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KINGDOM OF THE NETHERLANDS—THE NETHERLANDS

SELECTED ISSUES

July 2025

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KINGDOM OF THE NETHERLANDS—THE NETHERLANDS

SELECTED ISSUES

June 30, 2025

Approved By
European Department

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CONTENTS

BOOSTING DUTCH LABOR PRODUCTIVITY: DIAGNOSTIC AND POLICY OPTIONS[1]

Despite having one of the highest labor productivity levels globally, the Netherlands faces challenges in enhancing productivity growth. The analysis highlights the potential to boost productivity through reforms targeting workers and firms. Improving education outcomes and enhancing vocational training, especially in SMEs, will help fully utilize the potential of Dutch workers. Given lower productivity of the self-employed, efforts to reduce labor market duality should continue. Amid population aging, maintaining high skills across generations and effectively integrating migrants into the labor market are crucial. Additionally, in light of increased resource misallocation, promoting business dynamics and encouraging productivity-enhancing investment will be vital for Dutch firms. In this respect, continuing to push for the completion of the EU single market and addressing factors affecting investment activities (e.g., electricity grid, labor shortage, and policy uncertainty) will be critical. Promoting productivity spillovers both domestically and internationally, as well as encouraging SMEs to engage in more R&D activities, will also benefit productivity growth.

A. Context

1. Boosting labor productivity will be a critical source for future growth in the Netherlands. Given the expected stagnation of labor supply due to population aging and limited room to increase the employment rate, more attention is being paid to enhancing labor productivity (Figure 1, upper right). This urgency is reflected in several recent studies on labor productivity (e.g., Bettendorf & Polder (2025), Wache et al. (2025), DNB (2025)). This paper combines these findings with additional analysis to provide policy options to boost labor productivity in the Netherlands. The paper discusses productivity from the macroeconomic (Section B), employment (Section C) and firm (Section D) perspective, before summarizing policy considerations.

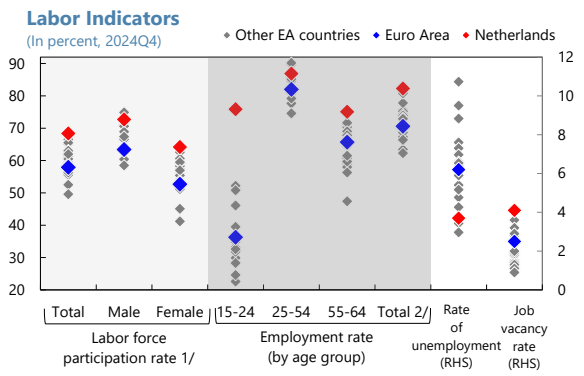
2. While the level of labor productivity in the Netherlands is among the highest globally, its growth has been declining and is now lower than that of its peers. Comparing labor productivity levels (per hour worked) among OECD countries shows that the Netherlands surpasses the Euro Area and is comparable to the United States and Germany (Figure 1, upper right). However, its growth rate is lower than that of other countries with similar productivity levels. Both labor productivity and TFP growth rates in the Netherlands declined after the global financial crisis, and they experienced disappointing productivity growth during 2013–19 despite high real GDP growth (Figure 1, lower left). The slowdown in productivity growth during this period can be attributed to (i) mining (phasing out of gas extraction),[2] (ii) manufacturing (slowdown in chemicals and electrical engineering manufacturing), and (iii) transport and storage (more labor inputs for parcel transportation due to the rise of online ordering) (De Vries and van Leeuwen, 2024 and 2025). Although the relatively large negative impact from mining is unique to the Netherlands, the

[1] Prepared by Shinya Kotera (EUR).

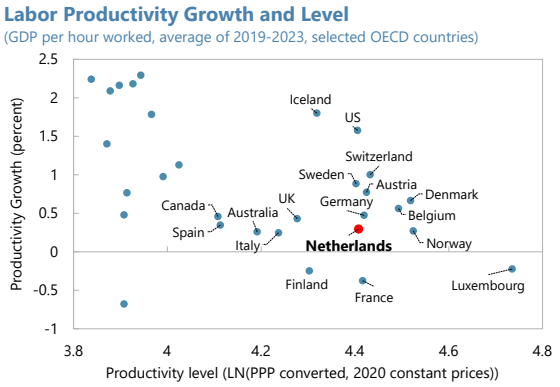
[2] The phasing out of gas extraction started in 2014, turned off in October 2023, and permanently closed in 2024.

productivity growth rate excluding mining and non-market sectors indicates that the Netherlands is still slightly lower than the median of peer countries (Figure 1, lower right).

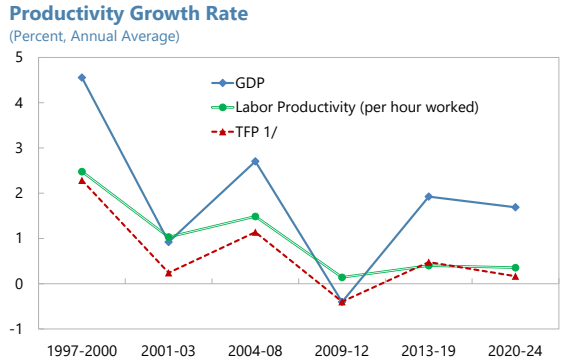
Figure 1. Context



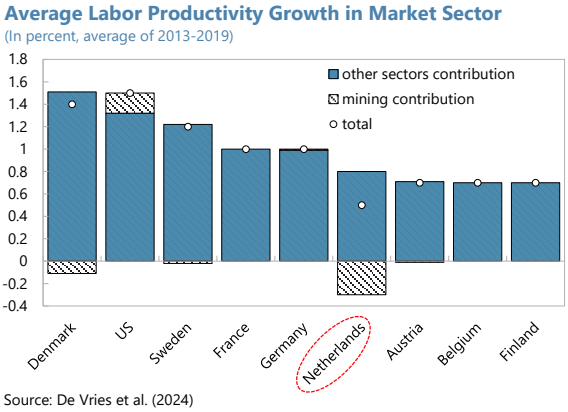
Sources: Haver Analytics; and IMF calculations.
1/ Among people aged 15 years and older. 2/ Among people aged 15-64 years.



Sources: OECD and IMF staff calculations.



Source: Haver Analytics
1/ Estimates from AMECO



Source: De Vries et al. (2024)

B. Macro Level Perspective

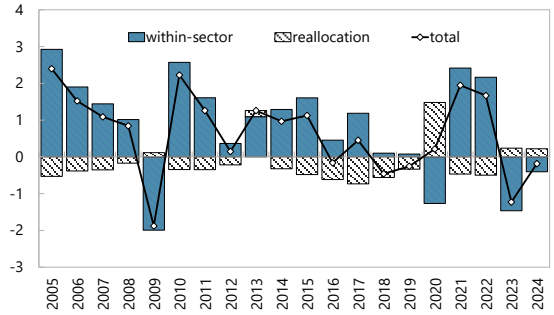
3. Aggregate productivity growth is analyzed from a sectoral perspective. Following Ando (2020), aggregate labor productivity can be decomposed into within-sector labor productivity growth and the reallocation of each sector's labor share (share in total hours worked). The former captures sectoral efficiency gains, and the latter reflects structural changes within the economy. Positive reallocation effects occur when more resources are allocated to higher productivity sectors (or fewer resources to lower productivity sectors).

4. Recent labor productivity growth (2019–23) was mainly driven by within-sector growth, and its contribution was relatively lower than peers. The decomposition shows that until 2019, within-sector productivity growth was the main contributor to overall productivity growth, while the reallocation effect had a slight negative impact (Figure 2, upper left). The trend after the pandemic is hard to discern due to large fluctuations in both productivity growth and its contributions. However, based on the average from 2019–23, around 80 percent of the total growth in that period can be attributed to within-sector productivity growth. Compared with peer countries,

the Netherlands ranks fifth out of seven in terms of both total growth and within-sector contributions (Figure 2, upper right). During this period, overall growth was supported by market services and high-tech knowledge-intensive services (Figure 2, middle). Conversely, other knowledge-intensive services (public, education, and social work), mining, and financial sectors hindered productivity growth. In manufacturing, high to medium technology sectors improved their efficiency, while medium to low technology sectors stagnated.

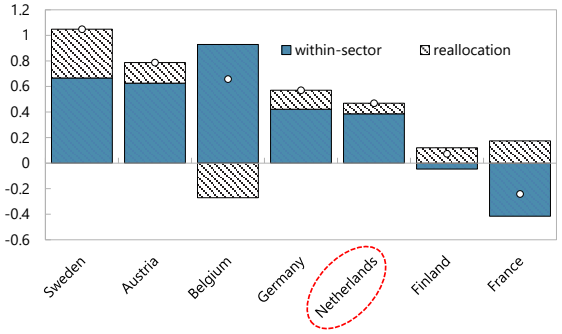
Figure 2. Labor Productivity Growth Decomposition

Labor Productivity Growth
(Percent, GVA per hour worked)



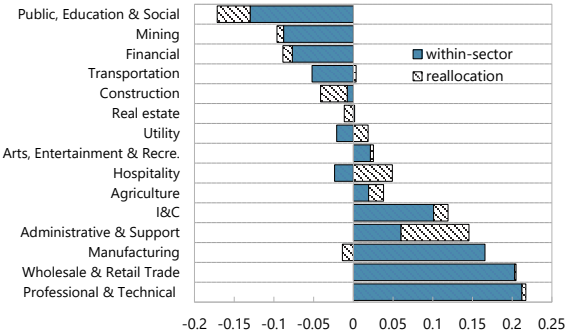
Sources: Haver Analytics and IMF staff calculations.
Note: Decomposition based on 20 sectors except 2024 (10 sectors).

Labor Productivity Growth
(GVA per hour worked, 2019-2023 growth average, percentage points)



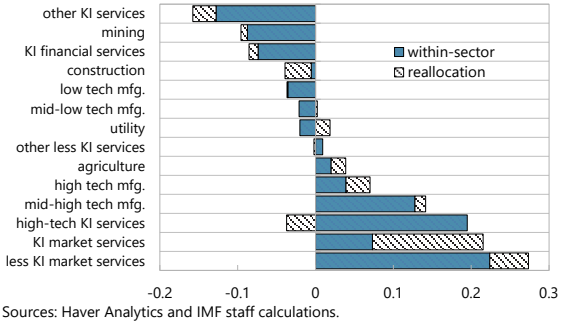
Sources: Haver Analytics and IMF staff calculations.

Contributions to Labor Productivity Growth by Sector
(GVA per hour worked, 2019-2023 average, percentage points)



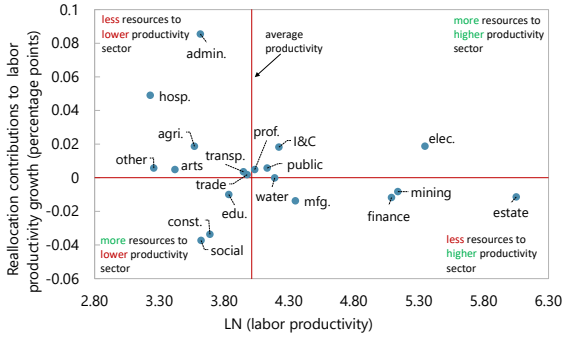
Sources: Haver Analytics and IMF staff calculations.

Contributions to Labor Productivity Growth by Sector
(GVA per hour worked, 2019-2023 average, percentage points)



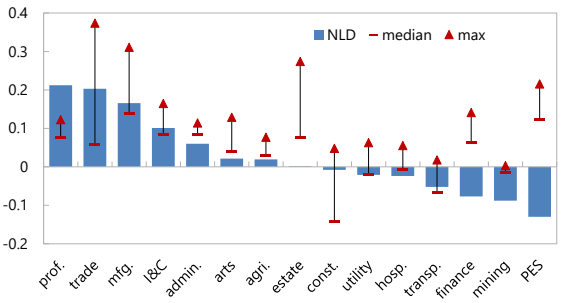
Sources: Haver Analytics and IMF staff calculations.
Note: Knowledge-Intensive (**KI**) Services and high-low technology manufacturing are based on the definition by Eurostat.

Reallocation Contributions to Labor Productivity Growth
(2019-2023 average, GVA per hour worked)



Sources: Haver Analytics and IMF staff calculations.

Within-Sector Contribution to Productivity Growth
(2019-2023 average, percentage points, comparison to 6 peer countries 1/)



Sources: Haver Analytics and IMF staff calculations.
1/ Median and Max are based on 6 peer countries (AUT, BEL, DEU, FIN, FRA, SWE)

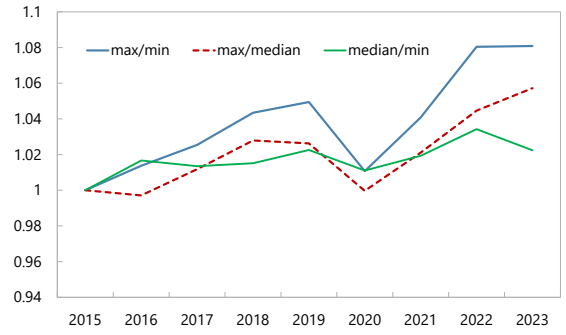
Note: agri. = agriculture, mfg.= manufacturing, elec. = electricity, utility = electricity & water, const. = construction, trade= wholesale & retail trade, tranp.= transportation & storage, hosp. = hospitality (accommodation & food service), I&C=information & communication, estate = real estate, prof. = professional, scientific & technical activities, admin.= administrative & support service, PES=public, education & social work, edu. = education, arts=arts, entertainment & recreation.

5. Allocating more resources to high-productivity sectors benefits productivity but may not respond to the evolving needs of society. Figure 2 (lower left) details reallocation effects by sector. Both the upper-right and upper-left quadrants indicate a positive contribution to aggregate productivity growth. The upper-right represents higher-than-average productivity sectors with increased labor share, while the upper-left represents lower productivity sectors with decreased labor share. The opposite holds for the lower-right and lower-left quadrants. Thus, positive allocation effects are observed in administrative & support services and the hospitality sector, while negative effects are seen in health & social and construction sectors. From a productivity standpoint, allocating more resources to higher productivity sectors (or fewer to lower productivity sectors) is desirable, but this may not necessarily be responding to evolving needs. As argued by Erken (2024), allocating more resources to health and education may be socially desirable (especially given population aging), even if these sectors have lower productivity levels.

