

The sixth annual conference of the Macroeconomic Risk Chair was held on October 16, 2023 at the Paris School of Economics, on the topic “Structural changes and their implications for macroeconomic risks, dynamics and policies”. Several influential economists participated to present their most recent research on macroeconomic risk.

This newsletter includes a brief description of the research papers discussed at the conference and the presentation of a research paper on **the heterogeneous effects of carbon taxation.** [+](#)



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Macroeconomic Risk

# The Spatial and Distributive Implications of Working-from-home: A General Equilibrium Model

Morgane Richard (University College London),

**The Spatial and Distributive Implications of Working-from-home : A General Equilibrium Model**, Working paper, January 2024. [+](#)

The Covid-19 pandemic radically changed our work habits, notably increasing the share of jobs that allow to work from home (WfH). Although the pandemic is now behind us, **data indicates that WfH arrangements are likely to persist, at least as part of a hybrid work model.** This raises crucial questions about the impact of WfH on the broader economy.

In her paper, Morgane Richard addresses these very concerns, centering on three fundamental questions: first, how does WfH affect how and where people live? Secondly, should this concern also those who are unable to WfH? And finally, how does this trend influence economic inequality? Richard's paper answers these questions using detailed housing data from London and a structural general equilibrium model of the housing market.

At its core, the model features two zones: a job-focused city center, and a residentially-inclined suburb. Household can choose to live either in the center (where everybody works) and pay little commuting costs, or in the suburbs at the cost of a longer (and more expensive) commute. House prices and rents are then determined in equilibrium by supply and demand. Importantly, the model features two types of occupations: one which does not allow WfH and another in which households endogenously choose how much to engage in WfH.

Richard then analyzes how the equilibrium in the model changes in response



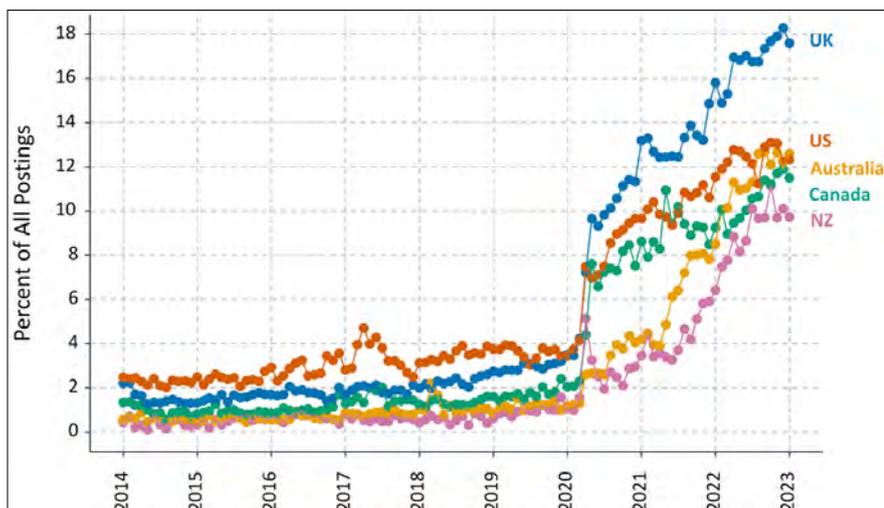
to a shift in preferences towards WfH (specifically, a sudden and unexpected increase in households' taste for working from home). Such shock is intended to mimic the pandemic's impact: in the old equilibrium households disliked WfH (e.g. because of a social stigma associated to it); then, the pandemic caused a permanent shift in households' tastes, and in

the new equilibrium everybody would like to work from home more.

The main finding is that **households in telecommuting occupations relocate to the suburbs to acquire larger homes, driving up house prices in those areas.** This "gentrification" of the suburbs crowds out the marginal buyers in those areas, which are forced to move to the center. However, due to the difference in prices between the center and the suburbs, these households often cannot afford to buy in the center and are pushed into renting.

