Capital and Labor Taxes, Macroeconomic Activity, and Redistribution

Albert Marcet

Capital and Labor Taxes, Macroeconomic Activity, and Redistribution

Albert Marcet *

Most Western economies have complicated tax systems. All sorts of taxes are inflicted on the taxpayers: personal income tax, corporate tax, consumption tax (VAT or excise), property tax, social security, etc. Generally speaking, taxes can be grouped into three categories: labor, capital, and consumption taxes. Labor taxes are applied to income from wages; capital taxes are applied to income from assets, such as capital gains from property or stocks, interest payments, profits, dividends, etc.; consumption taxes are applied to the value of a purchase of some consumption goods.

Much recent economic research has studied the effects of each kind of tax on aggregate variables. For example, is the tax on capital income so high that investment is below desired levels?, is the labor tax so high that it induces unemployment?, should consumption taxes be lowered in recessions to promote aggregate demand?, if any of these taxes is lowered, how should we make up for the lost tax revenue?. This research is concerned with the macroeconomic effects of the level of tax rates; therefore, it is of combined interest and relevance for public finance and for macroeconomics. Standard

models of modern macroeconomics (that is, equilibrium dynamic models with rational expectations) are particularly suitable for this type of study. In this *Opuscle* we want to discuss some of the results in this literature, in particular, the empirical measurement of average tax rates and, more concretely, the effects of capital and labor taxes for both the distribution of wealth and aggregate efficiency. It turns out that there are large differences in tax rates across European countries, and so our discussion will apply to the issue of harmonization of tax rates in the EU.

Almost all taxes in modern economies are "ad valorem", that is, they are paid as a percentage (or, more generally, a function) of some income or expenditure. Economists learn early on in their careers that "ad valorem" taxes have two effects: first, they discourage the demand (or the supply) associated with the good (or the productive) factor that is being taxed. In other words, the agents' decision is distorted, this is why economists call "ad valorem" taxes "distortionary" taxes. For example, a higher tax on capital income lowers the return from savings, this is likely to discourage savings, and, consequently investment will go down; hence, a higher capital tax has a distortionary effect on investment. The second effect is on tax revenue: clearly, an increase in the tax on capital is likely to increase the tax revenue from capital income.[1]

The government will often have to adjust some other fiscal variable if a certain tax is lowered, perhaps increasing another tax, or lowering spending, or increasing debt. The first effect distorts agents' decisions which is, in principle (that is, in the absence of other distortions), bad for the economy[2]. Therefore, a "good" tax will be one that raises a lot of revenue without causing large distortions.

From the *aggregate* point of view of an economy, however, a tax has a third important effect: it redistributes wealth across the population. Income taxes do this in an obvious way since they are progressive (richer agents pay a higher percentage of their income). But even flat-rate taxes, those with a constant percentage for all individuals, can have redistributive effects. For example, even if corporate taxes are defined in terms of a flat-rate, an increase of corporate taxes is likely to redistribute after-tax wealth against the fraction of the population who owns corporate stocks. Similarly, a higher labor income tax has a redistributive effect, in principle, against workers. In the same vein, increasing consumption taxes to reduce income tax redistributes wealth against low-income and retired workers, since they will pay the higher consumption taxes but will not benefit from a lower income tax.

Therefore, in order to study properly the effects of raising or lowering a tax we have to take into account the three effects: distortions, tax revenue, and redistribution. The problem is complicated by the fact that these three factors are interrelated. For example, if a cut on the capital income tax is successful in promoting investment, then productivity and wages are likely to increase, which in turn will increase revenues from the labor tax. Furthermore, if the increase in productivity is large enough it could happen that all agents benefit from a reduction in capital taxes, including those who only receive labor income.

Economists have been studying these issues for a long time, and the discussion of the three effects that we mention above and their tradeoffs is not new. Yet, there are two reasons for writing an *Opuscle* about this topic. First, there has been substantial progress in the development of

theoretical and computational tools that are appropriate for a complete study of the three effects jointly. Second, it is possible to observe large differences among tax rates within the European Union. Such large differences are not sustainable as the EU becomes more integrated and productive factors can move from one country to another at smaller costs. Therefore, some countries will have to adjust their tax rates, which might have a substantial effect on their fiscal policies and on the welfare of different parts of the population. A full study of the effects of tax harmonization in Europe has not yet been completed. We want to signal that this is an important issue that could be studied with the tools of modern macroeconomics.

We will concentrate our discussion on tax revenue, and so we will *not* discuss if governments should spend more or less, whether government transfers (such as unemployment benefits or social security) should be reformed, or whether the government should increase its spending in public investment. The sort of question we will ask is: given the level and distribution of government spending, what tax instruments should be used to finance it? We will allow government to get in debt if tax reform implies that total tax revenue decreases in some period, but in that case we take into account the additional interest and the repayment of debt that the government will face in the future.

