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Article

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Mehmet Ayaz, Lea Fricke, *Clemens Fuest* and Dominik Sachs

Who Should Bear the Burden of Increasing Fiscal Pressure? An Optimal Income Taxation Perspective

KEY MESSAGES

- Governments need to either cut other spending or raise more tax revenue to service the additional debt resulting from shocks like the Covid-19 pandemic. This paper considers the case when governments decide to raise additional revenue
- A key policy issue is how the additional tax burden should and will be distributed between households with different incomes. Generally, tax systems are progressive, but should they become more or less progressive in response to the shock?
- Generally, governments that maximize welfare in a society with given preferences for redistribution face a trade-off between raising tax revenue and redistributing between households. If they need to raise more, there is less room for redistribution
- To effectively raise additional tax revenues, governments should increase taxes and cut transfers for all taxpayers. Measured in euros, the additional burden on rich households is higher than that on poor households, but marginal and average tax rates rise more for households with lower incomes. Thus, optimal tax progressivity should decrease in response to growing fiscal pressure
- The difference between the actual and the revenue-maximizing marginal tax rates is a key statistic for the size of the increase in marginal tax rates across the income distribution. We find that this difference is highest for low incomes

The Covid-19 pandemic has had a profound impact on the global economy, leaving us with a significant stock of additional debt. For example, net government lending dropped from 1.5 percent (-2.3 percent) of GDP to -4.2 percent (-13.4 percent) in Germany (the UK) at the beginning of the Covid-19 pandemic. In addition, the economic fallout of the Russia-Ukraine war will increase the stock of government debt further. Servicing this debt will likely force governments to spend less or raise more revenue, probably a combination of both.

A widespread view is that the burden of servicing this debt should be distributed fairly, suggesting

that tax systems should become more progressive. For example, the IMF proposes that “countries have multiple options to enhance the effective progressivity of their tax system” (de Mooij et al. 2020, 1), including “options [that] include more progressive personal income tax systems” (de Mooij et al. 2020, 3). However, the IMF also emphasizes that “the optimal degree of progressivity should strike a balance between equity and efficiency” (de Mooij et al. 2020, 4).

How should the optimal degree of income tax progression change if governments need to raise more revenues? In a new paper (Ayaz et al. 2023), we use the workhorse model of optimal income taxation to analyze the change in the degree of tax progressivity in response to the fiscal pressure caused by the Covid-19 pandemic. We bring our model to the data of five European countries (France, Germany, Italy, Spain, and the UK). Importantly, we use an inverse-optimum approach, which has the advantage that our results do not depend on a particular social welfare function. We find that total tax liabilities should increase more strongly for richer households than for poorer households. However, marginal and average tax rates should increase more strongly for poorer households than for richer households, implying that the progressivity of the tax schedule should decrease. We explain this decrease in optimal tax progressivity by the fact that the additional leeway governments have for raising marginal tax rates is significantly higher for low incomes. This is conceptualized by comparing current marginal tax rates with estimates of the revenue-maximizing marginal tax rate at different income levels.

INVERSE OPTIMUM APPROACH

To calculate the optimal tax-transfer system in a particular setting, it is necessary to make certain assumptions about the objective function guiding tax policy. This function may be interpreted as a welfare function or as a function of political influence. In the following, we use the term welfare function. A commonly used approach is to assign a welfare weight to each skill level. However, instead of taking such a normative stance and assuming society’s preferences, we adopt the inverse-optimum approach, as outlined by Bourguignon and Spadaro (2012). This approach assumes that the current tax-transfer system is the result of

Table 1

Parameters for Calibration

	France	Germany	Italy	Spain	UK
Mass of people with zero earnings (percent)	5.6	4.4	3.2	3.8	7.0
Lump-sum transfer (€)	13,347	20,763	2,540	6,991	15,037
Measure of fiscal pressure (percent)	2.65	2.96	3.52	3.58	4.90

Notes: The mass of people with zero earnings corresponds to the shares of recipients of disability benefits reported by OECD (2009). For France, the average across OECD countries is used. The values of the lump-sum transfer are set to the average minimum income protection from the 2017 Social Assistance and Minimum Income Protection Interim Dataset. We convert all values into euros. The measure for fiscal pressure is expressed as a percentage of GDP and refers to the scenario where governments need to repay the additional stock of debt in five years.

