

Comparative Analysis of Long-Term Foreign Trade Flow Patterns of Heavy Industrial and Light Industrial Goods

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Abstract

The main aim of the study is to examine the import-export specialization of heavy and light industrial commodities in twelve Anglophone and Nordic countries. The study compares and examines the long-term foreign trade flow patterns and trade-related emissions using two trade specialization indicators; The Revealed Symmetric Comparative Advantage (RSCA) index and the Normalized Trade Balance (NTB) by evaluating import and export data classified using UN Comtrade SITC Revision 1 methodology, using 1–5-digit codes, for the period 1970 – 2020. The study's findings do not support the idea that Anglophone and Nordic nations have become more specialized in importing or exporting heavy industrial items. Rather, the evidence points to the importance of natural resources like wood and basic metals in influencing trade patterns throughout time. They are continued to play a pivotal role in the trading patterns of high-income nations, highlighting their ongoing significance in the world of international trade. Therefore, it may be concluded that the observed increase in emissions associated with imports is due to factors other than changes in trade structure, showing a complicated dynamic affecting light and heavy industrial commodity trade.

Keywords: Heavy Industrial Goods, Foreign Trade, Light Industrial Goods, Trade Specialization, Emissions.

Introduction and Literature Review

This study examines global commerce's complicated dynamics and heavy vs. light industrial commodities. Manufacturing globalization has increased global trade, raising emissions and highlighted carbon leakage. This occurs when high-emission businesses are relocated to other nations, making global warming harder to control. Emissions evaluation is complicated. The Technology-adjusted Balance of Emissions Embodied in Trade (TBEET) technique accounts for energy systems and industrial technologies utilized in trade to better estimate consumption-based emissions (Barrett et al., 2013).

TBEET was employed to analyze carbon leakage in wealthy countries, but results were inconsistent. A bigger trend of exporting emission-heavy businesses is leading the UK, US, Australia, and Canada to specialize in carbon-intensive imports. This shift not only emphasizes

a common trend of outsourcing emissions but also indicates consequences for trade balance and specialization, possibly signaling a move from heavy to light industrial trade. The change is impacted by various factors such as natural resource availability, income per person, and economic growth trends, which align with the Environmental Kuznets Curve hypothesis (Aichele & Felbermayr, 2015).

The import-export specialization of heavy and light industrial commodities between Anglophone countries (Canada, Australia, New Zealand, South Africa, Ireland, USA, UK) and Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden) is examined in this paper. Using data from the UN Comtrade database from 1970 to 2020, the study examines long-term trade specialization tendencies using analytical frameworks such as the adjusted trade balance and the Revealed Symmetric Comparative Advantage (RSCA) index (Cui et al., 2022).

Manufacturing globalization has transformed international trade, increasing trade between nations. This development has boosted economic growth but also increased emissions, highlighting carbon leakage. Carbon leakage, caused by outsourcing emission-intensive enterprises to countries with lax environmental legislation, hinders global warming mitigation (Baumert, 2017; Nielsen, 2017). Monitoring and measuring emissions based on consumption is complicated, thus new methods that accurately capture exchanged product carbon footprints are needed. An innovative research of Nordic and Anglophone import-export specialization in heavy and light industrial goods uses a 1970–2020 longitudinal dataset. A recent study examines trade specialization patterns using the (RSCA) index and normalized trade balance. Refuting economic development theories and emphasizing natural resource endowments' long-term impact on export specialization improves the discourse.

So the main objectives of the study are to deepen knowledge of the historical import and export specialization of Nordic and Anglophone nations and to assert whether these countries are gradually transitioning from heavy industrial to light industrial exports or imports by examining the drivers of trade specialization and trade balance and evaluating long-term trade specialization patterns from 1970 to 2020.

Data and Methods

This study explores how trade specialization affects CO₂ emissions in Anglophone (Canada, Australia, Ireland, South Africa, US, New Zealand, UK) and Nordic (Finland, Denmark, Iceland, Sweden, Norway) countries. The UN Comtrade SITC Revision 1-classified trade datasets are utilized. This method categorizes things via distribution networks using 1–5-digit codes, enabling systematic economic sector analysis. This study investigates how these two regions specialize in light and heavy industrial trade. SITC Revision 1 categorization is used to research trade dynamics and specialization developments. We wish to comprehend long-term industrial commodity trade to better global trade dynamics study (Baumert, 2017).

