Measuring indirect vulnerability of Nordic Global Value Chains using harmonised Nordic Business and Trade Statistics

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Abstract.

The business statistics departments of the statistical offices in Denmark, Finland, Iceland, Norway and Sweden have established a co-operation, which is innovative in the following dimensions:

***Micro Data Infrastructure,** in terms of establishing national databases containing a range of business and trade statistics hosted in each NSI with a harmonised content and labelling*

***Methodology,** in terms of so-called distributed micro data research, allowing for cross-national microdata based analysis using centrally developed syntax to be run by each NSI, resulting in harmonised tabular output for further analysis.*

The databases have been used for several statistical analyses for the Nordic Council of Ministers and Nordic Innovation. In this paper, a recent project for the Nordic Council of Ministers, measuring the resilience of the Nordic Global Value Chains, will be presented, with a focus on the methodological set-up measuring the so-called indirect vulnerability by employing Micro data linking (MDL) and cross-country data co-operation.

Keywords: Resilience Indirect vulnerability Micro Data Linking Micro Data Infrastructure

1. Introduction

Business statistics are confronted with, on the one hand, new and emerging (ad hoc) user needs for data to support policy shaping, which need to be answered swiftly and, on the other hand, with an increasing call to reduce the administrative burden on businesses. The current regular statistical practices often involve data collection based on surveys, which can cause substantial delay, especially for statistics covering new and emerging topics. This reduces the relevance of the collected data for new policy areas that require urgent political action. An alternative to regular data collection can be identified in the so-called Micro Data Linking (MDL) approach, a statistical method for combining existing and available data about individual statistical units (enterprises, establishments or persons). MDL projects commonly utilise survey, register or administrative data to produce coherent statistics. More concretely, MDL:

1) is a powerful method for combining already available microdata on given entities such as enterprises, individuals, or a combination of both from surveys, administrative and other sources,

2) provides huge potential for keeping the respondents' burden at bay,

3) addresses in a timely and flexible manner user demands for data on emerging topics,

4) provides opportunities for creating new insights and to develop new statistics and indicators with already existing data sets.

Over nearly twenty years, the Nordic National Statistical Institutes (NSIs) have jointly carried out several MDL projects in business statistics. These ad hoc initiatives have been conducted in co-operation with partners such as Eurostat, the OECD, the Nordic Council of Ministers and Nordic Innovation, see Annex 1.

In order to become more efficient and produce more timely data, the departments for business statistics in the NSIs in Denmark, Finland, Iceland, Norway and Sweden have established a permanent Micro data Infrastructure (MDI), establishing databases in each NSI with a harmonised set of variables and labelling. The purpose of this infrastructure is to enable for decentralised execution of centrally developed syntax in order to swiftly produce new and needed statistical data that are comparable across

the Nordic countries. This MDI is expected to be financed by the Nordic Council for Ministers in the coming two years.

2. Nordic Micro Data Infrastructure

The harmonised Micro Data Infrastructure (MDI) across the Nordic countries builds largely on the strong foundations of existing register-based statistical systems. The Nordic countries have a long-standing tradition of utilising administrative data sources and maintaining comprehensive business and population registers, which has provided a natural basis for the adoption of the Micro Data Linking (MDL) approach. Close collaboration between the Nordic countries is essential: the aim has been to create a coherent solution in which each country maintains its own infrastructure while adhering to common standards and producing mutually comparable results.

In structural terms, the Nordic MDI is based on national data repositories in which key statistical domains in business statistics, such as the business register, structural business statistics, international trade in goods statistics, and registers describing enterprise group structures, are linked using a common and unique enterprise identification number.

The data in national MDI databases are harmonised according to shared naming and formatting conventions, even though the processes through which the data are produced for the national MDI databases may differ in terms of technical solutions and underlying data sources (such as surveys, administrative data, or a combination of both).

