International Trade[1]

Lecture Note: Stylized Facts

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[1]The notes are still preliminary and in beta. Please, if you find any typo or mistake, send it to malfaro@ualberta.ca.

Contents

Notation

This is a derivation

This is some comment

This is a comment on advanced topics that are not part of the course (you can ignore it without loss of continuity regarding the text)

- The symbol ":=" means "by definition".
- Vectors are denoted by bold lowercase letters (for instance, $\mathbf{x}$) and matrices by bold capital letters (for instance, $\mathbf{X}$).
- The set of nonnegative real numbers is denoted by $\mathbb{R}_+ := [0, \infty)$
- The set of of positive real numbers is denoted by $\mathbb{R}_{++} := (0, \infty)$
- The Cartesian product is denoted by $X_1 \times X_2 \times ... \times X_N$. If each set comprises the nonnegative real numbers, we use the notation $\mathbb{R}_+^N$.
- To differentiate between the verb "maximize" and the operator "maximum", I denote the former with "max" and the latter with "sup" (i.e., supremum). The same caveat applies to "minimize" and "minimum", where I use "min" and "inf", with the latter indicating infimum.
- "iff" means "if and only if"
- $\exp(x)$ is the function e^x.
- Random variables are denoted with a bar below. For instance, $\underline{x}$.

These notes contain hyperlinks in blue and red text. If you are using Adobe Acrobat Reader, you can click on the link and easily navigate back by pressing Alt+Left Arrow.

1 Introduction

Traditional theories of International Trade belong to the so-called Neoclassical models. They explain trade due to differences between countries, and in particular by dissimilarities in their supply side. The intuition is straightforward: assuming that industries comprise homogeneous goods, the only feature of a product relevant for consumption decisions is its price. Thus, the country with the lowest production cost for a particular good will become its primary exporter.

We studied in particular the Ricardian model, which considers differences in productivity. There are additionally other types of differences possible. For example, the Heckscher-Ohlin model supposes identical technologies across all countries, and instead incorporates differences in factor endowments. This determines that a country can produce more cheaply goods intensive in its abundant factor, thereby creating opportunities to trade. Regardless of the source of differences, all these models predict gains of trade through an expansion in each country's consumption possibilities. Additionally, they indicate that more dissimilar countries trade more intensively, and that countries never import a good they export.[1]

Nonetheless, some of these patterns are at odds with what we observe in the data. This led to the emergence of alternative theories of trade emerge, known as *New Trade Models.* Our upcoming classes will be focused on these theories. In these notes, we provide a brief introduction to the topic. Specifically, we review several empirical regularities that cannot be easily explained by Neoclassical models.

2 Stylized Facts

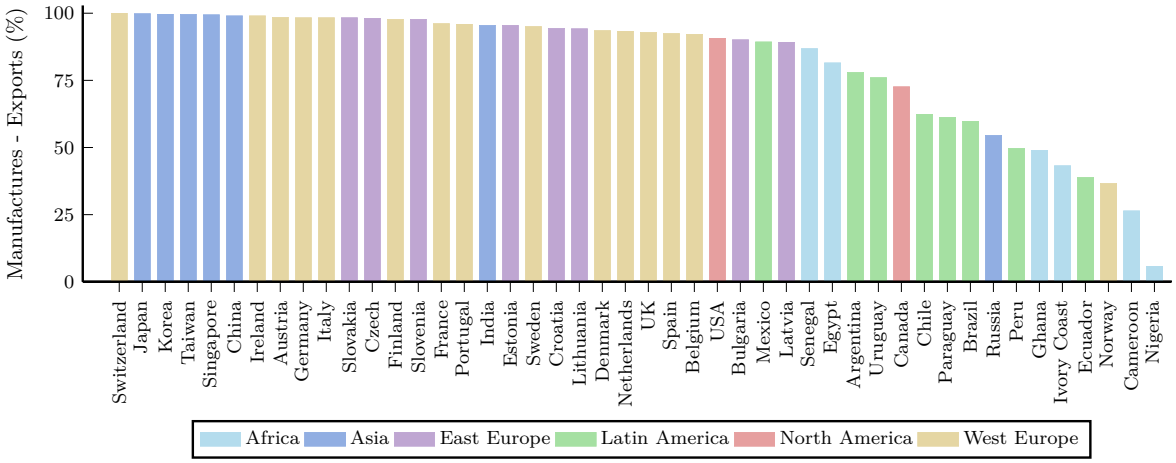
Our analysis begins by examining industry data, aggregated at a coarse level. We specifically classify industries into two sectors: manufactures and primary goods. At this level of aggregation, the data are consistent with a specialization pattern of trade predicted

