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The macroeconomic impact of the energy and climate provisions of the US Inflation Reduction Act: Evidence for the EU

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*JRC Working Papers on
Taxation and Structural
Reforms No 08/2023*

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Abstract

We assess the extent to which the \$391bn of energy and climate tax provisions under the Inflation Reduction Act in the United States could lead to a potential reallocation of investment and production activities away from the European Union. The analysis is based on the JRC's CORTAX multi-country, general equilibrium model in order to provide estimates of the potential impact of the IRA on main macroeconomic aggregates for the EU as a whole and the US. Our results suggest that, if the US had adopted the subsidies scheme unilaterally, the IRA provisions would have boosted investment in this country at the expense of investment in the EU. However, taking into account available funding from various EU programmes that are planned under the current Multiannual Financial Framework and NextGenerationEU (e.g. from the Recovery and Resilience Facility), the simulation results suggest that EU green sectors would significantly increase their activity while the positive impact on the EU economy as a whole would be positive and noticeable.

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Executive Summary

Policy context

The “Inflation Reduction Act of 2022” (IRA) adopted by the US in August 2022 represents a major policy reform aimed in particular at boosting investments in clean energies in this country. The use of generous tax provisions worth \$391bn represents a key element of this policy, which has spurred many comments in the public debate and the media reflecting worries that such policy may have detrimental effects on the EU’s attractiveness for business investment in green technologies. Yet, the EU has equally adopted ambitious policies, most notably under the NextGenerationEU investment programme, which provides €360bn in loans and €390bn in grants to assist the green transition and the digital transformation of the EU economy. More recently, the EU Green Deal Industrial Plan aims at creating a more supportive environment for scaling up the EU’s manufacturing capacity for the net-zero technologies and products required to meet Europe’s ambitious climate targets. Although EU public support to green investment is commensurate and even more ambitious than the IRA’s provisions, it is unclear whether the EU economy could potentially be put at a disadvantage, especially considering the different nature of both policies and their potential impact on green business investments.

Main analysis

We assess the extent to which the more generous tax credits and other provisions in the US could lead to a potential reallocation of investment and production activities away from the European Union towards the US, focusing on the impact of the IRA, while taking into account the potential impact of the NextGenerationEU investment programme. The analysis is based on the JRC’s CORTAX multi-country, general equilibrium model in order to provide estimates of the potential impact of the IRA on main macroeconomic aggregates for the EU as a whole and the US. One distinctive advantage of CORTAX is that it models in detail the provisions of the corporate income tax system and accounts for their impact on cross-border direct investment and on the economy as a whole. Importantly, we analyse the potential impact of the IRA implementation considering also the presence of the NextGenerationEU programme and other financial support for climate objectives via different programmes, notably the Recovery and Resilience Facility (RRF). This allows us to compare in particular the impact of the IRA on the EU economy to a hypothetical scenario under which no specific EU policy would be implemented. Our analysis provides estimates for the impact of IRA and NextGenerationEU on the green sectors and the macroeconomy as a whole.

Key conclusions

Our results suggest that under a unilateral adoption of IRA provisions, the boost to investment in the US would be indeed detrimental to green investments in the EU. However, in practice, the use of EU funding facilities for supporting EU green sectors significantly increases investment in the EU, even in the case of the IRA adoption. As a result, the capital stock and production level of the EU green sectors would experience significant rises, leading to pronounced increases in wages and employment in these activities. For the EU economy as a whole, the effects would be significant despite the relative small size of the green sectors, leading to increases in the capital stock, GDP and tax revenues. The expected positive effect of the IRA in the US would be slightly smaller compared to the scenario where the US would implement such reform unilaterally and without considering the EU funding in support of climate objectives. Our analysis therefore suggests that the impact of IRA on the EU economy and, in particular, on its attractiveness for green investments should be largely mitigated by the availability of the NextGenerationEU and other related programmes, resulting in a positive net impact for the EU’s green sectors and the EU economy as whole. However, the degree of implementation of the NextGenerationEU programme remains a key aspect for this positive outcome to materialise, since the expected productivity impact depends directly on the country-specific absorption of EU funding facilities.