Source: Authors' compilation.

optimal policy design by the government, where they possess knowledge about the economy's distribution of productivities and labor supply elasticities. It involves taking the observed tax-transfer system as optimal and then reversing the optimal taxation problem to uncover the underlying welfare criterion for society. By doing so, we replace a normative decision question with a positive inference question.

In our study, we calibrate the welfare weights for the five countries in our sample by assuming that the tax-transfer systems that were in place before the pandemic were optimal. This enables us to answer the following question: How should the optimal tax-transfer systems change when governments are under fiscal pressure due to the additional debt that has been incurred as a result of the pandemic?

BRINGING THE MODEL TO THE DATA

We bring our model to the data of the pre-pandemic economy of five European countries (France, Germany, Italy, Spain, and the UK). For this purpose, we need information about income distributions, income tax systems, a measure for fiscal pressure, and welfare weights for different households within each country. Table 1 gives an overview of the country-specific values used for the calibration of the model.

First, we approximate income distributions based on income data from the 2018 European Union Statistics on Income and Living Conditions (EU-SILC). The EU-SILC is a cross-sectional household survey containing annual income data in a harmonized framework allowing cross-country comparisons. To obtain smooth income distributions, we apply a standard kernel density estimation and assume that a fixed mass of the population earns an income of zero. We choose this mass such that it corresponds to the share of recipients of disability benefits reported by the Employment Outlook of the OECD (OECD 2009).

Second, we use the tax-benefit micro-simulation model EUROMOD with input data from EU-SILC to approximate the current income tax systems. This gives us effective marginal tax rates that include taxes, means-tested benefits, pensions, and social insurance contributions. Further, we set the lump-sum transfers such that they correspond to the average minimum income protection

from the 2017 Social Assistance and Minimum Income Protection Interim Dataset.

Third, we compute a measure of fiscal pressure that governments face as a result of the Covid-19 pandemic using data on government debt from the OECD (OECD 2019) and the IMF World Economic Outlook (IMF 2021). Specifically, we calculate the total amount of additional debt that governments have accumulated between 2020 and 2022, compared to pre-pandemic average deficit levels. Then, we assume that governments must repay this additional stock of debt within five years, placing a considerable burden on government spending.¹ The strain on government expenditure ranges from 2 percent of GDP for France to 4.9 percent of GDP for the UK. An additional stock of debt may not have a strong effect on the balance between expenditures and revenue in governments' budgets in a low-interest-rate environment. However, with higher interest rates an additional stock of debt matters for the balance between expenditures and revenues.

Lastly, we calibrate the welfare weights such that the approximated income tax system from EUROMOD is optimal. This approach ensures that we use the welfare weights that governments were implicitly using before the pandemic.

TOTAL TAX LIABILITIES SHOULD INCREASE MORE FOR RICHER HOUSEHOLDS

In Figure 1, we present our findings on the optimal increase in total tax liabilities for different income quartiles in the five countries in our sample. Our results indicate that governments should primarily focus on collecting more tax revenues from the highest income quartiles in all countries to service their additional

¹ In our paper (Ayaz et al. 2023), we also consider a period of ten years for paying back the additional stock of debt.