6. Comparing the within sector productivity growth with peers suggests that the Netherlands has room to achieve higher productivity growth. Given the difficulties of assessing the reallocation contribution, Figure 2 (lower right) focuses the within sector productivity contributions in the Netherlands and 6 peer countries.[3] Compared with peers, the Netherlands performed better than the median in 6 out of 15 sectors but lower than the top-runner in all sectors but one (i.e., professional, scientific and technical activities). Compared with the top performer, the relatively larger gap is observed in 1) public, education, and social (PES), 2) finance, 3) real estate, 4) trade, and 5) manufacturing. As the non-commercial sector (public, education, and real estate) faces productivity measurement issues because value added cannot be measured directly (De Vries and van Leeuwen, 2024), it does not efficiently contribute to overall growth despite some resource allocation. Comparing with the sector-wise productivity levels with the euro area, more effort for productivity improvement could be focused on information & communication as well as other services (DNB, 2025). Simply achieving the top-performer level of within-sector contributions could have raised Dutch productivity growth by 1.7 ppt (excluding mining), which implies that the Netherland still have potential to achieve higher productivity growth.

7. In addition to sectoral drivers, monitoring regional productivity developments is essential to promote regional balance. While the focus of this paper is at the country level, there are important regional productivity differences. Over the past eight years, labor productivity dispersion among provinces has increased moderately (Figure 3). While the productivity level of the top runner (Noord-Holland) is increasing, some provinces (e.g., Drenthe and Zuid-Holland) have

Figure 3. Labor Productivity Dispersion Among Provinces
(12 provinces, GDP per hour worked, 2015=1)



Sources: CBS and IMF staff estimations.

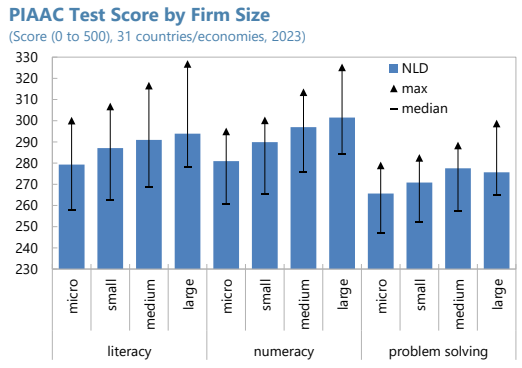
[3] The peer countries are Austria, Belgium, Germany, Finland, France, and Sweden, and these countries are selected based on the productivity level (see Figure 1, upper right).

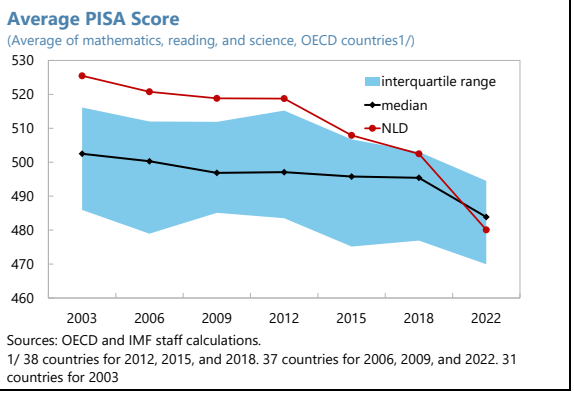
experienced negative productivity growth.[4] Although the current dispersion may not be necessarily elevated compared with other countries, there is a high risk of further widening in the future (PWC, 2025).[5] Closely monitoring the drivers and bottlenecks of regional productivity growth and leveraging regional innovation systems and other supporting measures can help promote regional growth and equity (OECD, 2020).

C. Employment Level Perspective

8. Dutch workers have relatively higher skill levels compared with OECD countries, although declining educational outcomes raise concerns. According to PIAAC (Program for the International Assessment of Adult Competencies), which surveys individuals aged 16–65 on key information processing skills, Dutch workers scored higher marks than those in other OECD countries (Figure 4, left).[6] The Netherlands ranked between second (numeracy in medium firms) and ninth (problem solving in large firms) and fourth based on average scores among the 31 countries and economies. The skill level of workers tends to be lower in smaller firms across all three categories, although this is a global trend. Furthermore, according to Eurostat, the share of workers with above-basic digital skills in the Netherlands is among the highest across all employment categories in 27 European countries. However, according to the Program for International Student Assessment (PISA), which measures students' (aged 15) ability to use their reading, mathematics, and science knowledge and skills, the score for the Netherlands has shown a declining trend (Figure 4, right). Based on the average PISA scores, the Netherlands ranked fifth in 2006 and 22nd in 2022. In 2022, 72 percent of Dutch students were in schools where principals reported instructional issues due to staff shortages and 46 percent were in schools with inadequately qualified staff; these ratios were 36 and 24 percent in 2018 (OECD, 2023b). This raises concerns about the skill levels of Dutch workers in the future, when the current younger generation starts to enter the labor market.

Figure 4. Skill Level





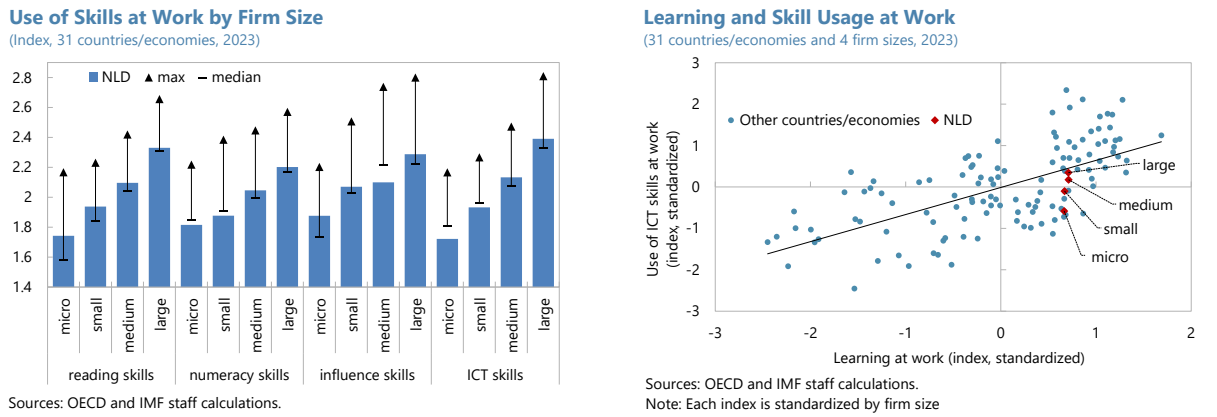
[4] Although the productivity level for Groningen province is not the lowest, it declined by 23 percent from 2015 to 2023 due to gas field closure. Using data with granular regional classification from 1995 to 2021, Raspe and Sande (2024) found that the group of lagging regions is considerably larger than the group of regions that have caught up.

[5] According to the data from OECD (2023a), labor productivity dispersion (ratio of max to min) among TL3 regions in the Netherlands is 1.6, while the median for 23 OECD countries is 1.8.

[6] 31 OECD and its partner countries/economies. PIAAC data includes 27 OECD countries, 2 sub-national entities (Flemish region for Belgium and England for the UK), and 2 partner countries (Croatia and Singapore).

9. Dutch workers may not fully utilize their skills at work, in particular in small firms, which might call for improved vocational training and capital deepening. Although the skill level of Dutch workers is relatively high, their indexes of use of skills at work (from PIAAC) stood around the median of OECD countries (Figure 5, left). Among the selected four indicators, the Netherlands ranked between 10th (reading in micro firms) and 22nd (numeracy in micro firms), with an average ranking of 15th place out of 31 countries and economies. Relative to other countries, numeric and ICT skills usage was particularly lower for Dutch workers in micro and small firms. Based on the data across countries and firm sizes, higher learning opportunities correlate with higher ICT skill usage, but the skill usage in the Netherlands tends to be lower than what the learning opportunities imply, especially for workers in smaller firms (Figure 5, right).[7] According to the EU-LFS, the participation rate of adult learning in the Netherlands is among the highest in EU countries, although CBS data indicate that workers in smaller firms are significantly less likely to participate in training and education. These findings suggest the importance of improving the quality of vocational training as well as supporting access to training in smaller companies. As discussed in the next section, deepening capital stocks (e.g., ICT equipment and software) to support operations could also help utilize workers' skills.

Figure 5. Use of Skills at Work



Note: The index of use of reading skills at work ranges from -3 to 7, the index of use of numeracy skills at work ranges from 1 to 6, the index of use of influencing skills at work ranges from 1 to 5, and the index of use of ICT skills at work ranges from 1 to 5.

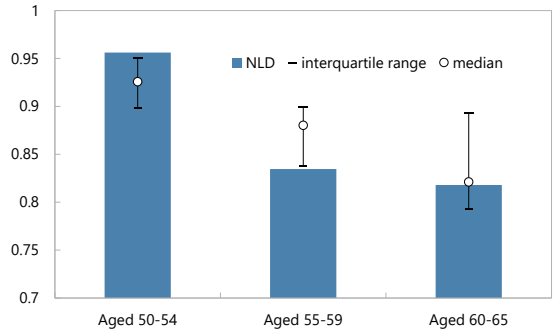
10. Given population aging, older workers should be encouraged to keep their skill levels and usage high. Empirical analysis for European countries suggests that workforce aging will reduce labor productivity growth (Aiyar et al., 2016). While it is a global trend that older workers use ICT skills less compared to young and middle-aged workers, the magnitude of this decline is higher for Dutch older workers than in countries, especially those aged 55–65 (Figure 6). This suggests the importance of supporting lifelong learning, which would help support longer working lives by increasing potential and improving mobility and employability (OECD, 2018), as well as adapting technological innovation to favor both young and older workers.

[7] Index of learning at work is constructed based on the workers' opportunities of 1) learning new things, 2) learning by doing, and 3) keeping up to date at work.

11. Labor market duality may be dragging down productivity growth. The share of freelance self-employed (SE) increased over the last two decades in the Netherlands, resulting in a higher SE share and increased fragmentation of the labor market (IMF, 2024a). A regression analysis among provinces shows that labor productivity and the SE share have a statistically significant negative relationship (Figure 7).[8] Bondt (2018) also argued that a rise in SE was one of the reasons for lower productivity growth in the Netherlands between 2008 and 2018. One possible reason for the lower productivity of SE is the lack of sufficient opportunities for skill development, whereas employees often receive company-specific training to enhance their productivity (Bovenberg and Groot, 2022). These findings underscore the importance of tackling labor market duality. In this respect, recent progress, such as reducing false SE, are welcome. Introducing mandatory disability insurance and strengthening pension arrangements for SE are other areas where attention is needed.

Figure 6. Use of ICT Skills at Work for Older Workers

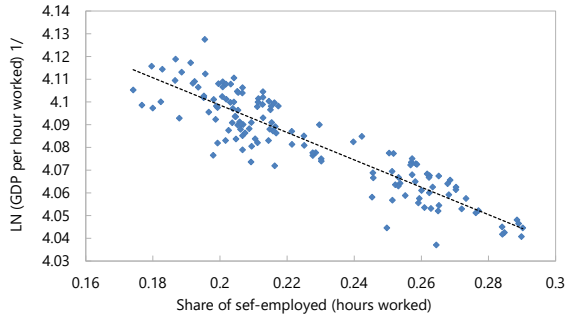
(Relative to workers aged 25-49, 31 economies/countries)



Sources: OECD and IMF staff calculations.

Figure 7. Labor Productivity and Self-employed in Provinces

(2010-2022, 11 provinces)

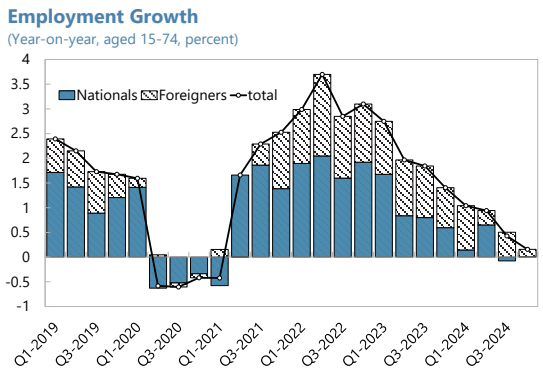


Sources: CBS and IMF staff estimation.
1/ Controlled for years, provinces, and 8 sectoral shares.

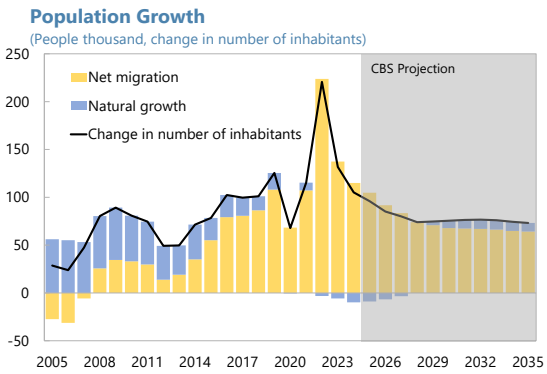
12. Effectively integrating migrants into the labor market offers an important avenue for enhancing labor productivity. Given population aging, recent employment growth has been supported by the increase in foreign workers (Figure 8 upper left). Over the medium-term, the population is projected to grow due to net migration with negative or near zero contributions from natural growth (Figure 8, upper right). Amid the tight labor market, migrant workers could help alleviate labor shortages, but successful integration is key to productivity growth. Simulation analysis by Caselli et al. (2024) suggests that GDP per capita drops if a TFP gap between natives and immigrants persists, but not if that gap gradually closes over time. However, based on PIAAC scores, there seems to be a higher skills gap between natives and foreign born in the Netherlands compared with OECD countries (Figure 8, lower left). Based on the Migrant Integration Policy Index, the Netherlands stands somewhere between the median and 75th percentile among EU27 countries, except for indexes of family reunification and permanent residence, where the Netherlands is below the median (Figure 8, lower right). Overall, this suggests room for better integration policies for the Netherlands. Although the skill levels for future migrants are unknown, efforts to integrate migrants in the most productivity-enhancing ways possible are essential to prevent persistent gaps between natives and migrants.

[8] The regression covers 2010–2022 and 11 provinces (Groningen is excluded due to irregular impacts from gas field closure). Independent variables are self-employed share (hours worked), 8 sectoral shares in each province, year dummies, and province dummies. The coefficient of self-employed is statistically significant at the 5 percent level.