[1] It is worth remarking that, unlike Ricardo, Neoclassical models do not necessarily predict complete specialization in production. This arises in Ricardo because the model assumes a linear technology. If instead there are decreasing returns to scale, countries produce all goods, but with a bias towards some set of goods. Likewise, the existence of trade costs can determine that some goods are not traded. Nonetheless, in all cases, it is still true that a country would never export and import goods belonging to the same industry.

by Neoclassical models.

Figure 1 depicts a country's proportion of manufacturing exports. The color coding reveals certain patterns. First, countries with a high share of manufacturing exports (right part of the figure) are mostly developed countries (North America and West Europe) and several successful developing economies in Asia and Eastern Europe. In contrast, Latin America and Africa exhibit a low share of manufacturing exports, which is equivalent to high share of primary goods in their exports.

Figure 1. *Manufacturing Exports as % of a Country's Exports Developing and Developed Countries - Year 2018*

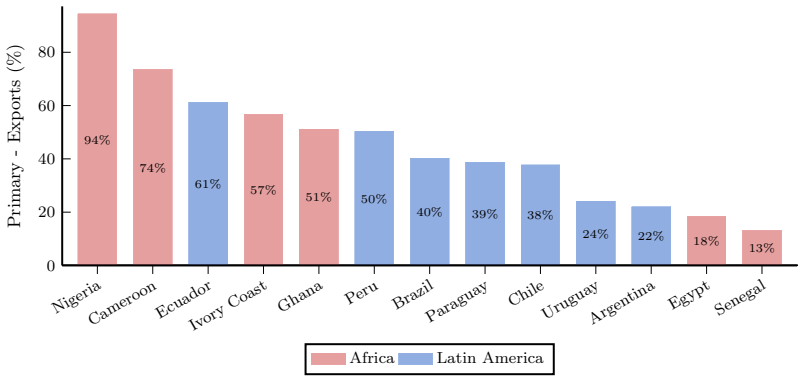


Note: Own calculations, based on the dataset "The Bilateral Trade Database by Industry and End-Use" (BTDIxE) by OECD.

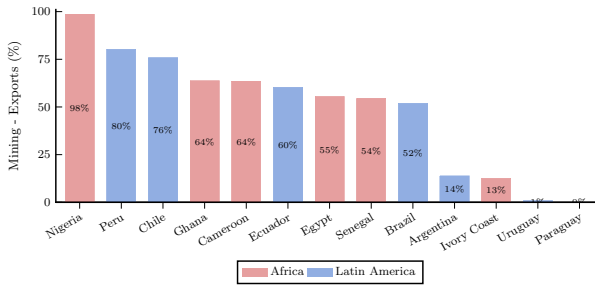
Taking a closer look at the the goods exported by specific regions, Figure 2 focuses on several Latin American and African countries. Figure 2a in particular depicts the share of primary-goods exported.