Consistency of the Data

Long-term foreign trade flow patterns of light and heavy industrial goods were studied in OECD, Anglophone, and Nordic nations. SITC commodity categories were meticulously restructured into product groups for internal trade data analysis coherence (Debbarma et al., 2022):

$$Z_{i,j+1,T} \equiv \sum_{j=1} Z_{ijT} \quad (1)$$

The study uses an equation to identify SITC commodity categories to examine long-term international trade trends in heavy and light industrial commodities in selected nation groups and the OECD. Deviation examination of aggregated product categories across twelve nations

shows close agreement between UN Comtrade trade numbers and actual import/export values, with the UK having the biggest deviation in the Nordic and Anglophone regions. These findings agree with Rozanski and Yeats (1994), who found few trade value changes between industrialized nations from 1962 to 1990.

The study emphasizes data validation to demonstrate the soundness of the analytical methodology used to investigate global trade trends for heavy and light industrial commodities.

Table 1

UN Comtrade Total and Aggregated Total Mean Deviation (1970-2020)

Country	Total Imports Mean Deviation	Total Exports Mean Deviation
United States	0.05%	0.03%
Germany	0.04%	0.06%
Ireland	0.06%	0.04%
United Kingdom	0.3%	0.3%
New Zealand	0.03%	0.02%
South Africa	0.02%	0.03%
Canada	0.001%	0.002%
Australia	0.004%	0.005%
Sweden	0.03%	0.03%
Norway	0.002%	0.001%
Denmark	0.001%	0.001%
Finland	0.002%	0.002%
Iceland	0.03%	0.03%

Table 1 shows the mean deviation of total imports and exports for each country, proving the trade data analysis's consistency with UN Comtrade totals. Due to countries adopting differing SITC standards since 1990, UN Comtrade's conversion to SITC Revision 1 causes trade data discrepancies. Additionally, some nations may not provide comprehensive volume data for all traded products due to confidentiality concerns, resulting in reported total trade values exceeding aggregated totals (Ding et al., 2022).

The empirical study in will employ aggregated trade volumes instead of reported trade flows to reduce these disparities. Despite slight differences, the total commerce should match the sum of commodity categories.

Final Classification

In foreign trade patterns, classifying industries as heavy or light takes careful examination. Avoiding the simple difference between emissions and energy use is crucial. Heavy industries, including iron and steel chemical and mineral fuel processing, are energy- and emission-intensive. Food, textiles, machinery, and transportation are milder on the environment (Li et al., 2021). Categories are needed to explain the dynamics of heavy and light industrial goods in global commerce, although energy-intensive sector discourses have centered on heavy industries. Enhancing categorization and studying complex trade linkages can reveal long-term industrial goods trade patterns.

Table 2

Classification of Recently Forming Commodity Groups.

Category	Heavy Industry Products	Light Industry Products
Basic Metals	Production of basic metals	-
Non-Metallic Minerals	Production of non-metallic minerals	-
Chemicals	Production of chemicals and chemical products	-
Iron and Steel	Production of iron and steel	-
Pulp and Paper	Production of pulp and paper	-
Mineral Fuels	Production of mineral fuels and lubricants	-
Food and Beverage	-	Food and beverage
Miscellaneous	-	Miscellaneous products
Rubber and Products	-	Rubber goods
Wood and manufactures	-	Wood manufacturing
Textiles	-	Textiles
Apparel and Footwear	-	Apparel and footwear
Machinery	-	Machinery and transportation
Electrical Machinery	-	Electrical equipment

Trade Specialization Indicators

International trade patterns are explained by long-term heavy and light industrial product flows. The Revealed Comparative Advantage (RCA) index and normalized trade balance compare trading trends. To ensure consistency, the study uses monetary exchange values instead of quantity. These indices allow the research to avoid oversimplification and reveal the complexities of trade connections across states with diversified and developed economies (Branger & Quirion, 2014).

The Normalized Trade Balance

Imports and exports divided by net exports determines trade:

$$NT_{ij} = \frac{X_{ij} - M_{ij}}{X_{ij} + M_{ij}} \quad (2)$$

X_{ij} indicates a country's exports and M_{ij} its imports in sector j . The index value, -1 to +1, allows unbiased time, country, and industry comparisons. A number above zero shows exports exceed imports, whereas below zero indicates import reliance. The easy-to-calculate natural trade balance shows trade flows and helps evaluate national and sectoral trade performance. However, specialization pattern inaccuracies may restrict its effectiveness. To remedy this, compare national performance to the trade balance (Li et al., 2021).

