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Climate Change in the EU's Macroeconomic Imbalance Procedure

EU member states observe an elaborate process to preserve macroeconomic stability: the macroeconomic imbalance procedure (MIP). The MIP is supposed to monitor and prevent macroeconomic imbalances – and if necessary, correct them. It considers a variety of variables to determine the existence of imbalances, e.g. the current account balance or unit labour costs. However, the macroeconomic impact of climate change is ignored. In light of the growing economic risks due to climate change, this article argues that the MIP should consider climate-related risks explicitly to maintain relevance.

In the wake of the European debt crisis, the EU established the European Semester, an annual process for the coordination and monitoring of economic policy between the European Commission and member states.[1] A core component of the European Semester is the macroeconomic imbalance procedure (MIP). Its goal is to identify, prevent and correct risks for macroeconomic stability in the EU, the euro area and single members states.

Every year in autumn, the EU Commission launches a new round of the MIP with its alert mechanism report. The report points out specific risks in individual member states that warrant so-called in-depth reviews. If these reviews determine the presence of imbalance for a member state, this member state may receive "homework" from the European Commission in form of country-specific recommendations, published in spring with the Commission's spring package. When an imbalance is "excessive", the excessive imbalance procedure may be triggered. However, this has not yet occurred.

The screening for potential imbalances is based on a scoreboard of economic indicators, combined with indicative thresholds. The scoreboard in its current form consists of 14 headline indicators and 25 auxiliary indicators, for example, the current account balance, unit labour costs, unemployment or private and public debt stocks.[2]

The European Semester addresses climate change so far only with respect to broad mitigation policies, and not with a focus on its macroeconomic effects. Environmental sustainability has been repeatedly mentioned as one of four main pillars for an EU growth strategy in the annual sustainable growth survey (ASGS). Yet, in its latest ASGS, the European Commission noted an "increasing need for Member States to consider and prepare for the fiscal impact of excessive weather events and other climate hazards in their medium-term budgetary planning" (European Commission, 2023a, 5). This underlines that the macroeconomic effects of climate change should be regularly monitored in the European Semester.

Time to reform

The MIP has been evaluated from various angles by the literature. For instance, Savage and Howarth (2018) illuminate the microeconomic structure of the procedure. Hodson (2017) assesses it in light of theories of European

1 For the history of and rationale for the MIP, see European Commission (2016).

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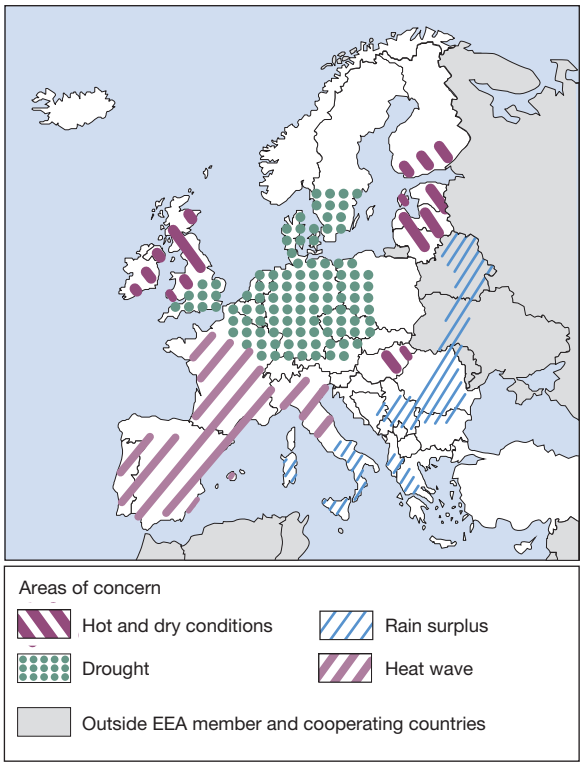
2 The latest data for the scoreboard indicators compiled by Eurostat can be accessed under https://ec.europa.eu/eurostat/web/macroeconomic-imbalances-procedure/visualisations.

integration. Others have highlighted the ineffectiveness of the MIP and demand reform (e.g. Koll and Watt, 2022 or Belke et al., 2016). Koll (2022) specifically argues for an MIP reform with respect to climate action. The most relevant branch of the literature deals with the composition of scoreboard indicators. However, these papers focus on the effectiveness of the MIP in detecting, preventing and correcting imbalances in the past (e.g. Bénassy-Quéré and Wolff, 2020; Pierluigi and Sondermann, 2018; Efstathiou and Wolff, 2018; Belke et al., 2016).