Figure 2. *Exports of Primary Goods*
Latin American and African Countries - Year 2018

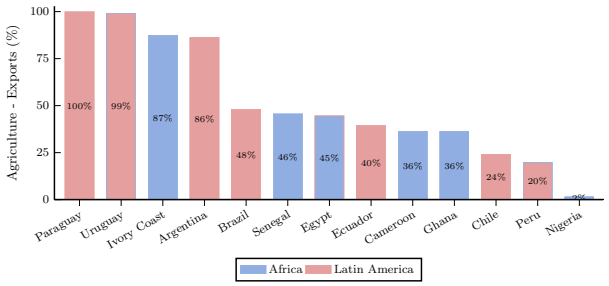
(a) Primary Goods Exported as % of a Country's Exports



(b) Mining Exports as % of Primary-Goods Exported



(c) Agriculture Exports as % of Primary-Goods Exported



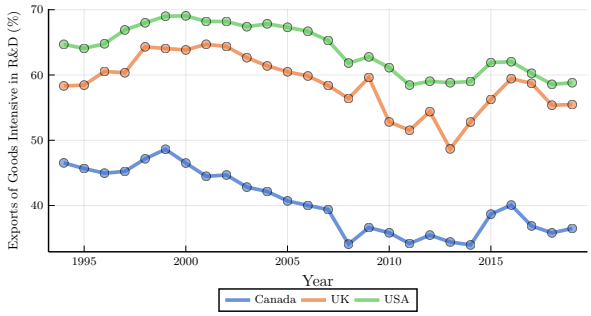
Note: Own calculations, based on the dataset "The Bilateral Trade Database by Industry and End-Use" (BTDIxE) by OECD.

The goods exported by these regions can be further broken down into two categories: agriculture and mining. The latter includes the extraction of crude petroleum and metal ores, among others. Figure 2b and Figure 2c reveal a pronounced heterogeneity in the shares of agriculture and mining sub-sectors. This means that, even when these regions predominantly export primary goods, there is no uniform specialization in agriculture or mining.

Turning to exports of manufactured goods, we can see the growing significance of several Asian and Eastern European countries. In recent years, their exports have been thriving, including countries such as China, South Korea, and Slovenia, among others.

Figure 3. *Exports of Medium and High R&D Goods as % of a Country's Exports Developed Countries - Year 2018*

(a) North America and UK



(b) West Europe

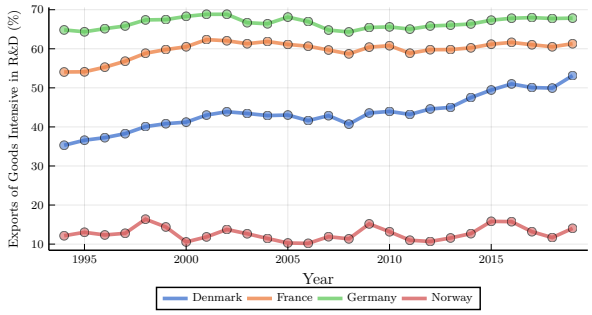
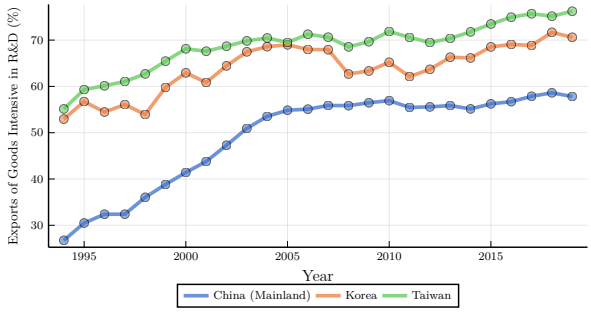
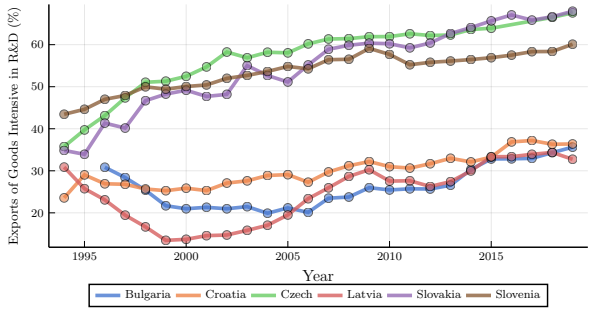


