that the poor households consume usually goods with reduced VAT rates. On the other hand, as a percentage of (disposable) income, VAT incidence seems regressive as the different saving patterns across the income deciles are mostly responsible for its regressivity. Taking into account the latter argument, Decoster et al. (2010) try to investigate the distributional effect of indirect taxes in five European countries using the same EUROMOD model. They conclude to the same results as the above researchers regarding VAT's progressivity while they try to explain analytically the reasons behind these conclusions. Markedly they claim that expressing tax incidence in terms of total expenditure describes better any household's welfare state. That is to say, using expenditure instead of current income "flatten out" temporary income shocks which may occurs in case of unemployment or retirement. At the same time, this approach can approximate a lifetime income concept by finding a measure for the average wealth state through household's consumption. However, in the case where the consumption decisions are affected by income fluctuations, the above statement fails. Furthermore, they support the expenditure approach because they strongly believe that the VAT's regressivity hides mostly on saving behaviors. In that extent, they claim that saving are just postponed consumption which eventually will be taxed. Henceforth, as the rich households save much more than the poorer, the evaluation in terms of consumption may yield completely opposite results on studies which using current income and they support VAT's regressive nature. Finally, the authors question the usage of current income as an indicator for the welfare state. For instance, they wonder if a measure of lifetime income would be a better indicator in order to investigate VAT liability. In any case, the analysis and the results are mostly affected by the household's welfare state definition.

Despite the differences in progressivity due to the two above approaches, Metcalf (1994) claims that the analysis' time frame is, also, an important concept. He concludes that VAT is "roughly proportional" when using expenditure as a proxy for lifetime income. Analytically, he tries to identify VAT's progressivity regarding three measurements of income; annual income, current and bequest adjusted consumption. As the above papers indicate, using annual income makes VAT look substantially more regressive than the last two. This picture changes when it viewed over the life cycle with VAT becoming proportional. Furthermore, with the introduction of zero or lower rated goods, it looks even more progressive, even though government's revenues are being diminished.

Background and status of knowledge

We will focus mainly our analysis on Metcalf and Caspersen's (1994) seminal paper; which is entitled “Is the Value added Tax regressive? Annual versus lifetime incidence measures”. They estimate the lifetime burden of a value added tax as a percentage of lifetime income by matching US panel income data with 1988 household expenditure data. They conclude that, on a lifetime perspective, a VAT in the USA is less regressive than on the annual-income perspective, regardless of using consumption or annual income as a proxy.

More in detail, they estimate the lifetime income as

$$Y = \sum_{t=1}^n \frac{I_t + E_t}{(1+r)^t} \quad (1)$$

where Y is the lifetime income; E_t is the inheritances (and gifts) received at time t ; I_t denotes the earned income and transfers at time t ; and r is the market's interest rate.

Two different overlapping data sets are used. The Consumer Expenditure Survey (CEX), which has annual consumption data and the Panel Study of Income Dynamics (PSID), which has annual income data. From the CEX, they construct VAT's tax base and they use PSID in order to derive lifetime income using annual income as proxy. Therefore, they first estimate the relationship between age and earned income for households by constructing a regression and then use these results in order to generate lifetime income estimates for the same households. For calculation proposes, they create two approaches (two measurements of lifetime income) with or without fixed effects adjustment. Even though, these two measurements generate slightly different earnings regression results, they both follow almost the same patterns in case of the distributional impact of a VAT, whilst the current consumption approach being less regressive.

Metcalf and Caspersen make some implicit assumptions to estimate the VAT's distributional impact. First, the government expenditures are assumed to be not affected by the introduction of VAT. Second, the tax burden affects only the consumers, making the supply of the consumption goods perfectly elastic. Finally, savings are not included in the tax base as they are included in current expenditure. Consequently, they propose looking at the progressivity of the Value Added Tax through the lenses of the average tax rate:

$$ATR = \frac{\tau C}{Y}, \quad (2)$$

where τ is the VAT rate, τC is the tax liability for every household, and Y is the relevant measure of income (annual or lifetime).

In the case of annual income, the tax liability depends on the saving ratio through the following accounting identity,

$$\frac{\tau C}{Y} = \tau \left(1 - \frac{S}{Y}\right), \quad (3)$$

As we can see from the above equation, the tax liability depends on the saving ratio. That is to say, if a household save more as its income increases, the right hand side becomes smaller and thus, the household are obligated to pay less tax. Including, also, the assumption that the rich households are more likely to save a larger percentage of their income, then VAT can be identified as regressive. In this event, VAT affects negatively the consumption decisions of the low income households. Now, we assume that every household consumes what it earns throughout its lifetime ($C = Y$) and there are no bequests. As a result, the tax liability in equation 3 will equal τC in every year and the average tax rate in equation 2 will simply equal τ , which is a stationary tax rate. Henceforth, VAT is considered to be proportional as its progressivity does not depend on household's income or consumption. Finally, switching towards the lifetime framework ($C \neq Y$), we use the equation 1 as the measurement for the overall lifetime income. Accordingly, the income indicator in equation 2 becomes substantially larger and the overall fraction is smaller than in the annual income perspective. Under those circumstances, VAT's regressivity is mitigated whilst the average tax rate is diminishing with the increasing denominator.