Notably, Pierluigi and Sondermann (2018) conclude that if the MIP's "indicators [had] been properly monitored in the first decade of the EMU, they would have predicted the crisis well in advance of its appearance in several euro area countries". This is probably correct. However, in its current setup, the MIP is blind to the risks that climate change poses to the European economy. This may be due to the fact that economists tend to struggle to properly capture the economic effects of climate change (Stern, 2013). In its 2023 autumn economic forecast, the European Commission included a special issue on the effects of extreme weather events, concluding that the economic costs of natural hazards are not well reflected in its own forecasts (European Commission, 2023b, 66). In any case, with climate change intensifying, its macroeconomic ramifications will be increasingly important, thus posing a risk that is originally macroeconomic (as we argue below). In fact, only one – rather brief – proposal by Sustainable Finance Lab (2022) suggests considering the effects of climate change on macroeconomic stability in the MIP.

Nonetheless, now is the best time to update the MIP with a sensor for climate-related macroeconomic risks. First, the EU's new economic governance framework, which went into force in April 2024, has opened up a bigger stage for the MIP. As a result of the Economic Governance Review, member states are supposed to compile national medium-term fiscal-structural plans, in which they outline their paths for fiscal policy, reform and investment. The results of the MIP will inform these plans. While the Stability and Growth Pact increasingly sidelined the MIP in recent years, the MIP now has the chance to obtain a more prominent role next to the updated rules of the Stability and Growth Pact. Second, the MIP is currently subject to a regular revision. More precisely, the scoreboard indicators and thresholds are currently under review by the Economic Policy Committee and its aiding working groups.[3]

Figure 1
Extreme weather events in 2018



Note: The UK left the European Economic Area in 2020.

Source: European Environment Agency (2019).

Climate change as a macroeconomic risk

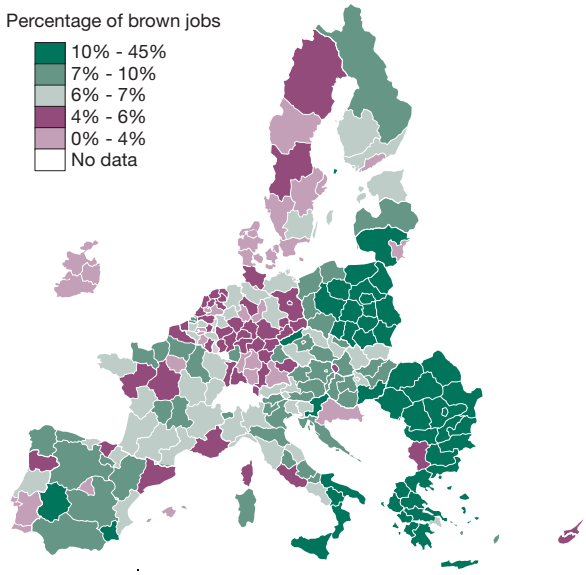
It is worth stating again that climate change is a global problem that entails not only ecological but also economic impacts. The latter can be separated into physical impacts and transition impacts:

Physical impacts from climate change result from a rise in adverse weather events, such as floods, droughts, forest fires or heat waves. Such events damage property, disrupt supply chains and cause infrastructure failures.[4] The resulting economic losses in the future will likely be high, but vary substantially across regions and member states. Research by the European Environment Agency shows that Europe's regions are affected differently by physical climate impacts (see Figure 1). Whereas northern Italy faces the risk of heat waves, the south is threatened by a rain surplus. In Central Europe, droughts are the main

3 The Economic Policy Committee (EPC) contributes to the work of the ECOFIN Council. The authors have participated in some EPC meetings for Germany in the past, and they are members of the EPC's LIME working group.

4 The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2022, Chapter 13.10.) identifies four key risks for Europe that go along with rising temperatures: i) mortality due to extreme heat, ii) heat and drought stress on crops, iii) water scarcity and iv) flooding and sea level rise.

Figure 2
Regions with "brown" jobs



Source: Vandeplas et al. (2022).

physical climate risk. An example of the economic impact of these events is the low water level of the Rhine river during periods with low precipitation. The resulting limitation of inland shipping causes a decline in industrial production of about 1% in Germany in a month of low water (Ademmer et al., 2023). On a global level, such effects are likely to lead to supply chain disruptions across regions and sectors (World Trade Organization, 2022).

Destructive weather events not only impair the capital stock, but also affect public finances: in the short run, by requiring higher spending on disaster relief and reconstruction, and in the long run by affecting productivity and debt sustainability (Avgousti et al., 2023c). Adding indicators that account for the risk of future physical impacts to the MIP scoreboard therefore seems useful.