Importantly, the author also highlights that higher inflation in house prices and rents disproportionately affects lower-income households, thereby exacerbating consumption inequality.

Concluding, Richard's paper effectively captures how a shift towards WfH has implications far beyond the workplace, affecting the structure of the housing market and of the overall economy.



# Female Labor Force Participation and Structural Transformation

Xincheng Qiu (Arizona State University), Moritz Kuhn (University of Mannheim), Iouri Manovskii (University of Pennsylvania),  
**Female Labor Force Participation and Structural Transformation**, Working paper.



Xincheng Qiu

In the last few decades, **labor markets across the developed world experienced two large changes: an increase in female labor market participation, and an overall shift from manufacturing to services.** In his paper coauthored with Moritz Kuhn and Iouri Manovskii, Xincheng Qiu offers novel insights into how these two trends were deeply linked.

In particular, they start by documenting that despite such large changes across sectors and across genders, the female employment share within these sectors remained surprisingly constant. For example the authors document that, even though the female employment

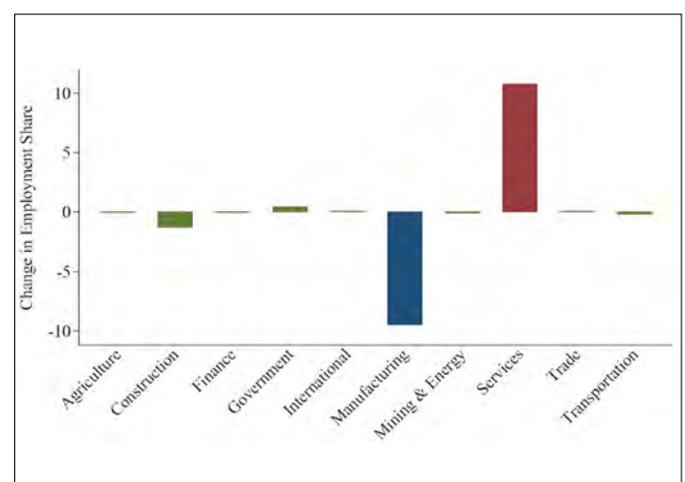
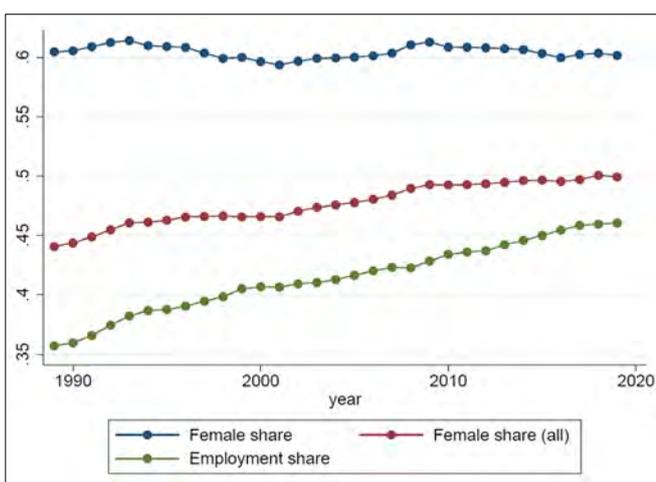
share in the overall economy increased by more than 5 percentage points (p.p.) since the 1980s (in both France and the United States), during the same period the employment share within the manufacturing and services sectors stayed constant at 30% and 60%, respectively.

The authors therefore point out that: first, a constant within-sector gender share suggests the existence of complementarities in the sectorial production function; and, second, that if genders are indeed complements an increase in overall labor market participation from females would necessarily induce a structural change in the economy.