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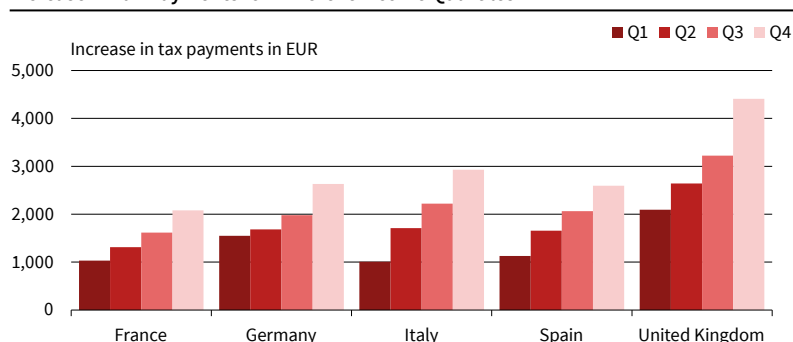
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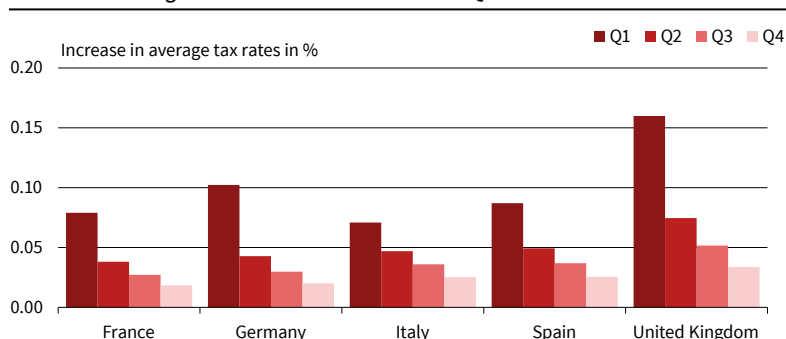
Figure 1
Increase in Tax Payments for Different Income Quartiles



Note: The figure shows the average change in absolute tax payments due to fiscal pressure for all quartiles of the income distribution.
Source: Authors' calculation.

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Figure 2
Increase in Average Tax Rates for Different Income Quartiles



Note: The figure shows the average change in optimal average tax rates in percentage points due to fiscal pressure for all quartiles of the income distribution.
Source: Authors' calculation.

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debt obligations. For instance, households in the highest income quartile in France should pay more than EUR 2,000 in additional taxes, whereas households in the lowest income quartile should only contribute about EUR 1,000 more.

The extent to which tax liability increases across different income quartiles varies across countries, as it is influenced by the initial tax-transfer systems in place and the magnitude of the fiscal pressure shock. Our analysis reveals that households within the first quartiles of the income distribution in France and Italy are projected to experience a similar amount (EUR 1,000) of tax liability increase, while the increase in the highest quartile is 50 percent more in Italy than in

France (EUR 3,000 vs. EUR 2,000). This disparity can be attributed to Italy's low initial lump-sum payment in our calibration. Conversely, our findings demonstrate that British households will face significantly higher increases in their tax liability compared to other countries, primarily due to the UK government's highest fiscal pressure in our calibration, estimated at 4.9 percent of GDP.

AVERAGE TAX RATES SHOULD INCREASE MORE FOR POORER HOUSEHOLDS

In Figure 2, we provide a presentation of our results in terms of average tax rates. In other words, we show the optimal change in average tax rates for different income quartiles. Our analysis reveals that the optimal increase in average tax rates is regressive. That is, the increase for lower-income households is higher than that for higher-income households. This result appears to contradict our finding on tax liability; however, the two results can be reconciled easily. Average tax rates are computed as the percentage of income that taxpayers pay in taxes, obtained by dividing the total tax paid by the taxpayer's income. Although higher-income households experience a greater increase in their tax liability, their higher income reduces their average tax rate. This explains why the optimal change in average tax rates is higher for lower-income households, even though the increase in tax liability is greater for higher-income households.

We find that the increase in average tax rates is significant, particularly for the lowest quartile of the income distributions. For example, in Germany, the average tax rates for the lowest quartile should increase by 10.2 percentage points, while the optimal increase for the highest income quartile is only 2.0 percentage points. Consistent with our findings on tax liability, the variation in average tax rate changes across countries can be attributed to the differences in the fiscal pressure faced by their respective governments. For example, the lowest quartile in the UK, whose government faces the highest fiscal pressure, is expected to experience a considerably higher increase, of 16.0 percentage points, in their average tax rates.

