

Climate: The urgency of justice

By [Éloi Laurent](#) and [Paul Malliet](#)

On the eve of the climate summit organized by the Biden administration on 22 and 23 April, which will be attended by 40 heads of state and government, we offer here some initial reflections on a critical issue facing international climate negotiations: how should the effort to reduce emissions be shared between countries within the framework of the United Nations?

The news on the climate emergency front at the start of 2021 is mixed, which might not be so bad: the new US administration's willingness to assume leadership on the climate agenda, within a multilateral framework, contrasts with the obscurantist obstructionism of the previous administration. Furthermore, 110 countries have announced their commitment to achieving carbon neutrality by 2050, with China sharing this goal, but by 2060^[1].

But in order to close the gap between the speed being attained by natural energy systems and the inertia inherent in today's economic and political systems, these encouraging geopolitical dynamics must pick up the

pace. In this respect, one key indicator is the gap between the status quo of current policies (“business as usual”) and the full implementation of the commitments made in the wake of the Paris Agreement: if all the commitments currently formulated and described in the States’ respective national contributions were really met, we would be heading towards 2.6° of warming by the end of the century; if everything continues as it is today, we are heading towards 2.9° of warming. As it stands today, the Paris Agreement (which has led to undeniable progress) is therefore worth only 0.3 degrees, or about a decade and a half of warming at the annual rate observed since 1981[3].

A new global climate strategy must therefore be developed and implemented, and it needs to bear fruit starting from the COP-26 meeting next November in Glasgow. The Biden administration is organizing a summit on 22 and 23 April, which will be attended by 40 heads of State and government. In line with the [American Jobs Plan](#), the [agenda for this meeting](#) emphasizes the economic gains expected from decisive climate action. But it fails to address the need for coordination: how should national efforts at emissions reduction be shared among the world’s countries? On the basis of what criteria? In other words, how can we map out the path towards the orientation indicated by the Paris Agreement?

We are proposing here an embryonic reflection (which we will elaborate on in the run-up to COP-26) on the

question which, in our view, is now the *raison d'être* of international climate negotiations: how to share the effort to reduce emissions between countries within the framework of the United Nations?

In the light of the IPCC's Special Report on 1.5° published in 2018, we determine a global carbon budget, which in 2019 amounted to 945 GtCO_{2e}; this corresponds to an intermediate target between the 1.5° and 2° budget associated with the 67th percentile of the Transient Climate Response to Emissions (TCRE), [\[4\]](#) in line with the goals set in Article 2 of the Paris Agreement.

The question of the fair distribution of this global carbon budget has been the subject of numerous studies (for a summary and proposals, see for example [Bourban, 2021](#)), but there is currently no work that integrates a complete vision of the three justice criteria identified in the academic literature – [equity, responsibility and capacity](#) – in order to determine an operational distribution of national efforts to avoid the climate catastrophe.

With this in mind, we focus our analysis on the top 20 emitting countries, [\[5\]](#) which accounted for 77% of emissions in 2019. We assume that the emissions reduction target will be shared by all countries by 2050 and that the carbon budget therefore covers the next 30 years, which translates into an average annual budget of around 30 GtCO_{2e} (for comparison, 36 GtCO_{2e}

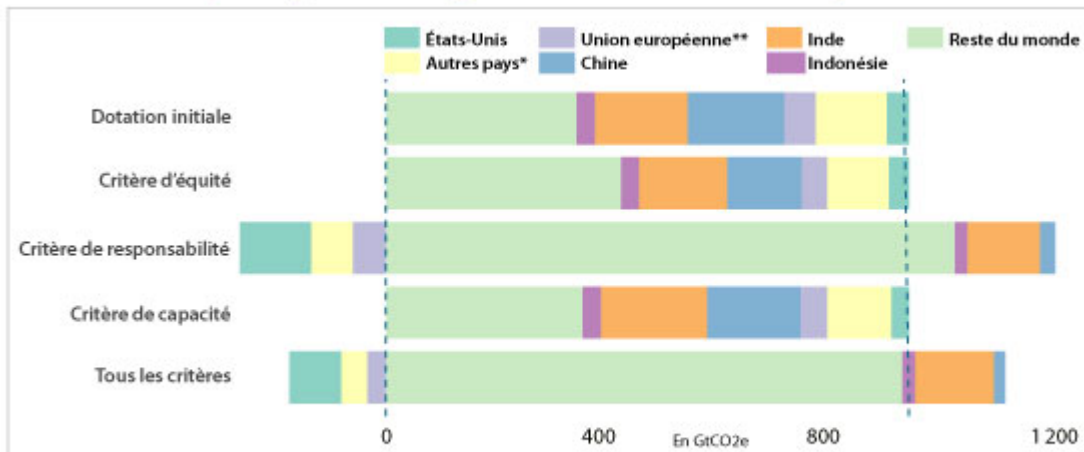
were emitted in 2019). We take as a starting point an equal distribution among all members of humanity in 2019, meaning an initial allocation of 122.5 tCO₂e up to 2050, i.e. about 4 tCO₂e per year (a country's budget being the aggregation of the individual allocations of its total population).

