

ADVANCED EXPORT INTELLIGENCE

New Export Opportunities for the Netherlands in Semiconductors

Identifying and quantifying untapped short- and medium-term export potential
across the semiconductor value chain, by product and by target market.

REPORT PREPARED BY

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Headline findings.

€11 bn

Short-term potential across eight products where the Netherlands already holds a proven comparative advantage (RCA > 1, RTA > 0).

€25 bn

Thirty one priority product-by-country opportunities outside China and Hong Kong — enough to nearly double 2025 exports.

€50 bn

Medium-term potential across 16 products with latent advantage — concentrated in integrated circuits (**€45 bn** in HS854231 [IC processors and controllers] & HS854290[IC parts]).

\$1.6 tr

The global semiconductor industry's projected value in 2030.

— The strategic case

The Netherlands is a global chokepoint in semiconductor manufacturing equipment through **ASML**, **ASM International** and **BESI** — but that near-monopoly leaves the ecosystem exposed to US–China decoupling. Export controls on semiconductors represent a geo-economic opportunity cost of **€3.74 bn** in lost China untapped potential (over and above the loss of actual exports as a result of the export restrictions). This report finds that alternative markets — **Singapore, South Korea, Vietnam, United States, Malaysia, Mexico, Taiwan and India** — can offset that loss in the short term, while a shift toward design-driven integrated circuits realistic can open around **€25 bn** of medium-term export diversification, which conservatively represents only 56% of total identified untapped potential.

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SECTION 1

Introduction

The global semiconductor industry has evolved from a commercial supply chain into a strategically contested domain characterised by geopolitical decoupling, heavy state subsidies, and capital concentration (de Jong et al., 2026). Driven by hyperscale artificial intelligence deployments and computing demand, the industry's economic value is estimated to exceed US \$1.6 trillion by 2030 (Wiseman et al., 2026).

Within this global environment, the Netherlands occupies a critical position. Its semiconductor industry generates around €46 billion in direct annual turnover, provides employment for 43,000 people, and accounts for one-third of all private research and development expenditure in the country (CBS, 2026; PwC, 2024). Through companies¹ such as ASML, ASM International, and BESi, the Netherlands maintains oligopolistic positions in semiconductor products such as advanced optical lithography, atomic layer deposition, and hybrid bonding tools.²

However, this dominance also generates vulnerabilities. The USA has utilised export control measures to restrict China's ability to develop or manufacture leading-edge semiconductors. Because advanced optical lithography represents an insurmountable engineering choke point for domestic fabrication, the USA pressured allied equipment-producing nations — notably the Netherlands and Japan — to harmonise their national export regimes.³ Concurrently, China is deploying state subsidies (reaching 8% of corporate revenues) to achieve legacy-node market dominance and expand semiconductor exports through Southeast Asian transshipment hubs (Weber and Laha, 2026).

In addition to these global geopolitical pressures, the Netherlands' semiconductor ecosystem faces structural strain domestically: physical infrastructure limits, electrical grid congestion, and talent shortages are eroding the high-tech “halo effect,” creating a fragile semiconductor monoculture (PwC, 2024).

Research by DGAP highlights that European microelectronics policy has suffered from an inward-looking focus (Weber and Laha, 2026). While European policymakers have concentrated on securing internal supply chains, mitigating dependencies, and subsidising domestic fab construction, they have largely overlooked the strategic necessity of exporting semiconductors into third markets. **It has been argued that by failing to establish an export network in neutral regions — such as Southeast Asia, the Western Balkans, Eastern Europe, and the Middle East — Europe (and the Netherlands) risks being marginalised as China continues to embed its computing hardware and standards across emerging digital economies** (Weber and Laha, 2026).

To reduce these vulnerabilities, the Netherlands must move beyond purely defensive industrial policies built only around its established champions.

Although such initiatives — for example those aiming to integrate the European Chips Act framework, including the multi-billion-euro Project Beethoven⁴ — are necessary, they need to be complemented by an explicit semiconductor export strategy for the Netherlands.

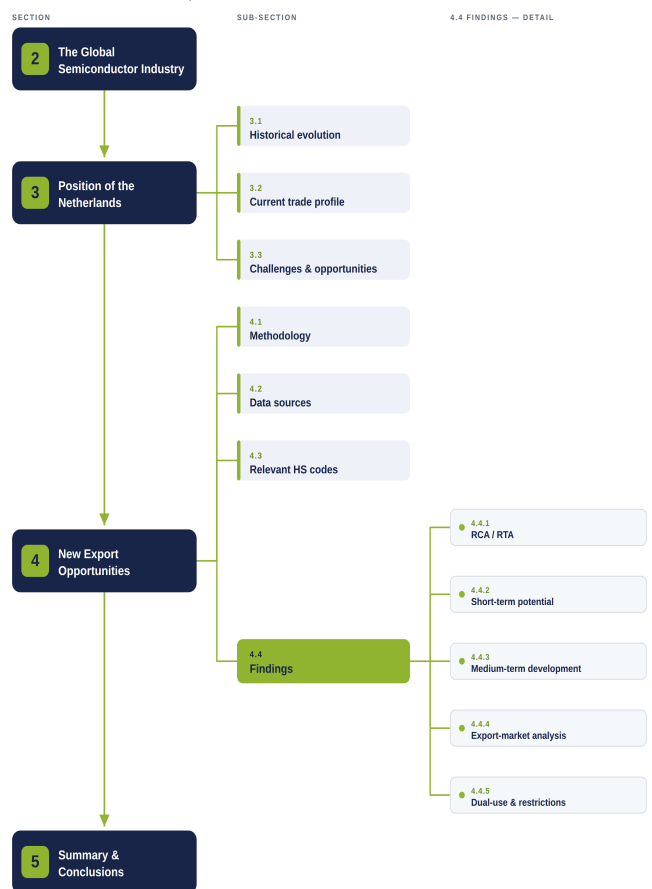
As a first step towards such a semiconductor export strategy, this report identifies and quantifies new export opportunities for the Netherlands in semiconductors. It provides an indication of the untapped export opportunities that exist over the short- and medium-term in the industry, by product and by country.

The rest of the report is outlined as follows.

AEXI · REPORT STRUCTURE

New Export Opportunities for the Netherlands in Semiconductors

Section 2 to Section 5 — overview of the report's structure and sub-sections.



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02

SECTION 2

The Global Semiconductor Industry

The semiconductor industry provides essential technological and related inputs and products that underpin modern telecommunications, consumer electronics, industrial automation, automotive systems, cloud data centres, and advanced artificial intelligence (AI) platforms. Semiconductor products fall into four overarching categories: (1) integrated circuits (ICs); (2) discrete semiconductor devices; (3) optoelectronics; and (4) sensors. The vast majority of worldwide semiconductor trade and revenue is in ICs.

The global semiconductor industry was valued at \$775 billion in 2024 and is projected to reach \$1.6 trillion by 2030. Within the semiconductor global value chain (GVC) five distinct stages can be distinguished: (1) R&D and IP design; (2) inputs and equipment manufacturing; (3) wafer fabrication; (4) packaging and testing; and (5) end-system integration (BCG, 2021).

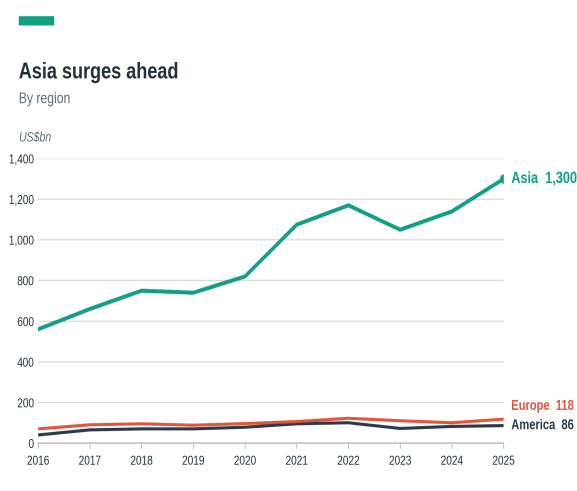
The global semiconductor value chain is defined by geographical specialisation.⁶ R&D and IP design are concentrated in the USA and Europe. Wafer fabrication is almost entirely concentrated in East Asia, where Taiwan Semiconductor Manufacturing Company (TSMC) and Samsung Electronics operate the only foundries globally capable of producing sub-5nm “logic”⁷ at commercial scale.

As a result of this geographical specialisation, the semiconductor GVC is, as the OECD stresses, exceptionally fragile.⁸ In recent times global production has faced disruption from international helium shortages triggered by geopolitical instability and shipping blockades in the Persian Gulf and Strait of Hormuz.

Total international trade — exports and imports — of semiconductors is primarily tracked under 4-digit headings within Chapter 85 (electrical machinery and equipment): **HS 8542** (electronic integrated circuits) and **HS 8541** (discrete semiconductor devices & diodes), as well as **HS 8486** for semiconductor manufacturing equipment. According to the *World Semiconductor Trade Statistics* (WSTS), by 2025 total revenues of semiconductors globally reached US \$795 billion, up from US \$26 billion in 1986 — a twenty-six-fold increase over four decades. By 2025, respectively 55% and 32% of this value accrued to Asia and America, and only 7% to Europe.

Using the HS codes mentioned, trends on exports of semiconductors per country and region can be compiled. Figure 1 shows the exports of semiconductors for the aggregate of HS 8542, HS 8541 and HS8486. By 2025 more than US \$1.4 trillion in semiconductors were exported, the bulk from Asia — which exported 87% of all semiconductors by 2025.

Figure 1. Semiconductor exports per world region, 2016–2025 (US \$ billions)



Source: Authors' compilation based on data from ITC TradeMap (trademap.org).

Figure 1 confirms the relatively marginal position of Europe in the industry as measured by its share of world exports: between 2016 and 2025 Europe's share declined from 9% to 8%.

WHY THE NETHERLANDS STILL MATTERS

In terms of total export *value*, the Netherlands' semiconductor exports may be small in relative terms. Yet, as the next section shows, the country occupies a strategic position — it is a chokepoint in the global semiconductor industry.

SECTION 3

03

Position of the Netherlands in the Global Semiconductor Industry

3.1 Historical evolution

The Netherlands has one of the highest rates of participation generally in global value chains (Volgina and Zharkova, 2021:1). As far as participation in the semiconductor GVC is concerned, since the early 2010s the Netherlands established an oligopolistic position in the global semiconductor manufacturing equipment trade network (Wang et al., 2025; Li et al., 2025). ASML emerged as the world's supplier of extreme-ultraviolet (EUV) lithography machines, dominating the high-end lithography market critical to advanced semiconductor fabrication (Li et al., 2025; Bown & Wang, 2024).

ASML's dominance was supported by United States inputs and intellectual property, integrating the Dutch firm into the American technological system (Ou et al., 2024; Ruck, 2024). The Netherlands complemented this lithography monopoly with a local equipment ecosystem, hosting packaging - equipment manufacturer BESI and photonic -chip developer SMART Photonics (Li et al., 2025).

The Netherlands' semiconductor industry is spatially concentrated around three cities in the provinces North-Brabant, Overijssel and Gelderland: Eindhoven, Nijmegen and Enschede.

3.2 Current semiconductor trade profile

The Netherlands is a significant net exporter of advanced semiconductor manufacturing equipment while serving as a high-volume logistics, import, and re-export gateway for integrated circuits, discrete semiconductor devices, and upstream materials into the broader European market.