Given the above theoretical background, they measure the average tax rates in both annual and lifetime perspective, by using the earnings regression across the different income deciles. As it was expected, their research confirms the theoretical background, stating that the VAT tax becomes less regressive and even slightly progressive when we shift to a lifetime perspective. However, at the same time, these results bear on a number of specific assumptions. First of all, the authors exclude bequests from both the lifetime income and the consumption

measures. In their defense, they argue that “bequests are typically excluded from the tax base for a VAT”. They, although, took into consideration Menchik and David's (1983) paper. Their main realization is that the “the median propensity to bequeath is roughly U-shaped”. Whilst the households were divided into deciles based on their lifetime earnings, the bequest function begins to increase at the 80th percentile of the earnings distribution. For instance, “the propensity to bequeath of the top quintile is about 70% higher than the 50th percentile”, which clearly indicates the contrast between the upper and middle classes. Moreover, they point out that a fixed-rate consumption tax will follow an inverse U-shape, since tax's liability will be larger upon the middle class than the rich. As can be seen, a consumption tax, such as VAT, will be regressive in a lifetime model. Nevertheless, Caspersen and Metcalf (1994) insisted that even though there are indications that bequests can affect VAT's progressivity, it is difficult to define households' motivation for bequeathing. Henceforth, it becomes very complicated to adjust the model according to the different types of motivation, such as altruism, and produce a well-defined model with bequests, a task which are “beyond the scope of this paper”. Furthermore, they do not take into account other expenses besides consumption expenses, for example for medical purposes and they refer to them as “unanticipated expenses”. Specifically, they consider these expenses as transitory shocks to consumption. That is to say, when the unanticipated expenses occur, they assume that the income will increase at the same percentage as the consumption driven by these additional expenses. Therefore, the impact in the overall consumption will be zero and VAT's average tax rate will stay unchanged, as we can see in equation (2).

Although the reasons for omitting those key factors in household spending decisions may seem logical, in reality these factors play an undeniable role in household's decision process. There are a large number of studies concerning the bequest patterns for different income households and the majority of them illustrate the existence of a considerable bequest difference among the low and high income households, like Menchik and David (1983). To begin with, let us take a look into Kotlikoff and Summers' (1981) paper. They argue that the intergenerational transfers seem to be the most important component on wealth accumulation. Therefore, their analysis has shown that bequests account for the majority of aggregate capital accumulation in the U.S economy. Later Gale and Scholz (1994) take it further as they claim that the net worth accumulation raises at least 51 percent if you add bequests into the overall “intended transfers”.

More recently, Dynan et al. (2002) show the importance of intergenerational transfers and their key role in decision-making process for various households. They construct and analyze their two-period model, which comprehend a bequest motive in a lifetime perspective. Additionally, they take into consideration empirical evidence and other numerous and previous papers about bequests and the motivation behind them. According to their analysis, the households will expect to inherit transfers from their ancestors. Also, regardless of the motivation behind their decision, altruistic for the next generations or not, bequeath will still be high as a precautionary concern for the current or the next generations. Henceforth, it can undoubtedly affects households' consumption decisions and extensively their tax liability throughout their lifetime, as bequests (savings) are not taxed. A couple years later (in 2004), the same authors examine the common idea that rich save more. They do agree as they conclude that "the marginal propensities to save and to consume differ substantially across income groups". When bequests exist, their results show that the high-income households bequeath a larger fraction of their lifetime income compare to lower-income households (assuming that the elderly high-income households do not dissave at a higher rate). On the other hand, if we assume that there are no bequests (and thus, they consume what they earn in their lifetime), higher-income households will still pay less flat-rate tax liability as they expect to receive a "disproportionate share of interest and dividend income". Henceforth, a consumption tax, such as a VAT, will be regressive on a lifetime basis in the extent that bequests are exempt from a flat-rate tax. In that case, they suggest that the government policies have a great distributional impact across income groups, which eventually affects their saving decisions. On the other side, some studies do not agree with the important bequest difference among various income groups. One of them comes from Becker and Tomes (1979).

Now let us focus on social services, which is a factor that affects a large percentage the households in many countries. Nowadays, a very disturbing phenomenon in many countries is wealth inequality. For instance, Rodriguez et al. (2002) try to follow the changes in inequality and mobility during 1990s. They compare households in data sets from 1992 and 1998 samples, using the exact same variables. Under their analysis, the top earnings quintile owned 49 percent of total wealth in 1992, and that percent increased to 55 percent in 1998. Likewise, the top richest 1 percent households owned 17.3 percent of the total wealth in 1992, and 24.1 in 1998 sample. While these positive changes occur for the rich households, "the changes in the

economic conditions of the earnings-poor are very small". Following these patterns, many other studies are investigating the health differences between low and high-income households. As one of them, Braveman et al. (2010) conclude that "the poor and least educated" heavily experience bad health issues. This picture changes only to those who belong to "the wealthiest and most educated". Therefore, in absent of any health insurance (private or public) can seriously affect health conditions and "the ability to pay for other necessities", like food, when these will occur. Under these circumstances, public spending in form of social services is essential for redistributing wealth among the various-income groups. Following the recent OECD's studies for social expenditure, we can see that the public social spending accounts for a considerable percentage of the GDP (20% on average). Social medical insurance and pensions are the largest areas, which governments' policies emphasize. Moreover, many public services, such as medical help, are provided exclusively to the most needed. This technique of social service provision is called means-testing. Means-testing is a way of providing welfare services to those most in need; while the government controls its public expenses. Finally, as can be seen, especially for low-income households, social services are an important part on their income; in the extent that this additional provided aid can heavily better their position in many different ways.