We interpret the equity criterion as meaning equal access of the world's citizens to the greenhouse gas (GHG) storage capacity of the atmosphere (this corresponds to a universal carbon endowment corrected for each major emitter for its population and for population growth by 2050).

Our responsibility criterion is the amount of GHGs already emitted since 1990 in consumption, thus combining a spatial justice criterion with a temporal criterion, reflecting the global as well as the historical responsibility of individual countries.

Finally, the capacity criterion is expressed here by the United Nations Human Development Index (HDI), which by construction ranges from 0 to 1, and which we relate for each country to the world average (which in 2019 was 0.737). Thus, countries whose HDI is lower than this world average would see their budget increase in proportion to their human underdevelopment, and vice versa for developed countries, i.e. they would see their budget decrease in the opposite direction (Figure 1).

Figure 1. Répartition du budget carbone mondial selon 3 critères de justice



* Canada, Arabie Saoudite, Australie, Japon, Royaume-Uni, Corée du Sud, Afrique du Sud, Iran, Mexique, Turquie, Brésil.

** Comprend les 27 États-membres.

Sources : Global Carbon Budget 2020, World UN Population, calcul des auteurs.

The equity criterion generally operates a reallocation from countries with a falling population to those with a rising population, which are almost entirely located in sub-Saharan Africa. In this respect, based on this criterion China undergoes a reduction in its budget of 44 GtCO₂e

(almost 25%), while the rest of the world benefits from an increase of 86 GtCO₂e.

The responsibility criterion appears to be the main determinant leading to a reallocation of the global budget between countries, with a transfer of nearly

263 GtCO₂e from the OECD countries to the so-called developing countries. The capacity criterion also leads to a reallocation towards developing countries, but much less (almost 34 GtCO₂e in total) [6].

Thus each criterion plays out differently (either by the nature of the rebalancing or by its extent), suggesting that the

interplay of this relatively simple set of three criteria does indeed enable different understandings or conceptions of climate justice to be

translated into a distribution of the burden of the mitigation effort (Figure 2).

Figure 2. Distribution of the global carbon budget according to the 3 justice criteria for the 20 top emitters and the rest of the world



Sources: Global Carbon Budget 2020, World UN Population, authors' calculations.

Note: Each bar indicates the effect of each criterion, taken independently of the others, on the average annual carbon budget per country. For example, while each American citizen has an initial allocation of

4 tCO₂e, the equity criterion leads to this budget being reduced to 3.73 tCO₂e, the application of the responsibility principle leads to the initial allocation turning negative and corresponding to a debt of 13 tCO₂e, and the capacity criterion reduces the initial allocation to 3.25 tCO₂e. The aggregation of these different criteria results in a total negative budget^[7] of 9.5 tCO₂e per capita per year.

However, this representation does not tell us anything about the future emissions trajectories of the different countries, the instruments that will be implemented and the justice criteria specific to each country that will govern the deployment of these instruments. In a second stage of our analysis, we will propose possible distributions of the budget globally determined for France in order to appreciate the issues of climate justice, moving from the global to the national and finally to the individual. In any case, this first step informs us about what could be a fair distribution capable of more explicitly capturing the guiding principle of the international community since the Rio summit in 1992 of “shared but differentiated responsibility”.

In the light of this initial analysis, one point seems perfectly clear: if the new US administration does indeed intend to reassume global climate leadership, in association with the European Union, it will have no choice but to face the existence of a climate debt to the rest of the world. Given its level, it is illusory to believe that this can be offset by hypothetical negative emissions, and should therefore be subject to one form or another of compensation^[8]. This could for example mean much

more significant amounts than those currently paid into the Green Climate Fund, which is still largely underfunded in relation to the initial stated ambition of reaching a budget of \$100 billion in 2020.