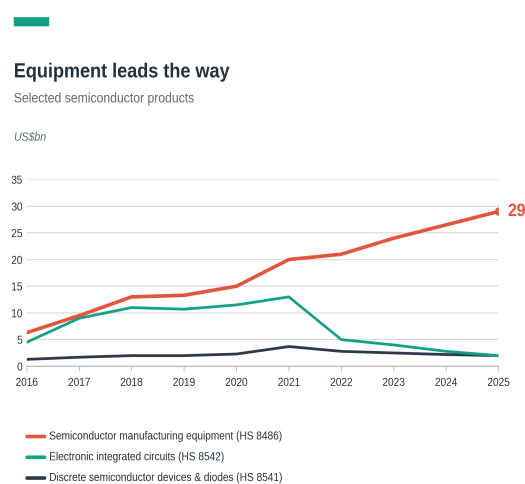
Figure 2 shows the export of semiconductors from the Netherlands between 2016 and 2025, using HS 8542, HS 8541 and HS8486 — comparable, as far as the total is concerned, to Figure 1. By far the most important semiconductor exports are semiconductor manufacturing equipment (**HS 8486**). Exports of these products increased from US \$6.2 billion in 2016 to US \$29 billion by 2025. By 2025 the Netherlands was exporting 19% of all global exports of semiconductor manufacturing equipment.

In contrast to semiconductor manufacturing equipment, the Netherlands exports less in electronic integrated circuits (HS 8542) and discrete semiconductor devices and diodes (HS 8541) — by 2025 around US \$2 billion in each category.

Figure 2 also shows that since 2021 exports of electronic integrated circuits from the Netherlands declined, dropping from over US \$13 billion in 2021 to around US \$2 billion by 2025. The reason is that 2021 was an unprecedented peak in the global semiconductor cycle, reflecting acute chip

shortages, panic ordering, and soaring spot prices during the COVID-19 pandemic. The subsequent industry-wide downcycle saw inventory destocking and price corrections across memory, automotive, and logic ICs. Furthermore, supply-chain rerouting took place away from European hubs, with multinationals now shipping more directly between Asian packaging/foundry hubs and end-assembly destinations rather than routing through Western European distribution centres such as the Netherlands.

Figure 2. Semiconductor exports from the Netherlands, 2016–2025 (US \$ billions)



Source: Authors' compilation based on data from ITC TradeMap (trademap.org).

As shown in Figure 2, the Netherlands is a major net exporter of semiconductor manufacturing equipment. The major domestic role-players, ASML⁹ and ASM International¹⁰ produce and export photolithography/steppers, CVD/ALD deposition tools (HS 8486.20) and high-precision fab parts, optics and modules (HS 8486.90). The primary export destinations are major global chip-fabrication hubs, including Taiwan, South Korea, China, and the United States. Imports are largely specialised components and subsystems from Germany, the US, and Japan.

As far as exports of electronic integrated circuits (HS 8542) and discrete semiconductor devices and diodes (HS 8541) are concerned, although the Netherlands is not a major exporter globally, the country nevertheless takes part in global value chains in ICs as a high-volume re-exporter and net consumer. A main player in this regard is NXP,¹¹ which designs processors and analog chips (HS 8542.31 / 8542.39) and largely exports to the European market (France, Germany). However, physical manufacturing is largely outsourced to East Asia, while significant imports of processors (HS 8542.31) and memory chips (HS 8542.32) are sourced from Taiwan, China, Malaysia, and Singapore.

The Netherlands is furthermore an importer and re-exporter of discrete semiconductor devices and diodes (HS 8541) — diodes/transistors (HS 8541.10–8541.29) as well as photovoltaic modules (HS 8541.41–8541.49). The latter reflects the Netherlands acting as Europe's primary entry point for solar cells and panels from Asia before continent-wide distribution.

Finally, the country is a specialised importer of substrate and raw materials (HS 2804.61 and HS 3818.00), importing doped electronic-grade silicon wafers and hyper-pure polysilicon from Japan, Germany, and the US to supply local research, pilot fabs, and equipment-testing facilities, alongside selective re-exports.

3.3 Challenges and opportunities

Since 2020, the Netherlands' position in the semiconductor GVC has been reshaped by escalating US–China technological rivalry (Ruck, 2024; Malkin & He, 2023). The USA has leveraged ASML's quasi-monopoly to restrict the export of advanced lithography machines to China, pressuring the Dutch government to align with American export controls.

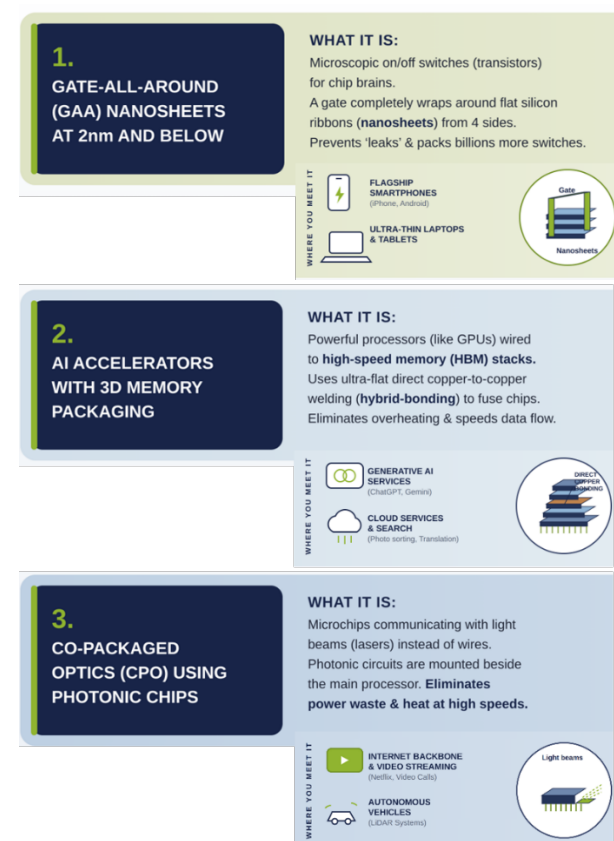
In January 2024, the Dutch government revoked export licences for shipments of ASML's advanced deep-ultraviolet (DUV) immersion lithography tools (specifically the TWINSCAN NXT:2050i and NXT:2100i systems) to select Chinese semiconductor manufacturers. In September 2024, the Dutch export-control regime expanded further, bringing TWINSCAN NXT:1970i and NXT:1980i DUV systems under national licensing mandates, thereby aligning Dutch policy with unilateral US controls. These measures prohibit China from acquiring EUV systems, restrict its acquisition of high-end immersion DUV scanners, and constrain Western toolmakers from providing ongoing maintenance and replacement parts for installed leading-edge tools.¹²

To bypass Western trade barriers, Chinese semiconductor flows have increasingly integrated Southeast Asian nations into their supply networks.¹³ Vietnam has emerged as a vital packaging and transshipment hub; while Chinese processor exports to Malaysia have plateaued, exports into Vietnam have expanded significantly, enabling Chinese-manufactured silicon to be integrated into assemblies destined for Western markets. Furthermore, domestic substitution within China is advancing rapidly: in the automotive sector, EV manufacturer BYD now produces in-house microcontrollers and power devices, reducing its reliance on traditional European suppliers such as Infineon and NXP.¹⁴

Against these challenges there are also notable opportunities for growth. The global expansion of generative AI and high-performance computing represents a major opportunity. The transition from general-purpose computing to distributed AI-model training is driving architectural shifts that require advanced lithography, atomic-scale material deposition, 3D heterogeneous packaging, and optical interconnects. This creates potential opportunities in three areas:

- **Gate-All-Around (GAA) nanosheet architectures** at the 2nm node and below — an opportunity to expand ASML International's tool content per wafer and to print sub-2nm features in high-volume manufacturing using ASML's High-NA EUV systems.
- **AI accelerators** (such as NVIDIA GPU clusters) that integrate discrete compute tiles with High-Bandwidth Memory (HBM3e/HBM4) via 2.5D and 3D packaging. As memory stacks exceed 16 layers, traditional micro-bump soldering creates thermal and height constraints — an opportunity for BESI's direct copper-to-copper hybrid-bonding systems.
- **Co-packaged optics (CPO)** using Dutch Indium-Phosphide and Silicon-Nitride photonic integrated circuits, enabling high-bandwidth, energy-efficient optical data transmission at the processor level and positioning the Dutch photonics cluster for high-margin global exports.

Diagram 1. Unpacking semiconductor technologies



Source: Authors.

To capitalise on these opportunities while insulating the ecosystem against geopolitical shocks, the Netherlands must diversify and grow its semiconductor exports beyond the current traditional lines.

As Weber and Laha (2026) argue, **European countries must look beyond defensive domestic fab subsidies and actively support European hardware vendors in securing export markets across neutral regions (Southeast Asia, MENA, Eastern Europe) to counter expanding Chinese compute ecosystems.** The remainder of this report identifies new export opportunities for the Netherlands in semiconductors.

04

SECTION 4

New Export Opportunities

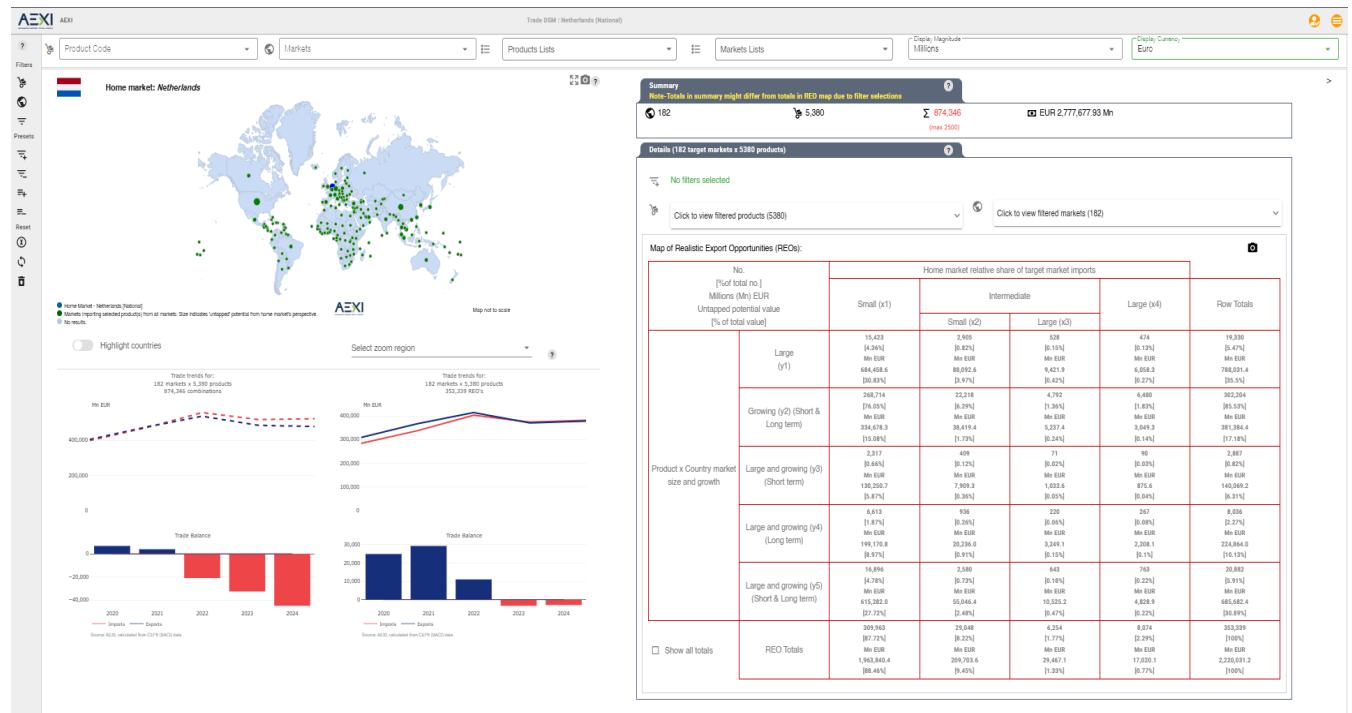
4.1 Methodology

To identify untapped realistic export opportunities for the Netherlands in semiconductors, the **AEXI Market Finder** tool (www.aexi.nl) is used.¹⁵ This software operationalises the decision-support model (DSM) methodology for export-

opportunity identification proposed by Cuyvers et al. (1995) and subsequently continuously refined over the last 30 years (See Cameron and Naudé, 2026).