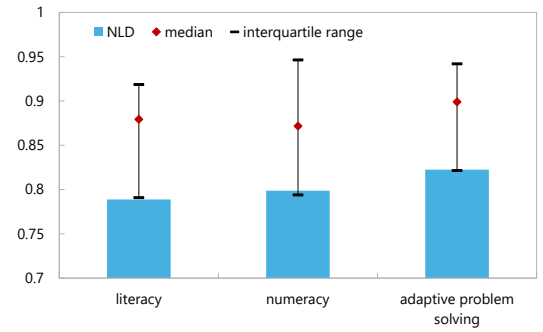
Figure 8. Migrants



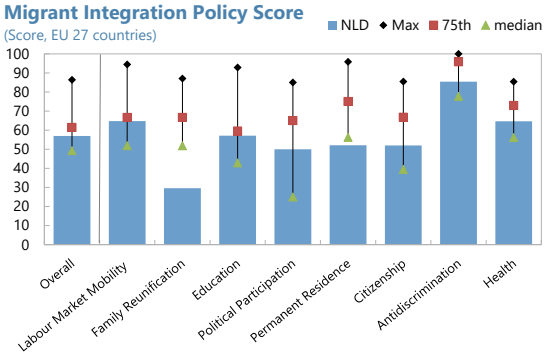
Sources: Haver Analytics, CBS, and IMF staff estimation.



Sources: CBS; and IMF staff calculations.



Sources: OECD and IMF staff calculations.



Sources: Migrant Integration Policy Index and IMF staff calculations.
Note: 2023 for NLD. 2024 for DEU and FIN. 2019 for other counties.

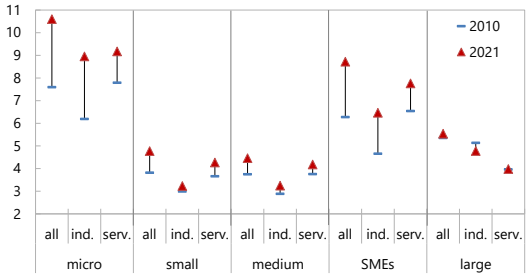
D. Firm Level Perspective

13. Labor productivity dispersion among SMEs has increased as frontier firms have become more productive, implying some degree of resource misallocation. The labor productivity dispersion among firms (ratio of 90th percentile to 10th percentile) increased among SMEs from 2010 to 2021, but remained unchanged for large firms (Figure 9, left). The magnitude of the increased dispersion was particularly high for micro firms (in both industry and services), while increases were also observed in small and medium firms. In addition, the difference in productivity levels was substantial in micro firms, as frontier firms were almost 11 times as productive as laggard firms in 2021. The productivity difference was also significant among large industry firms, while it was relatively muted in small and medium firms. The productivity growth at different percentiles shows a positive correlation between growth rates and labor productivity levels in SMEs (Figure 9, right). Productivity growth is even negative for small and micro firms at the 10th and 20th percentiles. The widening dispersion generally implies less efficient resource allocation, unless aggregate productivity can be raised by reallocating resources to more productive firms.[9]

[9] By estimating marginal revenue product of capital and labor, Bun and de Winter (2019) found rising capital misallocation and stable labor misallocation in 2001–2017, which lowered productivity growth by around 14 ppt.

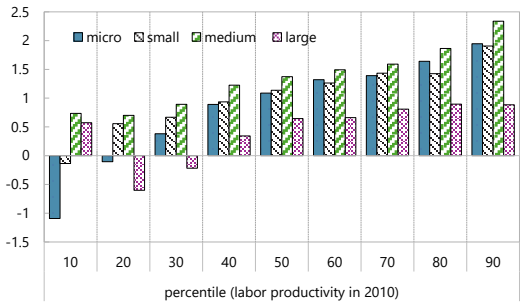
Figure 9. Labor Productivity Dispersion Among Firms

Firm-level Labor Productivity Dispersion (p90/p10)
(Ratio, 90 percentile of the productivity distribution divided by 10 percentile)



Sources: CBS-analyses Staat van het MKB 2024 and IMF staff calculations.
Note: Total (all) covers non-financial business economy (B to J, M, N and S95 of NIC 2008). Industry (ind.) excludes B and service (serv.) excludes S95.

Compound Annual Growth Rate of Labor Productivity
(Percent, changes from 2010 to 2021 by percentile)



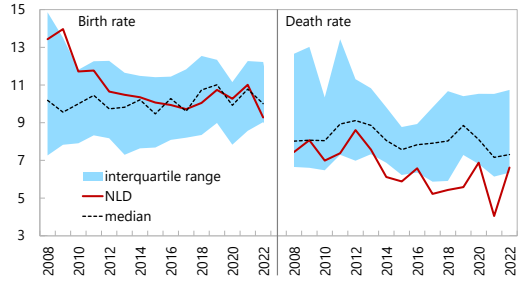
Sources: CBS-analyses Staat van het MKB 2024, Eurostat, and IMF staff calculations.
Note: Deflated by industry level deflator from National Accounts.

Note: Labor productivity is defined by value added per employed persons (full-time equivalent or FTE). Companies with less than 1 FTE on an annual basis and with more than 2 partners are excluded.

14. Business churn, an important factor for productivity growth, is relatively low in the Netherlands, highlighting the need to promote firm dynamism. Encouraging firm dynamism could help improve efficient resource reallocation. According to the analysis by Freeman et al. (2021), firm churn (firm births and deaths) is an important source of productivity growth, particularly in services. However, relative to the EU median, firm dynamics in the Netherlands declined until around 2014 (Figure 10, left). Since then, the birth rate has been around the EU median, while the death rate is at or below the lower edge of the interquartile range.[10] Aggregated sectoral firm productivity growth can be decomposed into the contributions of continuing, new, and closing firms. By excluding continuing firms, Figure 10 (right) focuses on the contributions from business dynamics (new and closing firms), and their contributions show a declining trend. Recent policy measures aimed at supporting firms during and after the pandemic could have disrupted creative destruction. From the cross country analysis, business dynamism has a positive correlation with lower regulatory burdens, efficient insolvency resolution, better access to finance, greater support for innovation, and higher education levels (Calvino et al., 2020). The completion of the European single market could also foster business dynamics (DNB, 2025).

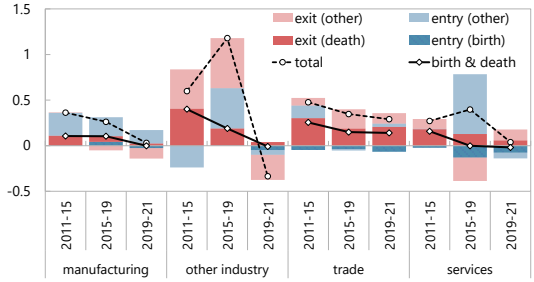
Figure 10. Business Dynamics

Firm Birth and Death Rate
(Percent, economic activities of market producers, EU countries)



Sources: Eurostat and IMF staff calculations.
Note: A break between 2020 and 2021. 19-25 EU countries before 2020 and 27 countries after 2021. Enterprise births/deaths divided by active enterprises.

Contributions of Firm Dynamics to Productivity Growth
(Percentage point, contributions to annual labor productivity growth)

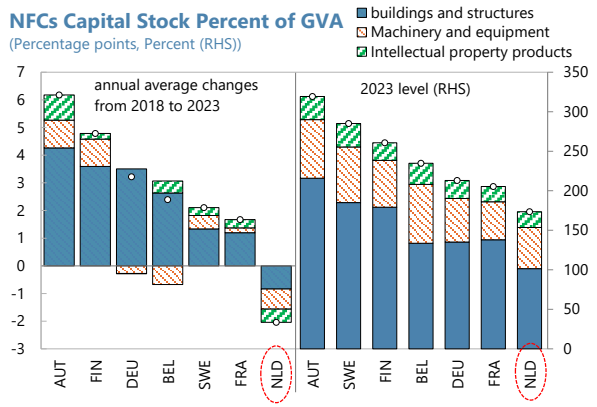


Source: CPB (2025) National Productivity Board 2024 annual report.
Note: NACE codes mfg.: 10-33, other ind.: 35-43, trade: 45-47, services: 49-82+95 entry/exit (other) includes M&A, restructuring, and split-offs.

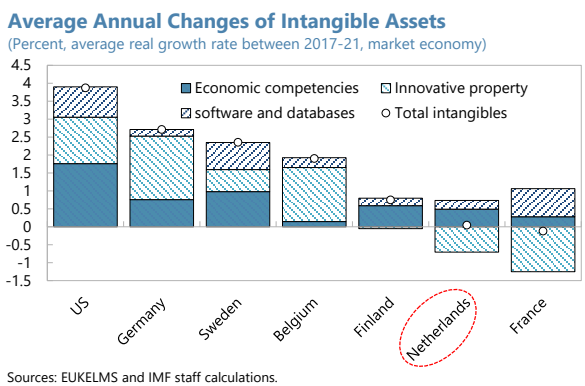
[10] By sector, birth rates are within the interquartile range in most sectors, whereas death rates are below the interquartile range, especially in services (based on the average of 2021 and 2022).

15. Low business investment and capital stock could be bottlenecks for improving labor productivity growth. Despite the critical roles of capital deepening and investment in improving productivity, the Netherlands is lagging behind its peers. National Accounts (NA) data indicate that capital stock for Non-Financial Corporations (NFCs) (as a percent of NFC gross value added) declined from 2018 to 2023 (Figure 11, upper left). The level of capital stock is the lowest among peer countries, although the relatively high gross value added share of firms in the service sector could partially explain this. Estimates from EU KLEMS, which includes intangibles not covered by NA, show a similar picture, as the real growth rate of intangible assets between 2017–21 was almost zero for the Netherlands, while that of other countries grew (Figure 11, upper right).[11] The level of NFC investment (as a percent of NFCs' gross value added) is the second lowest among EU countries, and their investment mainly focuses on replacement rather than capacity expansion or new products/services (Figure 11, lower left and right).

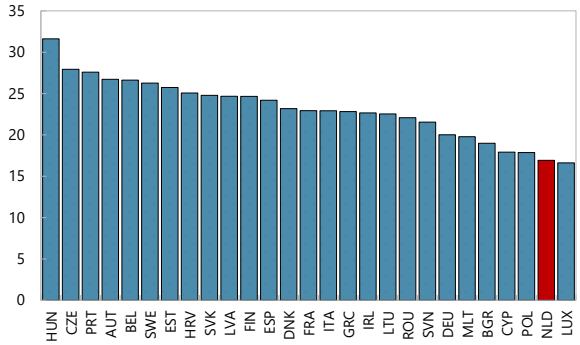
Figure 11. Capital Stock and Investment



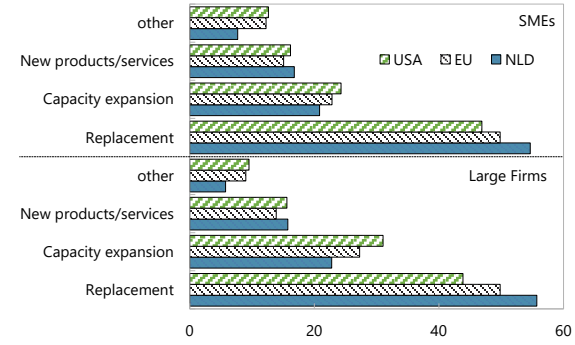
Sources: Eurostat and IMF staff calculations.



Sources: EUKELMS and IMF staff calculations.
Note: Economic competencies include brand, organizational capital, and training. Innovative property include R&D, entertain. & artistic originals, new financial product, and design.



Sources: Eurostat and IMF staff calculations.



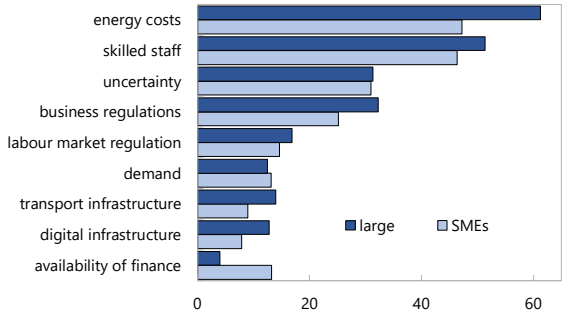
Sources: European Investment Bank and IMF staff calculations.

[11] Intangible assets estimated by EU KLEMS include new financial products, design, organizational capital, brand, and employer provided training.

16. Removing bottlenecks to investment will be critical for promoting productivity-enhancing investment. Figure 11 suggests the need for capital deepening and the need to examine barriers to investment for firms (Figure 12). First, concerns about energy costs could be mitigated by enhancing the electricity grid, as there is a long queue for large scale electricity connections. Second, measures to address labor market shortages (e.g., promoting training and labor mobility toward priority sectors) would help companies to find qualified workers.[12] Third, reducing domestic policy uncertainty and streamlining regulation will be critical to promote an investment friendly business climate. According to a survey targeting the Dutch business community, predictability and stability of government policies and facilitative legislation receive the lowest ratings for the business environment (De Jong et al., 2024).

Figure 12. Long-term Barriers to Investment

(Percent of firms 1/, 2024)



Source: European Investment Bank and IMF staff estimates.
1/ Calculated as 0.5 * (share of firms responding as minor obstacle) + 1 * (share of firms responding as major obstacle)

17. Domestic capital market reforms should improve financial access for SMEs. Availability of funding is critical for firm investment and thus productivity growth. However, SMEs—especially start-ups, innovative companies, and fast-growing firms—have difficulties accessing finance (CBS, 2025), as can also be observed from Figure 12. While Dutch firms have traditionally relied on bank funding, bank loans may not be optimal for certain SMEs due to their initially unprofitable business and inadequate collateral. Therefore, the importance of non-bank financing is increasing.[13] To secure sufficient funds for SMEs, capital market reforms, such as improving valuations, stimulating investor demand for both equity and debt instruments, and simplifying debt issuances, would be beneficial (see Box 2 of IMF (2025) for more details).

18. The importance of investing in intangible capital to enhance productivity has been growing. According to estimates by EU KLEMS, intangible investment (e.g., R&D, software, and human and organizational capital) was about 1.2 times higher than tangible investment (excluding residential structures) in the Netherlands in 2021. Analysis using Dutch firm data confirmed the positive and statistically significant impacts of intangibles on productivity growth, especially for laggard enterprises (Borowiecki et al. 2021). A regression analysis indicates that the elasticity of labor productivity with respect to intangible assets tends to be higher for micro and small firms, suggesting the importance of promoting intangible investment for small businesses (Figure13, left).[14]

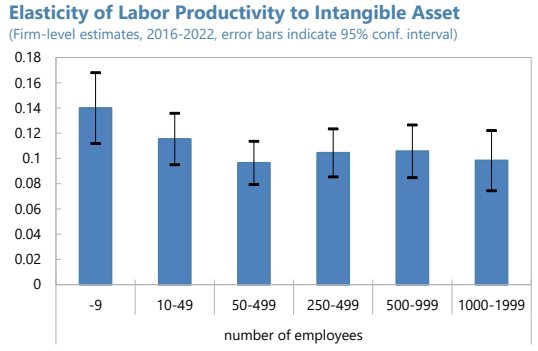
[12] See IMF (2024a) for more detailed measures to address labor market shortages.