A second point is that China can no longer claim to be a major emerging country in the climate negotiations, with an exploding emissions trajectory that is supposedly part of its right to development and economic growth. In 2020, and taking into account all the criteria adopted, its carbon budget, at 21 Gt, would be close to that of Indonesia, which has one-fifth of China's population.

It seems that the Biden administration wants to mark Earth Day on 22 April with two announcements: one concerning new 2030 climate ambitions for the United States and the other concerning further emissions reductions by the invited heads of State and government. These announcements will be fully credible only if the US manages to reconcile its national ambition with its global responsibility, and thereby convince China to do the same.

[1] This represents about 50% of the population as well as global GHG emissions.

[2] Climate Action Tracker, December 2020 projection <https://climateactiontracker.org/publications/global-update-pa>

[ris-agreement-turning-point/](#)

[3] Source: [NOOA](#).

[4] The TCRE translates the average variation of average temperature with the stock of carbon in the atmosphere with an associated probability. In our analysis this translates into the following:

There is a 67% chance that the carbon budget in question will lead to a temperature rise limited to 1.75°.

[5] The top 20 emitting countries in 2019 were: the United States, Canada, Saudi Arabia, Australia, Germany, Japan, Russia, the United Kingdom, Italy, South Korea, Poland, France, South Africa, Iran, China, Mexico, Turkey, Brazil, Indonesia, and India. We also include the 27-Member European Union to provide a basis for comparison.

[6] Note that among the countries we distinguish, only India would see its budget increase, but just by 3%.

[7] A negative budget here reflects the fact that the historical emissions taken into account via the responsibility criterion is higher than the current carbon budget allocated via the other criteria.

[8] The question of the monetary valuation of past emissions is a research topic in itself that we do not address in this text. As an illustration, a valuation of one tonne of CO₂ at \$1 would lead to a global amount of \$263 billion, and for a valuation at \$20, it would be \$5260 billion.

Reducing uncertainty to facilitate economic recovery

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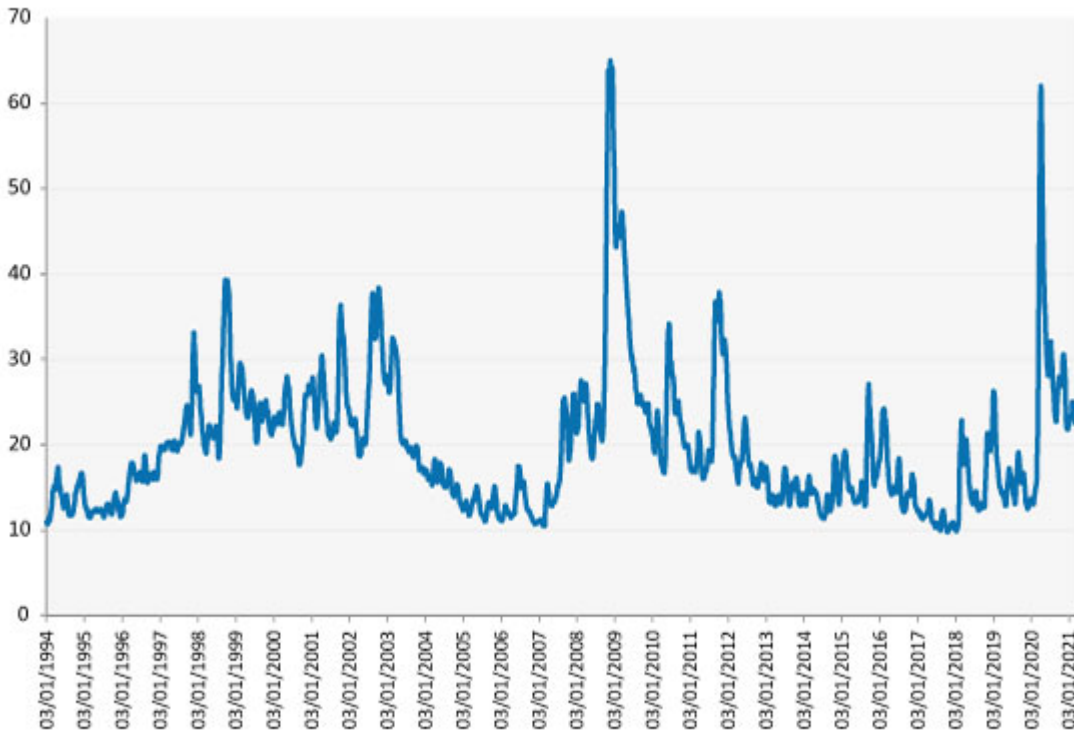
As the health constraints caused by the pandemic continue to weigh on the economy in 2021, the challenge is to get GDP and employment quickly back to their pre-crisis levels. However, companies' uncertainty about their levels of activity and profits in the coming years could slow the recovery. In order to cope with the possible long-term negative effects of the crisis, and weakened by their losses in 2020, companies may seek to restore or even increase their margins, which could result in numerous restructurings and job losses. Economic recovery could take place faster if business has real visibility beyond 2021. While it is difficult for the current government to make strong commitments, on the other hand mechanisms that in the long term are not very costly for the public purse could make it possible to take action.