To back such claim, they therefore attempt to estimate the causal impact of the rise in female labor force participation on industrial composition. Since female employment is potentially endogenous to industrial composition, however, they need to use an instrumental variable approach to identify the causal effect of interest. Hence, they instrument female employment using reforms of the income tax system (under the assumption that such reforms have a direct effect on female employment but do not affect, nor are affected by, industry composition). **They find that a 1p.p. increase in the female employment share leads to an increase in the service share of approximately 3p.p. and to a decline in the manufacturing share of about 2p.p.**

Finally, the authors also develop a quantitative model to more precisely quantify the contribution of the rise in female labor force participation to structural change and find that it contributes to about two thirds of the overall shift from manufacturing to services (the other third being accounted for by differences in productivity growth across sectors).

The paper therefore provides an interesting perspective on the observed structural change across manufacturing and services sectors, by showing that in the presence of gender complementarities in sectorial production functions, changes in female labor force participation can cause shifts in the relative importance of such sectors.



# The Medical Expansion, Life-Expectancy and Endogenous Directed Technical Change

Leon Huetsch (University Of Pennsylvania), Dirk Krueger (University Of Pennsylvania), Alexander Ludwig (Goethe University Frankfurt),

**The Medical Expansion, Life-Expectancy and Endogenous Directed Technical Change**, CEPR Discussion Paper No. 18610, November 2023. [+](#)

**One of the great improvements of modern age has been the increase in remaining life expectancy**, which raised from 40 years (at age 20) in the 19th century, to about 65 years in the modern day. How much of this increase was brought forward by the emergence of a “modern” health sector?

The paper presented by Alexander Ludwig (and co-authored with Leon Huetsch and Dirk Krueger), offers an analysis of the relationship between income growth, life expectancy, and the emergence of the modern health sector over the last two centuries. In particular, the authors provide a novel view of how economic and health sectors have evolved in tandem.

The paper addresses the transition in developed economies from a period marked by low income, short life expectancy, and minimal health expenditure, to an era characterized by higher incomes, longer life expectancies, and advanced health-care. The authors build a quantitative theory that can generate such transition and that can help investigate the role played by health-care policies in this transition. In particular, they aim to

quantify the impact of the modern health sector on life expectancy since the 1940s and analyze the factors driving the relative price increase of health goods and services from 1940 to 2020.

In order to do so, the authors construct a two-sector overlapping generations model incorporating endogenous and directed technical change. In particular, the model aims to capture the dynamics of income growth, life expectancy, technological progress, and the evolution of the health sector.

The model mechanism behind the interaction between these channels can be divided in three phases: in a first phase, households are relatively poor, and are not rich enough to invest into the health sector to increase their life expectancy; then, in a second phase, income grows - driven by technological progress - but the price of the modern health sector is still too high for them to afford

modern health goods and households only invest in a basic health good (which only slightly improves their life expectancy); finally, in a third phase as income becomes sufficiently high relative

to the price of modern health goods, the modern health sector (and, consequently, life expectancy) takes off. The model therefore allows for a detailed exploration of the interplay between economic growth and health sector developments.

The study finds that approximately 30% of the increase in life expectancy from 1940 onwards can be attributed to the modern health sector. This highlights the significant role of improved health goods - such as better nutrition and hygiene - in life expectancy expansion.

Ludwig and co-authors then decompose the increase in the relative price of health goods and services into two components: a first component driven by the increase in household demand for health goods due to income growth and productivity growth, and a second component driven by endogenous technological progress in the modern health sector. The findings show a balanced contribution of these factors until 1980, after which technological progress becomes the dominant force.

This paper sheds light on how income growth and technological progress have driven the expansion of the modern health sector, impacting life expectancy and the economy. The study not only enhances our understanding of past trends but also provides a framework for projecting future developments in health spending and its impact on society.