Given the above arguments, a model such as Caspersen and Metcalf's (1994) seems quite incomplete. Also, we can say that their model is inappropriate to compute a valid measure for a lifetime income without taking into considerations variables such as bequests and social services.

The two-period model with bequests

Consider a two-period lifetime model of a household. Expected lifetime utility of the household is given by:

$$U = E \left[U(C_1 + B_0) + (1 - \pi)V(B_1) + \pi \left(\frac{U(C_2)}{1+r} + V(B_2) \right) \right],$$

where E is the expectation operator; C_t is the consumption in each period $t = 1, 2$; B_0 is the bequest received from the parents while B_t is the bequest left at the end of period $t = 1, 2$; $V(B_t)$ is the utility of leaving such a bequest; $r > 0$ is the rate of interest; and, finally, π expresses the likelihood of surviving to period 2.¹

The household chooses consumption, savings, and bequests by maximizing its utility over the following budget constraints:¹

$$\begin{aligned} S_1 + (1 + \tau)C_1 &\leq B_0 + I_1, \\ B_1 &\leq (1 + r)S_1, \text{ and} \\ B_2 + (1 + \tau)C_2 &\leq (1 + r)S_1 + I_2. \end{aligned}$$

In period 1, the household decides how to share her period income I_1 and received bequest B_0 between consumption goods $(1 + \tau)C_1$ and savings S_1 . If the household does not survive to period 2, the savings (with their return) constitute the bequest left for the next generation, i.e., $B_1 \leq (1 + r)S_1$. If the household survives to period 2, it shares the savings $(1 + r)S_1$ and the period income I_2 between consumption $(1 + \tau)C_2$ and the bequest for the next generation B_2 .

We compute the lifetime income (Y) and the progressivity of the VAT tax in the same way as Metcalf and Caspersen (1994). Also, the aggregate wealth for every household in this two-period model is simply the present discounted value of the incomes and bequests. Thus, lifetime income is:

¹For instance, with probability π the household survives to period 2.

$$Y = I_1 + \left(\frac{I_2}{1+r} \right)$$

and wealth can be computed as follows:

$$W = I_1 + B_0 + \left(\frac{I_2}{1+r} \right) = Y + B_0.$$

If utility is increasing in its arguments, the wealth is entirely used for consumption and bequest. Thus:

$$W = (1 + \tau)C_1 + B_1, \quad \text{in case of early death, and}$$

$$W = (1 + \tau)C_1 + \frac{(1+\tau)C_2 + B_2}{1+r}, \quad \text{,otherwise.}$$

In expectation,

$$W = (1 + \tau)C_1 + (1 - \pi)B_1 + \pi \frac{(1 + \tau)C_2 + B_2}{1 + r}.$$

Let expected lifetime consumption be defined as:

$$C = C_1 + \pi \frac{C_2}{1 + r}.$$

Then, the average tax rate spent on VAT is given by:

$$ATR = \frac{\tau C}{Y}$$

In a lifetime environment without bequests, wealth equals to lifetime income. In that case, $Y = W$ and

$$ATR = \frac{\tau C}{Y} = \frac{\tau C}{(1+\tau)C} = \frac{\tau}{1+\tau} \quad (4)$$

which leads to the conclusion that the tax liability increases at the same rate as the income or wealth increases. Thus, the average tax rate is constant with respect to income or wealth and,

thus, the tax liability increases linearly with income (or wealth). In this case, the VAT is proportional. This result is summarized by the following proposition.

Proposition 1.1 *In the absence of bequests, the VAT is proportional to income and wealth.*

When we introduce bequests, the results change. First, we consider that the consumption is fixed as we add and change the intergenerational transfers. In other words, all the changes in bequests are *ceteris paribus*. Let us first look at households which receive a bequest B_0 but do not leave a bequest to future generations. Then,

$$W = Y + B_0 = \left(C_1 + \pi \frac{C_2}{(1+r)} \right) (1 + \tau) = C(1 + \tau),$$

and, rearranging,

$$W - B_0 = Y = C(1 + \tau) - B_0.$$

Based on the above, in terms of lifetime income Eq.(4) becomes,

$$ATR_Y = \frac{\tau C}{Y} = \frac{\tau C}{C(1+\tau) - B_0} \quad (5)$$

$$\text{and, in terms of wealth, } ATR_W = \frac{\tau C}{W} = \frac{\tau C}{C(1+\tau)} = \frac{\tau}{1+\tau}. \quad (6)$$

Under those circumstances, the tax liability changes form in respect to which measure we compare it with. For instance, the average tax rate in equation 5, is larger for low-income households. As income goes to infinity, the average tax rate tends to that of equation 4, in the extent that B_0 is a fixed quantity. Consequently, the VAT can be described as regressive. On the other side, the tax liability in terms of wealth has the same form as in equation 4.