Next, we discuss some problems associated with measuring average tax rates and we present some measurements obtained for different countries. After that, we will analyze the likely effects of lowering or raising tax rates both in terms of aggregate efficiency and redistribution of wealth. Finally, we will derive some implications for the issue of harmonization of tax rates in

Europe. We also include a brief methodological discussion as an appendix.

Measurements of Average Tax Rates.

Since we are concerned with the macroeconomic effects of the general level of tax rates, it seems reasonable to simplify matters by studying some kind of "average" tax rate.

The tax code is often quite elaborate. Taxes are not applied uniformly, different rates apply to different income brackets or types of individuals or types of goods. Furthermore, there are many exceptions, different scales and deductions. Therefore, the average tax rate in the economy as a whole can not be deduced just by reading the tax code. Obviously, considering average tax rates will leave out some important effects, but this is a familiar simplification: the leap of faith is similar to the one required to talk, or even care, about the "price level" or the "gross national product" of an economy.

A good measure of average tax rates should have different properties. First of all, it should capture closely the distortion that the economy is suffering from the tax on each kind of factor or good. In this respect, what matters is not the proportion of taxes to income (average tax rate), but the additional tax that will be paid as a result of a small increase in income (marginal tax rate), since the latter is the one that agents take into account in deciding if they should, say, invest more. Therefore, what matters is the marginal tax rate that is paid on average, across consumers. The second property of a good measure of an average tax rate is that it should also capture the total tax revenues that are obtained.

It is also important to notice that, specially in the case of capital income taxes, one has to take into account the effect of several taxes that are found in the actual economies. For example, if an individual buys one corporate stock, the total tax attributed to this investment includes the corporate tax paid by the firm as a percentage of its profits, the personal income tax paid by the stockholder when the dividend or capital gains from this stock are added to his personal taxable income, and the property tax. Observe that the income tax[3] affects both the income from labor and capital.

Several approaches can be used in order to obtain average tax rates. At one end, some authors start by describing an "average", or "representative" consumer using data on individuals. They find average labor income, average capital income, average deductions, etc., claimed by individuals and, putting these together, they construct the fiscal characteristics of a "representative" consumer. Then, they apply the tax code to this representative individual and the result is a measure of the average tax rate supported by individuals[4].

One can go into more detail and calculate marginal tax rates separately for different parts of the population, for example differentiating between the average income from joint returns, single returns, families of different sizes, etc. But the basic idea is to apply the tax code to calculate the marginal tax rate of a "representative" agent. Therefore, this approach combines observations on individual data with the tax code.

At the other end, some authors use only aggregate data on revenues from different taxes. The idea is, essentially, to take revenues from labor income taxes and divide them by total wages, adjusting for the difference between marginal and average taxes, and taking into account that the income tax is applied to both capital and labor income. The result is a synthetic measure of the tax effectively paid on average, considering all taxes and all deductions. We will refer to this as the "aggregate" approach[5].

The aggregate approach is less likely to take proper account of the difference between average and marginal tax rates, which is specially a problem if the tax code is very progressive, but it has the advantage that it uses only aggregate tax revenues and data from the national accounts, which are easily available for many countries. The first approach we discussed is, in a way, more accurate, but it necessitates individual data and can thus not be used in international comparisons because the necessary data are not available for many countries. But one should not be too pessimistic: Mendoza et al. (1994) compare the measurements obtained with different methods for the US economy and they argue that many features are unchanged across methods. When the aggregate method is used in US data, the tax rates are similar to those obtained with more complex methods. Therefore the use of the aggregate approach for international comparisons is justified.

Using the aggregate approach, Mendoza et al. obtain the rates for four European countries during the 80's that are described in Table 1.

The first thing to note is that many of these taxes are very high. In particular, labor taxes are very high in most of continental Europe. Second, we can observe large differences across European countries. The capital income tax and, in particular, the corporate tax, is much higher in

Average Tax Rates (in %) in the 80's.

Type of Tax	United Kingdom	France	Germany	Italy
Capital income	64	27	26	26
Labor income	28	45	39	38
Consumption	16	21	15	12
Corporate	57	34	9	28

the United Kingdom than in continental Europe. Also, we can see sizable differences in the level of capital and labor taxes across countries in continental Europe. It is worthwhile noticing that the capital income tax in the United States is approximately halfway between the capital tax in the UK and in continental Europe; thus, according to these data, the usual claim that continental Europe has more egalitarian tax systems than the US and the UK is questionable.

Although in many unified economies tax rates differ across regions (for example, across states in the US), those differences are nothing like those reported in the above table. Obviously, as the European Union becomes more unified these large differences are unsustainable: some countries will have to lower their tax rates (for example, the UK would have to lower its capital tax rate) and/or others will have to raise them (for example, France would have to increase its capital tax rate). This problem is particularly severe with capital and corporate taxes, since it is easy to move capital across countries. But different labor taxes are also a considerable problem, since they increase artificially the differences between labor costs in different countries.

Unfortunately, the harmonization of tax rates in Europe has not been at the forefront of policy discussion nearly as much as other issues.