The index measures overall trade performance, not trade specialization. Comparing national results with OECD economies' trade balances provides insights into long-term heavy and light industrial trade flow patterns.

Revealed Comparative Advantage Index (Symmetric)

Let's compare a country's sectoral proportion to the global reference group or another reference group while examining overall exports or imports. The Revealed Comparative Advantage (RCA) index, also known as the Balasa index, is one of the most widely used measures to identify patterns of trade specialization Pan et al (2020); this is what the formula looks like.

$$RCA_{ij} = \frac{X_{ij}/\sum X_i}{X_{aj}/\sum X_a} \quad (3)$$

In this case, a is the group of OECD countries, where the letter a indicates the reference group; The letter X_{ij} denotes exports of country i in sector j . By examining the above and taking all variables into account, the process of calculating national RCA indicators compares the structure of a country's exports with the reference group, in our case, the OECD, and thus provides a relative measure of specialization (Laursen, 2015). The RCA indicator also has an asymmetric distribution because its value can vary from 0 to $+\infty$.

If a nation's RCA index score is 1, it is considered to have the same degree of sector specialization as the OECD reference group. Conversely, a score greater than 1 indicates industry specialization, while a value smaller than 1 shows no specialization. The RCA index can also be used to calculate import dependency using the aforementioned equation (Gnidchenko and Salnikov, 2015). However, other authors Pan et al (2020); Brasili et al (2000); Dalum et al (1998); Laursen (2015) prefer to propose the following symmetric transformation in light of the index's asymmetric nature:

$$RSCA_{ij} = \frac{RCA_{ij}-1}{RCA_{ij}+1} \quad (4)$$

The RSCA index, equivalent to the normalized trade balance, ranges from -1 to +1. Positive values indicate specialization, while negative values suggest no specialization. Laursen (2015) emphasized the importance of correcting the RCA index's asymmetry in each study, focusing on RSCA indexes for Nordic and Anglophone nations.

The RCA/RSCA index is easy to develop and flexible, using import or export data. It provides insights into a nation's specialization level compared to a reference group, capturing specialization more accurately than other indices. While the index is sensitive to exported commodity quantity, it is essential to consider nations with similar development levels rather than diverse populations when applying the RCA index. Consideration should not significantly impact the analysis of industrialized country groupings.

Empirical Analysis

In the upcoming analysis of foreign trade flow patterns of light and heavy industrial commodities, key expectations will guide the interpretation (David, 2005):

1. Compared to import arrangements, export portfolios are typically more specialized, reflecting nations' focus on specific industries for export competitiveness.
2. Greater geographical variations in trade specialization indicate more diverse trade systems, particularly in larger nations.
3. Trade specialization patterns are expected to demonstrate consistency, evolving gradually over time due to economic, political, and social factors.
4. Changes within the Anglophone trade system may include increased heavy industry imports, a shift from heavy to light industry exports, or both, showcasing the bloc's adaptability and potential shifts in trade dynamics.

By aligning with these expectations, the analysis will reveal insights into long-term foreign trade flow patterns of light and heavy industrial commodities, shedding light on

international commerce dynamics across sectors and verifying these anticipated trade behaviors through statistical analysis.

Results and Discussion

The Group of Anglophone Countries

South Africa's heavy and light industrial commodity trade with Anglophone countries—Australia, Ireland, Canada, the UK, New Zealand, and the US—is examined across time. South Africa is evaluated separately due to data constraints and its unique growth stage.

As indicated in **Figure 1**, the Anglophone group was a net importer of heavy industrial items throughout the study. Interestingly, the company imported light and heavy industrial goods in the 1980s. Normalized trade balance (NT) variations reflect trade trends, as shown in the graph. The import of large industrial items is recurring. Heavy industry exports and imports were particularly uneven in the 1970s, possibly due to energy crises. Trade balance improved in the mid-1990s when NT approached zero. Imports of heavy industrial goods dropped after rising from 1995 to 2006.

With these data, this section explores how trade patterns have changed in the Anglophone country group, showing its persistent reliance on heavy industrial product imports and moderate fluctuations over time. Analyzing the complicated links between economic developments and global trends that affect these countries' trade dynamics provides for deeper research of long-term foreign trade flow patterns in heavy and light industrial goods.