Proposition 1.2 *When households receive a positive bequest and do not leave bequests, the VAT is regressive with respect to income and proportional to wealth.*

Let us now continue our analysis by considering the possibility of leaving a fixed bequests (B_1 and B_2) while $B_0 = 0$ (no receiving bequests). In that case, the equation 6 changes as

$$ATR'_W = ATR'_Y = \frac{\tau C}{C(1+\tau)+(1-\pi)B_1+\pi B_2} \quad (7)$$

The above equation indicates that, keeping bequests fixed, the tax liability with respect to income and wealth is smaller for the low-income households and matches the equation 4's slope at infinity. That is to say, wealth is defined by the accumulated income without considering the distinction between consumption and saving. In that extent, as the consumption becomes larger for the higher-income households, VAT becomes progressive with respect to wealth.

However, when bequests are endogenous, this result can change. If bequests are a normal good, the larger the income, the larger the part left for bequests. Moreover, if, as many studies have indicated, the high-income households are more likely to save a larger percentage of their income; and hence, they leave a larger proportion of bequests to the next generations. As a result, in case of no bequest received, the high-income households face lower tax liability than the lower-income households. Therefore, VAT is regressive in this case.

Proposition 1.3 *When households receive no bequest, but leave a positive bequest, the VAT can be both progressive and regressive with respect to income and wealth. The VAT is progressive if the elasticity of bequest to income is smaller than that of consumption. The VAT is regressive if the elasticity of bequest to income is larger than that of consumption.*

In Fig 1.1, we can see an illustration of VAT's progressivity as it changes upon the different occasions. With the red color, we compare tax liability with household's lifetime income. On the other side, with green color is with respect to wealth. Moreover, the event which we do not have any intergenerational transfers are showed with blue color (proportionality, slope equals to $\frac{\tau}{(1+\tau)}$). Finally, on the top left hand side VAT considered to be regressive; while on the lower right hand side VAT becomes progressive.

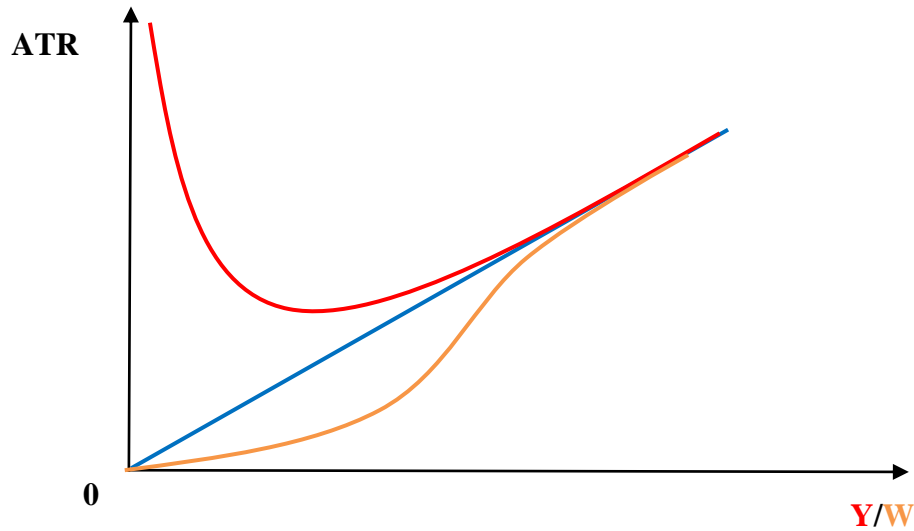


Figure 1. Progressivity of VAT in terms of income and wealth

Now let us include, also, the possibility of receiving a bequest ($B_0 \neq 0$). In this case, tax liability with respect to lifetime income change, as with respect to wealth remains unchanged. Thus, now we have

$$ATR''_Y = \frac{\tau C}{C(1 + \tau) - B_0 + (1 - \pi)B_1 + \pi B_2}$$

Now the picture gets more complicated. That is to say, it is difficult to decide which direction the equation 8 will follow with respect to income. For example, if the received bequests exceed the bequests for the next generation $B_1 < B_0$ and bequests do not respond to income levels, then we are above the straight line in equation 4. Thereupon, the low-income households pay more tax than those with higher-income. As a matter of fact, VAT can be called regressive. The opposite happens when $B_1 > B_0$ and then VAT becomes slightly progressive. Notably, the two different types of bequest can, also, change throughout a household's lifetime and hence, the average VAT's rate will no longer be a given fixed rate for every household. Moreover, the intensity of those changes lies on how big or small the difference is between these two different types of bequests.

Proposition 1.4 *When households receive and leave a positive bequest, the VAT can be both progressive and regressive with respect to income and wealth. Ceteris paribus, receiving a bequest makes the VAT more regressive with respect to income (see Prop.2). Leaving bequests affects progressivity based on the elasticity of bequest to income (see Prop.3). The joint effect depends on their magnitude.*

Given the above analysis, the progressivity of VAT depends heavily on intergenerational transfers. That is to say, a household which starts its life with a given bequest from its ancestors has a significant larger expected consumption; without changing its income. Consequently, it can consume larger amounts of goods, using the given bequest. As the consumption is taxed by VAT, these extra expenses add more tax liability to this household. As a result, it ends up paying more VAT in proportion to income than if it had not received a bequest. In this event, where the household cannot leave a bequest but only receive, the VAT is regressive in respect of lifetime income. However, VAT's progressivity is heavily affected by the magnitude of the given bequest, and less upon household's income-level. Below we can see how the given bequests affect tax liability, as the income-level is hold fixed into two groups. With $\frac{1}{Y}$ being the slope, it increases as the income decreases. The low-income households, colored with purple, seems to be affected more as the given bequests increases. In a lower scale the high-income households (blue colored) are affected by the B_0 .

