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Inequality and Tax Progressivity

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1. Introduction

How should we design the tax system? Is the current tax system too progressive, or on the contrary should it be even more progressive? These questions regularly arise in political discussions and the opinions expressed often reflect the ideological stance of those who defend them. In recent years a great deal of research based on computational methods¹ has been done. This research, regardless of ideological positions, may introduce relevant elements to this debate. In this study I will review the foundations of such research, bypassing their more technical aspects, and will explain their fundamental conclusions on the properties of the optimal degree of tax progressivity.

Specifically, in these pages I will analyze the role of progressivity in income taxation as a mechanism to achieve two objectives: equity between individuals with different earning capacities, and insurance against the unexpected labour income fluctuations that individuals experience. These positive objectives must be balanced out against their negative impact on economic efficiency (implied by the introduction of distortions in the labour and savings decisions of individuals).

This study does not intend to be exhaustive. As I have mentioned previously, the analysis is based on the taxation of income, and does not discuss other tax rates such as taxes on consumption. Nor

does this analysis study all the existing dimensions of the tax debate. Instead, it focuses on the balance between the objectives of equity and insurance versus efficiency costs. For this purpose I will take the preference of tax authorities for equity as a given, without entering into discussions on social justice.

Setting out now the key conclusions:

1. The optimal progressivity in income tax is obtained using a flat tax on labour income with a substantial exemption, and a flat tax on capital income.

2. The optimal capital income taxation is high. This is not due to equity or insurance criteria but to efficiency reasons in the allocation of consumption and hours worked throughout the life-cycle.

These results are from a quantitative exercise based on the US economy. However, since they are based on fundamental aspects observed in most industrialized countries their basic principles are generally applicable to other economies.

2. Income differences, inequality and capital markets

That we are different is evident. People differ in their height, age, sex, physical strength, entrepreneurship, knowledge, and so on. In this study, the purpose of which is to analyze tax progressivity, I will focus on some of the differences that affect the ability of individuals to generate labour income.

One of the important dimensions is age. The labour earnings of individuals vary substantially with age due to work experience and human capi-

tal accumulation factors. And even then, individuals of the same age differ substantially in their capacity to generate income. Some of these differences occur prior to entering the labour market, such as innate or genetic ability, the environment in which one has grown, or the quality and level of education received. A further difference is due to factors related to personal labour experience. For example, it is possible that individuals work in sectors that *ex-post* generate different opportunities, some may work for a company that languishes over time, whilst other individuals may work for a successful company, some may be affected by illness, or some may simply lose their jobs while others keep theirs.

In this study I shall classify the differences in three dimensions:

1. Initial type: refers to all the factors that are determined before entering the labour market, and are assumed independent of the employment history of the individual.

2. Age.

3. Luck: refers to random circumstances throughout the individual's working life.

Thus, each individual has an initial type, age and a luck history in the labour market. The combination of these three dimensions will determine the individual's labour productivity.

From a tax system design perspective, the quantitative importance of each dimension is crucial, as is the structure of capital markets. To clarify this point, imagine a world in which initial type differences cannot be insured in the private market, while the risks associated with the labour market are insurable in capital markets. In that world, private insurance would eliminate the impact of the

luck factor, thereby isolating consumption capacity from fluctuations in income. In this case, tax progressivity would be an instrument with the sole purpose of reaching a determined equity objective through the redistribution of resources from the more productive to the least productive individuals. On the other hand, if the luck factor matters and insurance capacity is limited, progressive taxation will play an additional role by introducing an external source of insurance against labour income risk.

Furthermore, throughout their lives individuals make their work-consumption-savings plans according to their current income and future income expectations. If differences only existed in the initial type, individuals with similar preferences would make plans proportional to one other. Those individuals with more skills would have a higher income in each period and would proportionally accumulate more assets, according to their planned lifetime consumption. In this case, the relative impact of capital and labour income taxation would be the same for all individuals. On the other hand, if the luck factor is of significant importance, individuals with greater luck will accumulate assets more than proportionally (to insure against a potential reverse of luck in the future). As a result, the proportion of labour and capital income would differ substantially amongst individuals (as observed in the data), which is a reason why differential taxation on income sources asymmetrically affects different individuals. A tax system based on capital income taxation rather than on labour income taxation would proportionally have a greater impact on older individuals who have had more luck and have accumulated a higher level of assets.