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# Decomposing the Drivers of Global R\*

Ambrogio Cesa-Bianchi (Bank of England), Richard Harrison (Bank of England), Rana Sajedi (Bank of England),  
**Decomposing the Drivers of Global R\***, Bank of England Working Paper No. 990, October 2023. [+](#)

As interest rates around the world rose again in the last few months some may wonder whether this is somehow a reversal of the secular decline in interest rates that was observed in the previous decades or just a short-term phenomenon. To answer such question, however, one needs to understand what drove the secular decline in the first place. In her paper co-authored with Ambrogio Cesa-Bianchi and Richard Harrison, Rana Sajedi tries to do exactly this: she decomposes the evolution of the real interest rate into its potential drivers, by using a combination of structural modelling and reduced-form empirical techniques.

**The primary objective of the paper is to understand the factors that have driven the global trend in real interest rates** - referred to as “global R”. The authors focus specifically on five key drivers: productivity growth, population growth, longevity, government debt, and the relative price of capital. In particular, they abstracts from business-cycle fluctuations, focusing instead on slow-moving trends.

To achieve these goals, the authors develop a structural model that treats the entire world as a single large economy with overlapping generations of finitely lived households. The model is a relatively standard version of the neoclassical growth model but, importantly, it incorporates the relevant macroeconomic drivers of the real interest rate mentioned above. They therefore use the model to simulate the path of the real interest rate under varying global conditions.

To a high level, the five factors considered by the authors have all the potential to drive the real interest rate by acting either on the demand for capital (by firms) or on the supply of wealth (by households). In particular, a decline in productivity growth can be thought of as a leftward shift in the demand for capital, thereby reducing the expected return on capital; reduced population growth and increased longevity have similar effects on the supply of capital by households, by shifting the age distribution towards older (and typically wealthier) agents which increases average wealth and shifts capital supply outward; on the other hand, an increase



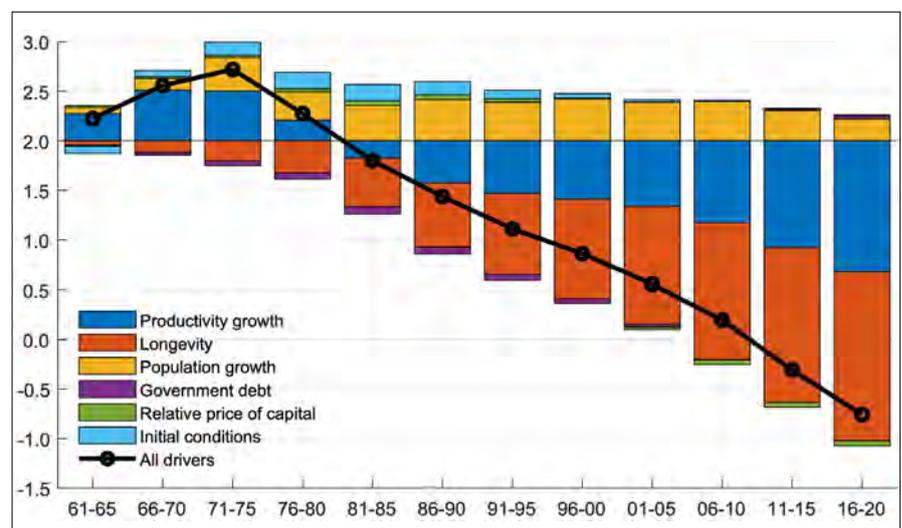
in government debt crowds out private capital and shifts capital supply to the left; finally, the relative price of capital directly acts on the demand for capital by the firms.

To estimate these five factors, the authors build a large long-run panel dataset from 31 high-income countries covering the time period from 1951 to 2020 and extract the common global trend from each of the five drivers.

By feeding the estimated sequences of the five drivers into the model, Sajedi and coauthors find that their measure of the global interest rate initially rises, starting in the 1950s, peaks around the mid 1970s and then starts to gradually decline since then. In particular, they

also find that the initial increase in the global R from the 1950s to the 1970s was mainly driven by higher productivity growth and population growth, while the subsequent 3p.p. **decline from the 1970s to 2020 is to be attributed to slowing productivity growth and increased longevity**. Interestingly, they find that these two factors alone account for the total fall, overshadowing the effects of other drivers.