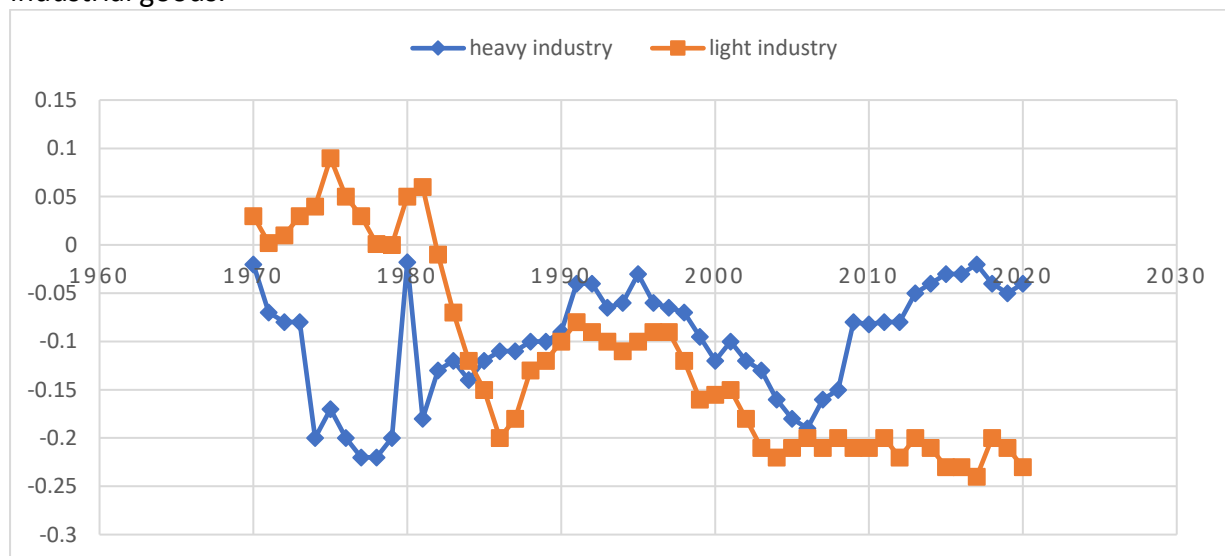


Figure 1: The Normalized Trade Balance of the Anglophone Country Group (1970-2020) for Light and Heavy Industrial Products.

The normalized trade balances (NTs) of individual countries in Appendix1 offer further information. From 1970 to 2020, Australia, Canada, South Africa, the United Kingdom, and more recently, Ireland since the 1990s were all net exporters of heavy industrial goods. Notably, whereas other countries substantially depend on imports from the light industry sector despite exporting a bigger percentage of heavy industry commodities, New Zealand, the United States, and Ireland prior to the 1990s have a surplus or virtually balanced trade in light industrial goods compared to imports. The normalized trade balance shows slow changes over time, demonstrating the amazing endurance of these specialized trading patterns.

Table 3

Comparison of Export and Import Patterns for Heavy and Light Industrial Goods in Different Countries

Country	Exports of Heavy Industrial Goods	Light Industrial Goods Imports
Australia	High	High
Canada	High	High
United Kingdom	High	High
South Africa	High	High
Ireland (1990s)	High	High
New Zealand	Low	Low
United States	High	Balanced
Ireland	High	Balanced

Table 3 evaluates export specialization among Anglophone countries relative to the OECD using the (RSCA) index in a number of areas. There is no discernible tendency toward specialization in the Anglophone countries' collective export patterns of heavy and light industrial items. However, because they are export-oriented, the UK, Ireland, and Canada, as well as industries like Wood and Manufacturing, Minerals, Fuels and Lubricants, and New Zealand, continuously exhibit high RSCA indices across the studied time. With the exception of the US, the export composition of Anglophone nations shows a specialization impacted by their abundance of natural resources.

Heavy industry sectors like pulp and paper, mineral oils and fuels, and basic metals and manufacturers have strong RSCA indices. Furthermore, while being categorized as light industries, the food, beverage, wood, and manufactured goods sectors show high exports in comparison to the OECD average because of their substantial usage of natural resources like wood.