There are therefore two fundamental and difficult tasks. First, determining what portion of labour productivity is due to differences in the initial

type and what portion is due to differences of luck in the labour market. And second, to determine the degree of access to insurance or, similarly, the degree of incompleteness of capital markets.

Finally, I should mention that until now I have referred exclusively to idiosyncratic risk and have deliberately omitted aggregate risk. In this study I do not take into account the role that the fiscal system plays in alleviating the impact of aggregate economic fluctuations. There is academic research that aims to determine the evolution of inequality with the business cycle. The most relevant references are Krusell and Smith (1998) and Storesletten, Telmer and Yaron (2004). However, to date, the research is not sufficiently advanced so as to be able to draw conclusions on tax progressivity. A partial exception is the analysis of the impact of intergenerational redistribution and social security by Krueger and Kubler (2006).

2.1. Quantifying the impact of the initial type and luck on labour productivity

What portion of the observed differences in the ability to generate income among individuals is determined by initial differences and what portion is due to luck?

Clearly, determining the impact of age is relatively simple, given that age is always observable. In contrast, determining what part of the individual's income corresponds to the ability type and what part corresponds to luck is very controversial. The reason being that many of the initial factors are not observable or easy to measure: skills, effort, work ethics, quality of education or professional ambition. The exercise becomes even more complicated if we consider that there are components of productivity revealed throughout working life which are not merely the result of luck, such as the effort put into work itself or occupational

choices (self-employment or paid employment, public or private sector employment, etc.).

It is due to these difficulties that economists differ in regards to the estimated impact that the ability type and luck factors have on labour income. I emphasize this because it plays a crucial role in the analysis of tax progressivity both from a standpoint of economic efficiency and from an equity perspective, as previously discussed.

Empirical studies on this matter cannot be conclusive, but they are indicative. In particular, estimates of the relative importance of the two different types of heterogeneity previously mentioned are not independent from the theoretical framework under consideration. For example, if in our analysis we take into consideration the human capital accumulation decisions of individuals throughout their working life, part of the differences in income that we attribute to luck would in reality be a result of those decisions. In any case, to date, estimates indicate that initial conditions explain between 50% and 90% of the differences in observed income (controlled by the age factor), and that the luck factor is very persistent (with an autocorrelation greater than 0.9).²

2.2. Access to insurance and market incompleteness

A key question is: what insurance capacity do households have against different types of risk? Insurance capacity is not constant in time or between different groups of individuals or countries. This is because, amongst other reasons, financial markets evolve through time, as do social norms, and regulation over these markets varies between different regions. In addition, not all random factors that affect individuals are equal. For example, a severe illness is a risk that could be **permanent**, while losing or keeping a job is **persistent** over

time, and some productivity fluctuations are purely **transitory**, as could be the peaks in the demand for a taxi driver or a restaurant.

Determining the ability of individuals to insure is an extremely complex task, since it depends on financial institutions and on the type of risks that the individual faces. Even the degree of development of financial markets is not a good indicator, since there are multiple forms of insurance that are not channelled through the formal financial system. In the first place, individuals may self-insure using personal savings. Aware of the potential fluctuations in their income, individuals can accumulate assets³ and adjust them to income variations, avoiding undesirable fluctuations in their consumption levels. Secondly, many informal insurance markets exist, such as transfers between members of a family or a network of friends, and even neighbours. Strong evidence exists about sophisticated mechanisms of informal insurance as is the case, for example, in isolated rural communities in India or Thailand (see Townsend, 1994 as well as other articles, books and research projects by the same author), or the case of “La Crema” in Andorra, by Cabrales, Calvo-Armengol and Jackson (2003).