Transition impacts encompass costs from structural economic adjustments due to climate change and decarbonisation. Costs also emerge from measures to alleviate social impacts of the transition, such as structural policies, income support or retraining. Again, the costs of transition vary greatly across member states. They are higher in member states with a high concentration of carbon-intensive industries (see Figure 2). In Poland, for example, about 0.8% of total employment falls on jobs in coal and lignite mining alone (106,000).[5] According to the European Commission, the costs just for retraining can amount to 0.8% of GDP for the EU as a whole. In countries with more carbon-intensive industries, these costs are higher and can amount to more than 1.5% of GDP (European Commission, 2022).

Moreover, extreme weather events and the switch to climate-neutral technologies will render some past investments uneconomical, leading to *stranded assets*. A rising number of stranded assets has substantial consequences for the financial system by increasing the likelihood of loan defaults or insurance claims. Stranded assets may be more likely to occur in the case of a disorderly transition (Gourdel et al., 2022). The ECB requires that banks include climate change risks in their assessment for credits by 2024 (see, for instance, Kanutin, 2023 or ECB, 2021).

That is, climate change will likely create its own macroeconomic turbulences, influencing both demand and supply (Ciccarelli et al., 2021). The MIP scoreboard will only indicate these impacts indirectly and retrospectively. Yet, the objective of the MIP is to detect emerging macroeconomic imbalances so that policy can respond to them. It thus should take into account the macroeconomic risks posed by climate change by incorporating appropriate indicators explicitly.

Indeed, some organisations are beginning to monitor the macroeconomic implications of climate change, most prominently central banks. The Bank of England (2022) has discussed the macroeconomic implications of climate change in general. The ECB (2023a) has published research on transition impacts specifically. Most notably, it already considers the management of climate-related risks of assets held on its balance sheet as part of its strategy (ECB, 2023b). It has also considered the implications of climate change for banking supervision and published related guidelines (ECB, 2020). In the same vein, the European Banking Authority is assessing on behalf of the European Commission the resilience of the EU banking system to the potential impact of climate risks, focusing on "climate-change related risks that could already materialise in the near term, most likely in the form of asset price corrections triggered by a sudden reassessment of transition or physical risks" (European Securities and Markets Authority, 2023, 2). In its October 2022 World Economic Outlook, the International Monetary Fund focused on the near-term macroeconomic impacts of decarbonisation policies, noting that decades of inaction have made a "smooth transition" unlikely (International Monetary Fund, 2022).

Principles for monitoring macroeconomic risks from climate change in the MIP

The motivation underlying the indicators that were originally selected for the MIP was to include variables asso-

5 Authors' calculation based on Eurostat data.

ciated with economic crises – based on the economic literature and the experiences after the events of 2008-2010 (European Commission, 2016). The legal basis for the shape of the scoreboard is given by Article 4 of Regulation 1176/2011, which states that the scoreboard shall encompass indicators that are useful in the early identification of both internal imbalances and external imbalances. Climate change-related impacts can be attributed to both kinds of imbalances, e.g. adverse financial and asset market developments (internal imbalance) as well as adverse developments of non-price competitiveness (external imbalance).

To select the original indicators for the scoreboard, the European Commission (2012) applied four principles:

Relevance. Indicators should focus on the most relevant dimensions of macroeconomic imbalances and competitiveness, particularly with regard to the smooth functioning of the euro area. The indicators should be associated with potential economic crises that are established by the economic literature and recent experiences.

Early warning function. Indicators and thresholds should reliably detect potentially harmful imbalances and competitiveness losses at an early stage of their emergence. Stock and flow indicators are used that can capture both short-term rapid changes and long-term gradual changes. The thresholds are set at prudent levels to avoid excessive "false alarms" and to signal deteriorations before they become entrenched. These thresholds are generally established by a statistical approach.

Communication and transparency. The scoreboard has a key communication role. Indicators should be simple, clear, and of limited number. Any data transformations should be transparent and replicable. The indicators should complement those used in other EU surveillance exercises.

High statistical quality. The indicators should be available for all countries and comparable across countries. They should be sourced from high quality sources such as Eurostat or ECB and be compiled according to the principles of the European Statistics Code of Practice of the European Statistical System.

For new indicators related to climate change, these principles pose challenges:

- The literature on the macroeconomic impacts of climate change is still emerging. The size of macroeconomic impacts on output, inflation or employment can often only be estimated (see e.g. Kahn et al., 2019).