Potentially, this could become a serious problem: for example, in the light of Table 1, we would expect British investors to have strong incentives to switch their capital to the French economy. Of course, if this happened, the United Kingdom would eventually lower its capital tax rates, but only after capital had flown and the revenue collected from capital taxes by the government had gone down for some time.

To the extent that a harmonization of tax rates is unavoidable, there are the following questions: should European countries harmonize to a high level of capital taxes and a low level of labor taxes, or the other way around and which sections of the population would be hurt, and by how much (relative to their pre-harmonization stance)? The first question can be rephrased as follows: from an aggregate point of view, is it more efficient to increase capital taxes or to lower them? The second question can be rephrased as: what are the redistributive effects of following the more efficient policy?

The case for abolishing capital taxes: aggregate efficiency

The question we want to discuss now is whether capital taxes should be lowered or increased in modern economies. The investigations which we review now will address this issue using data from the US economy.

Given the very high capital taxes that are often estimated, and since higher investment increases the productivity of labor, one would expect that lowering capital taxes would increase the aggregate efficiency of the economy. A high level of capital taxes for the US is not only found by Mendoza et al., but it is common across most

empirical explorations of average tax rates; for example, Joines (1981) and Barro and Sahasakul (1986) find even higher tax rates[6].

As we explained before, this is because the income from capital is taxed at many levels (by corporate, personal income, and property taxes).

It has been claimed by some politicians, as well as by some economists, that taxes are so high that total revenue would increase if taxes were lower. This is the well-known "Laffer curve" effect. This effect says that, when tax rates are already very high, investment might go down so much because of a further increase in taxes, that the net effect on tax revenue may be negative[7].

There is no doubt that, theoretically, a Laffer curve exists. This is shown in graph 1, which displays the curve relating total revenue raised at each tax rate (this curve applies to both labor or capital taxes). It is clear that, if the tax rate is zero, the total revenue is zero, so that the red point in graph 1 belongs to this curve. It is also clear that, if the tax rate is 100 % the revenue will be zero, because no input will be provided for a null net income from their productive activities, so that the grey point belongs to the curve. Also, it is clear that some revenue will be generated by some level of taxes between 0 and 100%. Therefore, the curve relating revenues to tax rates is like an inverted (possibly asymmetric) U. We can see that if the tax rate is very high, in the interval FL, a further increase in tax rates lowers total revenue.
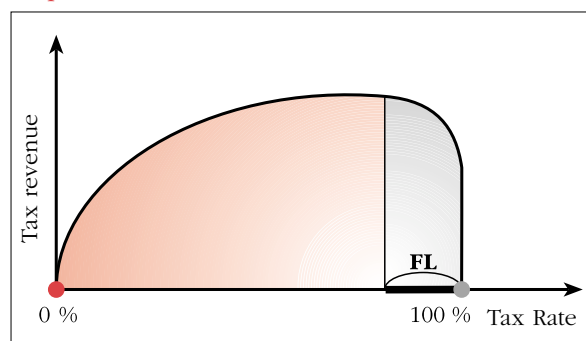
It would be indeed very nice if Western economies could benefit from lower tax rates and higher revenues … Everyone in the economy would be happier by lowering tax rates and anyone would call this a real free lunch. The

Possible Laffer curves

Graph 1
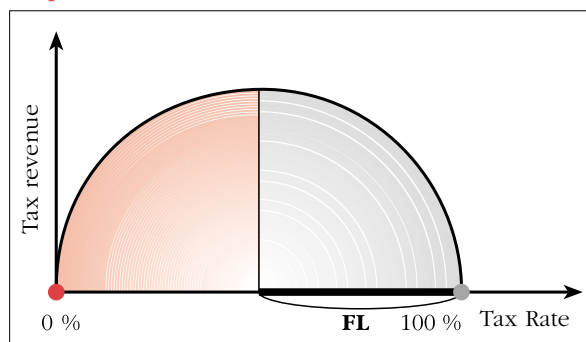
Graph 2

question is, however, if the real economy is actually in the interval FL. This depends on the actual shape of this curve in the economy and on the current level of taxes. In particular, it depends on whether the peak of the curve is very much to the left (as in graph 1) or to the right (as in graph 2). Graph 1 represents an economy where a small decrease in net wages has a big discouraging effect for employment and hours worked. But if an increase in the net wage does not affect much the amount of hours worked, the actual Laffer curve is better represented by graph 2[8].

Since FL is very large in graph 1, revenue increases in response to a tax cut even for moderate levels of tax rates. In graph 2, only for very high tax rates would a tax cut increase revenue.

Unfortunately, there is some evidence, both empirical and theoretical, that we are not in FL. Ronald Reagan campaigned in the 1980 election claiming that a reduction in taxes would increase revenue from taxes. He was showing pictures of the Laffer curve (mostly similar to graph 1) on television, and he argued that income taxes in the US were so high that they were on the decreasing part of the television curve. Reagan won those elections and, as a president, he did lower capital tax rates[9]. The outcome is well known: tax revenues were not sufficient to cover government spending, government debt in the US increased like never before in peace times, and real interest rates were very high in the first part of the 1980's.