Therefore, the empirical strategy generally consists in quantitatively assessing how much individual consumption responds to fluctuations in individual income. If the evidence showed that individual consumption is independent of transitory fluctuations in individual income, this would indicate that complete markets to insure temporary income fluctuations exist. The existing empirical evidence, however, indicates that revenue fluctuations are partially transmitted to consumption, by which we can conclude that insurance markets are not complete. Several conceptual frameworks exist to understand the reasons behind the absence of markets for insurance which could potentially improve the welfare of individuals. On the one

hand, it is possible that there is no capacity to prevent individuals from abandoning their insurance contracts once the relevant uncertainty has been partially or totally resolved. Kehoe and Levine (1992) formalized this aspect, and Krueger and Perri (2009) have analyzed its implications for tax redistribution. It is also possible that lack of information makes the signing of these contracts too complex, economically unprofitable or downright impossible. Based on the pioneering work of Mirrless (1971), there is a line of research that analyzes the optimal policy in this type of environment, see Golosov, Kocherlakota and Tsyvinski (2003).

While empirical evidence indicates that markets are not complete, the ability of individuals to insure themselves against transitory income fluctuations is quite high. This is because the level of personal savings, like the one observed for the average individual (about three times their annual income) is enough to self-insure against transitory income fluctuations. In contrast, the ability of individuals to insure themselves against persistent or permanent fluctuations is low, or non-existent.

This fact — the capacity of individuals to insure against transitory fluctuations, together with the relative importance of the different types of heterogeneity of individuals — will determine that **the tax system has a crucial role in achieving equity objectives (or *ex-ante* insurance for permanent differences in income-generating capacity), or to absorb persistent risks over time.**

In this respect it is important to emphasize one point that has been documented on various occasions: the introduction of public insurance mechanisms crowds out private insurance mechanisms (formal or informal) and does not necessarily increase the capacity of households to isolate their consumption habits from income variations. This

mechanism has been studied in Attanasio and Rios-Rull (2000) and Krueger and Perri (2009).

3. The concept of optimum and social welfare

In general most potential policies improve the welfare of some individuals and worsen the welfare of others. Therefore, the debate over what is considered a good policy is at the very least a controversial one.

As I described above, we will consider a world in which individuals are born, they are randomly assigned an ability type, they enter the labour market and in each period their productivity receives a random value, finally they retire and eventually die (with some probability that this can happen in each period). In this world there is a distribution of individuals based on their age, their ability type when entering the labour market, and their history of luck, in addition to considering all the future generations.

Ideally, through a utilitarian approach we would seek the tax system that maximizes the weighted average of welfare of all individuals, both currently alive as well as future generations. This would require determining, for any policy, the future evolution of the economy given initial common conditions. This task is computationally colossal, and the reason why in Conesa, *et al.* (2009) we opt for a different optimality criterion that is computationally feasible.

In our work on tax progressivity we look for the tax system that maximizes individual welfare before entering the labour market (before knowing its ability type), for a stationary equilibrium of the economy. Put more simply, imagine a large number of economies that are the same except for their tax system. Due to the fact that these

economies have different tax systems, individuals in different economies have different economic prospects, given that wages, interest rates etc. will differ. In this system, which tax system would provide newborns the greatest welfare prospects throughout their lifetime — today and in the future?

To summarize, this exercise consists in choosing a function that establishes how much tax an individual must pay as a function of his income so that individuals born in an economy with such a tax system would reach the highest possible expected welfare.

4. The keys of tax progressivity

Many potential tax systems exist. For this reason, in this study I shall merely consider tax systems in which the tax level paid by each individual depends solely on their observed income level. In other words, I shall consider a tax system that cannot discriminate as a function of other observable variables. Allowing for such discrimination would increase the tools available to the tax authority and therefore allow for more advantageous⁴ situations to be reached. In reality tax systems partially discriminate on the basis of some observable characteristics (if the individual is self employed or not, or the number of children, etc.), but in our analysis we will focus on a function that assigns a tax to each income level.

The functions that I consider range from a fixed taxation independent of income (total absence of redistribution, generating a highly regressive tax system in exchange for not introducing distortions) to a highly progressive function, or a proportional tax system.

4.1. Equity

Who should contribute most to the financing of expenditure on goods and services by public administrations? Theories on social justice have widely studied different definitions of justice, and I do not propose to go into details on this matter.

The equity criterion I use for the purpose of this analysis is very simple. It is based on the underlying utilitarian conception in the criterion of optimality that we discussed previously. Imagine that, as the tax authority, we value equally the welfare of two individuals with different income levels. If the additional welfare obtained by an additional unit of resources is decreasing⁵, and both individuals contribute the same amount to public revenues, then the individual with a lower income will sacrifice more welfare. This implies that individuals with higher income should contribute more resources to the financing of public expenditure.