- The risks of climate change can build up gradually, but strike suddenly. For example, the risk for imminent adverse weather events may vary substantially in the short term. The rising of sea levels, on the other hand, is a long-term process that can be largely anticipated today. As a result, monitoring the risk or development of these events in the MIP in order to steer medium-term macroeconomic policy is difficult.

- Potential indicators are still unavailable for some member states. Numerous efforts to improve the statistical comparability of economic impacts of climate change are underway, both at the member state level as well as at the EU level.

Possible indicators

Well aware of the current scarcity of proper indicators comparable at the EU level and suitable for the MIP scoreboard, the above suggests that the current MIP scoreboard is incomplete. It should be updated accordingly. However, selecting indicators for the macroeconomic impacts of climate change is more difficult than selecting indicators for classical macro-financial crises. For the latter, we have ample experience from a rich history of crises, while for the former the extreme experiences may still lie in the future. Based on the European Commission's principles for scoreboard indicators (relevance, early warning function, communication and transparency, and high statistical quality, as suggested in European Commission (2012)), we develop implications for new indicators that capture macroeconomic risks from climate change: the share of "brown" jobs or industries, the share of "brown assets" and the risk of medium-term adverse weather events.

Share of "brown" jobs or industries. This indicator could take different forms, e.g. the share of employment in industries such as mining of coal and lignite in the member state. A related indicator would be the industrial emissions in member states, relative to economic activity. Indicators of this kind have also been used for the allocation criteria of the Just Transition Fund (European Parliament, 2023).

- Relevance and economic rationale: The share of employment in "brown" jobs indicates the risk of transformation impacts on employment, such as costs of retraining the corresponding labour force. In addition, it may indirectly capture some risks of stranded assets. However, the availability of cost-effective alter-

natives is not captured by the indicator. It thus cannot be translated directly into "risk" but requires a careful economic reading.

- Early warning function: The indicator's warning function is questionable since employment in mining of coal and lignite is not very volatile in the first place, but stable or declining in nearly all members states. However, the share of employment in fossil industries must dramatically sink by 2045, which in turn increases the likelihood of sudden disruptions worth monitoring. Meaningful thresholds might be difficult to establish.

- Communication and transparency: The indicator is sufficiently simple and clear.

- High statistical quality: Employment figures for different industry sectors are available via Eurostat on a quarterly and annual basis, but with some delays. They are comparable across member states.

Share of "brown assets". This indicator assesses the share of the asset stock that is not compatible with the net-zero target.

- Relevance and economic rationale: A higher share of "brown assets" implies higher looming transition impacts as well as a higher risk of stranded assets. Read in conclusion with the public debt indicators, it simultaneously considers the member states' capacity to bear the associated transition costs.

- Early warning function: The indicator's warning function is reasonable since the share of brown assets has direct implications for future policy and its room for manoeuvre.

- Communication and transparency: The indicator would require some explanation, but nevertheless seems of below-average complexity.

- High statistical quality: Data on the emissions of single assets (i.e. installations) exist due to the Emission Trading System reporting procedures. Granular data on the valuation of these assets are not available, however. The indicator would therefore need to be estimated with a common methodology across member states.

Risk of medium-term adverse weather events. Such an indicator would measure the risk of physical impacts which have macroeconomic repercussions. A candidate indicator that may be suitable is the INFORM Climate Change Risk Index provided by the European Commission's Joint Research Centre (JRC), in particular its "Hazard and Exposure" dimension. It may need to be adjusted since it incorporates components for climate change-related risks, such as floods, droughts and tsunamis, but also for earthquakes and epidemics. It would also need to be regularly updated to be useful for the MIP. In the long term, mitigation and adaption measures should be considered as well.

- Relevance and economic rationale: As discussed above, physical impacts from climate change will result in substantial economic harm, such as sudden decreases in the capital stock, declining productivity or disaster relief costs.

- Early warning function: The indicator's warning function is reasonable, but depends on the properties of the underlying sources and the probability distribution for the respective events.

- Communication and transparency: The final indicator would likely be some kind of index, which requires sufficient explaining.

- High statistical quality: Estimates for the risk of natural disasters are well established in the literature on natural hazards, e.g. coastal flood hazard maps. They are, however, not updated regularly. In any case, they should be easily comparable at the level of member states.