1 Introduction

In August 2022, US president Joe Biden signed the “Inflation Reduction Act of 2022” (IRA) into law. This law aims to curb inflation and to reduce the deficit through a wide range of measures including lowering prescription drug prices, investing into domestic energy production, and promoting the advancement of clean energy usage. According to the Congressional Budget Office (CBO), the law, as passed, would raise some \$738bn and authorize \$391bn in nominal spending on energy security and climate change, mainly through tax provisions. The law will lead to an estimated reduction of the public deficit by \$238bn.⁽¹⁾

In this study, we assess the extent to which the more generous tax credits and other provisions in the US could lead to a potential reallocation of investment and production activities away from the European Union towards the US, focusing on the impact of the energy and climate \$391bn tax provisions. Such provisions concern primarily areas such as the renewable energy and grid energy storage, nuclear power, electric vehicle incentives, home energy efficiency upgrades and supply improvements, and advanced manufacturing processes. Additional funds are allocated to national clean energy production. This includes the continuation of production and investment tax credits toward clean energy manufacturing, including solar power, wind power, and grid energy storage.

The present paper focuses on the energy tax and subsidies part of the IRA, which has taken centre stage in recent discussions. The analysis is based on the JRC’s CORTAX multi-country, general equilibrium model in order to provide estimates of the potential impact of the IRA on the main macroeconomic aggregates for the EU as a whole and the US, including the capital stock, employment and output (Bratta et al., 2023). One distinctive advantage of CORTAX is that it models in detail the provision of the corporate income tax system and accounts for their impact on cross-border direct investment and on the economy as a whole.⁽²⁾ We consider two scenarios: one in which only the IRA is implemented in the US and another one in which we consider the potential impact of the EU’s long-term budget and the NextGenerationEU programme whereby the EU provides financial support for climate objectives via different programmes, notably the Recovery and Resilience Facility (RRF).⁽³⁾

To the best of our knowledge, only two other studies have examined the impact of the IRA on the EU economy based on a general equilibrium model, which accounts for the endogenous reaction of producers and consumers in an inter-connected world economy. Rusch et al. (2023) use an extended version of the ECB’s Euro Area and Global Economy model (EAGLE). The authors simulate the IRA implementation by introducing production subsidies for intermediate products in the US, which match the size of the IRA package, re-financed by higher corporate taxes for US firms to maintain a balanced government budget. The results suggest that the impact of the IRA on the euro area’s production is negligible, not exceeding an annual reduction of 0.1% in the next years as compared to the counterfactual development without IRA implementation. According to the authors’ results, the impact on the Netherlands is marginally more pronounced as compared to the euro area average given its status as a small open economy with strong trade linkages to the US. In a similar vein, Attinasi et al. (2023) employ a multi-country, multi-sector model developed by Baqaee and Farhi (2023) to simulate the effect of the IRA on trade, relative prices, and production in the EU, among other outcomes. Available tax credits and a bonus for additional investments in certain IRA-supported industries are modelled as trade cost shocks that reduce the prices of domestically produced goods and increase the prices of those products imported from countries that do not satisfy the domestic content requirements, such as member states of the EU. The simulation results indicate that the reshaped trade patterns and a reduction in EU exports to the US would eventually translate into a reduction of EU production between 0.5% and 3% in the affected industries, depending on the parameter specification. However, what these studies have in common is that they entirely neglect the simultaneous availability of support measures for environment and climate-related activities from various EU programmes that are

⁽¹⁾ See <https://www.cbo.gov/publication/58455>. This note is based on the legislative information as passed and signed into law in August 2022.

⁽²⁾ See the annex to this note for a summary description of the CORTAX model. A more technical treatment of the model, incl. functional specifications, individual optimization problems, details about market closures, and the empirical calibration, can be found in the following publication: <https://joint-research-centre.ec.europa.eu/system/files/2017-01/jrc104930.pdf>.

⁽³⁾ The EU’s current Multiannual Financial Framework (MFF) and the NextGenerationEU package provide financing for over EUR 2 trillion for 2021-2027. Of this amount, at least 30% will be spent to fight climate change. In this paper, we consider the EU funding supporting climate objectives, whereas funding supporting other environmental objectives only (e.g. circular economy, pollution reduction, biodiversity, water management) is not taken into account. In addition, we do not take into account funding from national sources in EU Member States. Thus, country-specific figures on the availability of funding in the EU for the environmental sector as a whole are underestimates.

planned under the current Multiannual Financial Framework and NextGenerationEU. In fact, as also pointed out in Rusch et al. (2023), compared to available funds at the European level, the amount of IRA funding for climate policies appears rather modest. Not accounting for EU funds will necessarily lead to an overestimation of the negative impact of the IRA on the EU economy.