Figure 4. *Exports of Medium and High R&D Goods as % of a Country's Exports Developing Countries - Year 2018*

(a) Asia



(b) East Europe



2.1 Facts at Odds with Neoclassical Models

Neoclassical models are inconsistent with two features of the data. First, Neoclassical models predict a *North-South* type of trade, as trade is driven by differences between countries. This means that developed and developing countries should trade more intensively. The second prediction is an *inter-industry* type of trade. This implies that countries import and export goods of different industries, thereby ruling out that a country simultaneously imports and exports goods from the same industry.

To illustrate the conflict between Neoclassical models and actual trade patterns, consider first the case of a North-South type of trade. The data are quite clear in this regard: developed countries tend to trade more intensively with other developed countries, indicating a North-North type of trade. This is illustrated in Figure 5, where we consider several developed countries.

Figure 5. *Main Trading Partners - Trade in %*
Developed Countries - Year 2018

(a) Canada

Trading Partner	Total Trade	Exports	Imports
USA	62.9	74.9	51.1
China	8.8	4.7	12.7
Mexico	3.8	1.4	6.2
Japan	2.5	2.2	2.8
UK	2.2	2.8	1.5

(b) United States

Trading Partner	Total Trade	Exports	Imports
China	16.0	7.2	21.6
Canada	14.6	18.0	12.5
Mexico	14.4	15.9	13.4
Japan	5.2	4.5	5.6
Germany	4.3	3.4	4.9

(c) Germany

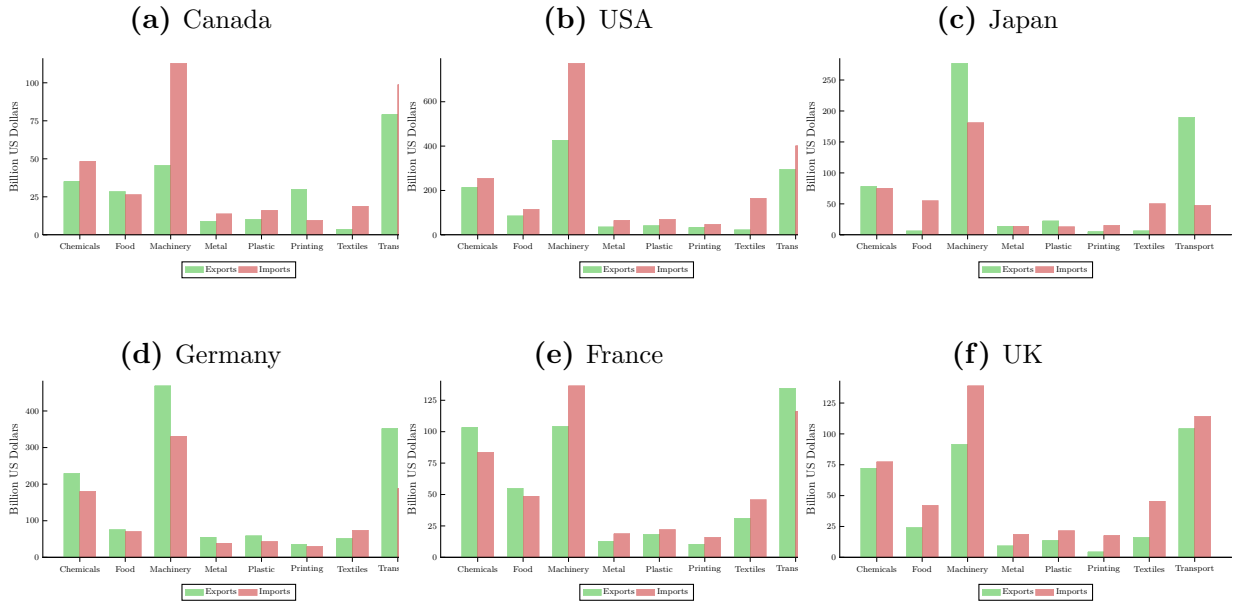
Trading Partner	Total Trade	Exports	Imports
China	8.3	7.1	9.8
USA	7.4	8.6	6.1
Netherlands	7.2	6.4	8.1
France	7.1	8.0	6.0
Italy	5.4	5.3	5.5