Taking this argument to the extreme, the optimum would be to impose taxes that equalize the after-tax available resources. The reason being that when income is redistributed from those who consume the most to those who consume less, the poorer individual will obtain a greater increase in welfare relative to the reduction in welfare that is inflicted upon the richer individual.

In this sense, if all differences in income were independent of the decisions of individuals it would be optimal to introduce in the tax system a complete redistribution, equalizing the resources available after taxes. In this manner a very strong social preference for equity is embedded in our concept of optimum.

4.2. Insurance

If the marginal welfare of individuals decreases with their consumption, and the risks faced by

individuals are not fully insurable, a tax system that redistributes from the more fortunate to the least fortunate individuals will improve expected welfare. The logic is the same as when I spoke of equity, with the same conclusions. Equity (and the associated redistribution) between different individuals *ex-post* constitutes an insurance from an *ex-ante* perspective, so that it is conceptually difficult — if not impossible — to distinguish between both aspects. In general, we refer to equity aspects when we speak of redistribution between individuals who differ in their initial type, whereas we refer to insurance aspects when we speak of redistribution between individuals whose difference depends on their luck in the labour market.

4.3. The distortions introduced by taxation: the efficiency argument

Introducing redistribution in this exercise implies that the level of tax payments is an increasing function of generated income. However, generated income is not independent of the decisions of individuals. Individuals generate more or less labour income according to their decisions to participate and put more or less effort in the labour market, or work more or fewer hours. Individuals generate more or less capital income according to their saving decisions. Therefore, the tax system makes the returns that individuals receive from private labour and savings decisions differ from the social productivity of work or from investment. Distortions exist when individuals change their economic decisions due to the tax system, often generating an efficiency loss. Due to this effect it is crucial to consider how the tax system affects the decisions of individuals.

4.4. The balance between equity-insurance and efficiency

As we have seen, equity and insurance criteria (given our objective function) would lead us to

balance the consumption capacity among individuals who differ in their initial type and luck. This would imply a marginal tax rate of 100%. On the other hand, if the consumption capacity were the same for all individuals regardless of their generated income level, and the marginal rate were 100%, then from an individual perspective there would be no incentive to participate in the labour market or to exert effort, or to sacrifice current consumption levels and save. This would generate huge efficiency losses (what we refer to as distortions).

Hence, on the one hand equity would call for higher marginal rates, while on the other hand these would imply greater distortions. The optimum consists in weighting out these aspects, and our welfare criterion is a particular way of doing that. According to this logic there is no concept of justice, in the sense that we consider that it is not “fair” to tax more the individuals that have made the greatest effort or have saved the most or have had the greatest luck. The reason why higher taxes are not imposed on those who have worked and saved the most is because in such a world too many distortions would exist and the welfare prospects of our children would be reduced because of both the direct impact of these distortions and because they would be born in a poorer world with lower wages. The optimal criteria used will therefore incorporate a strong preference for equity and redistribution, while the presence of distortions will halt a complete redistribution of income.

4.5. A remark: the tax system and effective taxation

Note that one single source of income may be subject to different tax rates. For example, labour income is subject to social security contributions (one fraction paid directly by workers and another paid indirectly through the employers’ contributions), and it is also taxed as personal income. In

the case of capital income, corporate taxes are applied to the net capital income generated by firms, after which dividends, interests or capital gains are taxed as personal income.

From a conceptual standpoint, we will continue to analyze capital and labour income taxation. Therefore, the empirical counterpart of these taxes will be the data on **effective** income taxation.

Consequently no direct comparisons should be made between the results of the exercise we propose in this study and income tax rates. The correct comparison is between effective rates, which in our theoretical work are obtained directly, while they must be calculated in the data. A well-documented example on how to calculate effective tax rates (including an appendix with the data) can be found in Conesa, Kehoe and Ruhl (2007) or in Conesa and Kehoe (2010).