Table 4

(RSCA) Export Specialization Indices in Anglophone Countries in Comparison with OECD

Sector	RSCA Index (Anglophone Countries)	RSCA Index (OECD Average)
Wood and Manufacturing	High	Moderate
Minerals, Fuels, and Lubricants	High	Low
Food and Beverage	Moderate	Moderate
Basic Metals and Manufactures	High	Low
Pulp and Paper	High	Low
Electrical Machinery	Moderate	Moderate
Machinery and Transport	Moderate	Moderate
Miscellaneous	Moderate	Moderate

Export portfolios seem to be more targeted overall than the composition of foreign imports, as shown in **Table 4**, an analysis of the Anglophone nations' reliance upon imports by sector. **Table 5** shows that export indices significantly outpace import indices, with fewer sectors having RSCA indices above zero in imports than in exports. Notably, Ireland and South

Africa have strong patterns of specialization when it comes to heavy industry commodities. High RSCA indices are noticeable in four of the six heavy industry sectors from 1970 to 2020. Furthermore, the UK focuses primarily on exporting products from the heavy industry sectors and only sporadically exhibits light industry specialization. In contrast, the US exports more electrical machinery, machinery and transport, and miscellaneous than the OECD average.

Table 5

Sectorial Specialization in Anglophone Countries

Country	Sector	RSCA Index (Exports)	RSCA Index (Imports)
Ireland	Heavy Industry	High	Moderate/low
South Africa	Heavy Industry	High	Moderate/low
United Kingdom	Heavy Industry	Moderate/high	Low
United States	Light Industry	Moderate/high	Moderate
United States	Electrical Machinery	Moderate	Low
United States	Machinery and Transport	Moderate/high	Moderate
United States	Miscellaneous	Moderate/high	Low

Jiborn et al (2018) analyze trade trends and provide carbon emissions and TBEET statistics. Interesting results emerge from trading trends between Anglophone countries, including Australia, the US, Canada, and the UK. Baumert (2017) mentioned these nations imported carbon emissions from 1995 to 2009. After accounting for this aspect, the research does not indicate a change in trade specialization in English-speaking countries. Adding a comparator of sectoral symmetric comparative advantage (RSCA) and single trade balance (NT) indices complicates trade patterns.

The dynamics of trade have changed without the US since the early 1980s. English-speaking countries have been net importers of light and heavy industrial commodities, in line with their average trade balance. In 1976, the group—apart from the US—began to export net heavy industrial items. Modification demonstrates how, in the event of the US's withdrawal, the English-speaking nations may end up being net exporters of carbon emissions.

There are no obvious patterns in trade specialization within the export or import structures when looking at nation-by-nation profiles. According to Baumert et al (2019), most nations continue to export heavy industrial commodities; the sole exception is Canada, where exports of these goods have declined. The normalized trade balances of the US, Canada, the UK, and Australia show varying degrees of trade specialization; however, there is no appreciable shift in the import or export of light and heavy industrial goods.

Furthermore, there is little evidence to conclude that the trend of trade specialization in import and export agreements among Anglophone nations is shifting, according to sectoral RSCA indexes. Though the UK's specialization in specific industries varies (e.g., Mineral Fuels, Lubricants, Non-metallic Minerals and Manufactures), no discernible trend suggests that export specialization for light industrial goods is changing or that certain sectors are becoming more dependent on imports. Some import trends show declines within specified durations, such as non-metallic minerals, manufactured goods, and pulp and paper.

According to the analysis, trade specialization's increasing negative effects on carbon emissions may be attributed to a fall in heavy industry exports that is greater than the decline

in heavy industry imports. According to Jiborn et al. (2018), this imbalance is probably a contributing factor to the rising emissions linked to imports. It is indicated by RSCA indices that express relative values.

As a result, a shift in trade specialization within import or export structures is not conclusively indicated by a comparison analysis of long-term trade flow patterns of heavy and light industrial items within Anglophone countries. Jiborn et al (2018); Baumert (2017); Kander et al (2015) provide insightful assessments of carbon emissions and the emission balance in trade, however the data demonstrate that trade dynamics among these nations are complex. New trade regulations and continuous research are needed to understand the intricate links between trade patterns and environmental impacts.

The Nordic Country Group

The normalized trade balance (NT) evolution for the Nordic nation group's heavy and light sectors is shown in Figure .2 It shows that, from the early 1980s, the Nordic region has been a major exporter of heavy industry items, deviating somewhat from the general trend noted by the OECD. The Nordic nations' trade balances differ regarding the light industry sectors; they can report a more balanced trade when the net trade deficit (NT) approaches zero, or they can be net importers. This result supports the claim that the Nordic region is typically a net exporter of emissions. . However, Nordic light industry trade balances are trending toward net import or balanced trade (Davis and Caldeira, 2010; Kander et al., 2017).