In practice, the solutions adopted by Nordic statistical institutes for implementing a harmonised MDI vary, even though the end result is aligned. In its simplest form, implementation may involve renaming and reformatting existing variables. In more complex cases, however, constructing the required MDI variables may necessitate adjustments to upstream production processes, for example to ensure that the necessary micro-level data are stored in suitable formats or locations, and to enable the integration of multiple datasets. The structure of MDI databases can also be designed to update automatically as new annual data become available, for instance by using SQL views or automated update routines.

Centrally developed analytical syntax is distributed to participating Nordic countries, where it is executed within national environments. This approach enables the production of standardised and comparable output tables without the need to exchange microdata between countries. In practice, efficient implementation of common analytical processes is possible despite differences in the underlying national data systems, as harmonised MDI structures are built on top of these existing data environments.

The decentralised model supports data confidentiality and national autonomy, since microdata remain within each country while still allowing for the production of comparable results at the Nordic level. The Nordic MDI both leverages and further strengthens the region's highly developed register-based statistical systems, making it a particularly efficient and scalable approach for MDL-related work.

The Nordic NSIs have, since 2012, established and maintained a Micro Data Infrastructure. This infrastructure consists of harmonised databases in each NSI holding selected variables from a number of annual business and trade statistics, including Statistical Business Register, Structural Business Statistics, Business Demography, International Trade in Goods Statistics, International Trade in Services Statistics, Foreign owned enterprises (IFATS) IT usage by enterprises statistics and Innovation statistics.

3. Measuring the resilience of the Nordic Global Value Chains

The Nordic NSIs have recently carried out a project for the Nordic Council of Ministers measuring the resilience of the Nordic Global Value Chains. The first part of the project was mainly using International Trade in Goods Statistics and used a method to classify if a certain imported good could be characterised as vulnerable based on three criteria: concentration of supplying countries, extra European share and substitution potential.[1]

Nordic companies utilise a significant volume of imported materials, components, and other inputs in their manufacturing processes. These materials and semi-finished

[1] For method and sources used and results, see Nordic Council of Ministers: The Value Chains of the Nordics - Tracking Resilience and Vulnerabilities (2026)

products—defined as intermediate goods—serve as inputs for the production of further goods or services.

Imports themselves are not inherently a cause for concern; quite the opposite, in fact. It is practically impossible for small Nordic countries – or in fact any country - to produce all necessary intermediate products domestically.

Thus, it is natural and economically efficient to import intermediate goods. In the current era of heightened geopolitical tensions, however, the critical question is less about the necessity of imports and more about the specific regions or countries from which those goods originate.

The analysis of intermediate goods imports by Nordic countries reveals a strong, primary reliance on European partners (excluding Nordic countries) and, secondarily, significant trade within the Nordic region itself. Imports from major non-European economies, while present, play a smaller role in supplying the necessary intermediate inputs (Table 1).

Trade within the Nordic region serves as the second most important source for all five Nordic countries, underscoring the importance of regional supply chains. However, almost four-fifths of imported intermediate products originate from outside the Nordic countries, leaving the Nordic share at an average of 21%.

Table 1. Import of Intermediate Goods to Nordic countries 2024

	Denmark	Finland	Iceland	Norway	Sweden
Other Nordic countries	18.4	23.4	21.3	20.6	22.3
Other European countries	52.5	45.5	39.8	41.3	57.3
USA	10.1	6.8	4.9	8.6	4.9
China	8.4	7.7	8.2	6.8	5.0
Rest of World	10.6	16.5	25.8	22.7	10.5

Source: Nordic Council of Ministers: The Value Chains of the Nordics - Tracking Resilience and Vulnerabilities (2026)

The second part of the project focuses on measuring the so-called indirect vulnerability by employing Micro data linking (MDL) and cross-country data cooperation in a new and innovative way.

Measuring indirect vulnerability means that goods imported from countries considered to be safe suppliers (e.g. other Nordic countries) might, in a prior step, consist of intermediate goods imported from other regions, for instance China or other non-European countries. This second layer of vulnerability is measured by identifying from which countries, the firms exporting to other Nordic countries import their goods, making the project innovative in its approach to measuring vulnerability. The methodology is further described below.