One important contribution of our work compared to existing studies is that we take into account the specific nature of the policies implemented in the US and in the EU. The IRA aims at boosting investments through direct tax subsidies while the NextGenerationEU programme aims at supporting green investment and innovation through grants and loans. These differences are reflected in the way we model and analyse both investment support programmes following the standard approaches used in the literature. On the one hand, the impact of IRA tax subsidies plays out through the reduction in the cost of capital such that it is expected to influence business investments directly. On the other hand, the impact of NextGenerationEU is expected to affect firms' productivities which, in turn, have a positive effect on their investment activities. The degree of absorption of NextGenerationEU funds therefore plays a key role in determining the size of the expected impact on business investment in the EU case. Our results suggest that, if the US had adopted the subsidies scheme unilaterally, the IRA provisions would have boosted investment in this country at the expense of investment in the EU. In this counter-factual scenario, investment in US green sectors would have increased substantially (+21.5%) thanks to the increase in the after-tax return of capital in the US vis-à-vis third countries. Output in these sectors would experience significant increases (+6.5%) while the impact on total US GDP would remain more contained (+0.3%). As a result of the unilateral US policy, and not taking into account ongoing and future EU-level support programs for green activities in the EU, business investment in EU green sectors would indeed fall by 2.5% in the longer run while wages in that sector of activities would decline by 1.1% driven by the fall in capital stocks. For the EU economy as a whole, the effects would have been minor with a fall in GDP of -0.01%.

Under a multilateral policy change scenario in which the US adopts the IRA and EU member states make use of available resources of EU funding facilities for supporting climate objectives, the EU green sectors would significantly increase their activity while the positive impact on the EU economy would be noticeable. The capital stock (+3.7%) and production level (+12.0%) of the EU green sectors would experiment significant rises, leading to substantial increases in wages (+8.0%) and employment (+5.2%) in these activities. For the EU economy as a whole, the effects would be significant despite the relative small size of the green sectors. The total capital stock would rise by 0.1% and GDP would increase by 0.3%. Such impacts would lead to higher corporate income tax revenues in the longer run (+0.7%) while total tax revenues would rise marginally (+0.4%) thanks to the positive effects of such measures on the economy and on other tax revenue sources. Under such scenario, the expected positive effect of the IRA in the US would be slightly smaller compared to the scenario where the U.S. would implement such reform unilaterally and without considering the EU funding supporting climate objectives. Importantly, the degree of implementation of the NextGenerationEU programme remains a key aspect for this positive outcome to materialise, since the expected productivity impact depends directly on the country-specific absorption of EU funding facilities.

2 Policy Evaluation Tools and Calibration

In order to calibrate the Inflation Reduction Act in CORTAX, we use inflation-adjusted estimates of the CBO and the Tax Policy Center. Those project a \$241bn additional net tax expenditure on investment activities and “Green Energy” output over ten years (in real terms). The annual government deficit would then increase by an equivalent of 0.13% of GDP in 2031.⁽⁴⁾ Against this background, we simulate the policy change by a reduction in the corporate tax base through increases in the generosity of corporate income tax deductibilities in the US that matches a decrease in total tax revenues in the US of 0.13% relative to GDP.⁽⁵⁾

For the calibration of the impact of EU funding supporting climate objectives, we follow the methodology of Pfeiffer et al. (2021).⁽⁶⁾ We assume that the sum of additional funding from various EU programmes that is planned under the current Multiannual Financial Framework and NextGenerationEU (e.g. from the Recovery and Resilience Facility, RRF) translate into higher permanent factor productivities, e.g. resulting from technological innovations. Productivity changes are country-specific and depend on the sum of receipts from EU funding facilities. The availability of additional EU funds supporting climate objectives is matched by higher government debt levels, as funds need to be re-financed in the longer-run.⁽⁷⁾