[13] According to SMF (2025), the total non-banking financing targeting SMEs increased by 16.4 percent in 2024.

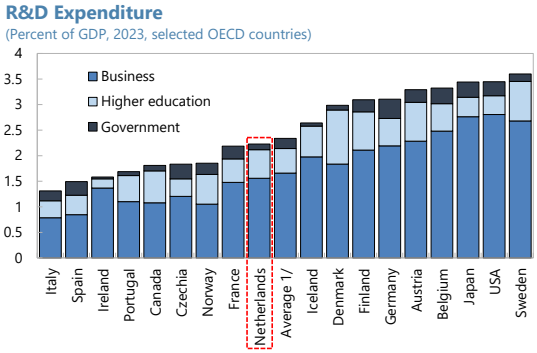
[14] Estimates based on Orbis data (non-financial firms less than 2000 employees). Labor productivity is measured by value added per employee. For some firms, value added data are imputed based on year, sector, and firm size. Both labor productivity and intangible assets (per employee) are deflated. The regression controls for firm size (number of employees), NACE (4-digit level), and year. The estimation period is from 2016 to 2022, and the sample size is 10,810.

19. The Netherlands needs more R&D investment to increase productivity, especially among smaller firms. Figure 13 (right) illustrates R&D expenditure by sector of performance as a percentage of GDP. Both total and business sector R&D expenditures in the Netherlands are slightly lower than the OECD average, suggesting room to increase investment, including fostering growth in the R&D-intensive sector. In addition, R&D activities are concentrated in large firms, as about 70 percent of R&D expenditure (in-house activities) came from large firms in 2022. Although the impact of R&D funding is often greater when supporting small businesses, the existing scheme (e.g., the Research and Development Promotion Act (WBSO)) supports small businesses only to a limited extent (De Ridder, 2024).

Figure 13. Intangibles



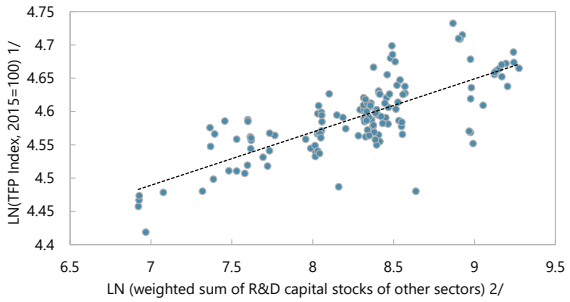
Sources: Orbis and IMF staff estimation.
Note: Controlled firm size (number of employees), NACE (4 digit), and year.



Sources: OECD and IMF staff calculations.
1/ Simple average of 30 OECD countries (including those not shown in the chart).

20. Promoting knowledge diffusion or spillover both domestically and internationally will benefit productivity growth. A simple regression analysis among sectors shows a positive and statistically significant correlation between TFP and other sectors' R&D stock, even after controlling for their own innovative property, suggesting the important role of spillovers (Figure 14).[15] The impacts of knowledge spillovers on firm productivity can be further enhanced if the innovation is more fundamental due to the ease of replication (Dyevre, 2024).

Figure 14. R&D Spillovers and Productivity
(12 sectors, 2010-2020)



Sources: EU KLEMS, Eurostat, and IMF staff estimation.
1/ Controlled own innovative property capital stock, year, and sector.
2/ Weighted by intermediate consumption of each sector.

Other empirical studies have also found the importance of spillovers. Exporters tend to have higher productivity, partly due to interactions and collaborations with foreign partners (learning effects), and domestic firms connected to the export sector receive productivity benefits (Bettendorf and Polder, 2025). Analysis by Wache et al. (2025) suggests a higher effectiveness of horizontal FDI on

[15] The regression covers 2010-2020 and 12 sectors (excluding NACE codes A, B, and N, due to lack of data or irregular movement). Independent variables are TFP (2015=100), sector's own innovative property capital stock, other sectors' R&D stock (weighted by intermediate consumption from the use table), sectoral and year dummies. Capital stock data are chained linked volumes. The coefficient of R&D is statistically significant at the 10 percent level.

productivity (compared to vertical FDI) due to stronger linkages with domestic activities, which facilitate knowledge sharing. The case of Brainport-Eindhoven is a good example with respect to spillovers (see Box 1). These findings underscore the importance of the government's role in promoting investments with high spillovers (e.g., fundamental research), facilitating closer connections among firms, supporting completion of the EU single market, and reducing trade barriers.[16]

Box 1. Case Study of Brainport-Eindhoven[1]

Brainport-Eindhoven is a renowned deeptech ecosystem located in the southern Netherlands. Its region (Noord-Brabant) accounted for over 30 percent of private R&D expenditure in the Netherlands and ranks eighth in business R&D intensity among the 198 NUTS II regions in the EU (CBS, 2022).

The region's transformation into a technological hub is rooted in its historical association with Philips, which grew into a multinational corporation over the course of a century. After World War II, Philips urged the government to establish an engineering institute, leading to the creation of Eindhoven University of Technology. Philips divested its lithographic technology in the 1980s, resulting in the founding of ASML, and its electronic division at the beginning of the 21st century, leading to the formation of several new deeptech companies (e.g., NXP Semiconductors). The establishment of other research institutes in the region further strengthened the knowledge infrastructure. This historical development created fertile conditions for collaboration around innovation and entrepreneurship in the region.

The uniqueness of Brainport-Eindhoven is characterized by collaborative governance designed to foster cooperation among local government, educational institutions, and industries as equal partners (known as the "triple helix model"). The Brainport Foundation, established in 2006, plays a crucial role in coordinating efforts among various stakeholders, ensuring that initiatives align with the region's strategic goals. This collaborative framework is essential for maintaining the region's status as a leading center for deeptech entrepreneurship. The physical infrastructure of Brainport-Eindhoven significantly contributes to its innovative capabilities. The region has multiple physical locations or hotspots (e.g., High Tech Campus Eindhoven). People visit these places for social and business activities, facilitating informal interactions and exchange of ideas among companies and institutions. These locations also offer daily rentals for cleanrooms and testing instruments, making the campus an attractive location for startups. Furthermore, hosting many knowledge brokers on the campus, who seek to develop new value chains, contributes to innovation.

Although it may be difficult to replicate the ecosystem of Brainport-Eindhoven due to its uniqueness and location-based factors, collaboration among stakeholders as equal partners could be an important element for enhancing regional labor productivity.

1/ The box is summarized based on Romme (2022a and 2022b) and Stam et al. (2016).

E. Conclusion and Policy Considerations

21. The analysis highlights the Netherlands' potential to enhance productivity by addressing bottlenecks affecting workers and firms. Despite having one of the highest productivity levels globally, the Netherlands faces challenges in enhancing its productivity growth

[16] Despite efforts toward the single market, barriers remain. Average intra-EU trade costs are estimated to be as high as a tariff equivalent of about 44 percent for goods and about 110 percent for services (IMF, 2024b).

rate. Skill levels of Dutch workers are generally high, but they might not fully utilize their potential at work (especially in SMEs) and declining skill levels of young students raise concerns. Self-employed workers show lower productivity. With population aging, it is crucial to maintain high skills across generations and integrate migrants effectively into the labor market. Additionally, with signs of resource misallocation, higher business dynamics and capital deepening will be important for firms, given low churn and investment levels. In this respect, addressing factors impeding investment (e.g., electricity grid, labor shortage, and policy uncertainty) will be critical. Promoting productivity spillovers both domestically and internationally, as well as encouraging SMEs to engage in more R&D activities, will also benefit productivity growth.

22. The analysis offers a number of angles to enhance the productivity growth.

- *Improve education outcomes to enhance skill levels of future workers*: It is important to continue investing in education and improve outcomes by fostering early childhood education, boosting secondary educational attainment, and addressing shortages of teaching staff. Aligning education with (future) labor market needs or priorities, along with improved career guidance and counseling, would help mitigate labor shortages and reduce skill mismatch.

- *Enhance vocational trainings and lifelong learning programs to fully utilize workers' potential*: Facilitating close collaboration between training institutions and business representatives will help ensure that training programs are aligned with current and future market demands. Adjusting active labor market policies by reorienting trainings towards skills needed to address shortages and incorporating new technologies would be beneficial. Promoting e-learning resources and providing financial assistance, especially to those from disadvantaged backgrounds and workers in smaller firms, would enhance accessibility to a diverse range of learners. Beyond financial support, promoting awareness and local initiatives could foster continuous education in SMEs.[17]

- *Continue to reduce labor market duality*: To establish a more level playing field between employees and self-employed, the authorities have introduced and accelerated a phase-out of the self-employed person's tax. Recent progress to address labor market duality, such as reducing false self-employment, are welcome. Introducing mandatory disability insurance and strengthening pension arrangements for the self-employed are important measures to be implemented to enhance social protection.

[17] Ludolph et al. (2023) reported innovative local initiatives in Finland and Germany (see box 5.11 and 5.12). In Vantaa, Finland, the city administration proactively approaches SMEs and identifies modular training courses for them. In Germany, the government launched "continuous education and training employers' networks", aiming to develop joint training measures that can be carried out across company boundaries in a resource saving manner.

- *Effectively integrate migrants into the labor market*: Providing stepped-up language training together with vocational training, supporting job search, and recognition of qualifications acquired abroad would help.[18]

- *Promote business dynamism to enhance resource allocation:* Strategies include deepening single EU market, re-examining the efficiency of regulatory barriers to entry and insolvency regime,[19] removing hurdles to scaling up businesses (e.g., eliminating the reduced profit tax rate for SMEs), and facilitating labor mobility toward priority sectors.

- *Encourage productivity-enhancing investment for capital deepening:* The government needs to address factors affecting firms' investment decisions, such as the electricity grid, labor shortages, nitrogen constraints, and domestic policy predictability. Policies should also aim to encourage investment in new technologies (e.g., digitalization), implement tax reforms incentivizing productive investment, enhance access to finance for SMEs through domestic capital market reform, and promote R&D activities, especially for smaller businesses.

- *Promote productivity spillovers*: The government should aim to foster productivity spillovers by implementing and promoting investments with large spillover effects (e.g., research parks and networks) to build connections among firms, research institutions, and regions. The Netherlands will reap productivity gains from enhancing the functioning of the EU single market.[20]

[18] Based on the labor market mobility of Migrant Integration Policy Index, the score for the Netherlands in 2023 is particularly low for 1) education and vocational training and study grants and 2) economic integration measures of third-country nationals.

[19] According to the OECD insolvency indicator in 2022 (André and Demmou, 2022), the Netherlands ranked 6th among the most unfavorable insolvency frameworks out of 24 EU countries, with a relatively unfavorable score for prevention and streamlining (i.e., enabling the early detection and resolution of debt).

[20] See Budina et al. (2025) for the discussion on the synergies between domestic and EU-level reforms.

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EMERGING CLIMATE AND ENERGY TRANSITION ISSUES[1]

New macroeconomic issues are emerging as the Netherlands progresses towards its ambitious energy transition targets. Specifically, the scaling up of mitigation policies and diffusion of clean technologies may interact adversely with existing policies and raise distributional and acceptability concerns. This chapter covers two specific issues related to the expansion of the EU Emission Trading System (ETS) and electrification of road transportation.

A. Introduction

1. Over the next several years, the EU ETS will expand in coverage and stringency, requiring governments to proactively understand and manage distributional impacts. Over the remainder of the decade, free allowances for heavy industry will be phased out and the Carbon Border Adjustment Mechanism (CBAM) phased in, while a separate ETS will be introduced for road transportation and building fuels. In the Netherlands, these policies efficiently reduce emissions and raise additional revenue (0.7 percent of GDP in 2030), but at the same time put upward pressure on the cost of emitting activities (1.9 percent decrease in purchasing power in 2030).[2] To maintain acceptability of these ambitious policies, the government needs mitigating policies that mitigate adverse distributional outcomes if they materialize.

2. Achieving nationwide emissions targets requires continued electrification of the vehicle stock, but this raises potential fiscal, power sector, and economic issues. Taxes on vehicle purchases and fuel use currently raise around 1.5 percent of GDP but this is projected to nearly halve by 2035 with improving fuel economy and switching to more lightly taxed EVs. These trends will further strain the power grid (a nine percent nationwide increase in demand is projected due to EVs alone by 2030) and worsen road congestion. Still, emissions by road transportation, the Netherland's second largest emitting sector, are projected to exceed targets under current policies.

3. The chapter is structured as follows. It first explores the distributional impacts of upcoming changes to the EU ETSs, finding that impacts take place through different transmission channels, including via consumption, passthrough, "pass back" and free allowances. Impacts are broadly homogenous across the income distribution and for rural vs. urban households via consumption, although free allowances, passthrough and CBAM implementation change this distribution. Considering the redistributive fiscal system in the Netherlands, compensating measures should be weighed carefully against potentially gaining fiscal space for other productive activities. The second section projects fiscal and power sector impacts, non-climate externalities, and emissions in the road transportation sector. Additional policies are needed to maintain sectoral revenue, manage power sector demand, meet emissions targets and correct for non-climate

[1] Prepared by Ian Parry, Nate Vernon-Lin, Alberto Garcia-Huitron, Cristian Chagalj, and Sunalika Singh (FAD).

[2] IMF Staff based on CPAT.

externalities like congestion. Road user charges, potentially coupled with fuel tax increases, EV subsidies, and congestion pricing, are a promising option.

B. Distributional Implications of ETS Reforms

4. Several policy changes are set to affect the EU climate landscape in the next years. The combined effects of CBAM, free allowances, and the expansion of the EU ETS through ETS2 will shape carbon pricing impacts, but the ultimate distributional outcomes will vary significantly by country. These differences depend on national economic structures, sectoral carbon intensity, energy consumption patterns, and the extent to which governments use tax and transfer systems to redistribute income. In countries with higher reliance on coal or less efficient housing and transport infrastructure, such as Poland or some Southern and Eastern European member states, household exposure—especially among the more vulnerable—may be greater than in countries like the Netherlands or Germany, where energy efficiency is higher and tax-benefit systems are more redistributive. The literature emphasizes that policy design, including how revenues are recycled,[3] is critical in mitigating regressive effects and maintaining public support for carbon pricing.[4]

Introduction and Background

5. The EU ETS, introduced in 2005, is a cornerstone of the EU's climate policy. The EU ETS aims to reduce greenhouse gas (GHG) emissions through a cap-and-trade mechanism. As the world's first large-scale GHG emissions trading scheme, its initial three trading phases progressively expanded coverage and tightened emissions caps to enhance effectiveness, while structural reforms were introduced to stabilize permit prices.