The issue of whether or not the economy is in the decreasing part of the Laffer curve has been explored more formally by some studies based on economic modeling. For example, Garcia-Milà, Marcet and Ventura (1998) consider a model where agents receive income from labor and capital. Our model does not have any feature that could work, a priori, against the effectiveness of cutting capital taxes[10]. We initially disregard differences across agents, and study a model with a single consumer representing the aggregate economy. As is normally done nowadays in macroeconomic modeling, we fix the values for the parameters of the model economy in a way that is consistent with some features of the real economy. Tax rates in the model are assumed to be constant over time, and they are set at the level suggested by the data, according to measurements similar to those discussed in the previous section. Then, we

calculate the relationship between capital tax rate and capital tax revenue (Laffer curve), and we find that, in fact, even considering the highest estimated average tax rates, an increase in tax rates would bring about an increase in capital tax revenues in the model economy. Nevertheless, it must be said that the increase in revenue would be rather small, and that capital tax rates are quite close to the interval FL in our model economy.

There may be some benefits from lowering taxes that are not taken into account in our study. For example, there may be a positive effect in curtailing capital flights to off-shore banking locations. Also, since the income tax is progressive, many investors might be actually on a decreasing part of their Laffer curve. But, in summary, it appears that there is no free lunch to be had by lowering capital taxes.

So, if capital taxes are lowered some other fiscal variable will have to be adjusted. Lucas (1990) addressed this question by studying the trade-off between capital and labor taxation. He carried out the following experiment: would the economy be better off by maintaining the current level of government spending, suppressing capital taxes, and making up for the lost revenue by increasing labor taxes? The hope is that the lower capital taxes would induce an increase in investment, productivity and wages that would offset the negative effects on labor supply of the higher labor tax.

Lucas considered a model where a "representative consumer" was taking the decisions of how much to save, work, etc. Because this representative consumer should be thought of as representing a kind of average, the issue that Lucas addressed was whether or not the economy, *on the average*, would be better off by

abolishing capital taxes. Calibrating the parameters of the model economy according to the observed data in the US, he studied how the economy would change along time if capital taxes were suppressed. This exercise is not straightforward, because in order to find the labor tax that compensates for the lost revenue from capital taxes, one has to take into account that productivity, wages, and the tax base in the future will be higher, as a consequence of the growth induced by the higher investment. Lucas found that the behavior of the economy after abolishing capital taxes would be as suggested in graph 3.

We can see how lower capital tax induces higher investment, and how the capital stock starts to grow toward a higher long run value. Clearly, the larger capital will induce higher productivity and wages. Nevertheless, the only way that the economy can finance a higher investment in the initial periods is by lowering consumption, which explains the initial drop in this variable. Later on, when capital and output are high, consumption is also higher than before. On the other hand, labor supply initially increases, due to the fact that labor is highly productive after the additional capital has been put in place, but later on, since the economy is richer, the representative consumer decides to work fewer hours.

Therefore, the economy is better off in the long run by abolishing capital taxes but it is worse off in the short run, since consumption is lower and the work hours longer. How can we decide if, on the whole, it is worthwhile to abolish capital taxes? To answer this question we have to weigh the improvement in the long run with the worse situation in the short run. Lucas simply uses agents' preferences for current versus

Graph 3
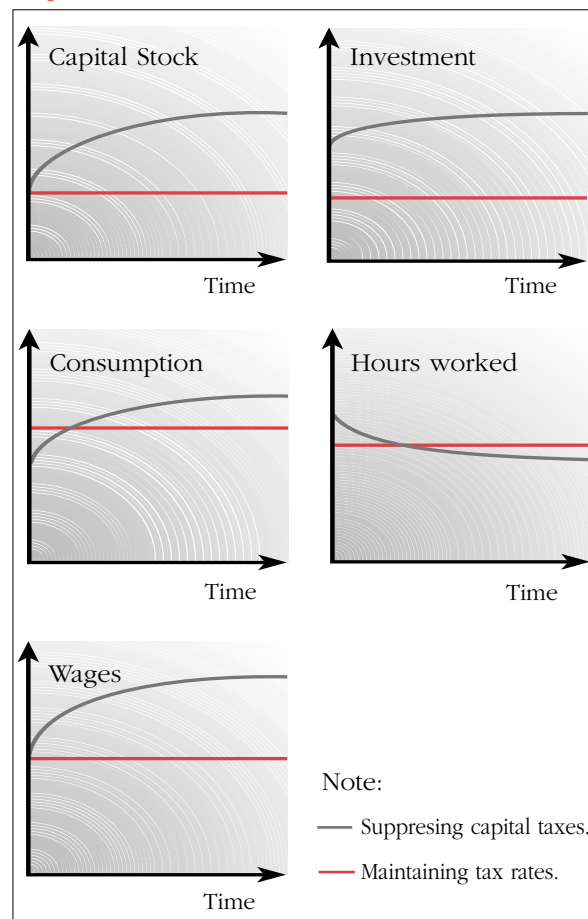
future consumption in order to compare the current situation with the abolition of capital taxes. In other words, in keeping with economics' tradition, one decides whether or not something is good for an economic agent by evaluating the new situation according to the agents' preferences, the same preferences that the agents use to decide on the combination of consumption/savings that they want to hold. In this manner, the welfare criterion used to decide

if a certain government policy is good, is consistent with the way agents take decisions in the economy.