We adapt the CORTAX model in order to account for the relative size of the green sectors in the US and EU economies. By design, CORTAX is a one-sector economy, i.e. it does not distinguish between different industries and activities of the economy. Therefore, in order to back out the specific macroeconomic impacts for the subset of activities mostly concerned by the IRA, we adjust the economy-wide results by considering the EU-wide share of employment in the environmental goods and services sector in total employment following Eurostat’s definition.⁽⁸⁾ For example, if the share of employment in activities related to such goods and services was 10% in total employment and the economy-wide GDP effect of the IRA was -2% then the effect would be $-2\% / 10\% = -20\%$ in such specific activities. This holds under the assumption that there is no change in any other activities of the economy.⁽⁹⁾

We follow Eurostat’s definition of the environmental goods and services sector (EGSS) considering that such classification covers the sectors concerned by the IRA. According to the terminology of Eurostat, the EGSS, also referred to as the “environmental economy” or “eco-industries”, consists of a heterogeneous set of producers of goods and services, across various industries, aiming at the protection of the environment and the management of natural resources. Accordingly, the goods and services are considered “environmental” if their purpose is either to protect the environment or to maintain or restore the stock of natural resources. One group of goods and services, related to the protection of ambient air and climate, comprises various measures and activities aimed at reducing emissions of greenhouse gases, air pollutants and gases that negatively affect the ozone layer. It includes the development and advancement of electric and hybrid cars and low-carbon fuels, the adoption of more energy-efficient production processes, an accelerated transition towards consumption of products that consume less energy, improved waste and wastewater management, and the protection of biodiversity and landscapes, among other things. The second group of services and products considered in Eurostat’s classification are resource management activities aimed at preserving and

⁽⁴⁾ See the documentation of the Tax Policy Center here: <https://www.taxpolicycenter.org/taxvox/context-federal-budget-inflation-reduction-act-wasnt-very-big>.

⁽⁵⁾ The “Green Energy” component of the IRA comprises various other support measures for firms (and households), including tax credits, loans, loan guarantees, and grants. What they have in common, and what they are intended to achieve in practice, is to reduce firms’ cost of financing and to incentivize investments in green activities. While it might be the case that there are differences in the effectiveness of individual measures, e.g. with respect to take-up of firms or differences in effectiveness across industries, we think that these differences are only nuanced and that the exact design of the package is only of secondary importance to gauge the general impact of the IRA. We would also not expect firms operating in the “green industry” to respond differently from firms in other sectors.

⁽⁶⁾ See Pfeiffer et al. (2021). Quantifying Spillovers of Next Generation EU Investment. European Economy Discussion Papers, No. 144, and in particular section 3.6 on the calibration of changes to factor productivity therein.

⁽⁷⁾ In this simulation, we focus on EU-level support programs and do not take into account other public funding supporting climate objectives, e.g. additional funding at the national level. Furthermore, the model does not incorporate the inter-institutional agreement which stipulates that the NGEU program should be refinanced by new own resources.

⁽⁸⁾ See Eurostat (2009), The Environmental goods and services sector, Eurostat Methodologies and Working Papers, European Commission, Luxembourg: <https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-ra-09-012>.

⁽⁹⁾ A natural corollary of this approach is that we cannot account for potential spillover effects – both positive and negative ones – between those activities subject to the IRA and other activities. For instance, the IRA could divert skilled labour away from activities not subject to the IRA and towards those activities that do benefit from the IRA, thereby reducing the output of the former ones (negative externality). At the same time, activities subject to the IRA may generate knowledge spillovers or reductions in energy input prices that would ultimately increase the output of activities not subject to the IRA (positive externality).

enhancing the stock of natural resources. They include a transition towards a sustainable use of water resources and forest areas, minimisation of the use of fossil energy resources, enhanced production of renewable energy resources as well as improvements in the efficiency of using those.⁽¹⁰⁾