By exploring the underlying forces that have shaped global interest rates over recent decades, Sajedi and coauthors provide relevant insights for both macroeconomists and policymakers and conclude that, unless there is a significant reversal in the observed trends, interest rates are likely to remain low.



# Unequal Global Convergence

Shoumitro Chatterjee (The Johns Hopkins University), Elisa Giannone (Centre de Recerca en Economia Internacional), Kan Kuno (The Pennsylvania State University),

**Unequal Global Convergence**, Working Paper, April 2023. [+](#)

One of the key topics in macro-development is that of cross-country convergence: **poorer countries generally grow faster than their richer counterparts**. Elisa Giannone - in joint work with Chatterjee, Kleineberg, and Kuno - provide a novel perspective on convergence by specifically focusing on its spatial dimension: they investigate how growth dynamics vary across regions within countries and how such dynamics are connected to the observed structural shift towards services.

First, **they show that the observed cross-country convergence was driven by a few high-growth regions within developing economies**; that is, within-country convergence fell and regional inequality increased. Then, since employment in services is usually more spatially concentrated than other types of employment, they ask if the shift towards services might have played a role in the increase of regional inequality.

In order to be able to answer such questions, one obviously needs to have data at a regional level for a large set of countries and for a long period of time. They address this issue by assembling a novel panel sub-national dataset for 674 regions that cover 34 countries across all 5 continents between 1980 and 2015. Their sample is representative of approximately 80% of world GDP and 66% of the world population.

The paper finds that within-country convergence between 1980 and 1990 is



larger than between 2005 and 2015, when it is close to zero. This fall in regional convergence is present in 56% of the countries considered and, in fact, the authors find no evidence of regional convergence after 1980. Additionally, they also show that **countries with a higher share of employment in the services**

**sector have lower regional convergence**, which suggests the structural shift towards services might play an important role to explain the pattern of regional convergence.

To test this idea, they develop an economic geography model that allows for structural transformation. The model includes both regional convergence forces and divergence forces across three sectors - agriculture, manufacturing, and services - and is calibrated to a "representative"

country built from their sample. The model indicates that the divergence forces, particularly the agglomeration economies in services, play a significant role in the process of regional convergence. In fact, the authors find that the shift towards services contributed by about one third to the fall in regional convergence. This highlights an important trade-off between regional inequality and faster aggregate transformation.

By demonstrating that the growth of service sectors and the accompanying spatial concentration of economic activity exacerbates regional disparities, this paper offers a new perspective on the relationship between structural transformation and regional development. It underscores the need for policies that address spatial inequalities while fostering economic growth, especially in the context of the global shift towards service-based economies.

## The shift towards services contributed by about one third to the fall in regional convergence



# Technological Change and Earnings Inequality in the U.S.: Implications for Optimal Taxation

Pedro Brinca (Nova School of Business and Economics), João B. Duarte (Nova School of Business and Economics), Hans A. Holter (University of Oslo), João G. Oliveira (Nova School of Business and Economics),

**Technological Change and Earnings Inequality in the U.S.: Implications for Optimal Taxation**, Working Paper, October 2022. [+](#)

Since the 1980s, the United States have witnessed a steady increase in earnings inequality, alongside rapid technological growth. Additionally, this period also saw a pivotal shift in the structure of the economy, marked by a decline in the relative price of equipment investment goods - such as cheaper access to computing power and storage - which likely reflects investment-specific technological change (ISTC). João G. Oliveira - together with colleagues Brinca, Duarte, and Holter - explores the relationship between technological advancement, income inequality, and optimal income-tax progressivity. Specifically, **the primary objective of their paper is to assess the degree to which technological change has contributed to the observed increase in earnings disparity and to evaluate its effects on the optimal structure of taxation.**

The authors tackle such objective by developing a life-cycle incomplete-markets model with occupational choice. In their model, occupations differ in terms of the nature of the tasks being performed: tasks can either be routine or non-routine (i.e. whether they are more susceptible to automation or not, respectively) and either manual or cognitive. When households start working, they therefore choose among the four available occupations based on the (idiosyncratic) cost of acquiring the relevant skills for each occupation and on the corresponding profile of future earnings. Importantly, the model also allows for different sources of technological growth: ISTC, labor-augmenting technological change, and growth in total factor productivity.