The approach makes use of the big data that characterises international trade. Diagram 2 shows a screenshot of the menu-driven dashboard of the AEXI Market Finder.

Diagram 2. The AEXI Market Finder tool



Source: Authors

The challenge of big data in international trade data is addressed by reducing the potential set of options that need to be considered, using well-researched filters relevant to a particular question. The approach takes into consideration all possible worldwide product (HS 6-digit) and market (country) combinations, using four major filter categories — each with sub-filters. The approach systematically eliminates less-promising markets until those with the greatest prospects of success are revealed.

Methodologically, the filtering approach rests on rigorous mathematical foundations. As proven by Konstantakopoulou and Tsonas (2024) this filtering process operates as a highly efficient heuristic for a complex combinatorial optimisation problem: comparing the DSM's filtering choices against exact mathematical optimisation (the GRASP algorithm¹⁷), they establish that the heuristic DSM correctly identifies 98.2% to 100% of optimal product-market export opportunities. (at a fraction of the relative effort (read cost) of exact mathematical optimization).

These filters are briefly described, drawing on Naudé and Cameron (2021, 2025) and Cameron and Naudé (2026). **Filter**

1 considers broad general market potential as reflected in economic size, growth, and political and commercial risk. Key variables include GDP and GDP -per -capita values and their annual growth rates, as well as country -risk ratings.¹⁶ The main filter consists of two sub -filters: sub-filter 1.1 eliminates markets that pose too high a relative political and/or commercial risk; sub-filter 1.2 considers relative macro-economic size or growth. The overall rationale is to reduce the set of countries carried into subsequent filters.

Filter 2 classifies each potential product-market combination by its import -demand characteristics (size and growth). Three descriptive quantitative characteristics are calculated per product -by -country combination: short-term import growth (last 2 years), long-term import growth (last 5 years), and relative import -market size. (structural on a 5-year time-weighted basis).

Filter 3 considers product-country market -access conditions. Cuyvers et al. (1995) recognise that simply being selected on the basis of size and growth does not imply that a market can easily be penetrated. Two categories of trade barriers are

identified: sub-filter 3.1, the degree of import -procurement supplier (import source markets) concentration (using an adjusted Herfindahl-Hirschmann Index (Hirschman 1964); and sub-filter 3.2, trade restrictions. Hoekman and Nicita (2008) found that the Logistics Performance Index (LPI), the cost -to-import measures, and ad valorem equivalent tariffs¹⁸ per product¹⁹ are important measures of market access.

Filter 3.2 therefore converts transport and logistics cost elements into comparable ad valorem terms — international shipping time and cost, domestic time and cost to import, and the LPI — combined into a market -accessibility index scoring each product-country combination relative to all others.

In the final step, **Filter 4** categorises each product-market combination based on the home market's current exports and the target market's size, growth patterns and accessibility, as well as the home market's current **revealed comparative advantage (RCA)** and **revealed trade advantage (RTA)** (Cuyvers, 1997).

Revealed Comparative Advantage (RCA)

RCA assesses a country's relative advantage or disadvantage in producing a particular good or service (for the purposes of exports), based on its export performance. The most common formulation is the Balassa Index:

$$RCA = (X_{ic} / X_{it}) \div (X_{wc} / X_{wt})$$

X_{ic} = country i 's exports of product c • X_{it} = country i 's total exports • X_{wc} = world exports of product c • X_{wt} = total world exports.

In this report, the RCA in exports is the ratio of the Netherlands' share of exports in a particular line of semiconductor products against the world's share of exports in the same product line. **If $RCA \geq 1$, the Netherlands has a revealed comparative advantage in that product**; if $RCA < 1$ it has a revealed comparative disadvantage. A country can improve its RCA by investing in technology, infrastructure and skills to raise efficiency and lower cost; by promoting products through branding and marketing (trade promotion); and by adopting policies to move up the value chain.

Revealed Trade Advantage (RTA)

We also apply the RTA indicator. The Netherlands is a transit country for many goods entering Europe and other regions; re-exports are a significant part of total exports.

An indication is therefore needed of whether a product is locally produced or probably only re-exported. While the RCA indicates comparative advantage, it accounts only for exports; by ignoring imports it can give a distorted picture of the Netherlands' true export advantage. Detailed data on local production versus re-exports per HS code are not available, but an indirect measure can be obtained from the RTA.²⁰

The RTA accounts for exports and imports simultaneously and is used as an indicator of product-level competitiveness and productive capacity. **An $RTA > 0$ on a consistent basis (5-year time weighted) reveals positive comparative trade**

advantage: the country exports more of the product than it imports, implying local production for the purposes of exports. It is calculated as:

$$RTA = RXA - RMA$$

where RXA is relative export advantage (the RCA above) and RMA is the analogous relative import advantage. M = imports; i is a country, j a product, t all traded products, and n all countries.

If $RTA > 0$, export has a higher comparative advantage than import (relatively more is exported of the product than imported versus the world average); if $RTA < 0$, the reverse holds. **An $RTA > 0$ can therefore be assumed to indicate that exports observed contain locally produced product.** The relative difference between imports and exports indicates how significant the locally produced exports is for the domestic economy i.e. a higher RTA proxies relatively larger domestic production for purposes of exports.

Finally, a monetary indicator distinguishes the relative size of unconstrained, untapped potential export value to prioritise the shortlisted export opportunities. This is the average market-import value from the top six competitors in each market, excluding imports from the home market (in this instance the Netherlands) where it is among the top six sources. "Unconstrained" means the potential is not limited by production or supply constraints from the home market's perspective. All variables are calculated in a time-weighted index format to address data volatility.

4.2 Data sources

The key data sources used by the AEXI Market Finder to operationalise the DSM methodology are:

- **CEPII BACI** — the primary source for trade -flow data; a reconciled version of UN Comtrade that harmonises mirror flows and estimates missing data, providing a more complete picture of sparse global trade.
- **MacMap (ITC)** — applied tariff data at HS 6-digit level, distinguishing MFN from preferential tariffs; crucial for the market-access filter.
- **World Bank Doing Business²¹ and LPI** — used to parameterise logistics costs and model border friction and port efficiency.
- **UN National Accounts** — GDP, population estimates, exchange rates.
- **IMF World Economic Outlook** — GDP projections.
- **Credendo (formerly ONDD)** — country-level political and commercial risk ratings used in Filter 1.
- **Freight-rate data** — cost estimates, routes and scheduling from World Freight Rates,²² Searates,²³ the Logistics Cluster²⁴ and Google Maps.²⁵ Routing tables use the four largest containership operators (Maersk, MSC, CMA-CGM, COSCO), which handle around 50% of global container cargo; annual price escalations for 500+ sea lanes draw on Container Trades Statistics Ltd (CTS).²⁶

Table 1 summarises the DSM methodological filters and their respective data sources.

Table 1. Summary of DSM filters and data sources

Filter step	Focus area	Key variables	Theoretical basis	Core data sources
Filter 1	General Market Potential (country level)	GDP _{tw} , GDP growth _{tw} , IMF projections (WEO), GDP/capita _{tw} , political risk, commercial risk	Gravity model (economic mass); risk aversion	UN National Accounts; Credendo (risk ratings); IMF WEO
Filter 2	Import Demand Potential (product level)	Import value _{tw} (size); short-term growth _{tw} (2yr); long-term growth _{tw} (5yr)	Demand-driven growth; product life cycle	CEPII BACI; UN Comtrade
Filter 3	Market Accessibility (barriers — country × product)	Market concentration _{tw} (HHI); tariffs (AVE); logistics costs (LMAI/CMAI); time costs	New economic geography; trade costs; institutional friction	ITC MacMap; World Bank LPI; Doing Business; shipping lines; CTS
Filter 4	Strategic Categorisation (competitiveness — country × product)	RCA _{tw} ; RTA _{tw} ; untapped potential value _{tw}	Comparative advantage; heterogeneous firms	CEPII BACI; calculated indices

Source: Authors.

4.3 Relevant HS codes

New export opportunities are found by applying the four filters through the **AEXI Market Finder** to international trade data covering the five stages of the semiconductor value chain. For each stage the appropriate products are identified by their HS code.

The relevant six-digit HS codes follow the OECD's list of semiconductor-related products (based on HS version 2017). That list contains 59 HS codes; one — HS 848630 (*machines for the manufacture of flat-panel displays*) — was dropped as not directly relevant for this semiconductor industry analysis study.

The resulting set of 58 HS codes, by stage of the value chain, is listed in **Appendix A**.

4.4 Findings

This sub-section reports the findings from applying the AEXI Market Finder across the four DSM filters (summarised in Table 1) and present them here as follows:

Product export and production maturity assessment: First, sub-section 4.4.1 calculates the RCA and RTA for all 58 semiconductor product exports and sorts them into four quadrants.

Identifying short-term export promotion opportunities: Sub-section 4.4.2 presents the untapped potential for short-term export promotion.

Identifying medium-term export development (investment attraction): Sub-section 4.4.3 presents the untapped potential for medium-term export development.

Key product-by-country analysis: Sub-section 4.4.4 presents the main product-by-country analysis for the key diversification opportunities; and

Regulatory context: Sub-section 4.4.5 discusses export restrictions and dual-use regulations applying to the 58 semiconductor products.

4.4.1 Revealed Comparative Advantage and Revealed Trade Advantage

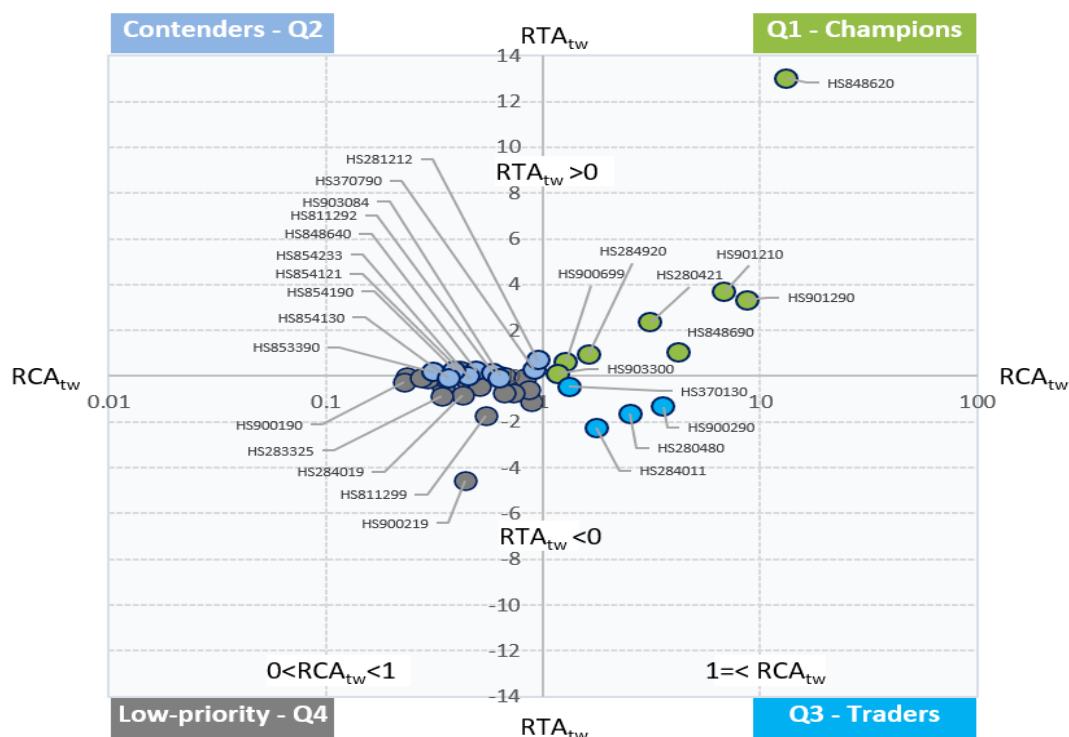
Consideration of the export-focused production characteristics and possible policy implications for the Netherlands for this group of products based on the RCA and RTA indicators:

