A comparison of emissions trends for three small open economies

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Summary:
Despite many similarities, emissions data for the Republic of Ireland (ROI), Austria and Sweden showcase distinct trends and sources of emissions. Sweden leads in emissions performance, showing significant declines between 1990 and 2019 across a number of sectors, particularly in emissions tied to fossil fuel use. In contrast, despite declines from peaks during the 2000s in Austria and ROI, 2019 emissions remained above (slightly in the former, significantly in the latter) 1990 levels. This was largely the result of increased transport emissions, particularly road transport. Idiosyncrasies arise in the cases of Austria and ROI in the areas of *Industrial processes and Product Use* and *Agriculture* respectively, which offset declines elsewhere in each territory.

Introduction

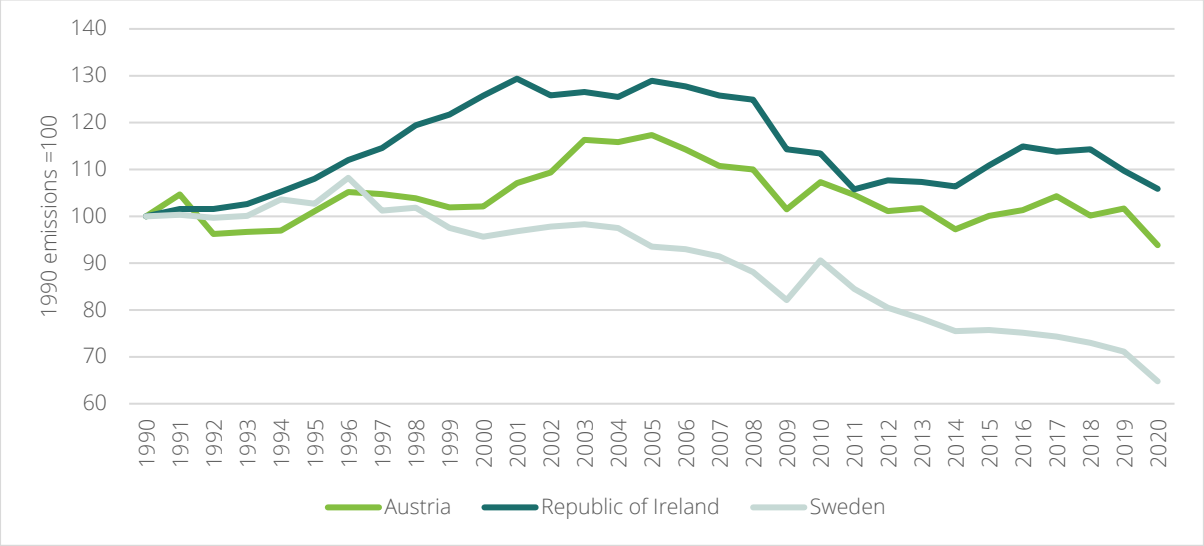
This InBrief examines emissions trends over time using UN data collected under the Climate Change Convention (UNFCCC). This data compiles emissions using the inventory method, which measures emissions within a territory by activity. These inventory data are the basis for emissions reductions targets at the national, EU level and global scale. This analysis is restricted to changes between 1990 and 2019, given 2020's unusual conditions.

The data display distinct trends. Generally, Sweden represents the best performer in emissions reduction and scaled (per person terms), while ROI is the worst performer. Swedish data indicate significant reductions led by the *Energy* sector, which captures fossil fuel use. However, these data show significant reductions in the Irish case from pre-crash maximums by 2019 even as emissions remained above 1990 levels. This is largely a function of increased emissions from Transport (within the broader *Energy* sector) and *Agriculture*, which outweighed declines in subsectors such as energy industries. Austrian emissions reductions in areas like *Waste* and *Agriculture* were largely offset by growth in *Energy* emissions and more distinctly, *Industrial Processes and Product Use.*

Relative emissions performance

Sweden is the best performer in emissions reductions terms over the period 1990 to 2019. Despite having the lowest gross emissions per head among the comparators in 1990, total emissions fell by 28.9 per cent by 2019, from 71.4 million to 50.8 million tonnes of CO_2 equivalent (hereafter Greenhouse Gases or GHG). Sweden also saw the earliest (and smallest) peak in emissions, in 1996 at 77.3 million tonnes of GHG (8.74 tonnes per head) or 8.2 (4.8) per cent above 1990 levels.