Oliveira and coauthors find that technological change can fully account for the observed increase in earnings inequality between 1980 and 2015 and that, in particular, ISTC contributed to 2/3 of the overall increase: as the price of investment goods fell, this stimulated capital accumulation and increased labor demand in occupations featuring higher capital complementarity (non-routine cognitive occupations). The rise in labor demand in turn created a wage premium

for workers in such occupations which drove up wage inequality.

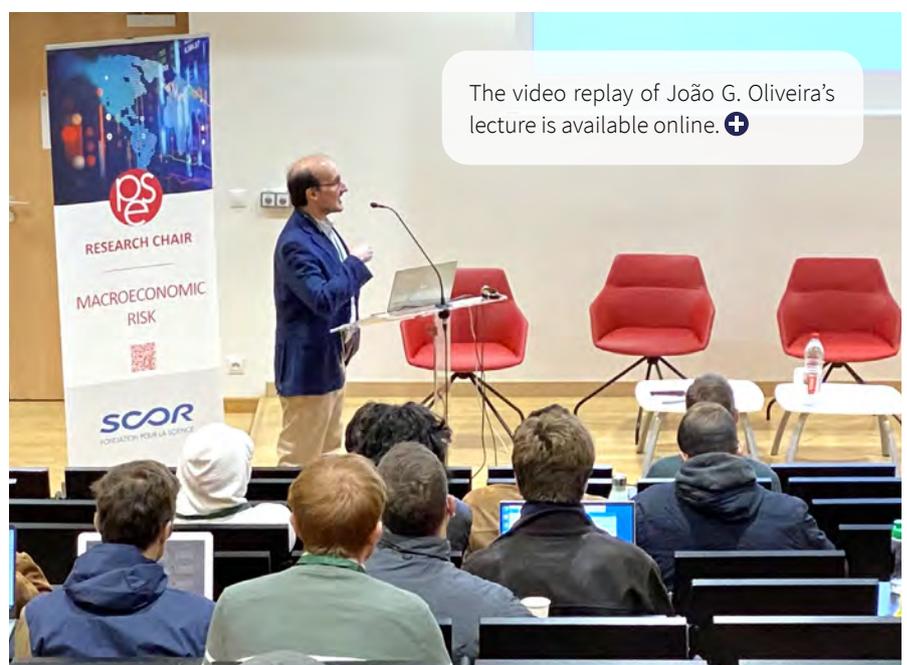
The authors then used the model to analyze how this affected the optimal degree of tax progressivity and - somewhat surprisingly - find that despite increasing earnings inequality, a social planner would find it optimal to decrease the progressivity of the income tax system of about two thirds from 1980 to 2015. To understand why this is the case, consider that a progressive tax system influences welfare through three main channels: first, the so-called efficiency channels tells us that, by taxing individuals who save more (and therefore contribute more to the overall stock of capital), progressive taxes reduce aggregate capital, output, and consumption; second, by redistributing income, they lower consumption dispersion, thereby raising welfare (a redistribution channel); third, because they reduce income volatility, precautionary savings in the face of earnings uncertainty also fall (insurance channel).

The paper finds that **ISTC tilts all three channels in favor of a less progressive income tax system**: through the efficiency channel, lower progressivity implies a larger stock of capital (and therefore consumption); because ISTC increases the complementarity of capital with high-earning occupations, it leads to an even larger increase in consumption (compared to a world without ISTC). Additionally, by directly affecting households' occupational choice, lower progressivity increases households' incentives to choose high-wage occupations, which reduces the wage

in those occupations and increases that in occupations further down the wage ladder. This compresses wage inequality and reduces consumption dispersion. Finally, by increasing returns to capital, ISTC also makes it easier for households to self-insure and weakens the insurance channel.