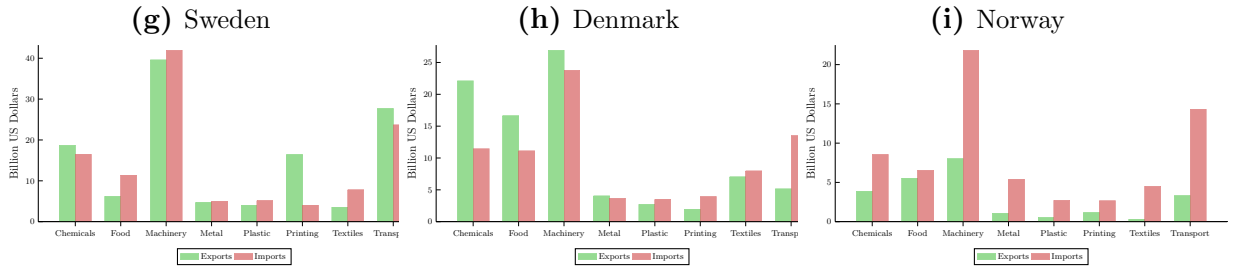
(d) France

Trading Partner	Total Trade	Exports	Imports
Germany	15.2	14.6	15.6
Italy	7.6	7.5	7.7
Spain	7.1	7.8	6.6
USA	7.1	8.0	6.4
Belgium	7.1	7.1	7.1

As for an inter-industry trade, we already have shown the tendency of countries to specialize in the export of some goods. This is especially true when we consider aggregated data. Neoclassical models can in principal account for this type of bias. However, they fail to explain another important phenomenon: countries usually export and import goods belonging to the same industry, which is referred to as *intra-industry trade*. We illustrate this in Figure 6, where we consider several industries within the manufacturing sector.

Figure 6. *Exports and Imports of Develooped Countries*
Manufacturing Industries - Year 2018