Importantly, the services and products represented by the EGSS closely match those for which tax credits are awarded in the US under the IRA and include companies that are likely to benefit from EU funding for climate objectives. For example, IRA tax credits are granted for the production of and investment into renewable energy sources, the development of low-carbon fuels for transport and aviation, improved carbon and emissions management, the adoption of low-carbon materials, residential clean energy usage and improvements in energy efficiency, and landscape resilience, among other things. Furthermore, a clean vehicle credit is granted for the purchase of, for example, a new electric vehicle.⁽¹¹⁾ EU climate funding takes various forms in the different funding programmes, and includes investment support for the deployment of renewable energy sources, decarbonisation of industry and agriculture, deployment of sustainable mobility, measures to boost energy efficiency, and support to research and innovation for the net-zero economy. According to Eurostat data, in 2020, the latest year for which information was available, a total of approximately 5.1mn people were employed in the environmental goods and services sector, corresponding to a share in total employment of 2.71%.⁽¹²⁾ Following the same methodology, Georgeson and Maslin (2019) estimate that the share in the US is 4.2%, as of 2016, which is the last year available of the study.⁽¹³⁾

⁽¹⁰⁾ For a complete list of all services and products under the classification see the documentation: <https://ec.europa.eu/eurostat/documents/1798247/12177560/CEPA+and+CReMA+explanatory+notes+-+technical+note.pdf/b3517fb9-1cb3-7cd9-85bd-4e3a3807e28a?t=1609863934103>

⁽¹¹⁾ A detailed overview of all energy and climate related measures is provided by the Bipartisan Policy Center: <https://bipartisanpolicy.org/blog/inflation-reduction-act-summary-energy-climate-provisions/>.

⁽¹²⁾ It is not unreasonable to assume that firms outside of the EGSS sectors will also benefit from EU funding for climate objectives. Furthermore, contrary to the IRA, firms benefitting from EU support need not necessarily be based in the EU. For example, it could include the installation of solar panels that are purchased from non-EU countries.

⁽¹³⁾ Georgeson, L., Maslin, M. (2019). Estimating the scale of the US green economy within the global context. Palgrave Commun 5, 121. Note that the nuclear sector is not included in the EGSS accounting but in the estimate for the US. Inclusion of around 1 million jobs that the industry sustains in the EU27 (<https://www.world-nuclear-news.org/Articles/Study-highlights-nuclears-value-to-EU-employment>) would increase the EU employment share by half a percentage point to 3.21% and would reduce sector-specific results in Tables 1 and 2 for the EU by around 20% in magnitude.

3 Results

3.1 Unilateral US Policy

Table 1 summarizes the main effects, separately for the (entire) EU and for the US. It covers the counterfactual scenario in which the US would have unilaterally adopted the IRA energy subsidies, absent any policy reaction from the EU. Our simulation results show that the provision of tax credits and subsidies under the IRA increases the after-tax return on capital used in the US vis-à-vis other countries. Therefore, not surprisingly, we observe a decrease in investment in the EU and, ultimately, a decrease in the size of the capital stock in European countries' energy and climate related activities of 2.5%. An additional channel through which the EU is affected is via the interest rate. Higher capital demand in the US does increase the price for lending on international capital markets, thereby driving up the real interest rate and increasing the cost of financing for firms in Europe.

Table 1: Effect from unilateral adoption of IRA Green Subsidies in the US

	EU	US
In Environmental Goods and Services Sector		
Capital Stock	-2.51%	+21.48%
Wages	-1.07%	+8.14%
Employment	+0.30%	+0.88%
Output	-0.52%	+6.52%
Overall Economy		
Capital Stock	-0.07%	+0.90%
Wages	-0.03%	+0.34%
Employment	+0.01%	+0.04%
GDP	-0.01%	+0.27%
Budgetary Impact		
CIT Revenues	+0.15%	-14.78%
Overall Tax Revenues	+0.01%	-0.66%

Source: Own computations based on CORTAX simulation results.

Smaller levels of tangible and intangible capital stocks weigh on workers' productivity, which eventually reduces wages for workers producing such goods and services. Across the EU, the results point toward a decline in equilibrium wages of 1.1% in those jobs related to the affected activities. Lower wages and higher interest rates on capital have made labour input relatively cheaper, thereby creating incentives for firms to increase their demand for labour. On average, the simulations suggest a slight increase in employment of 0.3%. Nevertheless, substantial declines in the employed capital stock and lower productivities of workers would eventually lead to lower output in energy and climate related activities. Across the EU, the projected decrease in output would be 0.5%.