Post-pandemic uncertainty will hold back a recovery

In economic terms, the pandemic represents an atypical crisis.

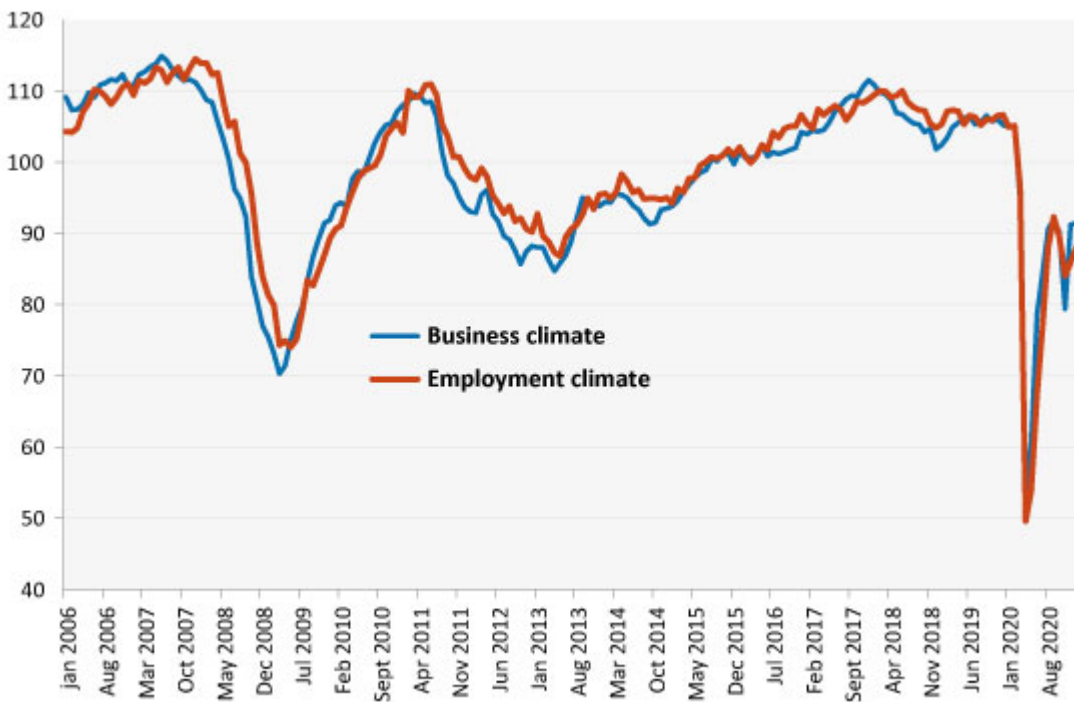
It combines both goods and labour supply shocks and a fall – largely constrained – in consumption (Dauvin and Sampognaro, 2021). There are not many recent episodes that can provide useful points of comparison for economic actors. Some elements do indicate a rapid return to normalcy, including the dynamism of some Asian economies, in particular the Chinese economy, and the resilience of the US economy and the Biden administration's economic policy. On the other hand, there are other factors that may limit economic growth in the coming years. The heavy losses of some companies could lead to a wave of bankruptcies (Guerini *et al.*, 2020; Heyer, 2020), with possible negative effects on productivity or the employment of certain categories of workers. Some consumption patterns could be modified permanently, with a heavy impact on sectors like aeronautics and retailing. The trajectories of some of the emerging economies are another unknown, as they cannot afford the same level of fiscal support as do the US and Europe. Finally, the concentration of the shock on sectors that tend to employ low-skilled workers risks increasing inequalities within countries, and thus generating a further rise in global savings. Some indicators reflect this still high uncertainty. The VIX index, which captures market expectations for the volatility of US stock prices, remains twice as high as before the crisis and is comparable to the levels reached during the Dotcomcrisis (see Figure 1). In France, the business and jobs climate has rebounded strongly from its historical low in March-April 2020, but is still at the same level as during the low point of the eurozone crisis in 2012-2013 (see Figure 2).