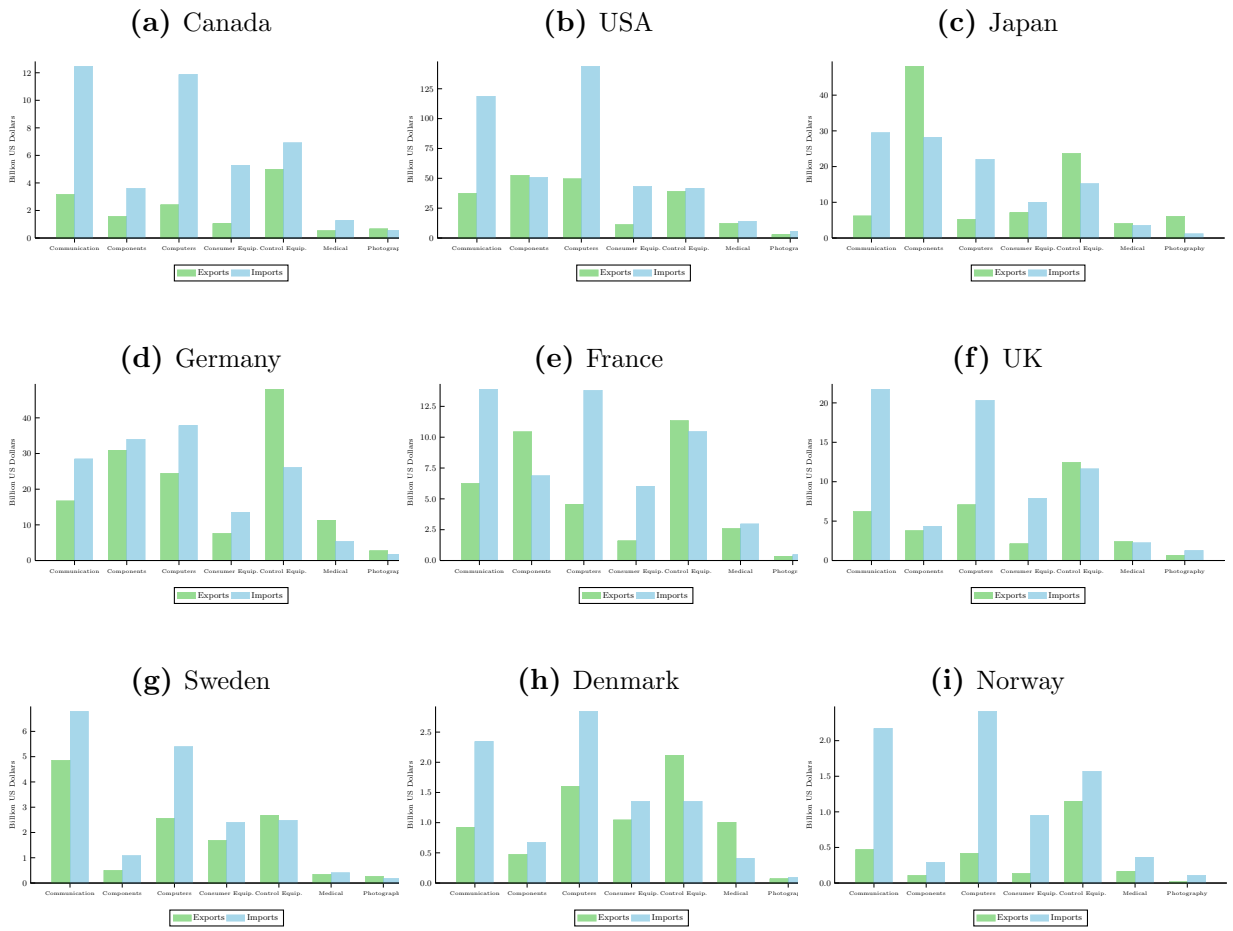




Note: Own calculations, based on the dataset "The Bilateral Trade Database by Industry and End-Use" (BTDIxE) by OECD.

It could be argued that Figure 6 still provides an aggregated view of industries, and that specialization occurs at a more granular level. However, Figure 7 demonstrates that intra-industry trade is still present at a more disagregated level. This is shown this by considering sub-industries belonging to Computers and Electronic Products.

Figure 7. *Exports and Imports of Developed Countries*
Computer and Electronic Products - Year 2018



Note: Own calculations, based on the dataset "The Bilateral Trade Database by Industry and End-Use" (BTDIxE) by OECD.

2.2 Some Remarks: Value Added and Trade In Services

We finish this brief review by considering two empirical aspects. The first one is related to how exports and imports are measured in the data. Unlike gross domestic production (GDP), values in international trade are expressed in gross terms. This means that countries report the value of goods as they cross borders, without discounting the fraction that is re-imported or re-exported. As a result, countries that primarily assemble imported intermediate products tend to overestimate the contribution of exports to their national income.

Recently, there has been some efforts to compute the contribution of exports to domestic value added. Using this data, let's consider the top 15 countries in the world according to their export values. Table 1 presents data for a country's total exports, while Table 2 focuses only on manufacturing. Figures (a) in each table sort countries by gross exports, which is the value of goods as they cross borders. Figures (b) in each table compute the value added created within the country, as a fraction of gross exports. It is worth remarking that the added value in manufacturing is based on the value created domestically, irrespective of whether this originates in the manufacturing sector. Finally, Figures (c) in each table compute the domestic value added in values.