6. The EU ETS targets aims to reduce GHG emissions by 62 percent by 2030 relative to 2005, with planned adjustments to increase carbon prices over time. Now in its fourth trading phase (2021–30), the system regulates emissions from power generation, manufacturing industries and aviation, accounting for approximately 45 percent of the EU's total GHG emissions. Permit prices fluctuate across and within years and averaged €65 per metric ton in 2024. As the supply of allowances tightens, and as the market reserve absorbs surplus allowances, prices are expected to rise to nearly €150 per metric ton[5] by 2030.

7. Concerns regarding the competitiveness of trade exposed sectors and carbon leakage led to allocating free allowances across sectors. The cost increase associated with permit prices

[3] The Dutch budgetary rules are based on separation of revenues and expenditure budgeting. Following good public financial management practices, the suggested revenue recycling alternatives do not encourage earmarking of expenditure. Instead, the expenditure decisions should be taken independently, in line with the Dutch budgetary rules. In the Dutch context, revenue recycling would imply that the increased fiscal space from higher carbon price revenue could be used in part to manage distributional effects on the vulnerable households, hence increasing public support for climate reforms.

[4] See Kanzig (2023), Dabla-Norris et al. (2023), Antosiewicz et al. (2022).

[5] Bloomberg NEF, for example, forecasts allowance prices to reach €149 per metric ton in 2030, while Morgan Stanley forecasts prices reaching €135 per metric ton.

led to widespread concerns regarding potential loss of market share to foreign firms that did not face the same price for emissions embedded in their production processes. Therefore, firms in sectors with high trade openness were granted free allowances. During its first phase (2005–07), allowances were allocated through grandparenting. In its second phase (2008–12), 90 percent of allowances were allocated for free. In the third phase (2013–20), 57 percent of allowances were auctioned, although there were variations across sectors and countries; free allowances were provided in the power sector of lower income member states and in industries classified as energy-intensive and trade-exposed. In its fourth phase, the percentage of auctioned permits remain consistent with that of the third phase, while free allowances continue to be granted to mitigate carbon leakage concerns, contingent upon the implementation of energy efficiency measures.

8. To address competitiveness and carbon leakage concerns, the EU designed the Carbon Border Adjustment Mechanism (CBAM). CBAM allows to level the playing field between EU industries subject to carbon pricing and foreign producers that are not. It imposes a carbon price on certain goods imported to the EU, equivalent to what domestic producers pay. Initially covering cement, iron, steel, aluminum, fertilizers, electricity and hydrogen, CBAM will be gradually phased in, with full implementation expected in 2026. CBAM is also designed to recognize explicit carbon taxation in foreign countries such that a country with the same carbon price as the EU would not need to pay at the point of import. Therefore, from a theoretical perspective, CBAM prevents carbon leakage, protects exposed EU industry and incentivizes global decarbonization by providing incentives to implement domestic carbon pricing as opposed to paying a carbon price to the EU.

9. The EU plans to coordinate the elimination of free allowances with an expansion of CBAM-covered goods. Free allocation is set to be gradually phased out from 2026 to 2034, coinciding with CBAM's introduction. Simultaneously, the EU plans to review CBAM, potentially expanding CBAM's scope to include all sectors covered by the EU ETS by 2030. CBAM is currently in a transitional phase which will be over in end 2025 in which importers are required to report the embedded emissions of their imports on a quarterly basis but are not required to pay yet. Starting in 2026, importers must purchase and surrender CBAM certificates corresponding to the embedded emissions in their imported goods minus domestic carbon pricing.

10. The ETS is set to expand to the transport and building sectors with implementation of the ETS2, which will be supported by the establishment of a Social Climate Fund. In 2023, a separate ETS was approved, designed to reduce emissions from fuels used in buildings and road transport by 42 percent by 2030, relative to 2005 levels. Allowance trading under the ETS2 is expected to begin in 2027. Similar to the original ETS, it will have a rule-based market stability reserve to manage allowances, either eliminating excess or increasing supply based on market developments. Unlike the original ETS, however, the ETS2 will focus on upstream emissions, meaning that the responsibility to surrender allowances will rest with fuel suppliers. Given that the impact on households and micro-enterprises is expected to rise with the operationalization of ETS2, a Social

Climate Fund (SCF) to support a fair transition to climate neutrality will be created, and EU countries can access its resources by submitting Social Climate Plans.[6]

11. Most EU-level climate policies, including the ETS, CBAM, and ETS2, have been enacted through directly applicable EU regulations. Once such regulations enter into force, member states are required to align national legislation and administrative frameworks to ensure effective implementation. In the Netherlands, the ETS has been primarily implemented through the Environmental Management Act and its accompanying regulations and decrees. Implementation of ETS2 will require the Dutch authorities to establish or revise national systems for emissions monitoring and reporting, administer the auctioning and revenue collection of allowances, and operationalize a Social Climate Plan to address the distributional impacts of carbon pricing. Regarding CBAM implementation and enforcement, the Dutch government needs to ensure that CBAM obligations are integrated into import procedures and manage CBAM reporting, certificate surrender and compliance monitoring.

Methodology

12. We assess the distributional impact of the EU ETS, modeling the existing system, the introduction of CBAM and the expected effects of higher permit prices and expanded sectoral coverage. First, we evaluate the impact of the current ETS based on the 2024 average allowance price. Second, we model the introduction of an expanded CBAM by 2030, covering all sectors under the ETS. Third, we assume a gradual increase in allowance prices to €100 per ton of CO_2e by 2030. Fourth, we assess the impact of the introduction of the ETS2, which expands the coverage to the transport and building sectors. The scenarios we model are additive and can be summarized as follows:

- **Baseline scenario.** This scenario models the impact of the current EU ETS with a permit price of €65 per ton of CO_2e.
- **Expanded CBAM scenario**. This scenario models the impact of the introduction of an expanded CBAM by 2030, covering all products in the ETS.
- **CO_2e price increase scenario.** This scenario models the impact of the existing ETS, the introduction of the expanded CBAM (scenario b), with a gradual price increase to €100 per ton of CO_2e by 2030.

[6] The SCF was established to support a fair transition to climate neutrality by mitigating the social and economic impacts of the revisions to the EU ETS, particularly for those affected by energy and transport poverty. Member States will develop National Social Climate Plans outlining targeted measures and investments. The SCF will be financed through auction revenues, supplemented by a mandatory 25 percent contribution from Member States, with a goal of mobilizing at least €86.7 billion from 2026 to 2032 according to the European Commission. Social Climate Plans must include measures on energy efficiency, building renovations, zero- or low-emission mobility and transport, the reduction of greenhouse gas emissions and a decrease in the number of vulnerable households, micro-enterprises and transport users. Temporarily, they can also use the Fund to provide targeted direct income support to vulnerable households and transport users, as long as structural measures are still being developed or have yet to take effect.

- **ETS2 scenario.** Additional introduction of the ETS2 with expanded coverage to transport and buildings.

13. For each scenario, we assess the distributional impact of different transmission channels, including both direct and indirect effects on household consumption, the role of free allowances and cost passthrough. We use data from the Netherland's Household Budget Survey (HBS)[7] to estimate the share of household spending on fuels and other goods and services across income groups. This is combined with GTAP's Input-Output (IO) matrix to capture the carbon intensity of each sector, which allows to estimate emissions embedded in the consumption bundles of households by income level. Additionally, the impact of the ETS on consumer prices depends on the extent to which firms pass increased carbon costs onto prices. We account for sector-specific passthrough to estimate resulting price changes. For costs not passed on, we apply a framework of firm behavior: firms may absorb these costs by reducing wages, cutting employment or lowering profits, which varies by trade intensity of the firm's industry. The distributional effect therefore also depends on the income composition (labor vs capital) of each income decile in the Netherlands. We call this effect the pass-back. The effects of pass-back are, however, eliminated when pass-through increases. Since CBAM would allow for a higher passthrough, we assume that ETS-covered sectors would be able to fully reflect the costs of the ETS in their prices once CBAM is implemented.[8] Finally, when free allowances are granted and firms are nonetheless able to increase prices, it creates windfall profits which mostly benefit high income households, which own the vast majority of capital in the country. See Annex 1 for further methodological details.

14. The modeled results represent an upper-bound estimate of the distributional impacts, as they do not account for the structural transformation expected from the EU ETS and related reforms. While the methodology incorporates household-level behavioral responses to price changes across fuels and products, it does not capture deeper, longer-term shifts in the economy. The analysis could also be strengthened by incorporating more recent microdata on household consumption patterns and by controlling for households' capacity to adapt to higher energy prices by income level. The cost pass-through and passback methodology could be enhanced by accounting for sectoral market concentration, distinguishing between white- and blue-collar workers, and integrating more granular data on market frictions and wage stickiness across sectors.

15. The overall distributional impact also depends on how carbon pricing revenues are recycled. Well-designed revenue recycling can make carbon pricing both growth-enhancing and progressive. Revenue use involves trade-offs among policy goals and may influence public support for the reform. In the Netherlands, support for energy-poor households has fluctuated. In 2022, the Dutch government introduced a temporary price cap in connection with the increase of energy prices following Russia's invasion of Ukraine; this was a lump sum transfer through energy providers

[7] European Household Budget Survey for the Netherlands, 2015.

[8] If the coverage of CBAM goods is not extended in 2030, the impacts of passback for non-covered CBAM goods would continue affecting households negatively, although the impact through the consumption channel would be smaller considering the lower level of passthrough.

for all households in November and December, equal to €380 per household. In 2023, the government introduced a price cap on gas and electricity below a certain use,[9] after which households would pay the market price. Nonetheless, the support was not explicitly linked to the EU ETS and has been discontinued. While these allowances expired in 2024, an increase in the energy tax reduction for households, companies and institutions of €200 million in 2026–28 was included in the 2025 Spring Memorandum. The Dutch government also implemented, starting in 2010, the *Energiesprong* program, a sustainable housing program which retrofitted social housing to achieve net-zero standards by installing insulating material, renewable energy systems and increasing overall energy efficiency.

16. How the government decides to support households will greatly determine the overall distributional impact of climate-related policies. In the analysis that follows, we assume that 8 percent of the ETS revenues are allocated to targeted cash transfers for vulnerable households.[10] This support is directed to the lowest income quintile, reflecting that around 7 percent of the population is in energy poverty,[11] with others in the same group at risk. In addition, once the Social Climate Fund is operationalized, the Dutch government will be required to increase support to vulnerable populations. We assume the Dutch government will increase its targeted cash transfers by an amount equal to its share of the Social Climate Fund[12] as defined by EU guidelines.[13] We also discuss trade-offs between alternative delivery mechanisms.

17. The best instrument to support households must be assessed against the progressivity of the tax-benefit system and the broader social protection system in the Netherlands. The literature suggests that the Dutch tax system (including tax expenditures but before transfers) is regressive overall, primarily due to high consumption taxes and relatively low taxation on capital income. However, the regressivity of the tax system is compensated by government spending, which results in a reduction in income inequality achieved through cash transfers that are strongly targeted at the bottom of the income distribution.[14] This also signals a robust capacity to provide well-targeted support. The average tax rate is relatively flat across the income distribution, ranging from approximately 45 percent to 48 percent of pre-tax income across deciles. In contrast, the benefit rate is highly progressive, reaching 85 percent for the poorest decile and only around 5 percent for the richest (Bruil et al. (2022))

[9] For electricity: €0.40 per kWh up to an annual use of 2900 kWh; for gas: € 1.45 per m^3 up to an annual use of 1200 m^3

[10] Based on 2023 data from the European Environmental Agency (EEA).

[11] See Mulder et al. (2023). Energy poverty is measured through a multidimensional approach, with households facing high energy costs, with low quality insulation and low income, classified as energy poor. Additionally, the study also suggests that 48 percent of households in the Netherlands are unable to participate in the energy transition on their own. Energy poverty is a useful metric in the context of the Netherland's climate-related reforms because energy-poor households (i) are more vulnerable to energy price increases and (ii) the social safety net already has programs targeting vulnerable households using other poverty metrics, not necessarily specific to energy.

[12] Including a required co-financing of 25 percent of the cost of activities included in the Social Climate Plan.

[13] Based on Jungling et al (2025).

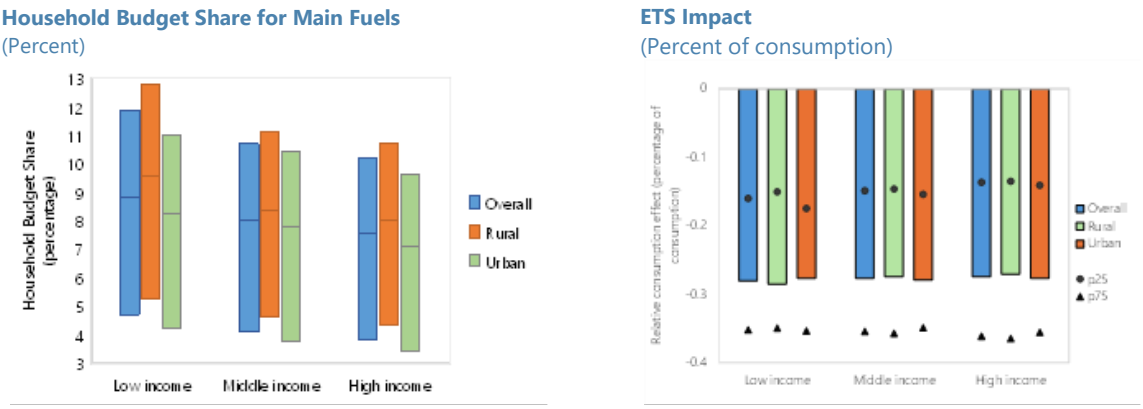
[14] See Bruil et al. (2022).

C. Results

Baseline Scenario

18. The reduction in household purchasing power from the EU ETS currently in place is relatively uniform across income groups when looking exclusively at the consumption channel (Figure 1). In line with similar analysis performed for Belgium in 2023,[15] there are two effects that offset each other, causing the overall impact to be homogeneous. On the one side, lower-income households spend a higher share of their budget on fuels (direct effect)—about 9 percent compared to 7.5 percent for higher income households. On the other side, total emissions embedded in consumption are higher for wealthier groups (indirect effect)**.** There is also a clear rural-urban divide. Rural households typically spend more on fuels, partly due to more limited access to alternatives like public transport. For example, a low-income rural household in the 75th percentile spends about 12.5 percent of their total consumption on fuels, compared to 10.6 percent for a similarly placed urban households, and around 7.3 percent for a high-income urban household. The opposite happens with the indirect channel, as the bundle of goods consumed by higher income households use more fuel in its production process vis a vis lower income households. The overall impact of the ETS across income groups, therefore, remains broadly similar, at around 0.3 percent of household's purchasing power across income groups and types of households, once both direct and indirect consumption channels are considered.