3.1 Methodology used for Measuring indirect vulnerability

3.1.1 Step 1: Identifying the import industries to be analysed

As this is an innovative approach, we use a case-based approach in order to test the methodology. In this step, we identify five manufacturing industries that show a combination of a high value of imports of intermediate goods from other Nordic countries, a considerable Nordic share thereof and a considerable employment.[2]

3.1.2 Step 2: Identify the intermediate goods imported by one country from the other Nordic countries

In order to bring down the number of imported intermediate goods by the selected industries in step 1 to be analysed, for each of the selected industries, the following thresholds at goods level (6-digit CN) are implemented:

1) Imports of the intermediate good from other Nordic countries must be worth at least EUR 5,000.
2) Imports of the intermediate good from other Nordic countries must account for at least 10% of the total import of the intermediate good.
3) Imports of the intermediate good from each Nordic country must account for at least 10% of the total import of the intermediate good from other Nordic countries.

A list of the imported intermediate goods fulfilling the above-mentioned criteria for each exporting Nordic country is extracted and circulated to the relevant NSI. For example,

[2] For information about the selected industries, method to calculate indirect vulnerable imports and results, see Nordic Council of Ministers and ETLA: Hidden Networks: Value Chain Vulnerability and Indirect Sourcing in the Nordic Region (forthcoming)

Denmark distributes a list of intermediate goods to Finland, where the import of each good is worth at least EUR 5,000, other Nordic countries (other than Denmark) account for at least 10% of the total imports of the intermediate good, and Finland accounts for at least 10% of the total imports of the intermediate good from other Nordic countries (other than Denmark). These criteria must be fulfilled for at least one of the selected industries.

3.1.3 Step 3: Identifying which enterprise groups in the exporting country export the intermediate goods identified in Step 2

In this step, we mirror the import information listed in Step 2 for each good (at 6-digit CN level) in the export information from the exporting country. This is done in order to identify the individual enterprise groups exporting the identified intermediate goods imported by each Nordic country. For example, we identify the enterprise groups in Denmark that export the goods that Finland, Iceland, Norway and Sweden have identified as being imported from Denmark in the previous step. We do not observe a complete match between the import and export information.

As international trade is often carried out via special-purpose entities within an enterprise group in the form of wholesale units, the enterprise group is used as the statistical unit for identifying the imports in second-tier.

3.1.4 Step 4: Identifying indirect vulnerability

The imports of intermediate goods of the enterprise groups identified in Step 3 is measured and broken down by import region. This is done in order to identify indirect vulnerability, i.e. import of intermediate goods coming from e.g. China.

Based on Step 1 and Step 3 from each Nordic country, Statistics Denmark aggregates the import distribution for each exporting country to measure the indirect vulnerability for each import country.

The result of this exercise reveals that, on average only 17% of the imports from other Nordic countries identified in the direct import stage are also imported from Nordic countries in the second tier (indirect import), as shown in Table 2. In particular, the

approximately 25% imported, on average, from non-European countries constitute a further supply chain risk for the selected Nordic industries.

Table 2 Indirect import via other Nordic countries

	Denmark	Finland	Iceland	Norway	Sweden
Other Nordic countries	21,6	14,3	15,2	19,2	15,5
Other European countrie	55,0	62,6	58,7	59,4	50,9
USA	5,1	5,1	5,1	4,2	6,1
China	6,1	6,2	6,1	6,5	9,6
Rest of World	12,3	11,7	14,9	10,7	17,9

Source: Nordic Council of Ministers and ETLA: Hidden Networks: Value Chain Vulnerability and Indirect Sourcing in the Nordic Region (forthcoming)

4. Issues for discussion

The continuous co-operation between the business statistics departments, in terms of hosting and updating databases with a harmonised content and labelling, has proven successful, and the Nordic Council of Ministers is interested in financing the updates for the coming two years. Would it be useful to consider this type of co-operation in other domains, such as social or environmental statistics?

So far, the databases have only been utilised for externally financed projects. Having established the databases, should the Nordic NSIs themselves utilise them and promote comparable Nordic statistics – especially in the current geopolitical environment?

5. Appendix: List of references

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