In the US, the adoption of more generous tax credits for the concerned activities would attract more capital in the production process. The increase in the capital stock is projected to be 21.5%. Higher capital endowment increases workers productivity, ultimately leading to higher wages (+8.1%) and higher employment (+0.9%). Taken together, the simulations point toward an increase in the output of the EGSS in the US of 6.5%. For the US economy as a whole, the simulation results suggest an increase of the overall capital stock of 0.9% and

an increase in wages and GDP of 0.3%. Overall employment is hardly affected. Concerning the overall effect for EU Member States, changes are minor, given the relatively small share of environmental goods and services in the overall economy. (¹⁴)

The positive stimulus effect in the US through additional tax credits comes at the cost of a pronounced reduction in CIT revenues (-14.8%). Despite the fact that the initiative is expected to create additional jobs and to increase wages and production, such policy is not expected to be self-financed, with a reduction in annual tax revenues of -0.7%. (¹⁵) According to CBO estimates, which are the basis for our simulation results, the US government balance would worsen by -0.13% of GDP per year for the time the initiative is in place. In the EU, CIT and overall tax revenues respond only marginally. Smaller payroll costs from reduced equilibrium wages would actually increase firms' profit margins, thereby increasing their taxable profits.

3.2 US Policy and EU Climate Funding

In Table 2, we consider the case in which not only the US implements the IRA but also EU Member States fully access the planned support for climate objectives provided through EU funding facilities under the long-term budget and the NextGenerationEU programme. In such case, equilibrium wages (+8.0%) and employment (+5.2%) in EU green activities respond both strongly to additional funding. The capital stock increases as well as it partially complements higher employment levels (+3.7%). As production, read GDP, is a function of capital and labour, and the efficiency of using both input factors, it rises strongly (+12.0%) for the EU's environmental goods and services sectors. At the same time, the effect would be slightly smaller in the US than under a unilateral adoption (Table 1), albeit still strongly positive. For the EU economy as a whole, the simultaneous provision of funding in the EU is projected to lead to an increase in the overall EU capital stock of 0.1% and wages rising by 0.2%. EU GDP would increase by 0.3%. (¹⁶) Pfeiffer et al. (2021) find a long-term effect from the NGEU program of 0.4% on GDP in their baseline results without accounting for the IRA package in the US. As for the US, the economy-wide capital stock and employment levels would increase by 0.8% and 0.3%, resulting in a GDP increase of 0.25% for the economy as a whole.

The fact that under a multilateral adoption of the environmental subsidies scheme *all* countries see their capital stocks increase, stresses the importance of considering the effects in general equilibrium: instead of just redistributing a fixed amount of capital – “firms invest here or there” – there will be *new* capital created coming from higher interest rates and higher household savings. Concretely, as firms intensify their usage of capital in the production process, the price of capital in the world markets, i.e. the (real) interest rate, increases, thereby strengthening the incentives for households to increase their savings rates, which eventually increases the total stock of capital.

(¹⁴) The impact on capital, wages and production would be by around 20% to 25% smaller in magnitude in the hypothetical case in which the “Green Climate” part of the IRA is combined with a worldwide adoption of a minimum effective tax rate on corporate profits. The size of the impact on employment remains almost unchanged.

(¹⁵) It should be noted that this effect might at least partly be explained by the way the tax policy change is parametrised in CORTAX. We model the package by reducing the CIT base, therefore by construction the entire effect in the model falls on CIT revenues. In reality, however, the initiative does not only comprise reductions in the corporate tax base but also other channels, e.g. additional government spending. For example, the IRA amends available funds for loans, loan guarantees and grants in various programs. These additional expenditures would not be reflected in smaller CIT revenues in practice. Our estimate of the CIT revenue effects can therefore be considered as an upper-bound estimate of the actual effect.

(¹⁶) The magnitude of the results for the EU will be by around 25% smaller when taking into account that countries do not fully absorb the available EU funding, using realised expenditures from the European Structural and Investment Funds (ESIF) under the previous MFF as proxies for future absorption rates. Country-specific numbers vary between 57% in the case of Spain and 93% in Portugal and are 75% for the EU on average (<https://cohesiondata.ec.europa.eu/overview/14-20#>). Note that these simulations do not take into account available support programs at the national level. Using country-specific data from the EU Commission's State Aid Scoreboard on how much financial support national governments have provided for “Environmental protection, including energy savings” in 2021 could give an indication on how much additional support is provided at the national level in the future, under the assumption that 2021 state aid support levels are maintained in the next years. Such additional funding, which comes in addition to available EU funds, further increases permanent factor productivities and leads to additional GDP gains of around 0.1 percentage points.