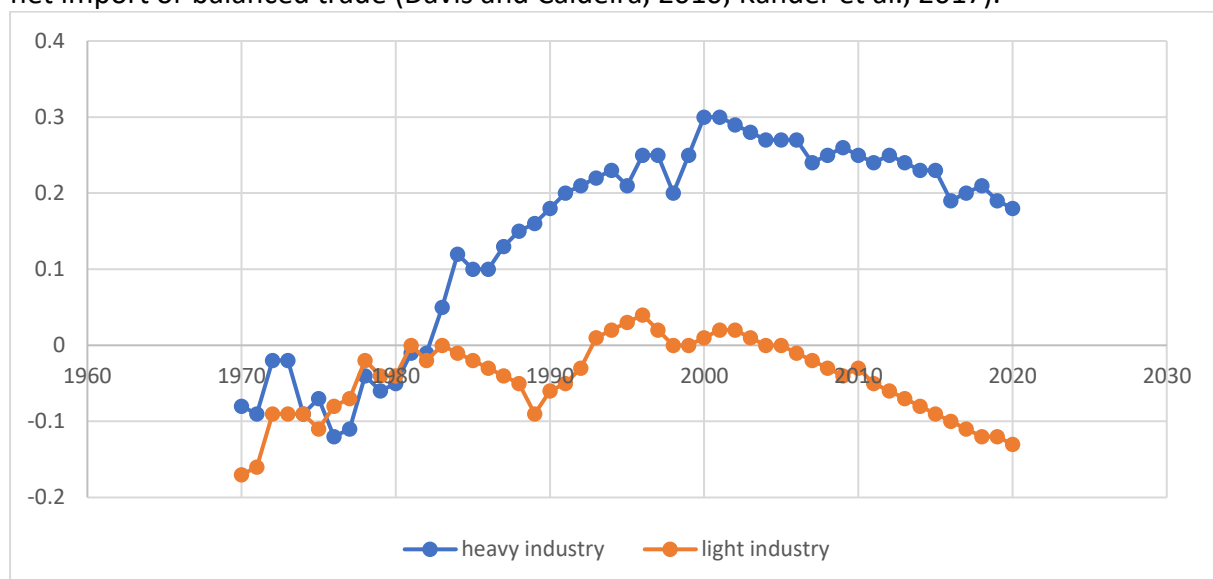


Figure 2: The Normalized Trade Balance of the Nordic Country Group (1970-2020) for Light and Heavy Industrial Products.

When NT values of each country are examined, different trade patterns over the researched period emerge. Finland and Norway export largely heavy industrial products, while Denmark, Sweden, and Iceland export light industry products. Trade in heavy industrial goods has converged among these nations, with Iceland achieving a balanced trade position that shows changing trading patterns (appendex2). Finland and Norway have unique Nordic trade patterns in heavy and light industrial net exports from the early 1990s to 2009. The analysis demonstrates how each Nordic country has approached trade and how heavy and light industry specialization has changed (Davis et al., 2011).

Examining each country's trade balances and sector-specific patterns helps understand the region's trade specialization and emission export profiles. This expands the body of knowledge for the next studies and policy considerations pertaining to sustainable trade practices.

Conversely, it is clear by looking at each country's NTs that there have been notable differences in their trade patterns during the studied time. There is a consistent trend of trade specialization between Sweden and Denmark. While Finland and Norway mainly export heavy industrial products, Sweden, Iceland, and Denmark are net exporters of commodities used in the light industry. Even though the three nations above mostly depend on the import of heavy industrial items, between 1970 and 2020, the difference in trade in this area has been closing, with Iceland even managing to achieve balanced trade. On the other hand, from the early 1990s until 2009, Finland and Norway were net exporters in the heavy and light industrial sectors (Dinda, 2004).

"Interesting insights are revealed by comparing the examination of long-term foreign trade flow patterns of heavy industrial and light industrial items with those of the Nordic Country Group's export specialty. The region's thirteen export industries' Revealed Symmetric Comparative Advantage (RSCA) indices are displayed in **Table 6**. Compared to the OECD average, the Nordic nations have significant exports in the food and beverage and wood and manufactured goods industries, but they also show a considerable specialization in heavy industry items.

Natural resource endowments appear to be influencing the export composition of the Nordic countries; throughout time, there has been a rising specialization in mineral fuels and lubricants, while manufactured goods and basic metals have become less important.

Analyzing individual nations in the area, we find that their diverse Natural Types (NTs) are connected with different export specialization trends. While Norway is a heavy industry leader in mineral fuels and lubricants, Denmark is a notable exporter of light industry goods such as food and beverages and miscellaneous things. While Denmark, Finland, and Sweden show proficiency in the wood, manufacturing, pulp, and paper industries, Iceland, Norway, and Sweden lead in basic metals and manufacturing.