Lucas found that the representative agent would be better off if capital taxes were abolished. The effect is quantitatively small but not negligible. In other words, the distortion caused by high capital taxes (i.e., the lower investment) is worse than the distortion caused by high labor taxes (i.e., the lower labor supply); the "average" individual is better off by freeing up capital income from all taxes even after considering the hardship in the few initial periods. Note that future generations will be even happier, because they do not have to endure the low initial consumption, so that the tax reform would not be reversed by future generations[11].

The case for not abolishing capital taxes: distribution of wealth

Lucas (1990) was very careful to state in his work that his main purpose was to show that the models used in modern macroeconomics could be "put to work" for the purpose of policy analysis, but that his conclusions were not definitive. In particular, he did not address any distributive issues arising from the abolition of capital taxes. His model, which considered the existence of a representative agent, was not designed for that purpose. In academic research it is a reasonable method of analysis to break up a problem in small pieces, so separating aggregate efficiency effects and redistributive effects is a good way to start.

In Garcia-Milà et al. (1998), we carry Lucas' analysis further in order to study the distributive effects of suppressing capital taxation. Consider graph 4, each point in that graph represents the

Graph 4
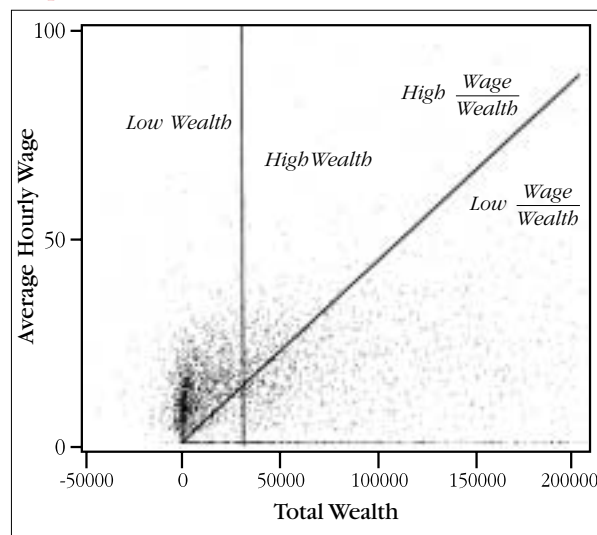
labor and capital income for a given family in a representative sample of US families[12]. According to this graph, there is great dispersion across families of the labor/capital income ratios, that is, on the proportion of wealth coming from labor or capital income. Some families have a large proportion of labor income, others have almost no labor income, and there are many points in between. Because of this dispersion, it is not clear if the beneficial aggregate effect of abolishing capital taxes that Lucas pointed out will carry over to most of the population. In particular, families on the upper left region of the graph, those who have a high labor/capital income ratio, will pay most of the additional labor taxes that need to be raised to finance government spending, and they are the main candidates to being hurt by the abolition of capital taxes.

To study this issue, we extend Lucas' model to consider heterogeneous agents, each agent having a different level of income from labor or

capital. We split the representative sample of the US population represented in Graph 4 in five groups according to their labor/capital income ratio, and we assume that our model economy has five agents, each agent representing one of the groups from the data. After careful analysis, using numerical simulation of our model, we find that about half of the population would see a large decline in their welfare if capital taxes were abolished. Obviously, the ones that would be hurt would be those with a higher labor/capital income ratio. While the aggregate improvement discussed in Lucas is small (but non-negligible), we find *substantial* losses in welfare for a substantial part of the population. This happens in a model with no unemployment, market imperfections, disequilibrium, etc. Some authors have asked how could governments not abolish capital taxes, if it was so obvious that they had to be abolished to promote investment. Our answer is clear: it is because only part of the population would benefit from such a measure, while a substantial part would be hurt.

Note that, although richer families tend to have a higher proportion of their income coming from capital, the correlation is far from perfect. Clearly, some poor families have most of their income coming from capital (these are farmers, owners of small family enterprises and some retired people) and some very rich families have most of their income coming from labor activities (young lawyers and MBAs, I suppose).