- Champions [$RCA > 1$, $RTA > 0$]:** Netherlands most likely a mature export-focused internationally competitive producer. For such products the Netherlands has both $RCA > 1$ and $RTA > 0$. The exports of these products ought in principle to be able to respond relatively fast to market opportunities and therefore should form the basis of short-term export promotion strategies.
- Traders [$RCA > 1$, $RTA < 0$]:** Netherlands most likely currently mainly a re-exporter. In the case where the Netherlands has an $RCA > 1$ for a product but an $RTA < 0$ it is likely a re-exporter. Here, industrial policy actions could assess and aim to attract investment into building more local production capacity focused towards ultimately exporting;

- Contenders [$RCA < 1$, $RTA > 0$]:** Netherlands most likely less competitive net exporting producer. Where the $RCA < 1$ but $RTA > 0$ the country is potentially a net exporting producer of the product but not internationally competitive. In such a case, supportive industrial policy by government could be worthwhile to improve producers' competitiveness in the sector and enable them to export more.
- Low-priority [$RCA < 1$, $RTA < 0$]:** Netherlands most likely net importer and not internationally competitive. In the case of products where $RCA < 1$ and $RTA < 0$ the country is neither a net exporting producer, nor internationally competitive. Such products ought not to be the focus of a supporting export marketing strategy funded by taxpayers.

To facilitate recognition of the various combinations of RCA and RTA values of all 58 semiconductor products, these can be plotted as shown in **Figure 3** provides a plot of a selection of values, where the RTA is plotted on the vertical axis and the RCA, on the horizontal. With the vertical axis at 1, the plan is divided into four quadrants. The strategic export marketing approach to each product will depend into which quadrant it falls. Figure 4 shows a selection of products to illustrate the approach.

Figure 3: RCA and RTA for Netherlands Semiconductor-related Products



Source: Authors, calculated from CEPII BACI (Feb 2026)

In Figure 3, for example, products HS 848620 falls in **quadrant 1 (Champions)**, with the highest RCA and RTA. This is the product "Machines and apparatus of a kind used solely or principally for the manufacture of semiconductor

devices or electronic integrated circuits" and as shown in Table 3 this is the front-end wafer fabrication of ASML and ASMI, wherein the Netherlands is a significant global player. Products like these in quadrant 1, need little technical and

financial support by the government and rather, if at all, geopolitical support given the global environment as discussed in section 3.3 **There are eight semiconductor products ranges (products as defined by their HS 6-digit tariff codes) for which the Netherlands has both RCA ≥ 1 and RTA > 0 .** These are described in Table 2.

For products in the other quadrants, different types of government support may be needed to increase exports. For instance, products in **quadrant 2 (Contenders)** are characterised by RCA < 1 and RTA > 0 , which means the Netherlands produce these products, but is not yet internationally competitive. Government support could be

to identify the factors that can raise such competitiveness. An example of a product in this quadrant is HS 848610 “Machines and apparatus of a kind used solely or principally for the manufacture of semiconductor boules or wafers”. Unlike HS 848620 (where the Netherlands is a dominant global leader with ASML and ASM International), the manufacture of complete crystal-pulling and raw wafer-slicing systems under HS 848610 is globally concentrated in Japan (e.g., Disco, Tokyo Seimitsu), Germany (e.g., PVA TePla), and China. The Dutch producers and exports of these products include Trymax Semiconductor Equipment (Nijmegen) and VDL ETG / Advanced High-Tech Contract Manufacturers.

Table 2: Semiconductor product groups for which the Netherlands has RCA > 1 and RTA > 0 (“Champions”)

HS code	Description	Stage in value chain	RCA _{tw}	RTA _{tw}
HS848620	Machines and apparatus used solely or principally for the manufacture of semiconductor devices or electronic integrated circuits	Stage 2: Inputs & Equipment	13.21	13.01
HS901290	Parts and accessories for electron microscopes, proton microscopes and diffraction apparatus	Stage 2: Inputs & Equipment	8.69	3.32
HS901210	Electron microscopes, proton microscopes and diffraction apparatus	Stage 2: Inputs & Equipment	6.84	3.67
HS848690	Machines and apparatus of heading 8486; parts and accessories	Stage 2: Inputs & Equipment	4.22	1.03
HS280421	Argon	Stage 2: Inputs & Equipment	3.13	2.36
HS284920	Silicon carbide	Stage 2: Inputs & Equipment	1.62	0.94
HS900699	Photographic flashlight apparatus	Stage 2: Inputs & Equipment	1.27	0.62
HS903300	Regulating or controlling instruments	Stage 2: Inputs & Equipment	1.17	0.10

Source: Authors, calculated from CEPII BACI (Feb 2025).

Falling into **quadrant 3 (Traders)** are products such as HS 900290 “Lenses, prisms, mirrors and other optical elements, mounted”. Within the semiconductor ecosystem, HS 900290 products are at the core of photolithography, optical inspection, and wafer alignment. Here, the Netherlands functions primarily as a re-exporter and assembly staging hub rather than a primary manufacturer of raw high-end optical glass and mirrors. The specialized optical fabrication (such as diamond-turning, magnetorheological finishing, and atomic-scale optical polishing) is concentrated in Germany (Carl Zeiss SMT), the United States, and Japan. In the Netherlands, ASML is the principal importer of high-precision mounted optics - notably from its strategic partner Carl Zeiss SMT in Germany. While ASML integrates many into complete scanners (HS 848620), it also imports, stocks, and exports large quantities of mounted optical modules and replacement lens/mirror blocks under HS 900290.

Finally, in **quadrant 4 (Low-priority)** are a product such as HS 284019 (Borates; disodium tetraborate (refined borax), other than anhydrous). Borates are vital fluxing agents and network formers in the production of alkali-free aluminoborosilicate glass, which serves as the substrate for advanced flat-panel displays (OLED/LCD) and specialized ultra-clean borosilicate laboratory glassware used in wafer fab wet-benches. Here for the Netherlands RCA < 1 and RTA < 0 so that the country is neither a net producer, nor international competitive. Türkiye dominates the global production and export of refined borates - holding over 70% of the world’s proven boron mineral reserves and controls around 60% of the global refined borate export market. Clearly, lacking the mineral reserves and the control over the global export market, it is not recommended that the Netherlands make such products the focus for supporting an export marketing strategy.

The eight semiconductor products listed in

Table 3 are currently export-focused and in which the Netherlands has established international competitiveness, is a current exporter, and has local production capacity (for the purposes of exports, i.e. it is not merely a re-exporter). Their exports ought in principle to respond relatively quickly

to market opportunities, and would therefore form the basis of short-term export-promotion strategies. All eight are used in Stage 2 of the semiconductor value chain.

Table 3 describes the role of each product and lists the major Dutch producers/exporters.

Table 3. Role of the Netherlands' key semiconductor export products and Champions

HS code	Description	Value-chain role	Dutch champion
HS848620	Machines and apparatus used solely or principally for the manufacture of semiconductor devices or electronic integrated circuits	Front-end wafer fabrication: photolithography scanners (DUV/EUV) and atomic -layer deposition (ALD/CVD) systems that project circuit patterns and grow atomic layers onto wafers.	ASML / ASM International (ASMI)
HS901290	Parts and accessories for electron microscopes, proton microscopes and diffraction apparatus	Metrology & failure -analysis sub-assemblies: specialised electron -optics columns, detectors, vacuum stages and sample-handling units for sub-nanometre inspection tools.	Thermo Fisher Scientific
HS901210	Electron microscopes, proton microscopes and diffraction apparatus	Process control & R&D failure analysis: SEM, TEM and scanning-probe metrology tools to inspect gate profiles, detect defect clusters and verify multilayer integrity.	Thermo Fisher Scientific / Nearfield Instruments
HS848690	Machines and apparatus of heading 8486; parts and accessories	Equipment subsystems & precision modules: high-precision mechatronic motion stages, wafer -clamping tables, reticle handlers and vacuum transport assemblies integrated into primary wafer tools.	VDL ETG (Enabling Technologies Group)
HS280421	Argon	Specialty gas / chemical inputs: ultra-high -purity inert gas for protective atmospheres during annealing, carrier gas in CVD/ALD, and primary plasma gas in dry etching/sputtering.	Air Liquide Nederland / Linde Gas Benelux
HS284920	Silicon carbide	Wide-bandgap substrates & furnace components: high-voltage, high-temperature power -semiconductor substrates; ultra-clean sintered SiC components (wafer boats, process tubes) inside fabrication furnaces.	ESD-SIC B.V.
HS900699	Photographic flashlight apparatus	Optical sources & strobe metrology: high-intensity pulsed illumination modules, discharge flash lamps and optical strobe sources for wafer alignment, defect inspection and exposure calibration.	Signify (formerly Philips Lighting)
HS903300	Regulating or controlling instruments	Inline process regulation & metrology optics: high-precision optoelectronic sensors, interferometers, laser -positioning components and real-time motion controllers regulating optical inspection and wafer positioning.	Prodrive Technologies

Source: Authors' compilation.

4.4.2 Untapped potential for short-term export promotion

Given that at least eight key products have favourable RCA and RTA (quadrant 1), an immediate strategy could focus short-term promotion on these eight products.

Applying the DSM methodology²⁷ through the AEXI Market Finder, there is at least **€ 11 billion** of untapped export potential from further exports of these eight products.

For each product, the estimated realistic potential to target markets and its relation to current exports is summarised in Table 4.

The single largest short-term opportunity is **HS 848620** (ASML and ASMI's major exports) at around **€ 7.29 billion**, followed by **HS 848690** (parts and accessories) at around **€ 3.3 billion**.

Table 4. Untapped export potential for short-term export promotion — values in '000s EUR

HS6 code	Description	Potential Markets (no.)	[A] Realistic export potential	[B] Home exports to target(s)	[C] = B / G	[D] = B / A	[G] Target imports	RCA _{tw}	RTA _{tw}
HS848620	Machines/apparatus for the manufacture of semiconductor devices or ICs	23	7,294,523	16,826,825	0.26	2.31	63,661,980	13.21	13.01
HS848690	Machines/apparatus of heading 8486: parts and accessories	31	3,313,817	2,700,392	0.11	0.81	24,498,762	4.22	1.03
HS901210	Microscopes (excl. optical): diffraction apparatus	35	340,511	470,660	0.17	1.38	2,697,566	6.84	3.67
HS903300	Chapter-90 machines/appliances: parts and accessories n.e.c.	66	286,285	73,721	0.03	0.26	2,432,906	1.17	0.10
HS284920	Carbides: of silicon, whether or not chemically defined	26	91,213	41,841	0.06	0.46	655,270	1.62	0.94
HS901290	Microscopes (excl. optical): diffraction apparatus: parts and accessories	43	87,695	165,066	0.22	1.88	763,280	8.69	3.32
HS280421	Gases, rare: argon	43	27,672	23,278	0.11	0.84	202,610	3.13	2.36
HS900699	Photographic flashlight apparatus: parts and accessories	63	23,491	7,901	0.05	0.34	174,835	1.27	0.62
TOTAL		330	11,465,207	20,309,684			95,087,209		

Source: Authors, AEXI Market Finder. [A] total realistic export potential to target market(s); [B] current home-market exports to those markets; [G] target-market total imports.