Figure 1. Household Budget Share for Main Fuels and ETS Impact



Source: IMF Staff using CPAT.
Note: the graph in the left-hand side shows the interquartile range; the difference between the first and the third quartile. Main fuels: Electricity, Gasoline and Natural Gas. The graph in the right-hand side shows the relative consumption effect.

19. The impact of the ETS becomes more progressive when accounting for pass back. When accounting for imperfect pass-through of carbon costs, the distributional impact of the current ETS becomes more progressive (Figure 2). This is because higher-income households face greater losses from reduced capital income, which is concentrated in higher-income deciles. The main driver of the impact is firm's limited ability to pass increased carbon costs onto prices and

[15] See Vernon-Lin (2023).

subsequent reductions in wages/employment and profits as firms pass back the increase of input costs. We estimate that 37 percent of total profit losses fall on the top income decile and 23 percent on the ninth. In this case, profit losses due to pass back are estimated to be higher than windfall profits from free allowances, which accrue to higher income deciles but are estimated to be small. In addition, we assume that labor costs from pass back affect households uniformly.[16]

20. If the Dutch government implements compensatory cash transfers benefitting the most vulnerable households, the distributional impacts of the EU ETS would be more progressive. Based on the European average, our model considers that 8 percent of EU ETS revenues in the Netherlands are used to compensate households via cash transfers,[17] introducing another channel of progressivity. However, such transfers would not be enough to fully offset the negative impact of the ETS for the two more vulnerable income deciles. A qualitative discussion of different types of support and its trade-offs can be found in the next section.

Expanded CBAM Scenario

21. Implementing an expanded CBAM, covering all ETS-covered sectors by 2030, without a full phaseout of free allowances, planned for 2034, would have a regressive impact in the income distribution (Figure 2). CBAM would allow for higher passthrough which increases the impact through the consumption channel, albeit it remains modest—averaging 0.5 percent of household spending. Higher passthrough, in turn, would eliminate the negative impacts of pass-back and open the space for windfall profits[18] in sectors that receive free allowances.[19] Such additional profits would equal the value of the allowance net of the average corporate income tax. Since capital ownership is concentrated among higher-income households, these gains disproportionately benefit wealthier households, hence the more regressive overall impact in this scenario. Such regressive impact can be offset for the two most vulnerable household groups which is modelled via cash transfers. In this scenario, if the Dutch government used 8 percent of the ETS revenue to compensate vulnerable households, the support would nearly offset the negative impact for the two lowest income deciles.

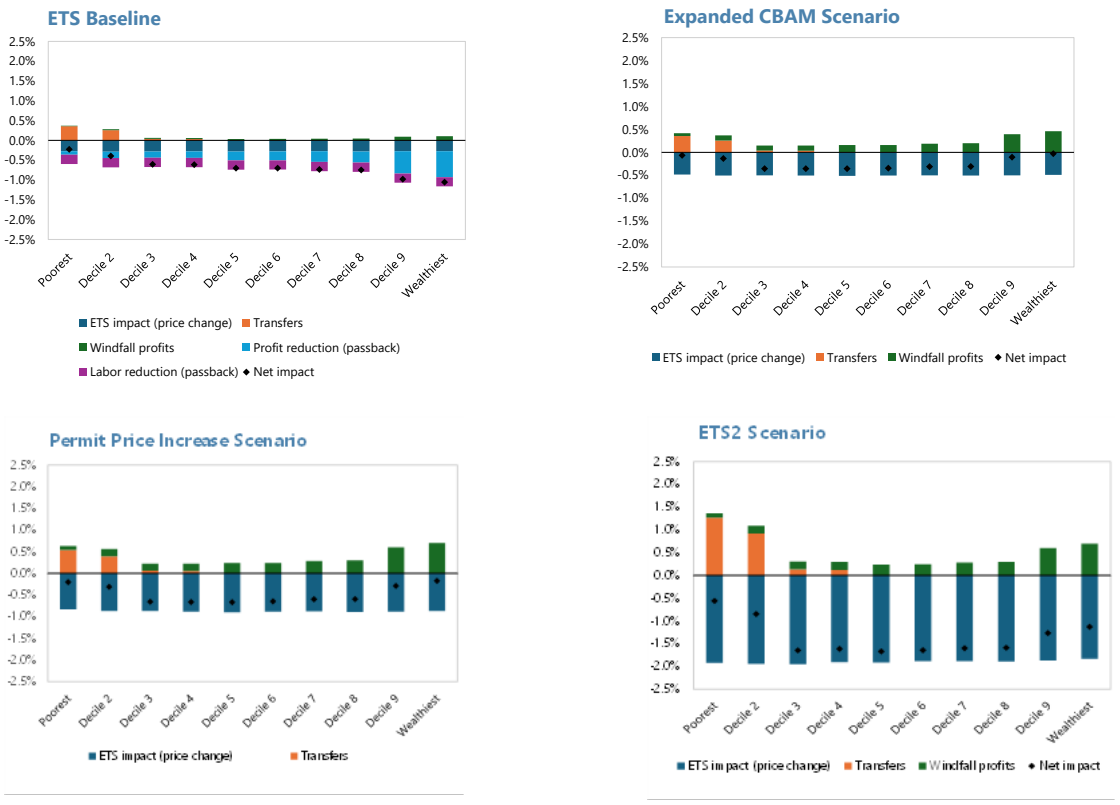
[16] A potential improvement to the methodology would differentiate between high-skilled and low-skilled workers across deciles, as different types of workers are set to be affected differently. In this case, we would expect lower income households to bear a higher share of labor costs from pass back.

[17] We further assume that transfers are targeted towards the two more vulnerable deciles.

[18] If European firms increase prices domestically, they might lose market share in foreign markets and their profit margins would be, therefore, affected. In such case, the benefits from windfall profits would be lower and could potentially become negative depending on the difference between the elasticities of foreign vs domestic consumption.

[19] Despite CBAM is designed to account for the percentage of free allowances per sector, the difficulty in measuring passthrough at a granular level complicates free allowance targeting (See Verde et al. (2019)), with indeed evidence of some firms that have nonetheless been able to increase prices (See Cludius et al. (2020) and Liang et al. (2013)).

Figure 2. Distributional Impacts Across Scenarios
(Percent of consumption)



Source: IMF Staff using CPAT.
Note: the y-axis in the graphs measure the relative consumption effect. That is, the amount of consumption that households would forego considering the new energy prices.

CO_2e Price Increase Scenario[20]

22. Raising the allowance price roughly doubles the impact through the consumption channel which nonetheless remains homogeneous (Figure 2). The third scenario assumes a gradual increase in allowance prices, reaching €100 per ton in 2030 alongside expanded CBAM implementation. Considering the increase in prices, the average burden on household consumption increases, with the impact rising to 0.9 percent of household spending.[21] In this scenario, 8 percent of ETS revenues are used to compensate lower income households, which partially protects households in the first two deciles from the negative impacts of rising energy prices. Additionally,

[20] Both for Scenarios 3 and 4, the costs of passback are canceled as passthrough in each sector increases due to the implementation of an expanded CBAM.

[21] Designing Comprehensive Climate Mitigation Strategies, IMF (forthcoming) estimates average distributional impacts via the consumption channel for other high-income countries of the additional implementation of a carbon tax of $75 per ton of CO2e. Results are broadly aligned with the estimates presented in this paper. For example, it finds Italy would see an average impact of -1.53 percent of household's purchasing power, Japan of -2.24, UK of -1.46 and US of -2.71. The allowance price increase modelled in the third scenario of this SIP is €100 per ton, €35 more vis a vis the baseline scenario.

windfall profits benefit high income households in sectors that receive free allowances and are nonetheless able to increase prices. In aggregate, the distributional effect follows a U-shaped pattern: higher income households benefit more from windfall profits, while lower-income households are partially protected through targeted transfers, meaning that households in the middle of the income distribution are, on net, more affected.

ETS2 Scenario

23. Expanding the EU ETS to cover transport and buildings significantly increases the impact through the consumption channel, but also allows for larger compensation given the increase in revenues (Figure 2). When the coverage extends to residential, road, rail, and domestic shipping sectors, the negative impact on household consumption increases to an average of 1.9 percent. The 1 percentage point increase compared to Scenario 3 is primarily driven by direct effects as the ETS2 now covers gasoline, diesel and natural gas, primarily used for residential heating. While we take into account that revenues to protect vulnerable households increase considering the operationalization of the Social Climate Fund, model estimates suggest that additional support would be required to offset losses for the two most vulnerable deciles.

Policy Implications and Key Takeaways

24. The distributional impacts of the EU ETS in the Netherlands affect households through multiple transmission channels, and all need to be accounted for to understand the net impact of carbon pricing policies. This analysis looked at how households are affected through direct and indirect consumption channels across the current ETS (baseline) and three modelled scenarios—the introduction of an expanded CBAM, higher allowance prices and ETS2 implementation. These estimates were complemented with a model of firm behavior in the absence of full passthrough, which can ultimately affect different population sectors due to cost pass back.

25. Reforms to the ETS have a relatively neutral effect across income groups when accounting for the consumption channel in the Netherlands, and thus, the overall distributional impact depends largely on cost pass back, windfall profits and compensatory mechanisms. Across the baseline and the three modeled scenarios, impacts on consumption rise as passthrough, prices, or coverage expand—from 0.3 to 2 percent of household's expenditure. Still, when both direct and indirect consumption are considered, effects remain broadly uniform across deciles. In the baseline scenario, limited passthrough results in a progressive outcome due to cost pass-back. In contrast, CBAM increases passthrough and enables windfall profits in sectors receiving free allowances. Higher allowance prices and ETS2 follow the same trend, with stronger effects on household purchasing power. In all scenarios, cash transfers are modeled as one policy option to help protect vulnerable households. However, the regressive effect of windfall profits raises questions about whether additional compensation is needed for lower-income groups, especially as higher-income households may benefit until free allowances are phased out. The high trade intensity of goods and concentration of capital ownership among higher income deciles in the Netherlands suggests that pass backs mainly impact higher income deciles.

26. The policy decisions behind the operationalization of the Social Climate Fund and Social Climate Plan need to be analyzed in light of the overall progressivity of the tax-benefit system and tradeoffs between different delivery mechanisms. For instance, the Netherlands can use its robust social benefit targeting methodologies to appropriately compensate affected households via cash transfers. Nonetheless, support via cash transfers should only be considered in Social Climate Plans on a temporary basis, as they would potentially increase the complexity of the social protection system, especially if new programs are created. In a context of relatively high inflation, decreasing payroll taxes would not only increase the efficiency of the tax system, but would stimulate labor supply and, therefore, offset the inflationary impact of rising energy prices. However, as discussed before, a reduction in payroll taxes would be mildly regressive as households in the top quintile would benefit the most, foregoing the benefit of adequate targeting. Alternatively, the government could reinvigorate the *Energiesprong program* and extend it to private households—generating a permanent increase in energy efficiency, relaxing electricity demand and pressures on the electricity grid, but at the cost of a higher capital cost per retrofitted house vis-à-vis compensation via cash transfers. The remaining share of revenue could be used to finance investment projects that would have positive impacts on economic growth or increase the economy's resilience to shocks.

D. Economic, Fiscal, and Power Sector Impacts of Road Transportation Electrification

27. In the road transport sector, additional policies are needed to avoid falling revenue and worsening congestion, while achieving climate targets and managing electricity demand. The sector currently generates a significant amount of fiscal revenue but this is projected to slowly decline with improved fuel economy and the shift to more lightly taxed electric vehicles (EVs). These trends increase driving levels, worsening road congestion, and further strain the electricity grid. Meanwhile, road transport CO2 emissions are projected to exceed the sectoral target by around 10 percent under existing policies (PBL 2024). Thus, new policies are needed to achieve the (at times competing) objectives of stabilizing revenue, emissions reductions, electricity demand management, and non-climate externalities. This section provides quantitative analysis of policy options to balance tradeoffs and meet road transport sector objectives. It starts with a review of existing and planned policies and then proposes reform options.

Existing and Planned Policies

28. There are several existing and planned EU and national road transport policies, ranging from fuel economy standards to taxes and subsidies. Key domestic policies include taxes on vehicle ownership (MRB) and purchase (BPM), which have rates varying with CO2 emissions rates and other factors; excises and VAT on road transportation fuels; and, starting in 2026, a tax per kilometer driven that varies with the CO2 emissions class of heavy goods vehicles. The most significant EU-level policies are vehicle fuel economy standards, progressively tightened to reach zero-emissions by 2035 for passenger vehicles, and an ETS that applies to road transport and building fuels starting in 2027. The 2025 Tax Plan includes significant reforms of existing policies

including phase-outs of the MRB and BPM tax exemptions for EVs and a discontinuation of EV subsidy schemes. See Table 1 for details on key existing policies.

Table 1. The Netherlands: Summary of Key Road Transportation Policies

Policy Name	Policy Details
Private Motor Vehicle and Motorcycle Tax (BPM)	€600 plus a variable rate that increases with the vehicle's emissions (shadow carbon price of ~€700 per ton); one-time payment at time of vehicle registration for private vehicles; EV exemption removed in 2025
Motor Vehicle Tax (MRB)	~€400 for petrol and EVs and ~€800 and increases with vehicle weight; paid annually; 75% discount for EVs starting in 2025, declining to 0% in 2030
Energy excises/subsidies	€0.79 and €0.52 per liter for gasoline and diesel, respectively, and €-0.086 and €0.03 per kWh for electricity used by households and industry, respectively; gasoline and diesel excises expected to increase by ~€0.10-0.20 per liter in 2026
EU ETS II	Capped at €45 per ton of CO2 (in real 2020 prices) until the end of 2029
VAT	21 percent on gasoline, diesel, and electricity
EV charging subsidies	The SPRILA reimburses 20–40% of costs related to EV charging points and the SPULA supports publicly accessible charging for heavy-duty EVs.
Heavy goods fixed payment and distance tax	€191–€2,404 annually in 2025 depending on emissions class and axles, transitioning to a distance-based charge that varies with emissions class in 2026 (shadow price of EUR 175 per ton of CO2); payable to road fund.
Passenger and light vehicle standards	95 g of CO2 per km (2020–2024), 93.6 (2025–2029), 49.5 (2030–2034), and all zero-emission after 2034 for passenger vehicles; higher emissions rates for vans
Heavy goods standard	45 percent reduction in emissions per km for new vehicles by 2030 relative to 2019–2020 levels, 65 percent for 2035, and 90 percent for 2040
Added Taxable Income Rate (Bijtelling)	22% and 17% of the list price for ICEVs and EVs company cars for private use, respectively, added to taxable income to be unified at 22% by 2026
Zero emission zones	Zero emission zones established in 15 cities for urban logistics. Some exemptions in place with the expectation that they will be phased out over time.