5. Determining the optimal degree of tax progressivity

First I will review the classic results on the optimal structure of income taxation, second I will analyze the most recent results that take into account individuals who differ on certain dimensions. The introduction in the analysis of heterogeneity between individuals and the incompleteness of capital markets, as I have discussed above, naturally creates a conceptual framework in which to discuss the balance between the arguments of equity-insurance and efficiency.

5.1. The classical results in taxation of capital and labour income

The classic references in this area are the papers of Chamley (1986) and Judd (1985)⁶. They analyzed

a simpler conceptual framework than the one that we have been discussing here. Imagine a family that is representative of the entire society, which takes decisions on how many hours they work and how much to save in relation to the return from work and investment, which are competitively determined by the productive sector. This family pays taxes on labour and net capital income. Since the analysis only considers a representative household in a deterministic environment, by definition there is no equity or insurance argument, it is exclusively an argument of efficiency.

Now let us consider a government that must finance a given level of public spending from today onwards, and must choose the best combination (for now and for the future) between capital and labour income taxes. The work of Chamley and Judd shows that in the long run the government should not tax capital income⁷. Moreover, even if workers have no capital income and the government only considers the welfare of workers, the result remains the same: the best policy from the perspective of the workers entails no tax imposition on capital income in the long run. Note that the assumption of competitive markets is crucial in this case. With non-competitive markets it is possible for companies to generate extra profits (beyond the normal return on investment), and it would be efficient to tax those surpluses.

From this exercise a very important lesson is learnt: contrary to what it may appear at first sight, taxing capital income in the long run is not an effective way to redistribute from individuals with more capital to individuals that rely more on labour income.

5.2. Some recent results

Of course, the world which was analyzed in the classic works that I have previously discussed

is very limited. Today, thanks to the existence of computers and to the development of computational methods, the same issue can be analyzed in a more complex analytical framework. A framework in which individuals differ along several dimensions and where the insurance capacity is limited (in fact we will assume that individuals can be insured only through individual savings).

This section will review the key findings obtained in Conesa, *et al.* (2009). The study is a quantitative exercise for the US economy, based on the factors that I have previously discussed.

The key findings are:

1. The most efficient way (i.e., the one that introduces fewest distortions in the decisions of individuals) to obtain redistribution is through a tax system that imposes for labour income a flat tax rate with a fixed exemption, and a flat tax rate for capital income.

2. The objectives of equity and insurance are obtained through the progressivity in labour income taxes, in this case introduced by the existence of the fixed exemption, while age is the factor that determines the optimal tax, in efficiency terms, of capital income. Thus, capital income taxation is not justified on the basis of redistribution criteria among different individuals, as the discussion on the classical results in the previous section suggested. The optimal level of redistribution is already achievable with the progressivity of labour income taxes.

To interpret these results it is convenient to recall the discussion on the balance between equity-insurance and efficiency. The arguments of equity and insurance call for a complete redistribution of resources, and hence a marginal tax rate of 100%. The argument of efficiency implies that high mar-

ginal rates greatly discourage labour and savings decisions. The balance, therefore, lies in some middle point. We obtain as the optimum a certain degree of progressivity in labour income taxation, and that redistribution is obtained through a unique tax bracket and a fixed exemption. This form of tax introduces the desirable progressivity with the least possible distortions, meaning the lowest possible marginal tax rate. Given a certain level of tax collection, more progressivity implies a higher income exemption and a higher flat tax rate, something that generates more distortions. On the contrary a lower degree of progressivity would imply a reduction in the income exemption, thereby reducing the tax rate and generating more labour and savings incentives. The quantitative result obtained is that the optimal flat tax rate on labour income is 23%, with a fixed exemption equivalent to 17% of the average income.

This result leads to the conclusion that the proliferation of tax brackets in income taxation is not optimal. The reason being that simplifying the tax code, combining a flat tax rate and a fixed exemption, one could achieve the desired progressivity level with a lower cost in terms of distortions in individual decisions (remember that distortions are increasing in the marginal tax rate). In this sense, the tendency to simplify the tax code, in line with the proposals of Hall and Rabushka (1995) among others, is the right direction, as already noted in Conesa and Krueger (2006).

Finally, there are no reasons to introduce progressivity in capital income taxation, since the poorest and least fortunate have low or no capital income. In the light of the classical results it is important to remember that capital income taxation is not a good instrument for income redistribution.