Table 5 shows the major destinations. For most products China is the most lucrative market, with €3.74 billion in untapped sales across seven of the eight product lines, followed by Taiwan (4 lines), South Korea (6 lines), the USA (7 lines), Singapore (7 lines), Japan (6 lines), Malaysia (6 lines), Ireland (5 lines), Hong Kong (5 lines) and Germany (7 lines).

Table 5. Short-term untapped potential — top products by top 10 countries (€ millions)

Country	Total (€ billions)	HS848620	HS848690	HS901210	HS903300	HS284920	HS901290	HS900699	HS280421
China	3.74	2,965.2	613.6	138.6	13.2	2.9	10.0	1.1	-
Taiwan	1.74	1,129.8	587.7	14.0	-	-	3.7	-	-
South Korea	1.71	1,176.7	444.8	85.7	-	-	5.7	0.3	0.0
United States	1.29	744.7	421.4	45.0	37.6	29.1	11.4	4.6	-
Singapore	1.08	470.5	581.1	4.5	12.9	1.2	4.7	0.4	1.5
Japan	0.58	299.7	247.4	13.9	11.2	-	10.8	1.1	-
Malaysia	0.35	117.1	224.0	-	7.3	-	1.4	0.6	0.1
Hong Kong	0.21	177.3	-	-	24.2	0.1	0.9	4.4	-
Ireland	0.19	187.5	-	0.8	2.5	-	0.2	0.1	-
Germany	0.14	-	80.7	15.0	23.6	9.0	7.6	1.5	1.4
TOTAL	11.03	7,268.5	3,200.7	317.4	132.3	42.2	56.4	14.1	3.1

Source: Authors, AEXI Market Finder. Note entries with 0 indicate small values, while '-' indicates no associated opportunity.

THE GEO-ECONOMIC COST OF RESTRICTIONS

With restrictions on exports of HS 848620 and HS 848690 to China in place at the time of writing, the untapped €3.74 billion should be read as the future opportunity cost to the Netherlands' semiconductor industry of these restrictions. These come on top of the direct export losses caused by the restrictions.

However, as this report shows, alternative markets can make up for this loss if exploited. Over the medium term, diversifying into other semiconductor products, most notably integrated circuits, can further limit the impact.

4.4.3 Untapped potential for medium-term export development

Products whose RCA and RTA place them in quadrants 2 (Contenders) and 3 (Traders) need dedicated (and different) industrial policy — grounded in a sound export -marketing strategy — to improve competitiveness and establish local production where re-exports dominate. The methodology was used to identify the untapped potential for these products. The results are shown in **Appendix B**, covering products in quadrant 2 (12 of the 58 products) and quadrant 3 (4 of the 58 products) where, over the medium term, a purpose-fit export -development strategy can help realise the potential and diversify Dutch semiconductor exports.

Appendix B shows around **€ 50 billion** in untapped potential across these 16 products, concentrated in integrated circuits: **HS854231** (processors and controllers) and **HS854290** (Parts of electronic integrated circuits), worth

€42 billion and **€3 billion** in these two products — a combined ‘untapped’ potential of around **€45 billion**. Table 6 shows the top -10 medium -term products by the top -10 countries.

Table 6. Medium-term untapped potential — top-10 products by top -10 countries (€ billions)

Country	Total	HS854231	HS854290	HS848640	HS370790	HS854121	HS854190	HS854110	HS852352	HS900290	HS903084
Hong Kong	11.64	10.80	0.38	0.05	-	0.27	0.07	-	0.03	0.02	0.01
China	9.51	8.07	0.11	0.50	0.30	0.07	0.14	0.14	0.02	0.06	0.04
Singapore	5.33	4.67	0.33	0.13	-	0.03	0.09	0.07	-	0.01	0.00
South Korea	4.13	3.76	-	0.20	-	0.04	-	0.07	0.01	0.04	0.01
Vietnam	3.49	3.32	-	-	0.01	0.02	0.04	0.05	0.02	0.02	0.00
Malaysia	3.36	2.44	0.61	0.07	0.00	-	0.18	0.06	-	-	0.00
United States	3.09	2.61	-	0.13	-	0.02	0.06	0.06	0.09	0.04	0.02
Mexico	2.22	2.08	0.02	0.01	-	0.02	-	0.05	0.03	-	-
Taiwan	1.88	1.62	0.09	0.10	-	-	0.02	-	0.01	0.03	0.01
India	1.58	1.51	-	-	-	-	0.01	0.05	-	0.00	0.00
Total	46.23	40.87	1.54	1.18	0.31	0.47	0.60	0.54	0.21	0.22	0.10

Source: Authors, AEXI Market Finder.

The top four markets for medium-term IC exports are Hong Kong, China, Singapore and South Korea, with further opportunities in Vietnam, Taiwan, the United States, Malaysia, Mexico and India. **It should be noted, as mentioned, that exports to China and Hong Kong is facing export restrictions.** Whether these may hold over the medium term is uncertain. **For the rest of the analysis the focus will be on markets outside of China and Hong Kong.**

4.4.4 Export-market analysis for key medium-term opportunities

This sub-section discusses the product-by-country opportunities for medium-term development (quadrants 2 and 3). The focus is on the opportunities (listed in Table 6) valued at more than €500 million, and to **countries outside China and Hong Kong** (following Weber and Laha, 2026).

These are shown in Table 7 — **31 product-by-country** combinations, for five products (HS854231, HS854290, HS848640, HS854110 and HS854190) across these eight countries.

The total value of these opportunities is **€25 billion**. If realised, this would nearly double the Netherlands' total 2025 semiconductor exports (estimated at around €33 billion) and reduce dependency on ASML/ASMI's exports of manufacturing machines (HS8486).

Table 7. Selection of product-by-country export-development priorities (€ billions)

Country	Processors & controllers (HS854231) [8/10 top markets]	Parts of electronic integrated circuits (HS854290) [7/ 10 top markets]	Machines for assembling semiconductor devices or electronic integrated circuits (HS848640) [6/ 10 top markets]	Electrical apparatus: diodes, other than photosensitive or light-emitting diodes (LED) (HS854110) [7/ 10 top markets]	Parts for diodes, transistors, semiconductor- and photosensitive semiconductor devices (HS854190) [6/ 10 top markets]
Singapore	4.67	0.33	0.13	0.07	0.09
South Korea	3.76	-	0.20	0.07	-
Vietnam	3.32	-	-	0.05	0.04
United States	2.61	-	0.13	0.06	0.06
Malaysia	2.44	0.61	0.07	0.06	0.18
Mexico	2.08	0.02	0.01	0.05	-
Taiwan	1.62	0.09	0.10	-	0.02
India	1.51	-	-	0.05	0.01
Total	22.00	1.05	0.63	0.41	0.40

Source: Authors, AEXI Market Finder (extract of Table 6)

Across the five product groups the identified medium-term opportunity totals around €25 billion, of which *processors and controllers (HS854231)* account for roughly €22 billion on their own. The remaining three groups each fall between €0.3 and €1 billion, while materially smaller in absolute terms, will have correspondingly less demanding scale for a new entrant.

Processors and controllers (HS854231)

There are medium-term opportunities of around €22 billion in Singapore, South Korea, Vietnam, the USA, Malaysia, Mexico, Taiwan and India.

Appendix C assesses these eight non-China markets. Tariff barriers are zero throughout, with competitive logistics into largely untapped destinations. Market entry divides in two: fast-expanding markets (Vietnam, the US, Malaysia) offer opportunities to capture growth, while stable giants (South Korea, Singapore, Taiwan, Mexico) require taking market-share from entrenched suppliers. India is a long-term growth market with diverse supplier networks.

Parts of electronic integrated circuits (HS854290)

There are medium-term opportunities of around €1 billion in Singapore, Malaysia, Taiwan and Mexico.

Appendix D contains an export-opportunity snapshot across these markets. While the Netherlands has historically captured little of the import share for this group (less than 0.05% on average), each market offers a favourable access environment with zero import duties and competitive logistics. This group represents four demand profiles: In global comparative terms, Taiwan is a relatively large market and shows strong short- and long-term import growth (requiring supplier scale), whereas Malaysia and Singapore are also large markets with Malaysia having exhibited recent growth while Singapore exhibits growth over the longer term. These markets will create potential for Dutch entrants to both displace established East-Asian competitors and tap into longer term growth. Mexico is a newer (in relative terms) emergent market.

Semiconductor handling machines (HS848640)

There are medium-term opportunities of around €0.6 billion in South Korea, the USA, Singapore, Taiwan, Malaysia and Mexico.

Appendix E contains an export-opportunity snapshot across these six non-China markets. Tariff barriers are zero throughout and logistics are competitive, while the Netherlands has to date supplied little of any of these markets. South Korea is the largest single opportunity and grows over both the short and long term, the USA grows over the longer term and Taiwan over the most recent two years, so all three reward exporters able to scale with demand. Singapore and Malaysia are large but flat, meaning entry there depends on displacing entrenched suppliers rather than riding growth, and Mexico is a small but expanding market suited to smaller-volume producers. Singapore itself is the leading competing supplier into most of this group, so competition is concentrated regionally rather than European.

Diodes (HS854110)

There are medium-term opportunities of around €0.35 billion in South Korea, Malaysia, the USA, India, Mexico and Vietnam.

Appendix F contains an export-opportunity snapshot across these six non-China markets. This is the most evenly spread of the four product groups, with each market representing roughly €0.05 to €0.07 billion, so market selection can be driven by an exporter's existing relationships rather than by size alone. Malaysia and India grow over both the short and long term, Vietnam over the longer term, while South Korea and the USA are large but flat and Mexico shows recent expansion without a positive trend across the full period. Tariffs are zero throughout. The defining feature of this group is that China is the leading supplier into four of the six markets, so entry is largely a question of displacing Chinese supply; Mexico is the exception, where the USA dominates.

Parts of semiconductor devices (HS854190)

There are medium-term opportunities of around €0.4 billion in Malaysia, Singapore, the USA, Vietnam, Taiwan and India.

Appendix G assesses these six non-China markets, all of which apply zero import duties and are relatively accessible from the Netherlands. Malaysia is the single largest opportunity in the group and shows long-term growth, while the USA and Vietnam expand over both the short and long term and together represent the clearest case for capturing new demand. Singapore is large but stable and Taiwan shows recent growth without a positive trend across the full period, so both are share-taking propositions, and India is small but growing in both horizons. Competing supply is overwhelmingly intra-Asian and China, Japan, Malaysia and Singapore recur across the group, with the notable exception of the USA, where Vietnam, Malaysia and Mexico lead.

4.4.5 Dual-use and export restrictions

Semiconductor products include goods classified as dual-use — items, software and technology usable for both civilian and military purposes, typically subject to export controls. Two lists were used. The first is the EU's **List of Common High Priority Items** — specific dual-use and advanced-technology items critical to Russian military systems, part of the EU's sanctions regime in response to the war in Ukraine. The second is the EU's **list of dual-use items** (Annex I to Regulation (EU) 2021/821), which implements internationally agreed controls.

The EU's dual-use list provides Combined Nomenclature (CN) codes; CN eight-digit codes can be mapped to HS six-digit codes via the EU's correlation tables. The January 2025 Dual-Use Correlation Table lists around 5,900 CN codes.