Sources: Ministry of Economic Affairs and the Ministry of Interior and Kingdom Relations, Government of the Netherlands (2025)
Notes: electricity excises vary with the user's electricity consumption (lower excises apply to higher usage)

29. Emissions, fiscal revenue, and other macroeconomic indicators are projected under current policies using a model that captures turnover of the capital stock, declining EV costs, and all major policies.[22] The model performs separate calculations for light-duty vehicles (cars and light commercial vehicles) and heavy-duty vehicles, with further disaggregation between used and new vehicles and internal combustion engine vehicles (ICEVs) and EVs, given the variation in policies and economics across vehicle types. The analysis captures interactions across policies, which is important given the web of EU and domestic road transport policies.

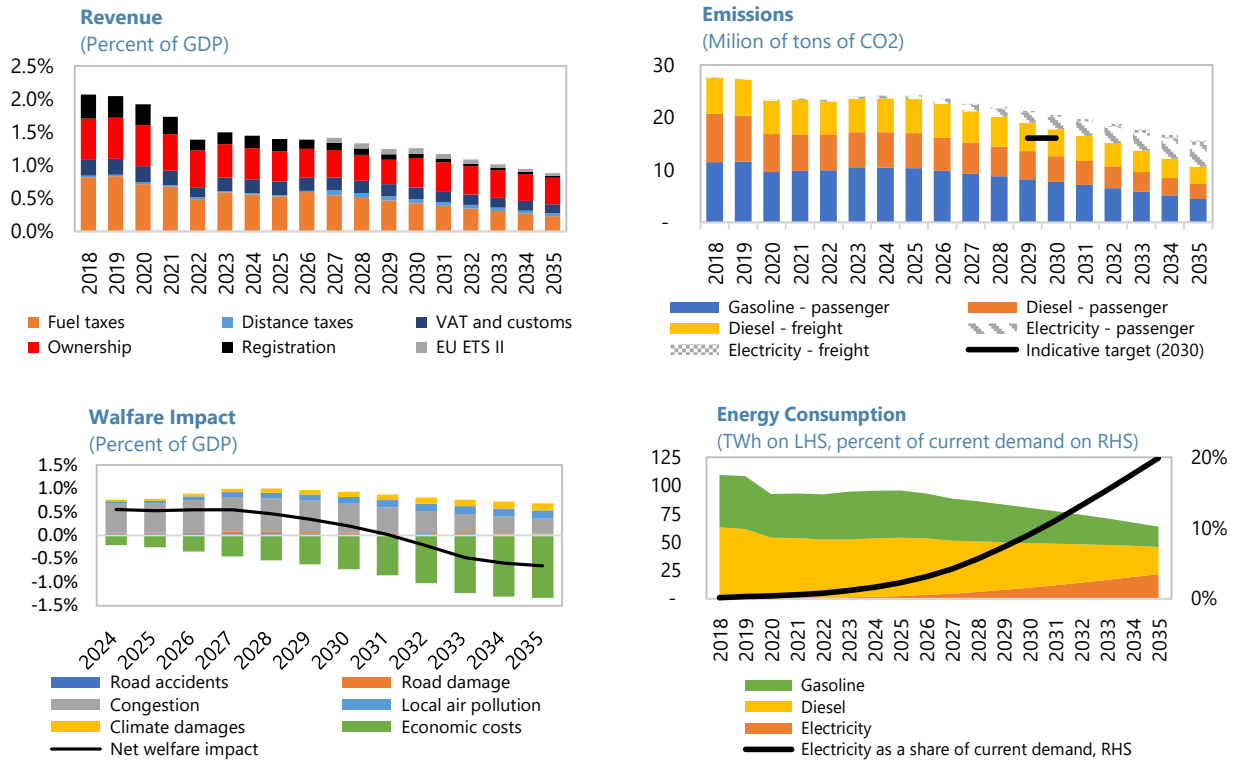
30. Fiscal revenues initially stabilize as new charges on fuels are introduced but then structurally decline over the next decade. Revenue from taxes on vehicles, electricity, and fuel is projected to remain at around 1.5 percent of GDP in 2027 due to the EU ETS II introduction (raising 0.2 percent of GDP) and removal of temporary fuel excise reductions (0.05 percent of GDP). This is followed by a long-term decline in revenue as ICEV fuel economy improves, resulting in lower fuel

[22] See Vernon-Lin 2024 for a complete description of the model applied to France and Black and others forthcoming for cross-country analysis.

excises, and as relatively lightly taxed and more energy efficiency EVs make up a growing share of the vehicle fleet.[23]

31. Meanwhile, emissions fall but still exceed targets, congestion worsens, and electricity demand grows (Figure 3). Emissions from road transport fall by 15 and 35 percent by 2030 and 2035, respectively, below current levels primarily due to the shift to EVs but still exceed targets. Policies generate net welfare gains of 0.5 percent of GDP in 2024 but gains erode over the next decade from worsening congestion as EVs are driven more than ICEVs due to lower costs per kilometer and as tightening of the fuel economy standards generate larger economic distortions. EV electricity demand reaches 10 and 20 TWh by 2030 and 2035, respectively, compared to current demand across all sectors of 110 TWh, which could further strain the electricity grid and increase prices without demand side management policies (e.g., time of use pricing) and increased supply.

Figure 3. Emissions, Revenue, Welfare, and Electricity Demand Under Current Policies



Source: IMF staff estimates.
Notes: EU ETS II price assumed to stay at EUR 55 after 2030, in line with PBL 2025. The indicative emissions target does not include emissions from generating electricity used to power electric vehicles.

[23] EVs require around three times less energy to travel one kilometer than do ICEVs. From a fiscal perspective, this is compounded by relatively low excise rates on electricity compared to fossil fuels. However, there is a strong economic rationale for lower excises on electricity since electricity does not directly cause externalities whereas fossil fuels do through pollution.

Analysis of Reform Options

32. A policy package can be designed to meet climate targets while reversing adverse fiscal, power sector, and congestion impacts. Road user charges (RUC),[24] which charge drivers per kilometer travelled, provide a revenue source that is resilient to electrification and more efficiently regulate driving related externalities.[25] RUCs can be applied to EVs in isolation, given the relatively low taxation of electricity, or all vehicles. Ideally, RUCs would be combined with congestion pricing in cities, which directly addresses urban, peak hours congestion and lowers the economywide RUC needed to address non-urban congestion. The planned increases to fuel excises and the EU ETS2 adequately price pollution related externalities, but in the absence of RUCs and congestion pricing, higher charges on diesel and gasoline are needed to address congestion from passenger ICEVs. As an EV-only RUC without corresponding increases in fuel taxes encourages switching to ICEVs, it could be coupled with an EV subsidy that, ideally, declines as the fleet electrifies and EV costs fall. A higher RUC on emitting heavy goods vehicles would promote further decarbonization and more closely align with the Eurovignette in nearby countries (e.g., Germany, Denmark).

33. Six road transportation policies options are analyzed (Table 2). The analyzed policies cover: (1) an EV-only RUC of €0.04 per km to align taxes per km driven for EVs and ICEVs and, in policy (2), combined with a EV subsidy of €400 per ton of CO2, (3) extending the €0.04 per km RUC to ICEVs, (4) a combination of the EV-only RUC and raising excises on diesel and gasoline to economically efficient levels[26] of €2.14 and 1.43 per liter, respectively in 2030, (5) increasing the heavy goods RUC for more emitting vehicles combined with a €0.04 per kilometer policy for all passenger vehicles, and (6) the RUC of €0.03 per km on all passenger vehicles and plus congestion pricing in cities. In all proposed cases, EU level policies are maintained, which has important implications for the design of domestic policies (e.g., the level of efficient fuel excises). Existing domestic policies (e.g., vehicle ownership and registration taxes, energy taxes) are also maintained.

Table 2. The Netherlands: Overview of Analyzed Reform Options

1. EV-only RUC	RUC of €0.04 per kilometer for passenger EVs only; €0.04 per kilometer is a similar rate to existing diesel and gasoline fuel excises
2. EV-only RUC with subsidy	RUC of €0.04 per kilometer for passenger EVs only with subsidy of €400 per ton (~€4,000 per EV in 2026, declining to €2,400 in 2030 and €720 in 2035)
3. All RUC	RUC of €0.04 per kilometer for all passenger vehicles

[24] RUCs for passenger vehicles are present or under consideration in New Zealand, Israel, Iceland, Utah, Oregon, and Virginia. They are implemented through odometer readings (New Zealand and Iceland), GPS (Utah), or both (Israel, Oregon, Virginia). Odometer readings may help address privacy and acceptability concerns.

[25] Fine-tuned instruments are more efficient but outside the scope of this analysis, with the exception of congestion pricing. These include charges that vary based on real-time congestion levels (e.g., differing charges of on and off peak hours in urban areas) to address congestion, insurance that charges per kilometer driven and varies with the riskiness of the driver, and distance taxes for heavy goods based on axles and weight (which will be introduced in the Netherlands in 2026).

[26] Economic efficiency requires that gasoline and diesel users consider full social costs, inclusive of congestion, local air pollution, and other externalities, when consuming the fossil fuels. See Black et al 2023 for more on efficient fuel taxes.

Table 2. The Netherlands: Overview of Analyzed Reform Options (concluded)	
4. EV-only RUC and higher excise	RUC of €0.04 per kilometer for passenger EVs only; diesel and gasoline excises increase to efficient levels of €2.14 and 1.43 for gasoline and diesel, respectively, in 2030
5. Increased heavy goods RUC and policy 2	RUC of €0.04 per kilometer for all passenger vehicles with a €360 per ton of CO2 RUC for heavy goods
6. All RUC with congestion pricing	RUC of €0.025 per kilometer for all passenger vehicles and congestion pricing during peak hours in cities of €0.13 per kilometer.
Source: IMF staff. Notes: RUC = road user charge. All monetary values are in constant 2024 US dollars.	

34. The evaluated policies can generate up to 0.4 percent of GDP in additional fiscal revenues in 2030 (Figure 4). EV road user charges of €0.04 per km lead to the smallest increase in revenue (0.15 percent of GDP or no change when combined with EV subsides) as EVs make up only a modest share of vehicles given slow turnover of the vehicle stock (~35 percent in 2030). Policies that additionally apply RUCs to ICEVs (policies 2, 4, 6) or increase fuel excises (policy 3) offer more resilient and larger fiscal revenue. Congestion pricing raises around 0.2 percent of GDP in revenue; this may accrue to municipal governments, and at least a portion is likely needed to improve public transport for efficiency and acceptability reasons. The fiscal cost of EV subsidies in policy 2 is around 0.15 percent of GDP but this could be reduced, while promoting equity and acceptability, by making a portion of the subsidy means-tested and potentially location based to address resistance in rural areas. Over the long-term, unless tax rates continue to increase, revenue (as a share of GDP) under all policy options slowly declines as driving levels increase at a slower rate than GDP.[27]

35. Emissions increase under the EV-only RUC, while all other policies allow the Netherlands to achieve its 2030 sectoral target. The EV-only RUC increases the relative cost of EVs, reducing EV shares of sales by 11 percentage points in 2030 and increasing emissions by three percent. Emissions still exceed targets when the EV-only RUC is combined with a sizable EV subsidy (€4,000 in 2025), highlighting the need for policies that reduce driving levels of ICEVs in addition to electrification. RUCs applied to all passenger vehicles (policy 3) achieve targets as emissions fall due to reduced driving of ICEVs. Increasing fuel excises to efficient levels (policy 4), rather than applying a RUC to ICEVs, results to slightly greater emissions reductions, although this could lead to increased fueling in neighboring countries (which is not an issue under the RUC). The higher RUC on emitting heavy goods' vehicles (policy 5) slightly reduces emissions without this risk of cross-border leakage. Well-designed congestion pricing (policy 6) is extremely effective in reducing driving in congested areas, leading to a large decline in emissions even though the RUCs in non-congested areas are lower than under other policies.[28]

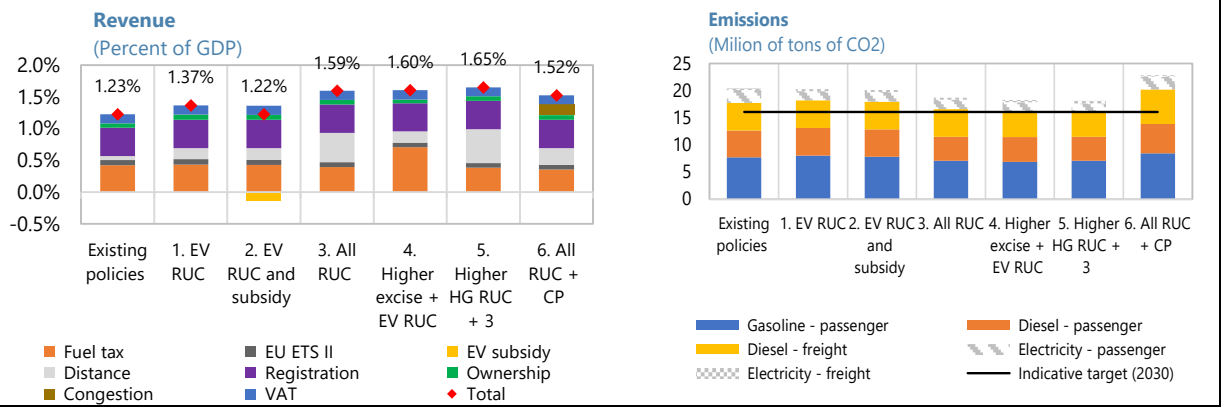
[27] Tax rates per km should optimally increase, in line with congestion costs (value of time), road accidents (value of statistical life), and road maintenance costs.

[28] It is assumed that drivers do not increase driving in non-congested areas and times to avoid the congestion charge. Some drivers will likely shift to driving in urban areas during non-congested times, which is not captured in this analysis and would result in smaller emissions reductions and higher fiscal revenue.