Figure 1. Changes in the VIX index since 1994



Sources: Chicago Board Options Exchange, VIX smoothed over 20 days, OFCE calculations.

Figure 2. Business and jobs climate in France



Source: INSEE.

The literature shows that uncertainty about the medium-term path of the economy affects the way companies behave today. By identifying uncertainty with stock price volatility, Bloom (2009) suggests that it has had a significant negative impact on GDP and employment in the US. A number of other studies

have used different methodologies to confirm this idea [\[1\]](#). Given the severity of the recession in 2020, uncertainty could have an even greater impact. Effects that are usually second-order may be enough to derail an economic recovery.

A proposal for giving visibility to businesses

The measures in France's current stimulus package basically focus on 2021 and 2022 and do not give any visibility to businesses about their activity or cash flow beyond 2022. It is true that it is difficult for the current government to commit to major expenditures that would have to be assumed by future governments. However, it is possible to envisage relatively strong measures that have limited budgetary costs over the next ten years (and therefore a limited impact on the fiscal manoeuvring room of future governments).

Proposal: Give companies the following **option**: a subsidy of 10% of their wage bill (wages under 3x the minimum wage – the SMIC) between 2022 and 2026 in exchange for an additional tax of 5% on their gross operating profits (EBITDA) over the period 2022-2030.

For firms applying for the scheme, this is **the fiscal equivalent of a temporary recapitalization**. They exchange a subsidy today for a fraction of their profits tomorrow. The implicit cost of capital would be particularly attractive. The scheme is calibrated so that its "interest rate" (given by the ratio between the sum of additional taxes over 2022-2030 and

the sum of subsidies over 2022-2026) is close to 0% for the “average” French company. This rate would be lower *a posteriori* for companies that will have performed less well than expected. Compared with other recapitalization methods such as direct public shareholdings or the conversion of loans into quasi-equity, there is no risk that the current shareholders will lose control of the company.

The advantage of the scheme is that it automatically targets the companies that face the greatest need. The businesses that anticipate possible economic difficulties over the next few years and that have employment-intensive activities will self-select, while others will have no interest in applying for the subsidy. As the subsidy is disbursed gradually, companies that maintain employment over the period will be favoured. Capital-intensive and high-growth companies would not be penalized, as the scheme would remain optional. The additional tax on EBITDA is temporary and should not have a negative impact on investment by those applying for it.

The cost in terms of public debt up to 2030 would be low: about 10 billion euros [\[2\]](#), or 0.4 percentage points of GDP, if all companies were to apply. The self-selection effect of the scheme would increase the

average cost per beneficiary company but would also decrease the number of beneficiaries, thereby having an ambiguous impact on the total cost. This does not take into account the beneficial impact of the scheme on the public finances in so far as it prevents job losses and the non-repayment of certain guaranteed loans. The fiscal impulse over 2022-2025 could on the other hand be quite strong, on the order of 1 to 1.5 GDP points per year (i.e. 4 to 6 GDP points over the four years) but would be counterbalanced by an automatic increase in revenue over 2025-2030 [3].

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[1] Fernandez-Villaverde, Guerron-Quintana, Rubio-Ramirez and Uribe (2011) show that increased interest rate volatility has destabilizing effects on Latin American economies. In a 2015 paper, the same authors suggest that increased uncertainty about future US fiscal policy leads firms to push up their margins, reducing economic activity. This result has been confirmed by Belianska, Eyquem and Poilly (2021) for the euro zone. Using consumer confidence surveys, Bachmann and Sims (2012) show that pessimistic consumers

reduce the effectiveness of fiscal policy during a recession. Finally, uncertainty among CEOs has a negative impact on output, as shown by German data analysed by Bachmann, Elstner and Sims (2013).