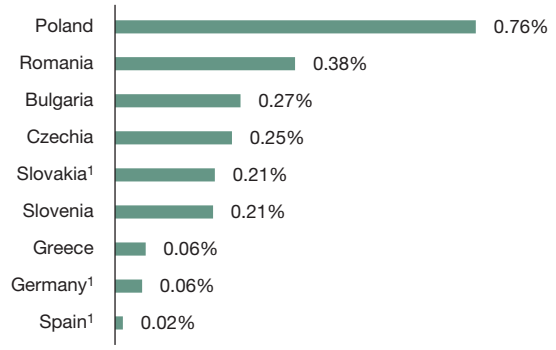
What would the indicators imply for member states?

Because "brown assets" are not (yet) comparably and robustly measured, we use the other two indicators suggested above – the share of brown jobs or industries as well as the risk of medium-term adverse weather events – to obtain a first indication for macroeconomic risks due to climate change by member state.

For the share of "brown" jobs or industries, we consider employment in the sector of coal mining and calculate the share of total employment. Figure 3 reveals that for Central and Eastern European member states, this share is particularly high. This implies high transition costs for these countries in the future. In Poland, for example, more than 100,000 workers were active in this sector in 2022.

For the risk of medium-term adverse weather events, we consider the INFORM CC Risk Index for 2022. The INFORM CC Risk Index has been developed as a tool for the communication of the potential impacts of climate change and the associated risks for individual countries (JRC, 2022a). It employs climate models and socio-economic projections for different scenarios, combining indicators

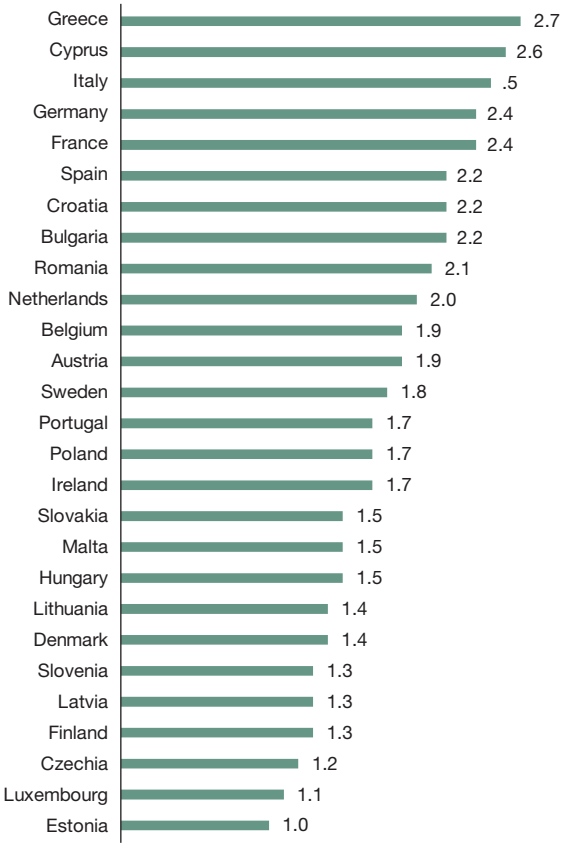
Figure 3
Employment in mining of coal and lignite, 2022
% of total employment



Notes: [1] For Spain, Slovakia and Germany, the reference year is 2018.

Source: Authors' calculations based on Eurostat.

Figure 4
Baseline risk of medium-term adverse weather events
INFORM CC Risk Index



Note: The risk index is given on an interval from 0 to 10.

Source: JRC (2022b).

for natural hazards, socio-economic vulnerability and the coping capacity of countries. We use its baseline risk index, which indicates the risk of climate change impacts at present (latest values available are for 2022).

Figure 4 shows the baseline risk index for all EU member states. The higher-risk countries are mostly Mediterranean countries and/or less economically developed member states. This may indicate a geography prone to impacts from climate change like draughts or heat waves, but also a lack of coping capacity of the respective countries.

Conclusion

The regulation underpinning the MIP defines an imbalance as "any trend giving rise to macroeconomic developments which […] have the potential adversely to affect, the proper functioning of the economy of a Member State […] or of the Union as a whole" (Regulation 1176/2011, Article 2). According to the European Environment Agency, economic losses related to extreme weather events have been increasing by 3% per year over the last 14 years in the EU (European Environment Agency, 2023). If this trend continues, macroeconomic impacts of all sorts will compound. This article shows that it would be the right thing to monitor imbalances and their possible macroeconomic repercussions for each member state, while it would be grossly negligent for the MIP to monitor almost 40 indicators that have no bearing on the costs of climate change. The key issue is, however, to find indicators that offer actionable, concrete policy options and that, at the same time, vary meaningfully across member states in order to work within the MIP framework. This debate clearly needs more contributions. The political will to face the dire reality that climate change will be a growing source for macroeconomic concern is also a necessity.

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