36. The evaluated policies can increase welfare by up to €11 billion in 2030 (0.7 percent of GDP) above current policies and reduce strain on the electricity grid. Under the EV-only RUC, congestion caused by EVs declines and economic distortions are marginal resulting in welfares gains of around 0.25 percent of GDP—these gains are offset by the distortions caused by EV subsidies (policy 2). Policies with RUCs applied to all vehicles or higher fuel excises (3–5) lead to greater reductions in congestion, local air pollution and climate damages, which more than offset larger economic distortion. Congestion pricing achieves the greatest welfare benefit by a large margin (0.7 percent of GDP) due to its efficiency in reducing congestion. Under all policies, reduced EV driving due to the RUC and/or congestion pricing reduces electricity demand by 2–3 percentage points relative to current national demand.

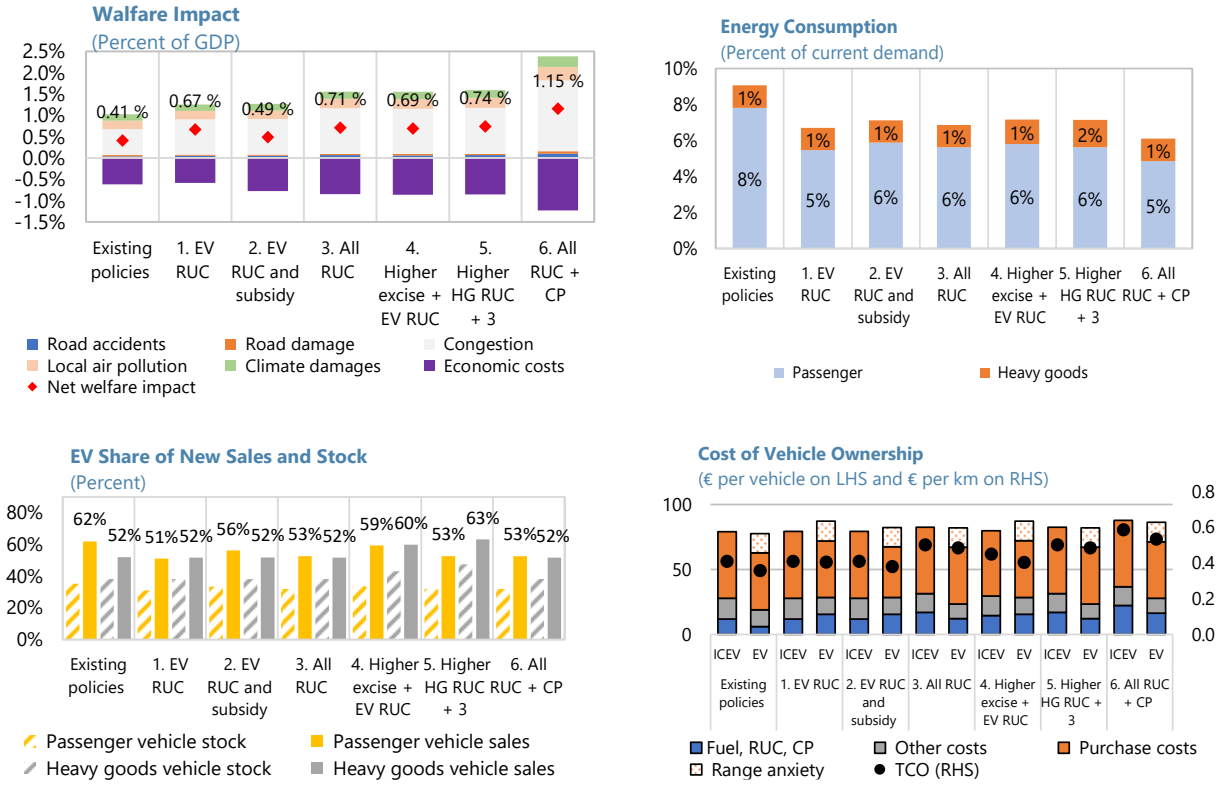
37. The total cost of vehicle ownership (TCO) over the vehicle's lifecycle increases under all proposed policies, with potential distributional implications.[29] The TCO increases by about €8,000 with a RUC of €0.04 per km or excises at efficient levels but purchase costs still dominate overall expenses, making up around 60 percent of the TCO compared to about 20 percent each for fuel and other costs (mainly maintenance and insurance). Understanding the distributional impact of these cost increases requires more detailed analysis—for example, while Figure 4 offers some understanding of economy-wide welfare impacts, distortions will be higher for some households and firms and lower for others. Prior to the introduction of any new reform, a comprehensive analysis of these distributional impacts should be undertaken so that they may be proactively managed. Redistribution of a portion of expected gains to vulnerable households and firms made worse off, accompanied by a careful communication strategy and phase-in of the policy reform, can support political acceptability and promote equity. For example, investments (or higher subsidies) in locations that lack charging stations and higher EV subsidies for poor or rural households could help improve acceptability while making the energy transition more equitable.

Figure 4. Emissions, Revenue, Welfare, and Electricity Demand Under Policy Reform in 2030



[29] The total cost of vehicle ownership captures all expenses related to owning and using a vehicle. Namely, the purchase price, insurance, fuel, maintenance, taxes, fees, and depreciation over the vehicle's lifespan.

Figure 4. Emissions, Revenue, Welfare, and Electricity Demand Under Policy Reform in 2030 (concluded)



Source: IMF staff estimates.
Note: The indicative emissions target does not include emissions from generating electricity used to power electric vehicles. Other costs primarily include insurance and maintenance. The purchase cost per kilometer increases for ICEVs under the RUC because kilometers driven per vehicle declines and the purchase cost in € terms remains constant. RUC = road user charge. CP = congestion pricing. TCO = total cost of ownership.

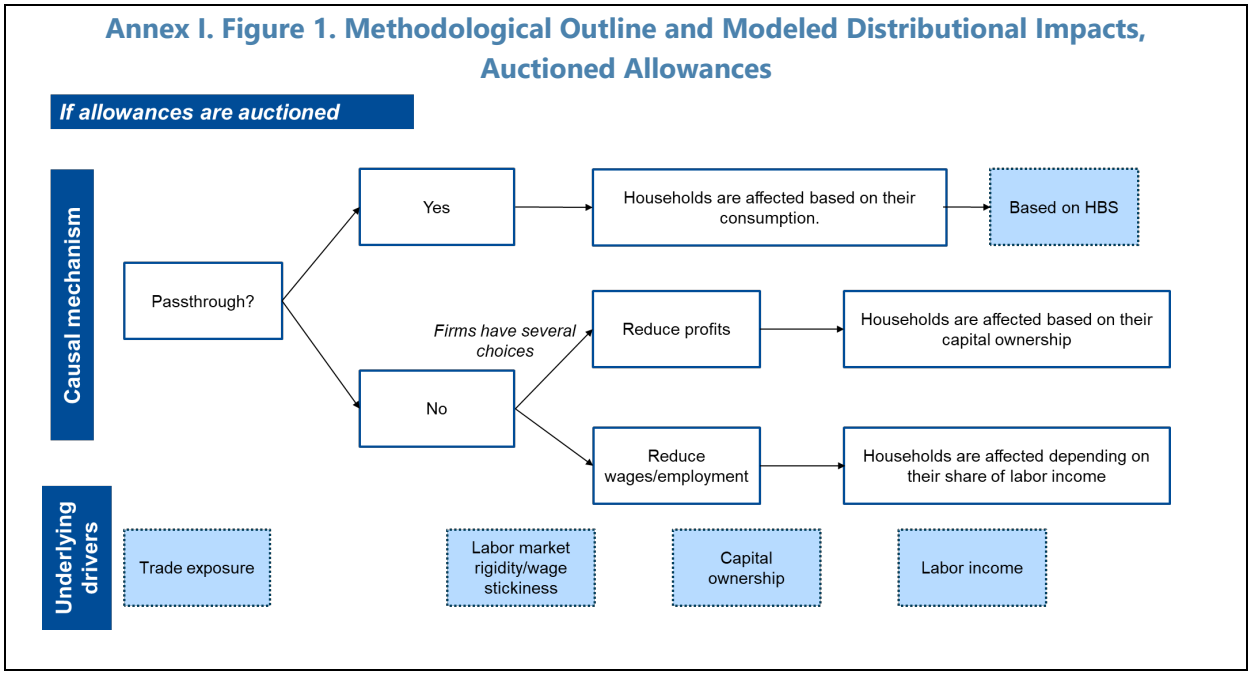
E. Conclusion

38. Transitioning to road user charges can help achieve fiscal, climate, and non-climate goals but requires managing distributional impacts. A RUC applied to all vehicles allows revenue to increase substantially (0.4 percent of GDP) and for the Netherlands to meet climate targets, while lessening congestion and electricity demand, but requires managing impact on vulnerable households. Increasing fuel excises coupled with a RUC only on EVs provides similar outcomes. A RUC applied only to EVs increases emissions, provides about half of the revenue benefits, and limits both congestion benefits and price increases for ICEVs. Combining a RUC with an EV subsidy (a potentially means tested) may improve distributional outcomes, while maintaining most of the welfare and fiscal benefits. RUCs would ideally be complemented with congestion pricing in urban areas to more efficiently reduce congestion and reduce the needed economywide RUC. There also is scope to progressively increase the stringency of the heavy goods RUC's CO2 component.

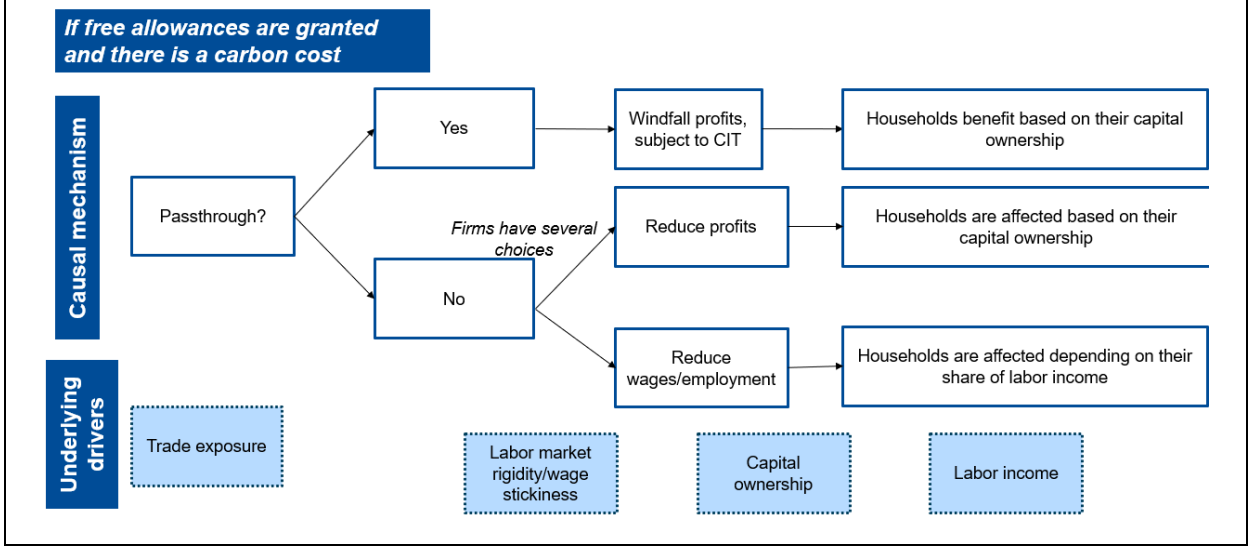
Annex I. Methodology to Estimate Distributional Impacts

1. The distributional impact of the current ETS is largely driven by the allocation of free allowances and the degree to which firms in different sectors can pass on price increases to consumers. Economic theory predicts that companies will increase their prices even if allowances are freely allocated because they are factoring in its opportunity cost. Nonetheless, several factors can influence whether a firm is able to pass on costs, such as its exposure to trade and market structure. Particularly, firms that are highly exposed to trade stand to lose market share if they increase prices, so passthrough can be limited. Regarding market structure, passthrough tends to be lower for less concentrated markets as they aim to maintain high output and large profits. The interaction between these variables will ultimately determine the final distributional impact, as cases in which firms both receive free allowances and are able to increase prices generate windfall profits – defined as the market value of the permit price minus the corporate income tax. Windfall profits, in turn, benefit capital owners which are mostly concentrated in higher income deciles. We assume that windfall profits, defined as the non-taxed gross operating surplus, will benefit each decile according to their share of capital ownership. In contrast, if firms are unable to increase prices, they face a trade-off between labor and capital, both at the intensive and extensive margins. That is, firms would either see a reduction in profits, a reduction in wages, a reduction in employment, or a combination of the previous options. This decision will also affect the ultimate distributional impact and is driven by several variables such as profit margins, wage stickiness and overall rigidities in the labor market. Our methodology is summarized by Figure 1 and Figure 2, which consider the cases of auctioned versus free allowances and the different transmission channels through which the ETS has distributional implications.

Annex I. Figure 1. Methodological Outline and Modeled Distributional Impacts, Auctioned Allowances



Annex I. Figure 2. Methodological Outline and Modeled Distributional Impacts, Free Allowances



2. We used the household budget survey and input-output matrix for the Netherlands to estimate distributional impact, as well as estimates from the literature to assess sectoral passthrough levels to build the impact of the ETS at the baseline. First, we estimate the effects of the ETS on consumer prices across different expenditure categories using input-output tables. To do so, we estimated passthrough to be inversely correlated with trade exposure.[1] For instance, we assigned low passthrough levels for sectors that are highly tradable and, conversely, high passthrough levels for sectors that are not tradable. We used the share of traded aggregate value with respect to total aggregate value to assess sectoral trade exposure based on the Netherlands' input output table. Second, we map these price changes to household income groups by linking them to budget shares for fuels and other goods, based on household expenditure surveys. The assessment captured both direct and indirect impacts through the consumption channel and accounts for revenue recycling but does not incorporate changes in factor income or employment.

3. The introduction of CBAM changes the ability of firms to pass on costs to consumers. Before the introduction of CBAM, firms in trade-exposed sectors that were negatively impacted by an increase in its costs could hardly pass the cost into higher prices, as local demand could easily switch consumption to foreign goods. This limits both passthrough and, therefore, the impact on household's consumption decisions. With the introduction of CBAM, foreign firms that were previously not subject to cost increases will now experience an equivalent increase in costs, either by paying at the EU border or domestically to avoid such payment, increasing the international market price for goods traded in Europe and, therefore, the ability of domestic firms to increase prices without fear of demand switching to foreign goods. Thus, we model CBAM as a shock to passthrough, whereby CBAM-covered sectors experience full passthrough. CBAM is expected to go through a revision of covered goods, with expectations that it will apply to all goods covered by the EU ETS in 2030.

[1] Tradability was measured according to the next formula, based on the Netherlands Input-Output table: (Exports + Imports) / Output.

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