The question now is: *could capital taxes be cut in such a way that we gain aggregate efficiency but, at the same time, prevent any perverse redistributive effects?* There is an obvious way of doing the above, but it is probably impossible to apply it in the real world. If there is a policy or a change in the environment that

increases aggregate efficiency at the cost of hurting part of the population, there is always the possibility of compensating the losing part of the population by redistributing wealth in their favor with lump-sum taxes. A tax is "lump-sum" if the total amount of tax paid can not be influenced by the agents' actions; for example, a lump sum tax could say: "every person whose last name begins with M will pay 100.000 pts.", or "every person who has ever worked in the olive oil industry will receive a grant of 50.000 pts", or "every resident of the Camden (London) district will pay 200 sterling pounds". But a tax that says "every producer of olive oil will receive a subsidy equal to the value of 10% of their total production" is not lump sum, because the total subsidy received depends on the total amount produced and, obviously, the tax itself affects total production.

But we all know that lump sum taxes are almost never observed. In part this is because modern societies feel that taxes should be paid according to people's earnings, which in turn depend on people's actions. In part, this is also because it is almost impossible to identify who should be compensated.

There is, however, another alternative that can be used in practice and that achieves aggregate efficiency in the long run while avoiding perverse redistributive effects. Consider the following question: *what would happen if, instead of suppressing capital taxes suddenly (as considered in Lucas and Garcia-Milà et al.), this tax was only gradually eliminated?* [13]

In a separate study (Marcet, 1998) we find that, in the presence of heterogeneous agents, we can insure that all consumers are better off if capital taxes are abolished very, very slowly. In this way, investment will increase in anticipation

of the lower future capital taxes, causing productivity and wages to increase before labor taxes do. In this way, even those agents who only have labor income can benefit from the gradual abolition of capital taxes, since they can benefit from the higher wages immediately. The slow elimination of capital taxes takes care of the redistribution of wealth, it insures that all agents end up being better off, and it achieves, eventually, the aggregate efficiency. Nevertheless, it must be said that this is not without a cost: the slow elimination of capital taxes causes a delay in the higher efficiency that is achieved by the lower capital taxes, therefore, it takes much longer to achieve the higher investment than under the case studied by Garcia-Milà et al. (1998) when all capital taxes are abolished immediately.

Conclusion

The research we have discussed in the *Opuscle* makes it clear that one can address issues of fiscal policy with modern macroeconomic tools, and that quite a bit of tax revenue detail can be introduced into the models. In particular, the dynamic efficiency, the effects on tax revenue and the redistributive effects of changes in the structure of labor and capital taxes can be studied jointly. One clear picture seems to emerge: lowering capital taxes will improve aggregate efficiency, but this can be beneficial to all members of the economy only if done very gradually[14].

This is important as a general proposition about the configuration of an ideal structure of capital and labor taxes, but it is also important in view of the vastly different tax rates that are observed across Europe. Differences as large as

those reported in Table 1 are unsustainable in a unified economy, and some countries will have to adjust their tax code. Given the extremely high level of capital tax rates, it seems obvious that it is better to adjust by lowering capital tax rates.

Even though the free lunch promised by Reagan in his 1980 campaign does not seem to exist, the research to which we have referred argues that lowering (or even suppressing) capital taxes could have beneficial effects to the aggregate economy. But if capital taxes are lowered too quickly large parts of the population could be vastly worse off, particularly those agents with a low capital/labor ratio. If the capital tax rate is lowered slowly and with sufficient advance notice, all agents in the economy can be better off. The latter is, therefore, the way to proceed: not a big, but a soft bang.

Some attention has been devoted to the issue of tax harmonization across EU countries, but not nearly as much as other topics. For example, much has been made about the fact that monetary union will imply that each individual country will lose its ability to smooth out asymmetric shocks (that is, shocks that affect some European countries but not others) by its own monetary policy. But having different taxes in different countries is like having a *permanent* asymmetric shock to the remuneration of different factors, so it would seem that much more attention should be devoted to this topic than to the loss of monetary discretion by each particular country.

Since the harmonization of capital and labor taxes in Europe seems unavoidable, it is better to anticipate this problem before it needs an urgent solution. If nothing is done, we would expect large movements of capital across countries in

order to take advantage of the lower taxes. Such movements are likely to cause losses in tax revenue in some countries and urgent measures will then have to be taken later on. Urgent measures are often not the best alternative but, in addition, as we have argued in the *Opuscle*, drastic cuts in one of the taxes are likely to hurt a large part of the population. To repeat: it is better to anticipate.

As the journalist Joan Barril explained in the newspaper *El Periódico de Catalunya*[15], the problem with the EU is that, to adapt to it, large parts of the population might get hurt. This remark expresses very well the main problem. To the extent possible, tax harmonization should be done in such a way that it improves everyone's welfare and, since models in modern macroeconomics can introduce many interesting elements in the study, we submit that they should play an important role in the discussion.

Appendix: A methodological note, and why science is not the same as ideology.