Our results indicate that the optimal capital income tax can be quite high. In the case of our

quantitative analysis for the US economy we obtain an optimal tax rate of 36%. Assessing the factors that determine this result, we note that the main reason for this result is the age factor. A lower return on savings, due to a higher capital income tax, is equivalent to increasing the price of consumption and leisure at an older age with respect to consumption and leisure at a younger age. In an economy with lower capital income taxation individuals work and save more when they are younger (when they are less productive), and enjoy more consumption and leisure at a more mature age (when they are more productive). In contrast, with a higher capital income tax, hours worked and consumption are reallocated over the individual's life. This encourages an optimum level of work when individuals are more productive, and consumption and leisure are redistributed in favour of the individual's initial life periods, therefore improving the welfare of individuals irrespective of their ability to generate income.

6. Discussion and main conclusions

The debate on the desirable degree of tax progressivity tends to focus on ideological arguments, often arising from different concepts of social justice or preconceptions about the origin or legitimacy of the observed differences in income. In these pages I have discussed a very different way of approaching the same question. The exercise involves a computer simulation of an economy where a large number of individuals differ in their ability to generate income due to the following three factors: age, factors prior to entering the labour market and luck in the labour market. With the best available estimate on the importance of these three factors we can build an artificial economy with a degree of inequality similar to that observed in the data. In this theoretical framework it is possible to an-

swer the following question: with what degree of tax progressivity is welfare maximized for a person who joins the labour market before knowing his initial type or the luck he will have?

The objective function used in the analysis generates a very strong preference for equity and redistribution among different individuals. Indeed, were it not for the distortions introduced by the tax system, the optimal solution would be a total redistribution of resources, therefore equalizing the consumption possibilities of all individuals. However, such a strategy would introduce huge disincentives to work and save.

In this conceptual framework the computational results indicate that the optimal tax is given by a flat tax rate and a fixed exemption on labour income, and a flat tax rate on capital income. This is an extremely simple fiscal policy prescription which delivers the least distortive way of obtaining a certain degree of progressivity. Also, the exercise shows that the optimal capital income tax is not determined by the willingness to implement redistribution through the tax system, but rather by an efficiency criterion in the allocation of consumption and leisure over the life-cycle, and this may involve a substantial capital tax burden.

In view of these results the proliferation of tax brackets in labour income taxes is a bad idea, and in consequence the tendency to eliminate brackets is an efficiency improvement that need not negatively affect the desired degree of tax progressivity. On the other hand, the tendency to establish a flat tax rate for capital income also appears to be a good idea, and that rate can be above the flat tax of labour income taxation.

Notes

(1) For an excellent academic revision on these type of models see Heathcote, Storesletten and Violante (2009). For applications to the study of tax progressivity see Conesa and Krueger (2006) and Conesa, Kitao and Krueger (2009).

(2) See Heathcote, et al. (2009) for a detailed discussion of these results.

(3) In general we are used to thinking of bank accounts or other type of real or financial assets. However, in less developed rural economies it is common that cattle, for example, play the role of an asset.

(4) For example, if I can discriminate by age I will always be in a more advantageous situation, since it will always be possible to choose equal taxes for all ages. The associated advantages of this possibility are analyzed in Erosa and Gervais (2001) or Conesa and Garriga (2008).

(5) This is a classic hypothesis in economic theory, consistent with the observed behaviour of individuals. A new line of investigation in the frontier of economy and psychology centred in the direct quantification of the degree of "happiness" (see Van Praag and Ferrer-i-Carbonell, 2004) seems to corroborate this hypothesis. It even suggests that beyond certain income thresholds the degree of happiness does not improve.

(6) I exclusively refer to the analysis of taxation in dynamic environments. The classic treatment of optimum progressivity in static environments with asymmetric information began with Mirrless (1971), who argued for the optimality of an inverse u-shape of marginal tax rates on labour income.

(7) These authors assume that a government can credibly announce its future policy and commit to not changing it later. In general, these policies are not credible since governments would have an incentive later on to reassess their policy and change it. This is known as the time inconsistency problem – see Kydland and Prescott (1977) for one of the first treatments of this problem.

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Juan Carlos Conesa

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