The first conclusion we can draw is that the share of domestic value added varies considerably among countries. In particular, Table 1c indicates that China's exports add less value domestically than the US, even when China exports more in terms of gross value.

Likewise, Table 2b reveals that Mexico's proportion of domestic value added is relatively low. This is consistent with Mexico's type of production, which mainly involves assembling imported intermediate products—the so-called maquiladoras. The opposite occurs with the UK.

Table 1. *Total Exports - Year 2018*

(a) Gross Value

Country	Value (Million USD)
China	2 429 056
USA	2 258 156
Germany	1 548 423
Japan	905 281
France	801 664
UK	721 874
South Korea	716 685
Italy	639 544
India	538 248
Canada	519 950
Netherlands	519 236
Russia	512 040
Mexico	479 856
Spain	467 540
Singapore	438 524

(b) Domestic Value Added relative to Gross Value

Country	Share (%)
China	83
USA	90
Germany	77
Japan	83
France	76
UK	82
South Korea	68
Italy	77
India	80
Canada	75
Netherlands	67
Russia	91
Mexico	64
Spain	76
Singapore	53

(c) Domestic Value Added

Country	Value (Million USD)
China	2 010 284
USA	2 043 726
Germany	1 193 876
Japan	749 524
France	606 463
UK	593 166
South Korea	487 422
Italy	491 497
India	431 424
Canada	390 589
Netherlands	347 968
Russia	468 199
Mexico	307 495
Spain	356 208
Singapore	231 151

Table 2. *Manufacturing Exports - Year 2018*

(a) Gross Value

Country	Value (Million USD)
China	1 985 752
Germany	1 063 472
USA	981 385
Japan	638 857
South Korea	592 694
Italy	422 042
France	414 730
Mexico	350 757
India	292 989
Canada	253 265
Spain	237 340
Netherlands	236 802
UK	224 613
Thailand	219 082
Ireland	212 742

(b) Domestic Value Added relative to Gross Value

Country	Share (%)
China	81
Germany	73
USA	84
Japan	79
South Korea	65
Italy	71
France	66
Mexico	54
India	71
Canada	63
Spain	65
Netherlands	55
UK	70
Thailand	58
Ireland	59

(c) Domestic Value Added

Country	Value (Million USD)
China	1 603 066
Germany	771 487
USA	826 429
Japan	504 288
South Korea	385 931
Italy	299 248
France	274 600
Mexico	189 797
India	208 446
Canada	159 034
Spain	154 410
Netherlands	129 196
UK	157 260
Thailand	126 751
Ireland	126 498

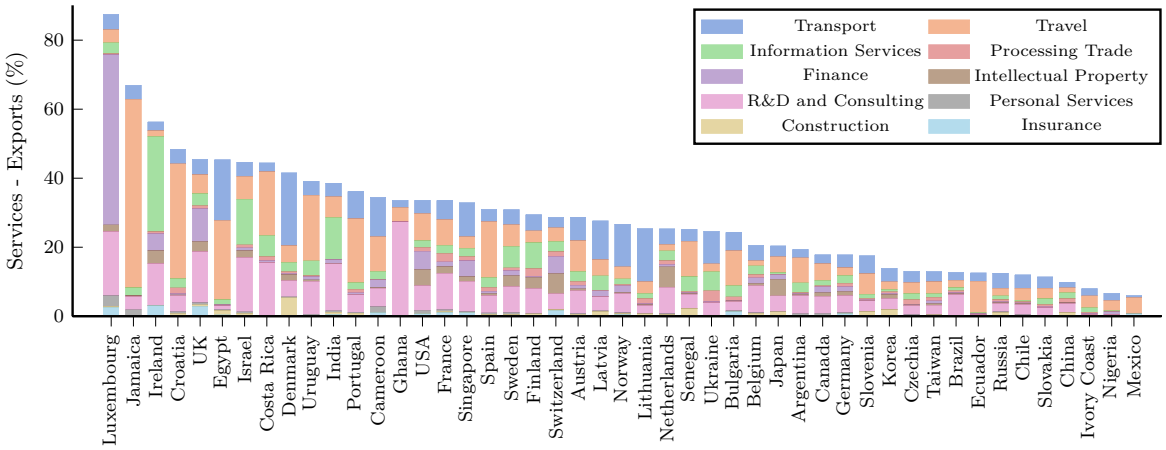
The second aspect we want to highlight is related to tradable goods. In Section 2, we exclusively focused on exports of manufactures and primary resources, excluding services. This approach is conventional, as these sectors have historically constituted the bulk of a country's total export. Additionally, services are often non-tradable, and exports in this sector mainly come from two industries travel and and transport.