There is a small difference between Sweden's export trends and the normalized trade balance findings, even with the notable developments in export specialization. Sweden is portrayed as a significant exporter of light industrial goods but as a net importer of heavy industry products. The discrepancy between the NT and RSCA indices implies that although Sweden imports products related to heavy industry, it continues to focus on exporting these goods, which include manufactured goods, iron and steel, basic metals, and pulp and paper (Dittrich and Bringezu, 2010).

The results highlight Sweden's dual role as an importer of heavy industry goods and an exporter of heavy and light industrial products, illustrating the complexity of its trade dynamics within the heavy industrial and light industrial sectors."

Table 6

Nordic Country Group Export Specialization Analysis

Nordic Country Group Export Specialization	Industrial Sectors	RSCA Indices	Noteworthy Points
Heavy Industry	Mineral Fuels and Lubricants, Basic Metals and Manufactures	Strong	Notable export specialization
Light Industry	Wood and Manufactures, Food and Beverages	Robust	Significant exports compared to the OECD average

The individual economies for the RSCA and the sectoral import indicators for the Nordic area are also shown in **Table 7**. When it comes to imports, the specialization patterns are more varied than those of exports from English-speaking countries. These five nations also seem to import a higher percentage of goods from a range of industries than the OECD average. Additionally, these countries seem to import a higher proportion of items in a number of industries.

The particular trade patterns that our study uncovered go counter to the conclusions drawn by (Baumert, 2017; Jiborn et al., 2018) since they refute the claim that Sweden, Denmark, and Finland mostly export carbon-intensive items. According to the results, there don't seem to be any noteworthy changes in this regard. As previously stated, the data for Sweden indicates a complicated business specialization. The analysis of Sweden's technology-adjusted emissions balance within trade points to an increasingly negative impact of trade specialization, even though the NT and RSCA indicators do not clearly show this trend.

Sweden's export specialization in base metals and manufactured goods declined between 1970 and 1975, but until 2020, the pulp and paper, iron and steel, and RSCA indexes continued to be high.

Table 7

Sectoral Import Indicators for the Nordic Region and Individual Economies Comparison

Indicator	Nordic Region	Sweden	Denmark	Finland	Norway
% of Goods Import	Higher	Higher	Higher	Higher	Higher
% of Commodities Import	Larger	Larger	Larger	Larger	Larger
RSCA Index (Iron and Steel)	High	High	-	-	-
RSCA Index (Pulp and Paper)	High	High	-	-	

Moreover, relative to the OECD average, there seems to have been less reliance on imports for goods connected to base metals, manufactured goods, chemicals, and chemical products between 1970 and 2020. Therefore, the indicators of trade specialization in the analysis do not corroborate the suggestion made by Jiborn et al (2018) in the instance of Sweden that since 1995. The nation now imports a larger proportion of heavy industry products rather than focusing on exporting carbon-intensive goods (heavy industry).

The UN Comtrade SITC Revision 1 database's lack of power trade statistics may explain the discrepancy. The database solely includes trade values for natural and manufactured gas-generated electricity, not coal, oil, or wind power. In contrast, WIOD input-output tables include "electricity, gas, and water supply". Denmark is a major net exporter of energy and wind electricity, so using world average production technologies to calculate the TBEET may

exaggerate Danish export emissions without reflecting them in the SITC Revision 1-based trade structure.

Summary

During the years 1970–2020, the first research topic examined the long-term trade patterns between groups of Anglophone and Nordic nations, with an emphasis on sector-specific import and export specialties. The study showed a more noticeable degree of specialization in these nations' export portfolios compared to their import structures (Nordhaus, 2019). It was noted that economies with smaller economies—like New Zealand, Ireland, and Norway—showed more specialization than economies with larger economies, like the United States or the United Kingdom, which showed lower export sector (RSCA) indices. There were no discernible substantial geographical disparities in the import structure despite the diverse assortment of specializations.

Net Trade (NT) analyses by country show that the following countries consistently support the hypothesis: trade patterns evolve gradually, preserving the relative specialization of each country in commerce across heavy and light industries: Canada, Australia, Sweden, Denmark, South Africa, New Zealand, the UK, and Iceland. On the other hand, since the late 1980s, the US trade pattern—which is defined by its status as a net importer in both sectors—has essentially not changed. Finland's trade balance fluctuates more than that of other countries, although changes in its heavy-industries trade take time to materialize—usually a decade or longer. These results provide credence to the studies of Gagnon and Rose (1995); Dalum et al (1998), which indicate that trade specialization patterns are impacted over an extended time by route dependency. But neither the normalized trade balances nor the sectoral RSCA indices show a persistent trend of specialization within the trade structure.