Table 2: Effect from adoption of IRA Green Subsidies in the US and increase in EU-level funding for climate funding in EU

	EU	US
In Environmental Goods and Services Sector		
Capital Stock	+3.69%	+19.33%
Wages	+8.04%	+7.26%
Employment	+5.20%	+0.95%
Output	+11.99%	+6.00%
Overall Economy		
Capital Stock	+0.10%	+0.81%
Wages	+0.22%	+0.31%
Employment	+0.14%	+0.04%
GDP	+0.33%	+0.25%
Budgetary Impact		
CIT Revenues	+0.70%	-14.38%
Overall Tax Revenues	+0.38%	-0.62%

Source: Own computations based on CORTAX simulation results.

4 Conclusions

In August 2022, US president Joe Biden signed the “Inflation Reduction Act of 2022” (IRA) into law. The present paper focuses on the energy tax and subsidies part of the IRA, which has taken centre stage in recent discussions. Based on JRC’s CORTAX multi-country, general equilibrium model we assess the extent to which the more generous tax credits and other provisions in the US could lead to a potential reallocation of investment and production activities away from the European Union towards the US, focusing on the impact of the \$391bn in energy and climate tax provisions.

In the counter-factual scenario in which the US would have unilaterally adopted the IRA energy subsidies, absent any policy reaction from the EU, the simulation results suggest that the provision of tax credits and subsidies under the IRA increases the after-tax return on capital used in the US vis-à-vis other countries. Therefore, not surprisingly, we observe a decrease in investment in the EU and, ultimately, a decrease in the size of the capital stock in European countries’ energy and climate related activities of 2.5%. Across the EU, the projected decrease in output of the affected sectors would account to 0.5%.

However, taking into account the planned support for climate objectives provided through EU funding facilities under the long-term budget and the NextGenerationEU programme, the simulation results point to sizable increases of the green sectors’ activity in the EU (+12.0%), despite the adoption of more generous tax credits in the US. Both, the capital stock and production levels of the EU green sectors would experiment significant rises, leading to substantial increases in wages and employment in these activities. For the EU economy as a whole, the effects would be significant despite the relative small size of the green sectors. The total capital stock would rise by 0.1% and GDP would increase by 0.3%, with positive effects on governmental tax revenues. Importantly, the degree of implementation of the NextGenerationEU programme remains a key aspect for this positive outcome to materialise, since the expected productivity impact depends directly on the country-specific absorption of EU funding facilities.

References

- Attinasi, M. G., Boeckelmann, L., and Meunier, B., 'Unfriendly Friends: Trade and Relocation Effects of the US Inflation Reduction Act'. VoxEU.org, 2023.
- Baqae, D. and Farhi, E., 'Networks, Barriers, and Trade'. *Econometrica*, forthcoming, 2023.
- Bratta, B., Pycroft, J. and Stoehlker, D., 'CORTAX 2019: Updated calibration and baseline results', JRC Working Papers on Taxation and Structural Reforms, No 07/2023, 2023.
- Eurostat, 'The Environmental Goods and Services Sector'. Eurostat Methodologies and Working Papers, European Commission, 2009.
- Georgeson, L., and Maslin, M., 'Estimating the Scale of the US Green Economy within the Global Context'. *Palgrave Commun* 5, 121, 2019.
- Pfeiffer, P., Varga, J., and in' t Velt, J., 'Quantifying Spillovers of Next Generation EU Investment'. European Economy Discussion Papers, No. 144, 2021.
- Rusch, J., Carceller del Arco, M., Vording, E., Heerma van Voss, B., and Mavromatis, K., 'Macroeconomic Effects of the Inflation Reduction Act'. DNB Analysis, 2023.

List of abbreviations and definitions

CBO	Congressional Budget Office
CIT	Corporate Income Tax
EAGLE	Euro Area and Global Economy model
ECB	European Central Bank
EGSS	Environmental Goods and Services Sector
ESIF	European Structural and Investment Funds
GDP	Gross Domestic Product
IRA	Inflation Reduction Act
MFF	Multiannual Financial Framework
NGEU	NextGenerationEU
RRF	Recovery and Resilience Facility

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