[2] The total of wages below 3 SMICs in 2019 was on the order of 480 billion euros (the total of gross wages and salaries came to 640 billion for non-financial companies, and the latest INSEE data suggest that wages below 3 SMICs represent 75% of the wage bill, an amount that seems consistent with the data on the cost of France's CICE tax scheme). The EBITDA of non-financial companies was 420 billion euros. Based on these 2019 figures, and if all companies were to apply for the scheme, the total subsidy would amount to $0.1 \times 480 \times 4$ or 196 billion euros. The EBITDA tax would under the same assumptions yield $0.05 \times 420 \times 8 + 0.05 \times 196$ (5% of the subsidy will be recovered via the extra EBITDA) or 186 billion euros.

[3] This additional tax revenue should not penalize activity over this period because (1) it will concern capital income for which the marginal propensity to consume is rather low, and (2) the beneficiary companies should be able to anticipate it correctly.

Dispersion of company markups internationally

[Stéphane Auray](#) and [Aurélien Eyquem](#)

The strong globalization of economies has increased interest in the importance of markups for companies with an international orientation. A markup is defined as the difference between the marginal cost of production and the selling price. Empirical evidence is accumulating to show that these markups have increased significantly in recent years (Autor, Dorn, Katz, Patterson, and Reenen, 2017; Loecker, Eeckhout, and Unger, 2020) and that large corporations account for a growing share of the aggregate fluctuations (Gabaix, 2011). Moreover, the dispersion of markups is considered in the literature as a potential source of a misallocation of resources – capital and labour – in both economies considered to be closed to international trade (see Restuccia and Rogerson, 2008, or Baqaee and Farhi, 2020) and economies considered to be open to trade (Holmes, Hsu and Lee, 2014, or Edmond, Midrigan and Xu, 2015). Finally, it has recently been shown by Gaubert and Itskhoki (2020) that these markups are a key determinant of the granular origin – i.e. linked to the activity of big exporters – of comparative advantages, or in other words, they may be a

determinant of trade competitiveness.

In a recent paper (Auray and Eyquem, 2021), we introduce a dispersion of profit margins by assuming strategic pricing via Bertrand-type competition in a two-country model with endogenous variety effects and international trade along the lines of Ghironi and Melitz (2005). Our aim is to understand the interaction between these margins, firm productivity and entry-and-exit phenomena in domestic and foreign markets. If there are distortions in the allocation of resources, as is usually the case in these models, our corollary objective is to study the implementation of optimal fiscal policy.

In models with heterogeneous firms such as Ghironi and Melitz (2005), firms are assumed to be heterogeneous in terms of individual productivity. The most productive firms are more likely to enter markets, because they are better able to pay fixed entry costs, whether in local or export markets. Moreover, because these firms are more efficient, their production costs are lower, which allows them to capture larger market shares. These effects, which seem relatively intuitive, have already been widely validated empirically.

In general, the introduction of strategic pricing behaviour allows firms with larger market shares to benefit from greater price-setting power, which leads them to charge higher markups – it being understood that the resulting selling prices may be lower than those of their competitors. A growing literature on international trade emphasises the importance of this kind of strategic behaviour and the resulting dispersion of markups for determining patterns of trade openness and their sectoral composition (see, for example, Bernard, Eaton, Jensen and Kortum, 2003; Melitz and Ottaviano, 2008; Atkeson and Burstein, 2008) but also for the magnitude of the welfare gains associated with trade (Edmond, Midrigan and Xu, 2015). Indeed, in addition to the usual impact of openness to trade, it could also reduce the adverse effects of the dispersion of markups through the resulting increase in competition, thereby boosting its positive effects.

First, as expected, when fiscal policy is passive, Bertrand competition generates a distribution of markups such that firms that are larger – hence the more productive firms – offer lower prices, attract larger market shares and obtain higher profit margins. Moreover, the mechanism for the selection of exporting firms described by Melitz (2003) implies that these firms are

more productive and therefore charge higher markups. These results are intuitive and consistent with the observed distribution of markups (see Holmes, Hsu, and Lee, 2014).

Second, we characterize the optimal allocation of resources and show how it can be implemented. The best possible equilibrium fully corrects for price distortions and implies a zero dispersion of markups and a near zero level of markups. It is implemented, as is often the case in this literature, by generous subsidies that cancel out markups while preserving the incentive for firms to enter domestic and export markets, i.e. by allowing them to cover the fixed costs of entry. This first-order equilibrium can be achieved using a combination of subsidies for a firm's specific sales, a tax scheme on profits that differentiates between non-exporting and exporting firms, and a specific labour tax.