The second study topic examined the long-term patterns of specialization in heavy and light industry imports and exports, both within and between the nation groupings. The individual trade patterns seen do not support the assertions made by Jiborn et al (2018); Baumert (2017) that Anglophone nations are now net importers of emissions. There are no observable patterns in heavy industrial imports or light industrial exports according to the trade specialization indicators. Because of the various trade patterns of the nations under investigation, the systematic outsourcing of high-emission production activities proposed by (Jiborn et al., 2018) could not be substantiated.

It's interesting to note that between 1970 and 2020, the export specialization indices challenged both the Environmental Kuznets Curve (EKC) hypothesis and Rostow's (1959) "drive to maturity" argument by highlighting the ongoing relevance of natural resources to economies. These theories predicted that businesses that rely heavily on natural resources would see a decline in specialization (Dinda, 2004; Debbarma et al., 2022). In contrast to the OECD average, the majority of economies have maintained or improved their export proportion of heavy industrial substances or goods from the food and beverage, wood, and manufacturing sectors, according to the RSCA indicators. Lee (2020) claim that "natural capital" is an important economic asset that improves a country's economic prospects in addition to its physical and human capital. As technology progresses, there are predictions that export sectors for natural products will shrink (Debbarma et al., 2022). Still, long-term trade trends show that the importance of natural assets in international trade will not decrease.

Limitations

Monitoring trade specialization trends poses limitations. First, UN Comtrade's SITC Revision 1 system classifies commodities by distribution routes rather than production or economic features, which is a fundamental shortcoming. This may not reflect the modern industrial environment, especially for high-tech products, making it harder to link them to new commodity categories. In addition, the SITC Revision 1 framework's lack of data on traded power and energy may skew assessments of countries like Denmark who export wind energy. Trade patterns affect CO2 emissions, but this exclusion makes it harder to understand, especially for huge energy exporters like Norway. Leaving out services, which are increasingly important to GDP and international trade, is another negative. Despite its scarcity, data on traded services may shed light on trade specialization and economic growth. Two trade specialization indicators in the study are problematic. Because the OECD was the reference organization, these measurements may misrepresent trade performance or sector economic importance. This choice may explain some discrepancies between this study and others on trade specialization. Finally, unlike Jiborn et al (2018); Baumert (2017), this study ignores national carbon intensity and efficiency and focuses only on commodity import and export values. As traditional trade theory stresses product specialization, this method limits this study's comparability with studies with more complete methodological concerns. These limitations require careful interpretation of the study's findings, which provide crucial information regarding nations' long-term trade specialization.

Conclusion

The objective of the study was to investigate why the Nordic and Anglophone nations are now importing heavy industrial commodities rather than exporting them. This article examined long-term specialization patterns using the (RSCA) index and the normalized trade balance by evaluating import and export data classified using the SITC Revision 1 methodology.

The findings validated earlier studies on trade specialization, showing that these nations' export structures are more specialized than their import structures. The research differentiated between bigger and smaller economies, with the RSCA indices revealing that smaller economies exhibit more robust specialization. Regardless, there was no discernible tendency toward specialization over the long run across any of the studied businesses.

The research disproved the theory that Anglophone and Nordic nations have become more specialized traders of heavy industrial goods. Norway, Finland, Denmark, New Zealand, and Canada stood out for their heavy industry concentration compared to their light industry focus, illustrating the persistent specialization tendencies within individual economies in both areas. Emission accounting methods or country-specific variables may impact the outsourcing of production with high emissions, given the US has been a continuous net importer in both areas since 1983.

Furthermore, contrary to the Environmental Kuznets Curve theory and economic literature, which projected that natural resources would become less critical as economies developed, the research demonstrated that natural resource endowments have a substantial impact on trade patterns. Wood and basic metals, which were not expected, continued to play a pivotal role in the trading patterns of high-income nations, highlighting their ongoing significance in the world of international trade.

Insightful viewpoints on the complexity of global trade contacts are offered by this summary, which encapsulates the paper's analysis of trade specialization dynamics, the role of natural resources, and the evolving trading patterns of Nordic and Anglophone countries.

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