To demonstrate this, Figure 8a depicts a country's service exports as a share its total export. Indeed, except for a few countries, the share of exports coming from services is

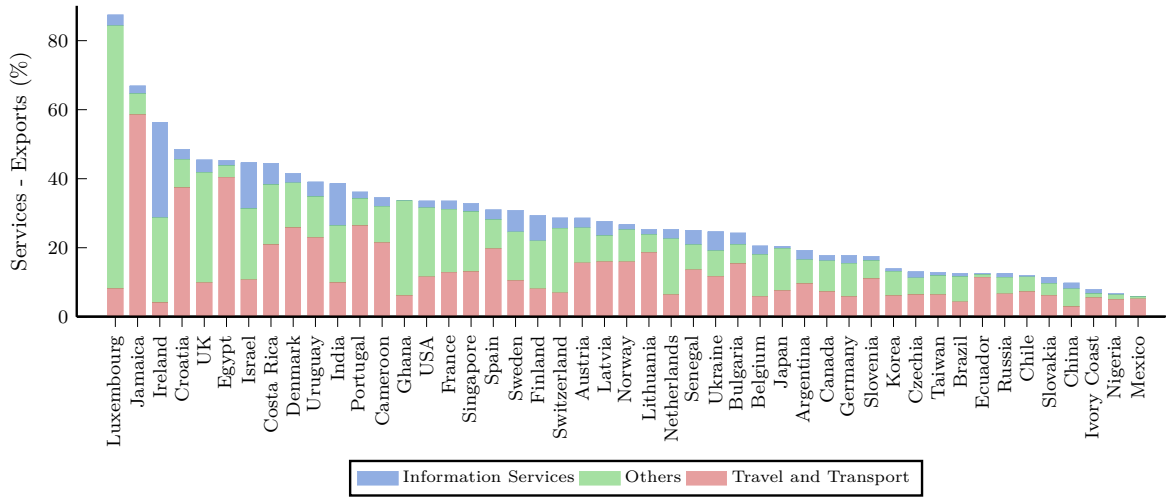
relatively low. Furthermore, Figure 8b corroborates that most of service exports occur in travel and transport.

Figure 8. *Exports of Services - Year 2018*

(a) All Categories



(b) Grouped Categories



Note: Own calculations, based on the dataset "The Bilateral Trade Database by Industry and End-Use" (BTDIxE) by OECD.

Simultaneously, Figure 8b reveals an emerging pattern: the growing importance of Information Industries (e.g., programming). Due to the tradable nature of this sector, trade in services has become increasingly important for some countries, as reflected in the blue portion of each bar.

Figure 9 considers Ireland and Israel as examples of this phenomenon. Figure 9a and Figure 9b show a declining importance of manufacturing exports in these countries,

and the simultaneous relevance of their export services. Likewise, Figure 9d and Figure 9d points out that this shift is driven by their development of the Information Services industries.

Figure 9. *Ireland and Israel - Exports of Information Services*

Note: Own calculations, based on the dataset "The Bilateral Trade Database by Industry and End-Use" (BTDIxE) by OECD.