MARGINAL TAX RATES SHOULD INCREASE MORE FOR POORER HOUSEHOLDS

Figure 3 shows how the marginal tax rates should optimally change for different income quartiles. As in our result for average tax rates, we find that the optimal increase in marginal tax rates is regressive. They should increase at a higher rate for lower-income households compared to higher-income households.

The differences in our results across countries can be attributed to variations in initial



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circumstances and the level of fiscal pressure. Specifically, we find that the UK has the highest increase in marginal tax rates due to it having the highest fiscal pressure in our calibration. The lowest quartile of the income distribution in the UK is expected to face a 5.4 percentage point increase, while the highest quartile is expected to face only a 0.9 percentage point increase.

Italy is another country with a high increase in marginal tax rates. Even though Italy faces lower fiscal pressure than Spain (3.5 percent vs. 3.6 percent of GDP), the marginal tax rates should increase more in Italy. This is due to the low level of the lump-sum payment in Italy in our calibration. Since the Italian government cannot decrease the lump-sum payments, which are already low, it responds by increasing marginal tax rates more.

Finally, note that the comparative statics that marginal tax rates should increase more strongly for low-income levels due to fiscal pressure is not an artifact of our inverse-optimum approach. In a recent paper, Heathcote and Tsujiyama (2021) have explored optimal nonlinear income taxation in a model calibrated to the United States. They found that the optimal utilitarian tax schedules feature higher marginal tax rates at the bottom, the higher fiscal pressure is. In the following, we provide an interpretation of such comparative statics in terms of the well-known concept of the Laffer curve.

UNDERSTANDING THE MECHANISMS: THE LAFFER CURVE

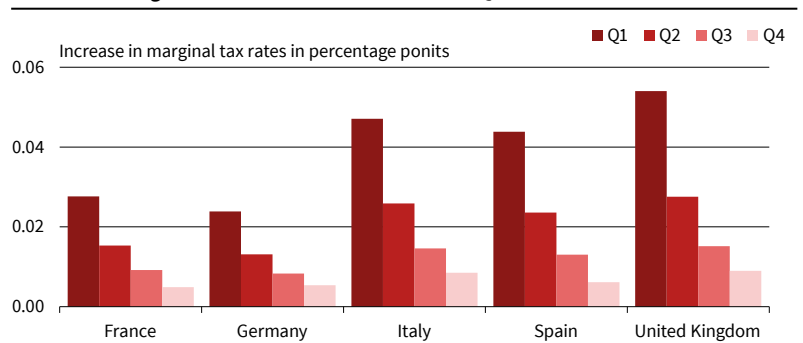
In Figure 4, we illustrate the change in marginal tax rates in a more granular way. As can be seen, the increase in marginal tax rates follows a U-shape: the increase is highest for low-income levels, then decreases for intermediate and high incomes, before it increases again for incomes above EUR 150,000. To understand this pattern, it is useful to look at the Laffer bounds for marginal tax rates.

In Figure 5, the red curve illustrates these Laffer bounds for Germany. The concept goes back to Lorenz and Sachs (2016) and it measures which value of the marginal tax rate at a given income level would maximize tax revenue, holding all other marginal tax rates fixed. We can see that these Laffer values follow a U-shape. This has its roots in the shape of the inverse Pareto coefficient of the earnings distribution, which usually has such a U-shape (Saez 2001). This is also in line with the often-found optimal U-shape of marginal tax rates (Diamond 1998).

The blue curve illustrates the current marginal tax rates that we have calibrated. The pink curve shows the optimal marginal tax rates after the fiscal pressure shock. As can be clearly seen, the increase in marginal tax rates is proportional to the difference in the Laffer bounds and the current marginal tax rates.