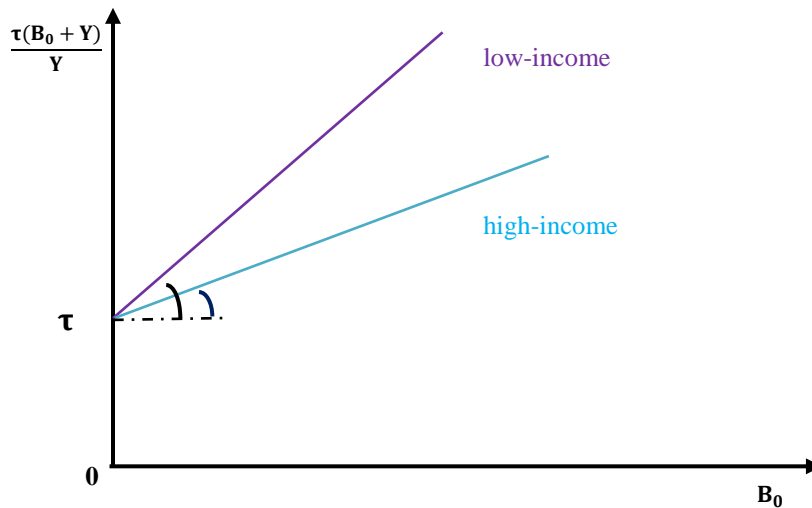


Figure 1. 2Change of tax liability as bequests received increase (two different income levels).

This picture changes as the ability to leave bequest enters into the above analysis. If we compute VAT's progressivity in terms of wealth, VAT becomes progressive without any given bequests. Following the conclusions of many previous studies, the high-income households do save larger percentage of their income; and hence, their consumption decreases in great number. If we assume that there is no bequest received, then the VAT becomes regressive, as its burden falls mostly on low-income households. In case we add the possibility to receive bequests, the picture gets more complicated. Therefore, the VAT's progressivity depends on the magnitude of bequests received in compare with bequests left and their elasticity. The latter picture is difficult to be defined as it has many different components, which some can be considered exogenous.

In conclusion, VAT becomes a less equal tax as the saving patterns favor the high-income households. Therefore, someone can argue that VAT with respect to income, burdens the lower-income households as it focuses on consumption; as it does not take into consideration other variables such as intergenerational transfers. In that extent, a more egalitarian tax system can be achieved as a combination of taxes on consumption (VAT), income and on intergenerational transfers.

The two-period model with social services

Now we consider an economy where the government provides services to the households. Here, we consider medical services, but the model applies more generally to education, public goods, culture, etc. As before, the households maximize their two-period utility given by:

$$U = U(C_1 + D_1) + \beta \left(\frac{U(C_2 + D_2)}{1 + r} \right),$$

where C_t is the non-medical consumption in each period $t = 1, 2$; D_t is the medical consumption provided by the government in each period; $r > 0$ is the rate of interest; and, finally, β is the time discount rate.²

Each household faces the following budget constraints:

$$\begin{aligned} S_1 + (1 + \tau)C_1 &\leq I_1, & \text{and} \\ (1 + \tau)C_2 &= (1 + r)S_1 + I_2, \end{aligned}$$

where I_t denotes the disposable income in each period t . In period 1, the household shares the available income between consumption and savings. In period 2, the household consumes the savings and income. We consider that household's total consumption in each period consists of medical and non-medical consumption, $TC_t = (1 + \tau)C_t + D_t$.

Let $C = C_1 + \frac{C_2}{1+r}$ and $D = D_1 + \frac{D_2}{1+r}$, then $TC = (1 + \tau)C + D$ in lifetime framework.

Now the progressivity of the VAT depends on the size of government-provided medical expenses D and on the correlation between medical expenses and income. We explore this relationship next.

²For the sake of simplicity, we are assuming perfect substitutability between individual consumption and social services provided by the government, but the analysis extends to weaker substitutability.

As in the previous model with bequests, we compute the tax progressivity and the lifetime income as Metcalf and Caspersen (1994). Moreover, in the absent of intergenerational transfers, lifetime income equals to total consumption. To compute VAT's progressivity, we recall the definition of lifetime income:

$$Y = I_1 + \frac{I_2}{1+r}$$

However, this income definition can be criticized for not accounting for the services provided by the government. Consistent to Aaberge et al. (2018), we discuss also progressivity of the VAT with respect to an “extended” income, which includes such services:

$$Y_{EXT} = I_1 + D_1 + \left(\frac{I_2 + D_2}{1+r} \right)$$

Let us begin to analyze VAT's distributional effect, taking the following equation

$$ATR = \frac{\tau C}{Y} = \frac{\tau C}{(1+\tau)C} \quad (1)$$

In the absence of any kind of social expenses, the VAT is proportional to lifetime income. The same outcome we have encountered in our previous two-period model. This means that the VAT burden rises with rate of $\frac{\tau}{(1+\tau)}$ as the income increases.