The nature of an *Opuscle* is not to give a methodological or technical discussion. Nevertheless, in view of the results discussed it is worthwhile having a (brief) methodological discussion about the models used in modern macroeconomic research. This is particularly interesting in light of the problem we analyze, because the topic of lowering capital taxes is usually highly charged with ideology. As we have seen from the previous discussion, basically the same model, only enriched with a multiplicity of consumers, can deliver results consistent with different ideologies: the homogeneous agent model discussed in Lucas (1990), interpreted

literally, would say that the abolition of capital taxes is good, while the heterogeneous agent model discussed in Garcia-Milà et al. (1998), when interpreted literally, says the contrary.

This research has used the (nowadays standard) framework of equilibrium, multiperiod models with rational expectations, explicit microfoundations and a well specified budget constraint for the government. Unfortunately, it is sometimes claimed that these assumptions are somehow based in favor of conservative policy measures. The model of Garcia-Milà et al. has all these ingredients but, nevertheless, it obtains the conclusion that it is not good for the economy to lower capital taxes. Therefore, this illustrates how the above analytical framework is completely unrelated to a conservative political stance. This is exciting, because it means that a lot of progress can be made purely at a scientific level.

It is worthwhile to provide a more detailed justification for why each of the ingredients listed above is important in order to study the taxation of capital and labor.

• *Multiperiod models:* The effect of lowering capital taxes has been studied, for example by Atkinson and Stiglitz (1980) and Diamond and Mirless (1971). These early studies were performed on the basis of static models. But in those models, where everything happens in one period, the role of savings is not very interesting. We all view investment as a good thing because it is used for production in the future, but a static model has no concept of future. Two-period models are not adequate either, since the potential benefit of a higher investment in future periods (i.e., future higher wages and productivity) is imposed on the model in an arbitrary way.

- *Equilibrium:* A lower capital tax rate has effects on the whole economy. It affects wages, interest rates, tax revenues, etc. In order to take into account the interaction of markets a general equilibrium model (as opposed to partial equilibrium models) is needed.

- *Government budget constraint:* Unfortunately, many undergraduate macroeconomics textbooks still discuss policy analysis ignoring the obvious fact that the government has a constraint and that, if one tax is lowered, spending will have to go down in some future period, or some other tax will have to compensate for the loss of government income.

- *Rational expectations:* This assumes that agents can formulate forecasts of future variables as well as possible. In the case that we study, it means that investors understand the changes in the evolution of the economy that will come about because of the tax reform. For example, investors are supposed to know that lower capital taxes will bring about higher wages, higher interest rates, etc. Rational expectations is the standard way to model agents' expectations in macroeconomic research, partly because it has been shown that, under reasonable assumptions, agents can learn to form rational expectations eventually. However, rational expectations could be particularly problematic in the kind of study that we discuss: how could agents figure out from the first period the effects of the lower tax? They certainly can not learn immediately from past experience, since past experience at lower taxes is almost inexistent, and how fast they learn matters a lot in terms of deciding if the transition to the higher level of investment is too costly or not. For this reason, it would be interesting to relax this assumption for this particular kind of study and assume that agents learn to form expectations in a consistent manner.

- *Microfoundations:* Before the 70's, macroeconomists often avoided the explicit modeling of how agents make their consumption/saving decisions. They just postulated some consumption function or a fixed savings rate (as in Solow's growth model). If we model consumers as behaving in order to serve their preferences (always the same preferences) for consumption in any possible tax environment. We can see how the savings rate is affected by the tax reform. Furthermore this has the advantage that the preferences of the agent can then be used to evaluate the benefit of the policy change; so, no ideological judgment intervenes in deciding if a policy change is good or bad for an economic agent.

Footnotes

Part of the research discussed in this Opuscle is based on joint work with Teresa Garcia-Milà and Eva Ventura, many thanks are due to both of them. Comments from Teresa Garcia-Milà, Esther Hauk, Guillem López, Michael Reiter and, specially, Andreu Mas, were extremely helpful.

(1) We will discuss later how, when the level of taxes is very high, tax revenues may increase if the tax rate is lowered.

(2) Related to this point is the fact that a higher tax rate promotes tax evasion and, therefore, might lower total revenue. Although this might be an important effect, we will not discuss it in this opuscle.

(3) In Spain, the Impuesto sobre la Renta de las Personas Físicas.

(4) This tax rate expresses the total tax paid as a proportion of total income. Therefore, deductions from the tax base are included as if they were a fixed proportion of total income. This is, of course, only an approximation to the real economy.

(5) See, for example, Mendoza, Razin and Tesar (1994) for an overview of different methods.

(6) Estimates of average capital taxes differ considerably across studies. This is partly because they look at different things. For example, some studies take into account that firms are allowed to deduct depreciation (gross investment) from their income while others estimate the implied tax for gross profits, before allowances are deduced.

(7) Total revenue can also go down if more income goes into the underground economy or is invested in off-shore banking. This effect, however, is not generally taken into account in the literature we review here.

(8) Using slightly technical terminology, Graph 1 represents an economy with a high elasticity of labor supply, while Graph 2 has a low elasticity.