Appendix H lists which of the 24 semiconductor products (8 short term and 16 medium term) identified as having realistic untapped potential are classified as having dual-use. It can be seen that a total of **11 are classified as dual-use** and are therefore subject to export controls. This shows that the products with the greatest export upside are precisely the ones most exposed to export-control licensing.

05

SECTION 5

Summary and Conclusions

The semiconductor industry forms the backbone of global digital infrastructure, artificial intelligence, and computing, projected to exceed US \$1.6 trillion by 2030.

Within this supply chain, the Netherlands occupies an indispensable position: its industry generates €46 billion annually, employs 43,000 people, and accounts for one-third of all private Dutch R&D expenditure. Anchored by global toolmakers ASML, ASM International, and BESI, the Netherlands exported 19% of global semiconductor manufacturing equipment (US \$29 billion) in 2025.

However, this reliance on manufacturing equipment leaves the Dutch ecosystem vulnerable to US-China decoupling. Tightened export-control licensing has curtailed semiconductor trade with China. At the same time, European microelectronics policy has focused on inward-looking policies, while overlooking export promotion in third markets.

To prevent marginalization as China expands legacy-node compute, the Netherlands must complement defensive policies - like Project Beethoven - with an active semiconductor export strategy. Applying the Decision Support Model via the *AEXI Export Market Finder*, this report identified over **€61 billion** in untapped realistic export potential, highlighting opportunities outside China and Hong Kong.

Short-term potential untapped export opportunities worth **€11 bn** exists for **eight** "Champion" products with established comparative and trade advantages ($RCA > 1$, $RTA > 0$). While export controls on China represent €3.74 billion in foregone future potential, alternative fabrication hubs can absorb this capacity, led by Taiwan (€1.74 bn), South Korea (€1.71 bn), and the United States (€1.29 bn). Equipment lines HS 848620 (€7.29 bn) and HS 848690 (€3.31 bn) dominate.

Medium-term potential untapped export opportunities worth **€50 bn** exists for **16** "Contender" and "Trader" products requiring industrial support. This untapped demand is heavily concentrated in integrated circuits: processors and controllers (HS 854231) at €42.72 billion and IC parts (HS 854290) at €2.44 billion.

Focusing outside China and Hong Kong, the report identified 31 priority product-by-country opportunities across eight key destinations to be developed over the medium term: *Singapore, South Korea, Vietnam, the United States, Malaysia, Mexico, Taiwan, and India*. Valued at €25 billion, these priority corridors provide the volume needed to offset Chinese market restrictions and nearly double total Dutch 2025 semiconductor exports.

Here, the Netherlands should target fast-growing markets like Vietnam and the US to capture expansion, while competing for share against entrenched suppliers in stable markets like Singapore, South Korea, and Taiwan.

Finally, of the 24 (8 + 16) short- and medium-term products for which untapped potential was identified, a total of 11 are classified as dual-use and are therefore subject to export controls. As such, it is important that the Netherlands addresses regulatory friction proactively in future, ensuring that export licensing frameworks will support efficient trade with allied non-China markets. For instance, the Dutch Central Licensing Office (CDIU) should implement streamlined General Export Authorizations (EU GEAs) and fast-track pre-clearance mechanisms for verified commercial end-users in allied target markets (US, South Korea, Taiwan, Singapore) to ensure licensing timelines do not impede commercial deliveries.

By pursuing these medium-term, design-driven opportunities, the Netherlands has the potential to close to double its total 2025 semiconductor exports.

APPENDIX A

A

HS codes for the semiconductor industry, by stage of the value chain

The relevant six-digit HS codes are grouped below by the five broad stages of the semiconductor value chain. Stage 1 (R&D and IP design) has no associated goods codes, as circuit

architecture and EDA/IP design are intangible services and software.

Stage 1 — R&D and IP design

HS code	Description
—	R&D, circuit architecture and EDA/IP design are intangible services/software — no HS goods codes.

Stage 2 — Inputs and equipment

HS code	Description
HS252800	Natural borates and concentrates thereof (whether or not calcined), excl. borates from natural brine; natural boric acid ($\leq 85\% \text{H}_3\text{BO}_3$)
HS280421	Argon
HS280429	Rare gases (excluding argon)
HS280461	Silicon; $\geq 99.99\%$ by weight of silicon
HS280480	Arsenic
HS281000	Oxides of boron; boric acids
HS281212	Phosphorus oxychloride
HS282560	Germanium oxides and zirconium dioxide
HS283325	Sulphates, copper
HS284011	Borates; disodium tetraborate (refined borax), anhydrous
HS284019	Borates; disodium tetraborate (refined borax), other than anhydrous
HS284920	Silicon carbide
HS285000	Hydrides, nitrides, azides, silicides and borides, whether or not chemically defined
HS370130	Photographic plates and film in the flat, sensitised, unexposed, any side > 255 mm
HS370199	Photographic plates and film in the flat, sensitised, unexposed (other materials); instant print film
HS370790	Photographic goods
HS811292	Gallium, germanium, hafnium, indium, niobium, rhenium and vanadium; articles, unwrought, incl. waste, scrap, powders
HS811299	Articles of niobium, gallium, indium, vanadium and germanium, n.e.s.
HS841459	Air or vacuum pumps; gas compressors and fans; ventilating/recycling hoods; safety cabinets; parts
HS841950	Heat-exchange units (excl. those used with boilers)
HS842129	Machinery for filtering or purifying liquids (excl. certain specified types)
HS842139	Machinery for filtering or purifying gases (excl. intake-air/exhaust filters)
HS842199	Parts of machinery for filtering or purifying liquids or gases, n.e.s.
HS848610	Machines/apparatus for the manufacture of semiconductor boules or wafers
HS848620	Machines/apparatus for the manufacture of semiconductor devices or ICs
HS848690	Machines and apparatus of heading 8486; parts and accessories
HS900120	Sheets and plates of polarising material / sheets of semiconductor
HS900190	Lenses, prisms, mirrors and other optical elements, unmounted
HS900219	Objective lenses
HS900220	Optical filters
HS900290	Lenses, prisms, mirrors and other optical elements, mounted
HS900699	Photographic flashlight apparatus
HS901210	Electron microscopes, proton microscopes and diffraction apparatus
HS901290	Parts and accessories for electron microscopes, proton microscopes and diffraction apparatus
HS903084	Instruments for measuring/checking electrical quantities, with a recording device
HS903300	Regulating or controlling instruments

Stage 3 — Wafer fabrication

HS code	Description
HS381800	Silicon wafers
HS854110	Diodes, other than photosensitive or light-emitting diodes
HS854121	Transistors (other than photosensitive), dissipation < 1 W
HS854129	Transistors (other than photosensitive), dissipation ≥ 1 W
HS854130	Thyristors, diacs and triacs, other than photosensitive devices
HS854140	Photosensitive apparatus, incl. photovoltaic cells (modules/panels), light-emitting diodes
HS854150	Photosensitive semiconductor devices n.e.s. in 8541, incl. photovoltaic cells
HS854160	Crystals; mounted piezo-electric
HS854231	Electronic ICs; processors and controllers (whether or not combined with memories, converters, logic, amplifiers, etc.)
HS854232	Electronic ICs; memories
HS854233	Electronic ICs; amplifiers
HS854239	Electronic ICs; n.e.c. in heading 8542

Stage 4 — Packaging and testing (ATP/OSAT)

HS code	Description
HS848640	Machines/apparatus for the manufacture/repair of masks and reticles, assembling semiconductor devices or ICs, or for handling items of heading 8486
HS854190	Parts for diodes, transistors and similar / photosensitive semiconductor devices
HS854290	Parts of electronic integrated circuits
HS903082	Instruments for measuring/checking semiconductor wafers or devices, incl. ICs
HS903141	Optical instruments for inspecting semiconductor devices

Stage 5 — End-system integration

HS code	Description
HS852351	Solid-state, non-volatile data-storage devices (flash memory/electronic storage cards)
HS852352	Cards incorporating one or more electronic ICs ("smart cards")
HS852359	Semiconductor media, unrecorded, for recording sound or other phenomena
HS853290	Parts of electrical fixed/variable/adjustable capacitors, n.e.s.
HS853390	Parts of electrical resistors

B

APPENDIX B

Medium-term export potential

The table below lists the 16 products in quadrants 2 and 3 of Figure 3 for which a medium-term export-development strategy could realise untapped potential. Monetary values are in '000s EUR; RCA and RTA are time-weighted.

Untapped medium-term export potential across 16 products ('000s EUR)

Quadrant	HS6 code	Description	Potential Markets (no.)	[A] Realistic potential	[B] Home exports	[C]=B/G	[D]=B/A	[G] Target imports	RCA _{tw}	RTA _{tw}
Q2	HS854231	Electronic integrated circuits: processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits	25	42,715,127	611798.8	0.0021	0.0143	287,291,691	0.40	0.05
Q2	HS854290	Parts of electronic integrated circuits	50	2,437,735	185422.2	0.0110	0.0761	16,852,634	0.46	0.07
Q2	HS848640	Machines and apparatus of a kind used solely or principally for the manufacture or repair of masks and reticles, assembling semiconductor devices or electronic integrated circuits, or for lifting, handling, loading or unloading items of heading 8486	15	1,243,052	106436.4	0.0124	0.0856	8,585,804	0.49	0.21
Q2	HS854110	Electrical apparatus: diodes, other than photosensitive or light-emitting diodes (LED)	44	780,905	44735.54	0.0078	0.0573	5,750,744	0.46	0.02
Q2	HS854190	Electrical apparatus: parts for diodes, transistors and similar semiconductor devices and photosensitive semiconductor devices	47	724,671	43060.07	0.0087	0.0594	4,963,833	0.39	0.24
Q2	HS854121	Electrical apparatus: transistors, (other than photosensitive), with a dissipation rate of less than 1W	29	577,692	13814.96	0.0037	0.0239	3,763,274	0.41	0.24
Q2	HS852352	Semiconductor media: smart cards, whether or not recorded, excluding products of Chapter 37	48	370,901	26406.04	0.0089	0.0712	2,970,192	0.63	0.01
Q2	HS370790	Photographic goods: chemical preparations other than sensitised emulsions, put up in measured portions or put up for retail sale in a form ready for use	22	354,345	31827.85	0.0145	0.0898	2,201,271	0.91	0.29
Q2	HS903084	Instruments and apparatus: n.e.c. in heading no. 9030, with a recording device	47	136,932	15005.05	0.0147	0.1096	1,020,542	0.63	0.03
Q2	HS811292	Gallium, germanium, hafnium, indium, niobium (columbium), rhenium and vanadium: articles thereof, unwrought, including waste and scrap, powders	14	101,543	10134.56	0.0142	0.0998	714,286	0.59	0.13
Q2	HS853390	Resistors: parts of the resistors of heading no. 8533	40	29,490	1648.947	0.0079	0.0559	208,223	0.31	0.18
Q2	HS281212	Phosphorus oxychloride	6	807	731.106	0.1437	0.9061	5,086	0.95	0.69
Q3	HS900290	Optical elements: n.e.c. in heading no. 9002 (e.g. prisms and mirrors), mounted, being parts or fittings for instruments or apparatus, of any material (excluding elements of glass not optically worked)	38	295,563	280172.6	0.1198	0.9479	2,338,980	3.58	-1.34
Q3	HS370130	Photographic plates and film: in the flat, sensitised, unexposed, with any side exceeding 225mm, of any materials other than paper, paperboard or textiles	49	225,932	73297.7	0.0494	0.3244	1,482,478	1.32	-0.46
Q3	HS284011	Borates: disodium tetraborate (refined borax), anhydrous	9	1,943	3400.942	0.2246	1.7503	15,143	1.76	-2.25
Q3	HS280480	Arsenic	12	739	924.8226	0.1738	1.2506	5,320	2.52	-1.65
TOTAL			495	49,997,378	1,448,817			338,169,500		

Source: Authors, AEXI Market Finder (CEPII BACI). [A] realistic export potential; [B] current home-market exports to target(s); [G] target-market total imports.