In conclusion, Oliveira's paper offers an interesting perspective on the effects of investment-specific technological change on both wage inequality and the optimal progressivity of the income tax system.

Technological change can fully account for the observed increase in earnings inequality between 1980 and 2015.



# The Dynamic Effects of Income Taxes in a World of Ideas

James Cloyne (University of California Davis), Joseba Martinez (London Business School), Haroon Mumtaz (Queen Mary University Of London), Paolo Surico (London Business School),

**The dynamic effects of income taxes in a world of ideas**, Working Paper, December 2023. [+](#)

Falling productivity growth is a first order concern for governments around the world, who often try implementing different tax policies to fight it. However, **little evidence exists** on the effectiveness of some of these policies; for example, **on how changes in income taxes** (both personal and corporate) **affect innovation and productivity**. In this paper - presented by Joseba Martinez - Cloyne, Martinez, Mumtaz, and Surico attempt to provide an answer to such issues. Specifically, do changes in income taxes have long run effects? And, if so, how do these long-run effects come about?

As a first step, Martinez and his co-authors provide empirical evidence on the effect of temporary tax cuts in both corporate and income taxes on total factor productivity (TFP), GDP, research and development (R&D), investment, and labor productivity. They find that **temporary corporate tax cuts have persistent effects on TFP and GDP: by stimulating short-term increases in R&D and investment**, such cuts lead to a sustained boost in innovation and productivity. In contrast, they find that personal tax cuts show more transitory effects on TFP and GDP, with a short-term increase in hours worked and productivity, but no significant response in R&D or innovation; hence, personal tax cuts imply significant responses of GDP only at short horizons (approximately 1 year).

**Complementarity between ideas and capital plays an important role in driving the long-run response of GDP to corporate tax cuts.**



Then, they develop a semi-endogenous growth model which features productivity growth via R&D and adoption. One key feature of the model is the existence of a “market for ideas” and therefore of a price for ideas. As shown by research in the past few decades, intangible assets - often in the form of intellectual property rights - are an important part of what gives a business its value; which is in fact confirmed by the large number of mergers and acquisition carried out with the primary intent of purchasing intellectual property rights. By carefully modeling the market for ideas, and the

tax amortization of intangible assets, the model can therefore account for the complementarity between ideas and capital.

In fact, Martinez and coauthors show that such complementarity between ideas and capital plays an important role in driving the long-run response of GDP to corporate tax cuts. Specifically, they use the model to decompose the GDP response to corporate taxes and find that the long run response of GDP is dominated by the endogenous TFP response and capital accumulation.

As the models used by tax authorities to estimate the effect of taxes mostly ignore their effect on ideas and productivity, this paper significantly contributes to the understanding of the long-term effects of tax policy on economic growth and innovation.



The video replay of Joseba Martinez's lecture is available online. [+](#)

# Geography Versus Income: The Heterogeneous Effects of Carbon Taxation

Charles Labrousse (Paris School of Economics), Yann Perdereau (Paris School of Economics),

**Geography Versus Income: The Heterogeneous Effects of Carbon Taxation**, Macroeconomic Risk Chair WP n°2024-12, March 2024. [+](#)

Carbon taxes stand among the most effective instruments for mitigating greenhouse gas emissions. However, they induce strong distributional costs, as energy represents a larger share of expenditures for low-income and rural households. These distributional effects are likely to reduce the political acceptability of carbon taxation, as shown in France with the Yellow Vests protest and the subsequent carbon tax freezing. These asymmetric costs, and the lack of political acceptability that follows, pose a significant risk to the green transition. Therefore, a socially acceptable carbon taxation design should account for its redistributive effects.