In a lifetime environment, household's “extended” lifetime income includes the additional social service that is provided by the government(D). We consider this aid as an additional income which household **cannot** save or manipulate for any other reason except by consuming that in order to cover its medical expenses. We, also, assume that there is no VAT on medical expenses. Henceforth,

$$Y_{EXT} = TC = (1 + \tau)C + D$$

Taking into account the above equation, we can argue that equation 1 becomes,

$$ATR' = \frac{\tau C}{Y_{EXT}} = \frac{\tau C}{(1+\tau)C+D} \quad (2)$$

According to the above equation, the denominator gets larger with the provided medical aid (ceteris paribus). Since, lifetime income increases as medical consumption rises; VAT's liability decreases. Therefore, VAT is progressive to extended lifetime income. Now let us consider that the provided medical aid is the same for all households. In that case, VAT will become proportional. However, the households will face a slightly less VAT liability than that in equation 2. That is to say, the slope will be smaller since the households receive an additional non-taxed financial aid.

Proposition 2.1 *When households receive an additional social service (such as for medical consumption), VAT becomes progressive to extended lifetime income. In case that this service is a fixed amount for all households, VAT is proportional with a slower increasing rate.*

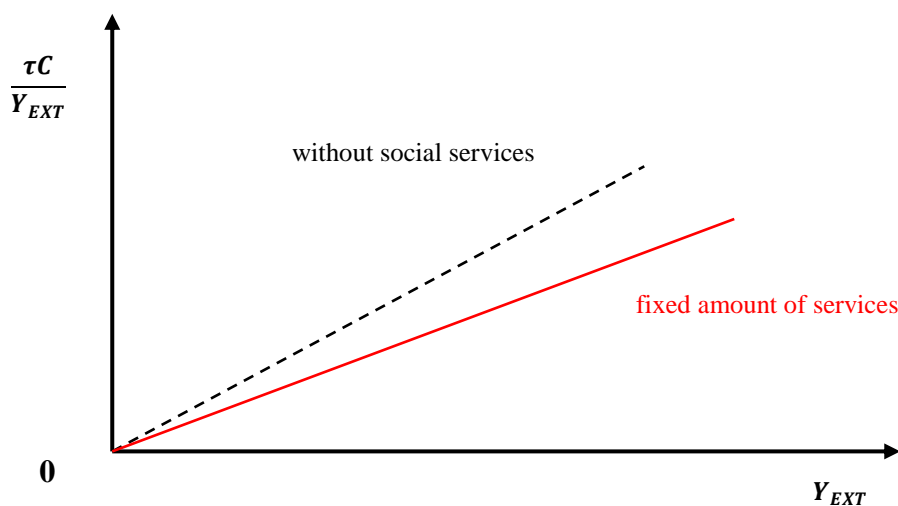


Figure 2 1 VAT's average rate with respect to extended lifetime income

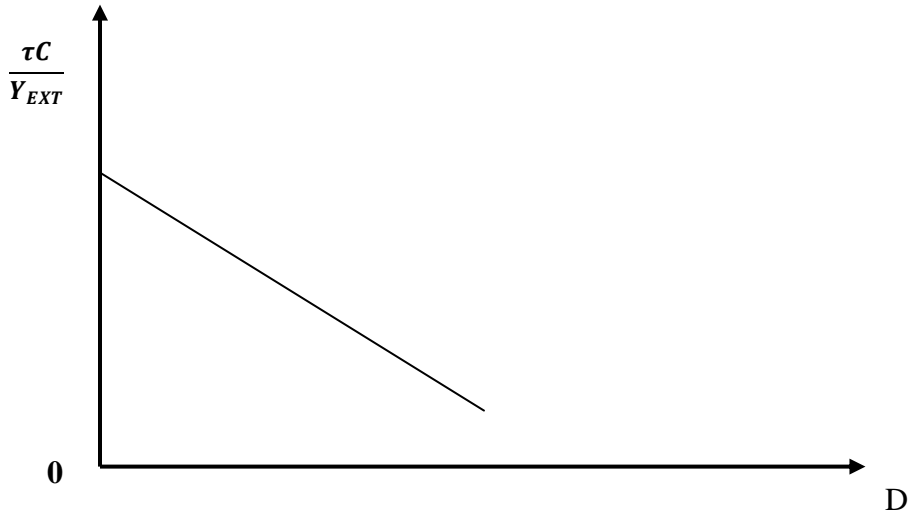


Figure 2 2 How VAT's burden falls as the welfare service increases (*ceteris paribus*)

At this point let us extend our analysis in the event that the income becomes a criterion for households in order to get financial help. Therefore, now the welfare services become *means-tested benefits*. We consider two income groups, rich and poor, with the poor being the only recipient of D_t . Thus, equation 2 becomes,

$$ATR_P = \frac{\tau C_P}{(1+\tau)C_P + D} \quad \text{for poor households and,}$$

$$ATR_R = \frac{\tau C_R}{(1+\tau)C_R} \quad \text{for the rich.}$$

As indicated above, the different-income households will face different average tax rates. For the poor households, VAT will be progressive if the given service is substantially bigger than household's income. In the event that, the provided financial help increases with the same rate as income, VAT can be slightly proportional. Consequently, VAT's progressive nature mostly relies on the provided service. On the contrary, let us consider that the social service is a fixed given amount regardless household's income. Henceforth, VAT can be regressive towards the lower-income households and proportional to higher-income.