APPENDIX C

C

Export-opportunity snapshot: processors & controllers (HS854231)

Medium-term opportunities for electronic processors and controllers (HS 854231) across eight non-China target markets.

Tariff barriers are zero throughout, with competitive logistics into largely all untapped destinations.

Target-market snapshot for HS854231

Market	Import demand	Competition	Access to market	Market-growth strategy	Existing relationship
Singapore	While Singapore meets the required overall import-demand evaluation criteria, this market's import demand is classified as relatively large in global terms, but stable or 'flat' from a growth perspective. Note that Singapore does not have an absolute positive growth trend for this product over the period.	Historical import patterns for Singapore specifically demonstrate that Singapore is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Taiwan, South Korea and Malaysia</i> .	In relative terms for this product, Singapore is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large but stable markets, this may be an ideal market to enter. A new entrant would need to consider how to take market share from existing suppliers. For new exporters this market may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Singapore's import demand specifically for this product. If an exporter is already mature at exporting it, Singapore may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
South Korea	While South Korea meets the required overall import-demand evaluation criteria, this market's import demand is classified as relatively large in global terms, but stable or 'flat' from a growth perspective. Note that South Korea does not have an absolute positive growth trend for this product over the period.	Historical import patterns for South Korea specifically demonstrate that South Korea is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Taiwan, Japan and Singapore</i> .	In relative terms for this product, South Korea is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large but stable markets, this may be an ideal market to enter. A new entrant would need to consider how to take market share from existing suppliers. For new exporters this market may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of South Korea's import demand specifically for this product. If an exporter is already mature at exporting it, South Korea may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Vietnam	While Vietnam meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years as well as the last 5 years (for which data is available). Vietnam exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for Vietnam specifically demonstrate that Vietnam is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>South Korea, China, Hong Kong and Malaysia</i> .	In relative terms for this product, Vietnam is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	This market is large in global terms and exhibits growth in both the short and long term. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Vietnam's import demand specifically for this product. If an exporter is already mature at exporting it, Vietnam may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.

Market	Import demand	Competition	Access to market	Market-growth strategy	Existing relationship
Taiwan	While Taiwan meets the required overall import-demand evaluation criteria, this market's import demand is classified as relatively large in global terms, but stable or 'flat' from a growth perspective. Note that Taiwan does not have an absolute positive growth trend for this product over the period.	Historical import patterns for Taiwan specifically demonstrate that Taiwan is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Malaysia, South Korea and China</i> .	In relative terms for this product, Taiwan is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large but stable markets, this may be an ideal market to enter. A new entrant would need to consider how to take market share from existing suppliers. For new exporters this market may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Taiwan's import demand specifically for this product. If an exporter is already mature at exporting it, Taiwan may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
United States	While United States meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years as well as the last 5 years (for which data is available). United States exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for United States specifically demonstrate that United States is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Malaysia, Taiwan and Israel</i> .	In relative terms for this product, United States is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	This market is large in global terms and exhibits growth in both the short and long term. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of United States's import demand specifically for this product. If an exporter is already mature at exporting it, United States may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Malaysia	While Malaysia meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years as well as the last 5 years (for which data is available). Malaysia exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for Malaysia specifically demonstrate that Malaysia is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>United States, Taiwan and Ireland</i> .	In relative terms for this product, Malaysia is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	This market is large in global terms and exhibits growth in both the short and long term. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Malaysia's import demand specifically for this product. If an exporter is already mature at exporting it, Malaysia may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Mexico	While Mexico meets the required overall import-demand evaluation criteria, this market's import demand is classified as relatively large in global terms, but stable or 'flat' from a growth perspective. Note that Mexico does not have an absolute positive growth trend for this product over the period.	Historical import patterns for Mexico specifically demonstrate that Mexico is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>United States, Malaysia and Vietnam</i> .	In relative terms for this product, Mexico is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large but stable markets, this may be an ideal market to enter. A new entrant would need to consider how to take market share from existing suppliers. For new exporters this market may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Mexico's import demand specifically for this product. If an exporter is already mature at exporting it, Mexico may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.

Market	Import demand	Competition	Access to market	Market-growth strategy	Existing relationship
India	While India meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the last 5 years (for which data is available), but less so in the latest 2 years. India exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for India specifically demonstrate that India is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>China, Taiwan and South Korea</i> .	In relative terms for this product, India is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large, long-term growth markets, this may be an ideal market to enter. Unless supplying niche products, it may require larger production capacity to fill import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of India's import demand specifically for this product. If an exporter is already mature at exporting it, India may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.

APPENDIX D

D

Export-opportunity snapshot: parts of electronic integrated circuits (HS854290)

Medium-term opportunities for parts of electronic integrated circuits (HS854290) across four non-China target markets.

Tariff barriers are zero throughout, with competitive logistics into largely untapped destinations.

Target-market snapshot for HS854290

Market	Import demand	Competition	Access to market	Market-growth strategy	Existing relationship
Malaysia	While Malaysia meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years (for which data is available). Malaysia exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for Malaysia specifically demonstrate that Malaysia is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>United States, Japan and China</i> .	In relative terms for this product, Malaysia is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large, short-term growth markets, this may be an ideal market to enter. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers, though the growth may not be guaranteed in the longer term. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Malaysia's import demand specifically for this product. If an exporter is already mature at exporting it, Malaysia may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Singapore	While Singapore meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the last 5 years (for which data is available), but less so in the latest 2 years. Singapore exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for Singapore specifically demonstrate that Singapore is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Taiwan, Malaysia and China</i> .	In relative terms for this product, Singapore is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large, long-term growth markets, this may be an ideal market to enter. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Singapore's import demand specifically for this product. If an exporter is already mature at exporting it, Singapore may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.

Market	Import demand	Competition	Access to market	Market-growth strategy	Existing relationship
Taiwan	While Taiwan meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years as well as the last 5 years (for which data is available). Taiwan exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for Taiwan specifically demonstrate that Taiwan is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Japan, Malaysia and China</i> .	In relative terms for this product, Taiwan is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	This market is large in global terms and exhibits growth in both the short and long term. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Taiwan's import demand specifically for this product. If an exporter is already mature at exporting it, Taiwan may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Mexico	While Mexico meets the required overall import-demand evaluation criteria, this market's import demand is growing in both the short and long term, but relative to other global markets it is a small market. Mexico exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for Mexico specifically demonstrate that Mexico is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>United States, Malaysia and Thailand</i> .	In relative terms for this product, Mexico is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively small but growing markets, this may be an ideal market to enter, understanding that larger volumes may only arise in future. This market may pose opportunity for smaller-volume export producers.	The Netherlands to date has supplied none or relatively little of Mexico's import demand specifically for this product. If an exporter is already mature at exporting it, Mexico may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.

APPENDIX E

E

Export-opportunity snapshot: semiconductor handling machines (HS848640)

Medium-term opportunities for machines and apparatus of a kind used solely or principally for the manufacture or repair of masks and reticles, assembling semiconductor devices or electronic integrated circuits, or for lifting, handling, loading or

unloading items (**HS 848640**) across six non-China target markets. Tariff barriers are zero throughout, with competitive logistics into largely untapped destinations.

Target-market snapshot for HS848640

Market	Import demand	Competition	Access to market	Market-growth strategy	Existing relationship
South Korea	While South Korea meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years as well as the last 5 years (for which data is available). South Korea exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for South Korea specifically demonstrate that South Korea is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Singapore, Japan and the United States</i> .	In relative terms for this product, South Korea is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	This market is large in global terms and exhibits growth in both the short and long term. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of South Korea's import demand specifically for this product. If an exporter is already mature at exporting it, South Korea may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
United States	While the United States meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the last 5 years (for which data is available), but less so in the latest 2 years. The United States exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for United States specifically demonstrate that United States is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Singapore, Japan and China</i> .	In relative terms for this product, United States is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large, long-term growth markets, this may be an ideal market to enter. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of United States's import demand specifically for this product. If an exporter is already mature at exporting it, United States may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Singapore	While Singapore meets the required overall import-demand evaluation criteria, this market's import demand is classified as relatively large in global terms, but stable or 'flat' from a growth perspective. Note that Singapore does not have an absolute positive growth trend for this product over the period.	Historical import patterns for Singapore specifically demonstrate that Singapore is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Malaysia, the United States and China</i> .	In relative terms for this product, Singapore is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large but stable markets, this may be an ideal market to enter. A new entrant would need to consider how to take market share from existing suppliers. For new exporters this market may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Singapore's import demand specifically for this product. If an exporter is already mature at exporting it, Singapore may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.

Market	Import demand	Competition	Access to market	Market-growth strategy	Existing relationship
Taiwan	While Taiwan meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years (for which data is available). Taiwan exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for Taiwan specifically demonstrate that Taiwan is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Japan, South Korea and Singapore</i> .	In relative terms for this product, Taiwan is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large, short-term growth markets, this may be an ideal market to enter. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers, though the growth may not be guaranteed in the longer term. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Taiwan's import demand specifically for this product. If an exporter is already mature at exporting it, Taiwan may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Malaysia	While Malaysia meets the required overall import-demand evaluation criteria, this market's import demand is classified as relatively large in global terms, but stable or 'flat' from a growth perspective. Note that Malaysia does not have an absolute positive growth trend for this product over the period.	Historical import patterns for Malaysia specifically demonstrate that Malaysia is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Singapore, the United States and Japan</i> .	In relative terms for this product, Malaysia is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large but stable markets, this may be an ideal market to enter. A new entrant would need to consider how to take market share from existing suppliers. For new exporters this market may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Malaysia's import demand specifically for this product. If an exporter is already mature at exporting it, Malaysia may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Mexico	While Mexico meets the required overall import-demand evaluation criteria, this market's import demand is growing in both the short and long term, but relative to other global markets it is a small market. Mexico exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for Mexico specifically demonstrate that Mexico is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>China, the United States and Japan</i> .	In relative terms for this product, Mexico is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively small but growing markets, this may be an ideal market to enter, understanding that larger volumes may only arise in future. This market may pose opportunity for smaller-volume export producers.	The Netherlands to date has supplied none or relatively little of Mexico's import demand specifically for this product. If an exporter is already mature at exporting it, Mexico may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.

APPENDIX F

F

Export-opportunity snapshot: diodes (HS854110)

Medium-term opportunities for diodes, other than photosensitive or light-emitting diodes (HS 854110) across six

non-China target markets. Tariff barriers are zero throughout, with competitive logistics into largely untapped destinations.

Target-market snapshot for HS854110

Market	Import demand	Competition	Access to market	Market-growth strategy	Existing relationship
South Korea	While South Korea meets the required overall import-demand evaluation criteria, this market's import demand is classified as relatively large in global terms, but stable or 'flat' from a growth perspective. Note that South Korea does not have an absolute positive growth trend for this product over the period.	Historical import patterns for South Korea specifically demonstrate that South Korea is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>China, Taiwan and Japan</i> .	In relative terms for this product, South Korea is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large but stable markets, this may be an ideal market to enter. A new entrant would need to consider how to take market share from existing suppliers. For new exporters this market may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of South Korea's import demand specifically for this product. If an exporter is already mature at exporting it, South Korea may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Malaysia	While Malaysia meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years as well as the last 5 years (for which data is available). Malaysia exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for Malaysia specifically demonstrate that Malaysia is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Singapore, Germany and China</i> .	In relative terms for this product, Malaysia is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	This market is large in global terms and exhibits growth in both the short and long term. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Malaysia's import demand specifically for this product. If an exporter is already mature at exporting it, Malaysia may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
United States	While the United States meets the required overall import-demand evaluation criteria, this market's import demand is classified as relatively large in global terms, but stable or 'flat' from a growth perspective. Note that the United States does not have an absolute positive growth trend for this product over the period.	Historical import patterns for United States specifically demonstrate that United States is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>China, Taiwan and Japan</i> .	In relative terms for this product, United States is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large but stable markets, this may be an ideal market to enter. A new entrant would need to consider how to take market share from existing suppliers. For new exporters this market may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of United States's import demand specifically for this product. If an exporter is already mature at exporting it, United States may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.