Figure 3

Increase in Marginal Tax Rates for Different Income Quartiles



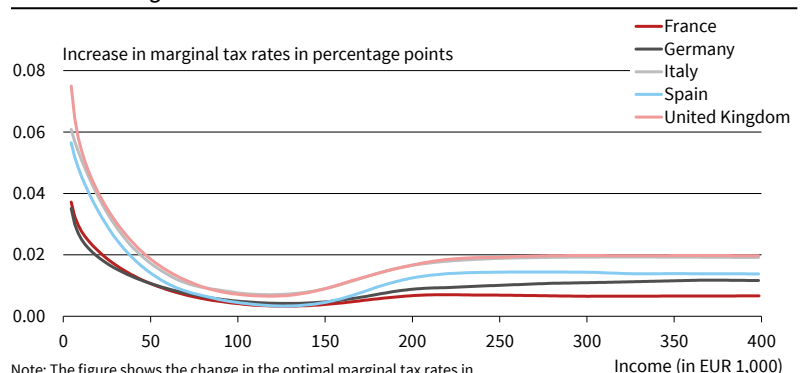
Note: The figure shows the average change in marginal tax payments in percentage points due to fiscal pressure for all quartiles of the income distribution.

Source: Authors' calculation.

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Figure 4

Increase in Marginal Tax Rates



Note: The figure shows the change in the optimal marginal tax rates in percentage points due to fiscal pressure up to an income level of EUR 400,000.

Source: Authors' calculation.

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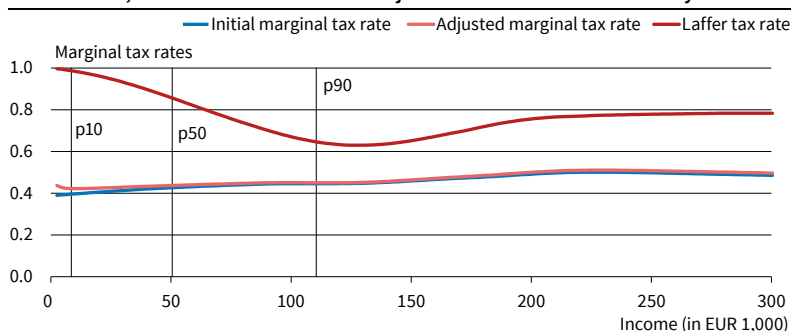
POLICY CONCLUSIONS

How governments should respond to rising fiscal pressure resulting from current crises including the aftermath of the Covid-19 pandemic, the Russian attack on Ukraine, and medium- to long-term issues like climate change and population aging is a policy question of growing importance. Intuitively, many politicians and economists argue that the burden of this fiscal pressure should be distributed fairly, implying that tax and transfer systems should become more progressive.

The difficulty with this conclusion is that even before these crises governments had to deal with the tradeoff between redistribution and other tax policy objectives like avoiding distortions and raising revenue. So, the question is how the optimal response to these trade-offs is affected by a shock forcing governments to collect more revenue or spend less. Our analysis shows that, for a given welfare function, the optimal degree of tax progressivity declines in response to fiscal pressure. This does not mean that households with higher incomes do not contribute. Measured in absolute terms, that is in euros, their tax burden rises more than that of households with lower incomes. But relative to income, the increase in the tax burden is higher for low incomes. The progressivity of the tax and transfer system declines.

Figure 5

Laffer Bound, Current Tax Schedule and Adjusted Tax Schedule for Germany



Note: The red curve shows the Laffer bound. The blue curve shows the current schedule of marginal tax rates based on a EUROMOD simulation of effective marginal tax rates. The pink curve shows the optimal marginal tax rates adjusted for fiscal pressure.

Source: Authors' calculation.

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One interpretation of this finding is a normative one, suggesting that governments should respond by raising taxes in a way that reduces tax progression. This is based on the assumption that normative considerations were a key driver of tax policy before the shock. An alternative interpretation of our findings is a positive one. If we interpret the objective function as a function reflecting political influence of different groups, our analysis predicts that governments will reduce tax progression.

To generate the result that optimal tax progression increases in response to rising fiscal pressure, one would have to argue that the shock changes the

preferences of society or, respectively, the political influence of different groups. That may well be the case. But whether the current crises shift political power towards lower income groups, or the opposite, is an open question, albeit a fascinating one for future research.

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