(9) Mc Grattan, Rogerson and Wright (1993) estimate that capital taxes in the 80's in the US were about 50% on average, down from an average of 60% in the 1945-80, period.

(10) In economic terms, we would say that the model is completely neoclassical: markets are perfectly competitive, prices are flexible and all savings are transferred to investment.

(11) The question arises of whether one could achieve a better outcome by compensating the abolition of capital taxes with some other kind of tax. This issue was addressed by Cooley and Hansen (1992). They considered a model, where, in addition to capital and labor taxes, the government could levy consumption taxes and an inflationary tax. They found that, in fact, the representative consumer would be better off by abolishing capital taxes and compensating the lost income with higher labor taxes.

(12) This graph is taken from Garcia-Milà et al. It uses information from the Panel Study of Income Dynamics data set.

(13) Actually, it must be possible to decrease capital taxes in such a way that all consumers are either indifferent or better off. Chamley (1986) and Judd (1987) showed that, if the government is allowed to change tax rates every period, the best thing to do is for capital taxes to converge to zero in the long run, even in the presence of heterogeneous agents, and even if the welfare of all agents is guaranteed not to go below the previous state. They did not study, however, how is the transition to the long run optimal capital tax.

(14) Research by Zhu (1992), Jones, Manuelli and Rossi (1993) and Milesi-Ferreti and Roubini (1994) shows that, under some conditions, capital taxes should not be lowered to zero in order to achieve aggregate efficiency. This research considers the effects of human capital accumulation, positive effect of government spending, etc.

(15) "The great unknown about the Euro is not whether it is going to succeed or not, but rather who will be better off with it and who will be worse off". (Published April 21st 1998).

References

Atkinson, A.B. and J.E. Stiglitz, 1980, "Welfare Implications of the Taxation of Savings", *Economic Journal*, vol. 90.

Barro, R.J. and C. Sahasakul, 1986, "Average Marginal tax rates from social security and the income tax", *Journal of Business*, vol. 59, 555-566.

Chamley, C.P., 1986, "Optimal Taxation of Capital Income in General Equilibrium with Infinite Lives", *Econometrica*, vol. 54, 607-622.

Cooley, T.F. and G.D. Hansen, 1992, "Tax Distortions in a Neoclassical Monetary Economy", *Journal of Economic Theory*, vol. 58.

Diamond, P.S. and J. Mirless, 1971, "Optimal Taxation and Public Production II: Tax Rules", *American Economic Review*, vol. 61.

Garcia-Milà, T., A. Marcet and E. Ventura, 1998, "Supply-Side Interventions and Redistribution", WP Ref. 115, Departament d'Economia i Empresa, Universitat Pompeu Fabra, Barcelona, (2nd version).

Joines, D.H., 1981, "Estimates of Effective Marginal Tax Rates on Factor Incomes", *Journal of Business*, vol. 54, num.2, 191-226.

Jones, L., R. Manuelli and P. Rossi, 1993, "Optimal Taxation in Models of Endogenous Growth", *Journal of Political Economy*, vol.101, num. 3.

Judd, K. L., 1987, "The Welfare Cost of Factor Taxation in a Perfect Foresight Model", *Journal of Political Economy*, vol. 95, 675-709.

Lucas, R. E. Jr., 1990, "Supply-Side of Economics: An Empirical Review", *Oxford Economic Papers*, 293-316

Marcet, A., 1998, "The Transition of Optimal Capital Taxes with Heterogeneous Agents", mimeo.

McGrattan, E., R. Rogerson and R. Wright, 1993 "Household Production and Taxation in the Stochastic Growth Model", Staff Report num.166, Federal Reserve Bank of Minneapolis.

Mendoza, E. G., A. Razin, L.L. Tesar, 1994, "Effective tax rates in macroeconomics: Cross-country estimates of tax rates on factor incomes and consumption", *Journal of Monetary Economics*, vol. 34, 297-323

Milesi-Ferretti, G.M. and N. Roubini, 1994, "Optimal Taxation of Human and Physical Capital in Endogenous Growth Model", WP International Monetary Fund and Yale University.

Zhu, X., 1992, "Optimal Fiscal Policy in a Stochastic Growth Model", *Journal of Economic Theory*, vol. 58.

Albert Marcet

Albert Marcet graduated in Economics at the Universitat Autònoma de Barcelona (1982) and earned his economic Ph.D. in Economics at the University of Minnesota (1987).

He is Full Professor of Economics at the Universitat Pompeu Fabra from its beginning. He has also been professor at Carnegie-Mellon University, Pittsburgh (1986-1992) and visiting professor at the London Business School, CEMFI (Madrid), the Federal Reserve Bank of Minneapolis, Institut d'Anàlisi Econòmica and the Universitat Autònoma of Barcelona.

His main areas of research are: macroeconomics, fiscal policy, solution methods of dynamic models, financial economy and learning models.

He has published numerous papers in a variety of professional journals and now he is associate editor of *Econometrica, European Economic Review* and *Moneda y Crédito.*