Market	Import demand	Competition	Access to market	Market-growth strategy	Existing relationship
India	While India meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years as well as the last 5 years (for which data is available). India exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for India specifically demonstrate that India is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>China, Japan and Taiwan</i> .	In relative terms for this product, India is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	This market is large in global terms and exhibits growth in both the short and long term. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of India's import demand specifically for this product. If an exporter is already mature at exporting it, India may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Mexico	While Mexico meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years as well as the last 5 years (for which data is available). Note that Mexico does not have an absolute positive growth trend for this product over the period.	Historical import patterns for Mexico specifically demonstrate that Mexico is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>the United States, Taiwan and China</i> .	In relative terms for this product, Mexico is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	This market is large in global terms and exhibits growth in both the short and long term. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Mexico's import demand specifically for this product. If an exporter is already mature at exporting it, Mexico may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Vietnam	While Vietnam meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the last 5 years (for which data is available), but less so in the latest 2 years. Note that Vietnam does not have an absolute positive growth trend for this product over the period.	Historical import patterns for Vietnam specifically demonstrate that Vietnam is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>China, South Korea and Hong Kong</i> .	In relative terms for this product, Vietnam is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large, long-term growth markets, this may be an ideal market to enter. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Vietnam's import demand specifically for this product. If an exporter is already mature at exporting it, Vietnam may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.

APPENDIX G



Export-opportunity snapshot: parts of semiconductor devices (HS854190)

Medium-term opportunities for parts of semiconductor devices, LEDs and similar devices (HS 854190) across six non-

China target markets. Tariff barriers are zero throughout, with competitive logistics into largely untapped destinations.

Target-market snapshot for HS854190

Market	Import demand	Competition	Access to market	Market-growth strategy	Existing relationship
Malaysia	While Malaysia meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the last 5 years (for which data is available), but less so in the latest 2 years. Malaysia exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for Malaysia specifically demonstrate that Malaysia is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Singapore, China and Japan</i> .	In relative terms for this product, Malaysia is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large, long-term growth markets, this may be an ideal market to enter. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Malaysia's import demand specifically for this product. If an exporter is already mature at exporting it, Malaysia may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Singapore	While Singapore meets the required overall import-demand evaluation criteria, this market's import demand is classified as relatively large in global terms, but stable or 'flat' from a growth perspective. Note that Singapore does not have an absolute positive growth trend for this product over the period.	Historical import patterns for Singapore specifically demonstrate that Singapore is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Japan, Malaysia and China</i> .	In relative terms for this product, Singapore is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large but stable markets, this may be an ideal market to enter. A new entrant would need to consider how to take market share from existing suppliers. For new exporters this market may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Singapore's import demand specifically for this product. If an exporter is already mature at exporting it, Singapore may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
United States	While the United States meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years as well as the last 5 years (for which data is available). The United States exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for United States specifically demonstrate that United States is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>Vietnam, Malaysia and Mexico</i> .	In relative terms for this product, United States is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	This market is large in global terms and exhibits growth in both the short and long term. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of United States's import demand specifically for this product. If an exporter is already mature at exporting it, United States may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.

Market	Import demand	Competition	Access to market	Market-growth strategy	Existing relationship
Vietnam	While Vietnam meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years as well as the last 5 years (for which data is available). Vietnam exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for Vietnam specifically demonstrate that Vietnam is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>China, South Korea and Singapore</i> .	In relative terms for this product, Vietnam is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	This market is large in global terms and exhibits growth in both the short and long term. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Vietnam's import demand specifically for this product. If an exporter is already mature at exporting it, Vietnam may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
Taiwan	While Taiwan meets the required overall import-demand evaluation criteria, this market's import demand is relatively large in global terms and has exhibited strong growth over the latest 2 years (for which data is available). Note that Taiwan does not have an absolute positive growth trend for this product over the period.	Historical import patterns for Taiwan specifically demonstrate that Taiwan is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>China, Japan and Malaysia</i> .	In relative terms for this product, Taiwan is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively large, short-term growth markets, this may be an ideal market to enter. Unless supplying niche products, it may require larger production capacity to fill typical import demands. It presents major opportunity in terms of both new demand associated with growth and potential to target the market shares of existing suppliers, though the growth may not be guaranteed in the longer term. For new exporters it may pose more challenges in penetrating it due to entrenched competitors.	The Netherlands to date has supplied none or relatively little of Taiwan's import demand specifically for this product. If an exporter is already mature at exporting it, Taiwan may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.
India	While India meets the required overall import-demand evaluation criteria, this market's import demand is growing in both the short and long term, but relative to other global markets it is a small market. India exhibits an absolute positive growth trend for this product over the period.	Historical import patterns for India specifically demonstrate that India is trading with various alternative supplying countries for this product, and this contributes to a more favourable evaluation of the opportunity from a market-access perspective. Main competing countries are <i>China, Singapore and the United States</i> .	In relative terms for this product, India is more accessible from the Netherlands than other markets for the same product in terms of logistics and tariff costs. The import-tariff level for this product from the Netherlands is low, with zero import duty at time of evaluation.	If a company's strategy is to focus on relatively small but growing markets, this may be an ideal market to enter, understanding that larger volumes may only arise in future. This market may pose opportunity for smaller-volume export producers.	The Netherlands to date has supplied none or relatively little of India's import demand specifically for this product. If an exporter is already mature at exporting it, India may be an excellent opportunity to develop for market diversification — though it will require some investment in time, effort and cost to develop this hitherto 'untapped' market.

H

APPENDIX H

Dual-use classified semiconductor products

Of the 24 short- and medium-term products for which untapped potential was identified, 11 are classified as dual-use and are therefore subject to export controls.

Dual-use classification of shortlisted semiconductor products

HS Code	Description	Dual-Use Category
HS848620	Machines/apparatus for the manufacture of semiconductor devices or ICs	Extended Dual Use
HS848640	Machines and apparatus of a kind used solely or principally for the manufacture or repair of masks and reticles, assembling semiconductor devices or electronic integrated circuits, or for lifting, handling, loading or unloading items of heading 8486	Extended Dual Use
HS848690	Machines/apparatus of heading 8486: parts and accessories	Extended Dual Use
HS852352	Semiconductor media: smart cards, whether or not recorded, excluding products of Chapter 37	Extended Dual Use
HS853390	Resistors: parts of the resistors of heading no. 8533	Extended Dual Use
HS854110	Electrical apparatus: diodes, other than photosensitive or light-emitting diodes (LED)	High Priority Dual Use
HS854121	Electrical apparatus: transistors, (other than photosensitive), with a dissipation rate of less than 1W	High Priority Dual Use
HS854190	Electrical apparatus: parts for diodes, transistors and similar semiconductor devices and photosensitive semiconductor devices	Extended Dual Use
HS854231	Electronic integrated circuits: processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits	Extended Dual Use
HS854290	Parts of electronic integrated circuits	Extended Dual Use
HS900290	Optical elements: n.e.c. in heading no. 9002 (e.g. prisms and mirrors), mounted, being parts or fittings for instruments or apparatus, of any material (excluding elements of glass not optically worked)	Extended Dual Use

Source: Authors, based on the EU List of Common High Priority Items and Annex I of Regulation (EU) 2021/821.



REFERENCE NOTES

Notes

1. As PwC (2024:4) note, besides the 'Big 5' (ASML, ASM, NXP, Nexperia, BESI) there are more than 300 other players in the Dutch semicon ecosystem, representing 41% of total Dutch semicon revenue, including many small companies (62% have revenue below €10 million).
2. See: thesemiconductornewsletter.substack.com/p/semiconductor-industry-in-the-netherlands.
3. See: thesemiconductornewsletter.substack.com/p/semiconductor-industry-in-the-netherlands.
4. See: tue.nl — TU/e strategy 2030, Project Beethoven.
5. See: mckinsey.com/featured-insights/charts/computing-to-propel-chip-boom.
6. See: McKinsey, 'Semiconductors: etching the new map of strategic supply'.
7. 'Logic' refers to chips that process information, run calculations and execute instructions, as opposed to chips that store data or regulate power.
8. See: OECD (2024), 'Speaking the same chip language'.
9. ASML's primary exports are advanced photolithography systems and related metrology equipment used to print nanoscale circuit patterns onto silicon wafers — including high-end systems (TWINSCAN NXE and High-NA EXE) for leading-edge nodes (3nm, 2nm and beyond) and DUV systems (immersion ArFi; dry ArF, KrF, i-line). Classified under HS 8486.20, 8486.90, and 9031.41/9031.49 (with parts under 9031.90).
10. ASM International is a market leader in wafer-deposition technologies; main exports are Atomic Layer Deposition (ALD), Chemical Vapour Deposition (CVD) and epitaxy systems for ultra-thin atomic layering in advanced nodes. Classified under HS 8486.20 and 8486.90.
11. NXP's primary exports include automotive microcontrollers (e.g. S32), general-purpose 32-bit MCUs (LPC, Kinetis) and i.MX application processors; in-vehicle networking transceivers, PMICs, battery-management systems, secure elements, NFC/RFID chips; RF power GaN and LDMOS transistors; MEMS and automotive-radar front-ends; and test wafers/bumped dies. Classified under HS 8542.31, 8542.39, 8541.21/8541.29, 8541.51/8541.59 and 8542.90.
12. See: thesemiconductornewsletter.substack.com/p/semiconductor-industry-in-the-netherlands.
13. See: tradeimex.in — semiconductor export data by country 2025.
14. See: thesemiconductornewsletter.substack.com/p/semiconductor-industry-in-the-netherlands.
15. See: www.aexi.nl.
16. Originally from the Belgian public credit-insurance agency ONDD, now the Credendo Group (rebranded in 2013).
17. The GRASP algorithm most commonly refers to the Greedy Randomized Adaptive Search Procedure, a multi-start metaheuristic used for solving hard combinatorial optimization problems (see Ferone, et al., 2025)
18. An ad valorem equivalent tariff is a tariff presented as a percentage of the value of goods cleared through customs, comparable with a tariff derived from unit quantities such as weight, number or volume (ITC, 2020).
19. Obtained from the ITC's Market Access Map (MacMap).
20. The scientific basis for the use of RTA is due to Vollrath (1991): 'Theoretical evaluation of alternative trade intensity measures of revealed comparative advantage', *Weltwirtschaftliches Archiv*, 127:265–280.
21. After data irregularities in Doing Business 2018 and 2020, the World Bank paused the report and initiated reviews; it was subsequently discontinued (World Bank statement, 16 Sept 2021).
22. See: worldfreightrates.com.
23. See: searates.com.
24. See: logcluster.org.
25. See: google.com/maps.
26. See: containerstatistics.com.
27. Note that in order to cut out extremely low monetary value opportunities the minimum requirement for the selection of opportunities are set to US\$ 1,000 equivalent.
28. See: ampleon.com.
29. See: bruco-ic.com.
30. See: axelera.ai.



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