In a similar model where markups are assumed to be the same for all firms, the best equilibrium is the same but, in contrast, much easier to implement through a single policy instrument: a uniform and time-varying subsidy for all firms.

In both cases, the gains associated with such policies are very large compared to the laissez-faire case, representing a potential increase in household consumption

of around 15%. However, given the complexity of implementing a scheme with heterogeneous markups and a cost to the public purse of over 20% of GDP – implementation requires large amounts of subsidies, whether the markups are heterogeneous or homogeneous – we consider second-order alternative policies, where the number of policy instruments is limited and the government budget must be balanced. We find that these restrictions significantly reduce the ability of policy makers to cut the welfare losses associated with the laissez-faire equilibrium, and that only one-third of the potential welfare gains can be implemented in this case.

Third, while the first-order allocations are independent of the degree of pricing behaviour, we find that the welfare losses observed in the laissez-faire equilibrium are lower when markups are heterogeneous and higher on average than the markups observed in the absence of strategic pricing. While this may seem surprising, the result can be rationalized by considering the effects of markup dispersion on both the intensive markup – the quantity produced per firm – and the extensive markup – the number of firms in the markets. Indeed, Bertrand competition implies that the dispersion and the average level of markups are positively related. Markup dispersion thus increases the level of markups with two effects. On the one

hand, all other things being equal, higher markups reduce the quantity produced by each firm – the intensive markup – and induce a misallocation of resources that generates welfare losses. On the other hand, higher markups imply higher expected profits for potential entrants, which stimulates entry and thus increases the number of existing firms – the extensive markup. According to our model, the welfare gains associated with the second effect dominate the welfare losses associated with the first effect. The result therefore implies that the dispersion of markups can generate welfare gains, at least when no other tax or industrial policy is pursued.

Fourth, while the previous results mainly focus on the implications of our model and the associated optimal policies on average over time, we also study their dynamic properties. Within the framework of passive (*laissez-faire*) fiscal policies, when the economy experiences aggregate productivity shocks – technological, for instance – the model behaves broadly like the Ghironi and Melitz (2005) model. An original prediction of our model is that markups are globally countercyclical while export markups are procyclical. The optimal policy involves adjustments in tax rates in order to reverse this trend, to align all markups over the business cycle and to make all markups procyclical.

These results are consistent with the findings of studies that focus on the optimal cyclical behaviour of markups with heterogeneous firms in closed (Bilbiie, Ghironi and Melitz, 2019) and open (Cacciatore and Ghironi, 2020) economy models. However, conditionally on aggregate productivity shocks, the dispersion of markups has little effect quantitatively compared to a similar model with homogeneous markups.

Finally, in the spirit of Edmond, Midrigan and Xu (2015), we conducted a trade liberalization experiment whereby the costs of trade gradually and permanently decline to almost zero. We find that the long-run welfare gains are much larger when the policy implemented is optimal. On the other hand, the laissez-faire equilibrium indicates that short-run welfare gains are affected by markup dispersion. Indeed, markup dispersion affects the dynamics of business creation resulting from trade liberalization in a critical way. As in Edmond, Midrigan and Xu (2015), markup dispersion reduces the long-run welfare gains from trade, but for a different reason: it affects the dynamism of business creation and reduces the number of firms in the long run. However, since in this case fewer resources are invested in the short run to create new companies, consumption increases more at the intensive markup in the short and medium run – less than

10 years. While the long-run welfare gains from trade integration vary from 12% to 14.5%, depending on the calibration, the short-run welfare gains with heterogeneous markups can be up to 3% larger than with homogeneous markups.

The conclusions of this study lead to an approach to corporate profit margins that is more nuanced than that usually found in the literature. Indeed, while the markups and their dispersion do have negative effects on the economy, they also have an important role to play in the phenomena of business entry and participation in international markets. Our work is a complement to a strictly microeconomic approach to industrial policy issues, which would conclude unequivocally that the market power at the origin of these markups is harmful. As such, in the manner of Schumpeter, this calls for a more balanced view of the role of company markups in modern economies, which would show a tension between distortions of competition and incentives to business creation.

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