Regarding the high-income households, VAT is proportional without social services (see eq.1).

Proposition 2.2 *In case of means-tested benefits; VAT's progressivity, for low-income households, is strongly affected by the social service. If the elasticity of the provided service to income is substantially larger than one, VAT becomes progressive. The VAT is regressive, if the elasticity of the provided service to income is smaller than one. In the same time, high-income households will continue to face a proportional VAT.*

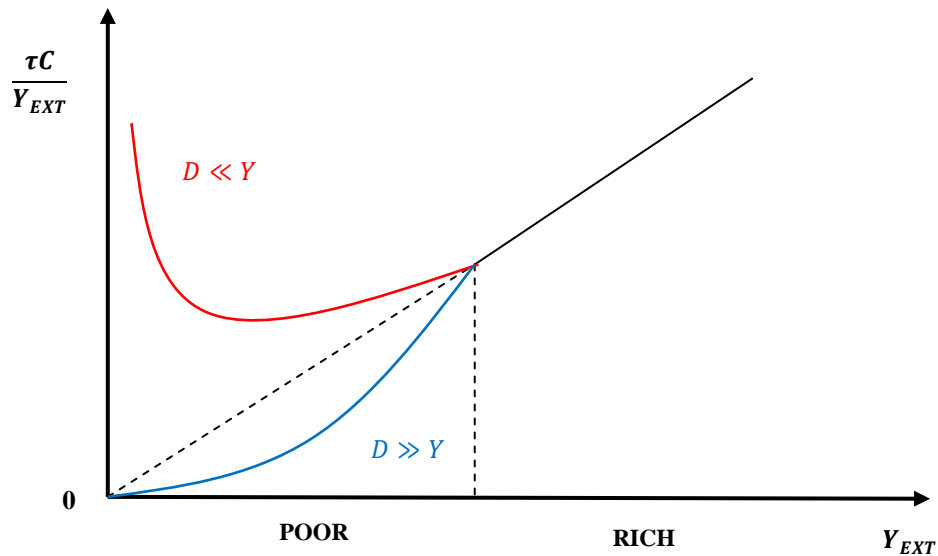


Figure 2 3 VAT's progressivity with means-tested benefits (two different income groups)

All things considered, social services heavily affect VAT's progressivity. As a better measure of computing lifetime income, “extended” income can help us to understand better these changes. At the same time, means-tested benefits should be carefully constructed if the main goal is to help low-income households and provide egalitarian welfare services.

Conclusion

In this thesis, we have investigated the progressivity of the value added tax (VAT) in a lifetime perspective. Contrary to many other economists, Metcalf and Caspersen (1994) concluded that the VAT is less regressive (and even slightly progressive) than previously thought, when expressed in a lifetime perspective. However, two important aspects of households' lifetime choices were excluded from their analysis. In this thesis, we study whether the conclusion of Metcalf remain valid when these aspects are considered.

The first aspect is related to intergenerational transfers. When including bequests (received from the previous generation or left to the next generation), the progressivity of the VAT is deeply affected. Moreover, we show that progressivity is strongly related to the measure of comparison adopted. Intuitively, when receiving bequests, lifetime income differs from lifetime wealth. Thus, the average tax rate presents generally different behavior when analyzed in terms of lifetime income and lifetime wealth. Furthermore, in the event that there are both received and bequest left, VAT's liability can be both progressive and regressive, depending on the size of the bequests and their sensitivity to income.

The second aspect is related to the social service by the government. In this case, we introduce the extended lifetime income. That is to say, extended income includes the social services which the households receive freely from the government. For simplicity, we assume that households will receive welfare service in order to cover their medical consumption. Therefore, since medical expenses increase as income increases, VAT is slightly proportional. When we introduce means-tested benefits, VAT's progressivity can be regressive or progressive for the low-income household. The latter relies mainly on the relation between income and given service. Finally, for the high-income households, VAT remains proportional.

While the current analysis is purely theoretical, a final assessment of the progressivity of the VAT will require a data analysis to support our propositions. Therefore, since the reality itself is more complicated, there are much more to investigate concerning VAT's impact to households' lifetime consumption or income.