Chart 1: Gross emissions Trend 1990-2020

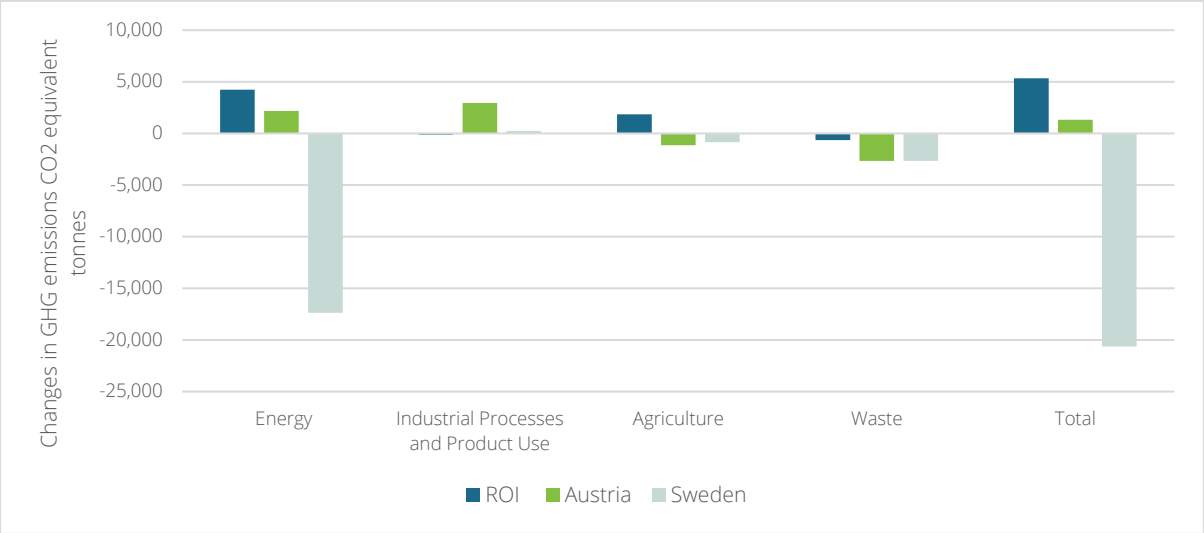


Sources: UNFCCC GHG Data Interface (2023)

Austria and the Republic of Ireland, reached their respective aggregate peaks in the early/mid 2000s. This peak was particularly stark for the Republic of Ireland in both aggregate and per capita terms, and likely related to ROI's rapid catch up growth from a relatively low income base in 1990. By 2001, emissions reached a peak of 70.9 million tonnes of GHG (18.34 tonnes per capita), 29.3 (17.6) per cent above 1990 levels. Austria's aggregate emissions peaked in 2005 at just over 92 million tonnes of GHG or 11.19 tonnes per capita. From this point, both jurisdictions showed a general decline in aggregate and per person emissions, notwithstanding growth in 2014-2016. By 2019, aggregate emissions in Ireland were about 9.7 per cent above their 1990 values at 60.2 million tonnes of GHG, although this represented a fall of 21.9 per cent in per capita terms given rapid population growth over this period. Austrian emissions had approximately returned to 1990 values in aggregate by 2019 at 79.7

million tonnes of GHG (just under 1.7 per cent above 1990 levels), though emissions per head fell by 12.1 per cent.

Chart 2: Changes in aggregate GHG emissions by inventory sector 1990-2019



Sources: UNFCCC GHG Data Interface (2023)

Within the inventory framework, emissions can be broken down by broad emissions sources. For gross greenhouse gas emissions, these broad sources comprise *Energy*, *Industrial Processes and Product Use*, *Agriculture* and *Waste*.[1] In the Irish and Austrian cases, *Energy* Sector emissions – which include all emissions from fossil fuel sources - were significant drivers of emissions growth, showing increased GHGs of 4.2 and 2.2 million tonnes of GHG respectively between 1990 and 2019. In both cases, increases in emissions related to transport activities – road transportation in particular - outweighed significant declines arising from Energy industries. In Austria, emissions from transport increased by 10.6 million tonnes of GHG over the period, with a corresponding figure in Ireland of 7.1 million tonnes. In the Irish case, the *Energy* sector accounted for nearly 80 per cent of the overall increase in emissions, while it exceeded overall emissions change in Austria. In the Swedish case, in contrast, *Energy* sector emissions drove aggregate declines across its constituent subsectors in GHGs, accounting for 84.2% of emissions reductions or some 17.4 million tonnes of GHG.

[1] An additional source is included in calculations of net emissions: *Land use, land use change and forestry* (LULUCF) which refers to carbon sinks in the form of wetlands, grasslands, forested land etc which result in a net contribution or subtraction from emissions. In the cases of Austria and Sweden, these sinks lower net emissions, while in the Irish case they contribute to net GHGs. See this piece from Climate Action Tracker for the benefits of excluding this sector from GHG pathways/fair share calculations.

Emissions from *Industrial processes and Product Use* are distinctive contributors to emissions growth in the Austrian case, whereas the sector was relatively unimportant to overall changes in Sweden and ROI. Emissions in the sector grew by 2.9 million tonnes, mostly as a result of the *Metal Industry* - steel production in particular - where emissions rose from 8.2 to 10.3 million tonnes from 1990 to 2019. This was enough to slightly increase the sector's emissions in per person terms, from 1.8 to 1.9 tonnes. In ROI's case, the distinguishing sector is *Agriculture*, which was both a much more significant contributor to emissions at the beginning of the series, and driver of emissions growth. Where Sweden and Austria saw aggregate declines of 0.8 and 1.1 million tonnes, Agriculture GHG emissions in Ireland rose from 18.9 to 20.8 million tonnes, an increase of 1.9 million tonnes. This was led by emissions from enteric fermentation related to the sector's cattle herd, which grew by 1.6 million tonnes.

Conclusion

Despite many similarities between Austria, the Republic of Ireland and Sweden – including high levels of international trade and comparable size, income levels as well as common membership of the EU –the data indicate differences in emissions trends. Sweden leads the pack, showing broad based declines across inventory sectors from emissions peaks in the mid 90s. ROI and Austria showed declines from their respective peaks prior to the 2008 financial crisis, but ROI remained significantly above aggregate emissions levels in 1990. This was largely due to increased fossil fuel use from transport (especially road transport) and increased Agricultural emissions. Transport emissions and emissions from steel production offset declines elsewhere in the economy to leave Austria approximately where it was in 1990 in aggregate GHG terms. These data point to distinct trends, and thus tailored policy responses to meet necessary emissions reduction targets.

References

United Nations Climate Change (2023) *Greenhouse Gas Inventory Data - Flexible Queries Annex I Parties* [data set] https://di.unfccc.int/flex_annex1