In a forthcoming working paper, Charles Labrousse and Yann Perdereau develop **a dynamic general equilibrium model with both income and geographic heterogeneities, to capture that energy expenditures heavily depends on living area and revenue**. Both imported fossil energy and locally produced cleaner energy are consumed as a non-homothetic final good by households and an intermediate input by firms. The model is precisely calibrated using French micro data, to match the energy bundle composition within each income quintile and living area. A gradual, permanent increase in carbon taxes on fossil energy used by firms and households is simulated, possibly at different rates. The model computes the aggregate and distributional welfare costs associated with this transition, considering various revenue-recycling policies.

The paper's results highlight the distributive and political risks associated with the green transition. Firstly, geography outweighs income or wealth in determining the distributive effects of carbon taxation. While the fiscal burden is relatively evenly distributed across income quintiles, it varies significantly across living areas. Rural households bear approximately twice the cost of urban households due to their higher incompressible energy needs – see *Figure 1*.

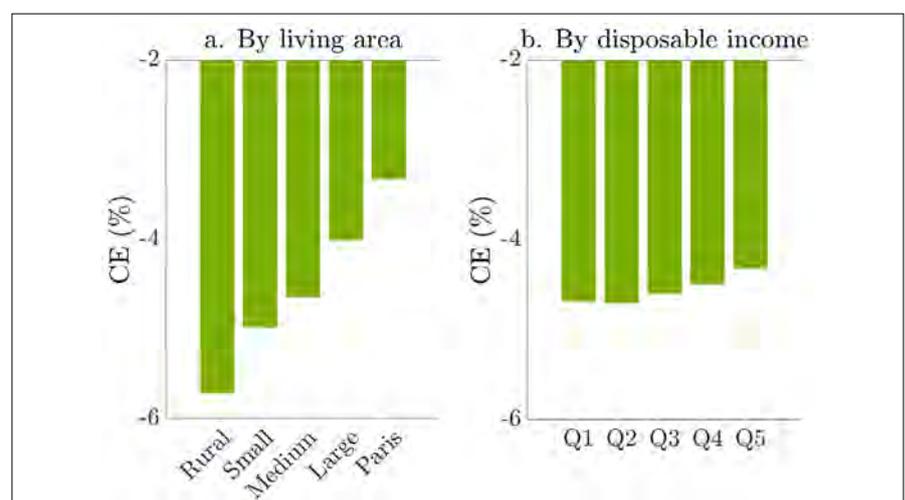
Secondly, taxing households' emissions is considerably more regressive than taxing emissions from firms. Taxing households'



energy consumption is regressive, because of the non-homotheticity of energy consumption, disproportionately affecting low-income and rural households. Conversely, taxing firms' energy consumption reduces both capital and labor income, affecting high-income households to a greater extent. Thirdly, it is possible to reduce emissions and make the policy progressive with respect to income. A 250 €/tCO<sub>2</sub> carbon tax with a uniform lump-sum rebate reduces CO<sub>2</sub> emissions by 18% per year, while enhancing overall welfare and reducing income inequality. However, this uniform transfer widens the rural-urban gap. Compensating for the loss experienced by rural households through targeted transfers entails a trade-off between equity and climate efficiency, as rural households exhibit a higher marginal propensity to consume energy. Compensating rural households

is welfare-improving but comes with a 6% increase in total emissions compared to the uniform lump sum transfer.

In conclusion, the paper contributes to understanding the political risks associated with the green transition and proposes a more equitable and socially acceptable framework for carbon taxation. The paper argues that **targeted transfers are crucial for communication and political acceptability**. These transfers explicitly distinguish carbon tax revenue from government budget, clarifying that the tax aims to alter behavior rather than finance public deficits. Finally, this research emphasizes the paramount importance of geography in comprehending the aggregate and distributional effects of carbon taxes, hence suggesting that future carbon tax designs should take geographical factors into account.



**Figure 1:** Welfare change in transition (in % CE)



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