References

- Aaberge, R. & Eika, L. & Langørgen, A. & Mogstad, M. (2018). Local governments, in-kind transfers, and economic inequality. *Statistisk sentralbyrå Discussion Papers* (888).
- Avi-Yonah, R.S. (2006). The Three Goals of Taxation. *University of Michigan Law School Scholarship Repository*, 60(1), 1-28. Retrieved from <https://repository.law.umich.edu/articles/40/>
- Björklund, A. (1993, December). A Comparison Between Actual Distributions of Annual and Lifetime Income: Sweden 1951-89. *Review of Income and Wealth*, 39(4).
- Braveman, P.A & Cubbin, C. & Egerter, S.& Williams, D.R. & Pamuk, E. (2010). Socioeconomic Disparities in Health in the United States: What the Patterns Tell Us. *American Journal of Public Health*, 100(S1), 186-196. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2837459/>
- Caspersen, E. & Metcalf, G.E. (1994). Is A Value Added Tax Progressive? Annual Versus Lifetime Incidence Measures. *National Tax Journal*, 47, 731-746. doi: 10.3386/w4387
- Davies, J.B. (1992, January). Tax Incidence: Annual and Lifetime Perspectives in the United States and Canada. In J.B. Shoven & J. Whaller (Eds), *Canada-U.S Tax Comparisons*. (pp. 151-188). University of Chicago Press.
- De Nardi, M. & Fella, G. (2017). Saving and wealth inequality. *Review of Economic Dynamics*, 26, 280-300.
- De Nardi, M. & Pashchenko, S. & Porapakarm, P. (2017). The lifetime costs of bad health. *NBER Working Papers*, 23963.
- De Nardi, M. (2004). Wealth inequality and Intergenerational links. *Review of Economic Studies*, 71, 743-768.
- Decoster, A. & Loughrey, J. & O'Donoghue, C. & Verwerft, D. (2010, Spring). How Regressive Are Indirect Taxes? A Microsimulation Analysis For Five European Countries. *Journal of Policy Analysis and Management*, 29(2), 326-350.
- Dynan, K.E. & Skinner, J. & Zeldes, S.P. (2002, May). The Importance of Bequests and Life-Cycle Saving in Capital Accumulation: A New Answer. *The American Economic Review*, 92(2), 274-278.
- Dynan, K.E. & Skinner, J. & Zeldes, S.P. (2004). Do the Rich Save More? *Journal of Political Economy*, 112(2), 397-444.
- Ebrill, L.& Keen, M. & Bodin J-P. & Summers, V. (2001, November 5) *THE MODERN VAT*. Washington, D.C: International Monetary Fund, Publication Services.
- Fullerton, D. & Rogers, D.L. (1991, September). Lifetime versus Annual Perspectives on Tax Incidence. *National Tax Journal*, XLIV(3), 277-287. doi: 10.3386/w3750

- Gale, W.G. & Scholz, J.K. (1994, Fall). Intergenerational Transfers and the Accumulation of Wealth. *Journal of Economic Perspectives*, 8(4), 145-160.
- Hernandez, M. & Pudney, S. E. & Hancock, R. M. (2006, April). The welfare cost of means-testing: Pensioner participation in income Support, *ISER Working Paper 2006(12)*. Colchester: University of Essex.
- Keen, M., & Lockwood, B. (2006, December). Is VAT a Money Machine? *National Tax Journal*, 59(4), 905.
- Kendall, K.A. (1961, September). The Significance of Social Welfare in the World Today. *The University of Chicago Press*, 35(3), 235-245.
- Kotlikoff, L.J (1988, Spring). Intergenerational Transfers and Savings. *The journal of Economic Perspectives*, 2(2), 41-58.
- Kotlikoff, L.J. & Summers, L.H. (1981). The Role of Intergenerational Transfers in Aggregate Capital Accumulation. *Journal of Political Economy*, 89(4), 706-732.
- Leahy, E. & Lyons, S. & Tol, R.S.J. (2011, Summer). The Distributional Effects of Value Added Tax in Ireland. *The Economic and Social Review*, 42(2), 213-235.
- Menchik, P.L. & David, M. (1983, September). Income Distribution, Lifetime Savings, and Bequests. *The American Economic Review*, 73(4), 672-690.
- Metcalf, G.E. (1994, January). Life Cycle versus Annual Perspectives on the Incidence of a Value Added Tax. In Poterba, M. (Ed), *Tax Policy and the Economy, Volume 8*. (pp. 45-64). MIT Press.
- Metcalf, G.E. (1995, Winter). Value-Added Taxation: A Tax Whose Time Has Come? *Journal of Economic Perspectives*, 9(1), 121-140.
- Mirer, T.W. (1980, April). The Dissaving Behavior of the Retired Aged. *Southern Economic Journal*, 46(4), 1197-1205.
- O'Donoghue, C. & Baldini, M. & Mantovani, D. (2004). Modelling the redistributive impact of indirect taxes in Europe: an application of EUROMOD. *EUROMOD Working Paper*, EM7/01.
- OECD/Korea Institute of Public Finance (2014). The Distributional Effects of Consumption Taxes in OECD Countries, *OECD Tax Policy Studies*, (22), OECD Publishing. doi: 10.1787/9789264224520-en
- Poterba, J.M. (1989, January). Lifetime Incidence and the Distributional Burden of Excise Taxes. *American Economic Review*, 79(2), 325-30.
- Revenue Statistics 2018: Tax revenue trends in the OECD* (2018). OECD.
- Rodriguez, S. & Díaz-Giménez, J. & Quadrini, V. & Ríos-Rull J.V(2002). Updated facts on the U.S. distributions of earnings, income, and wealth. *Quarterly Review*, 26(3), 2–35.

Warren, N. (2008, Jun 26). A Review of Studies on the Distributional Impact of Consumption Taxes in OECD Countries. *OECD SOCIAL, EMPLOYMENT AND MIGRATION WORKING PAPERS*, (64). doi: 10.1787/1815199X