UNCTAD DIGITAL ECONOMY: SHARE OF ICT GOODS AS PERCENTAGE OF TOTAL TRADE

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I. Introduction

The main topic for the data analysis in this project focuses on the share of information and communication technology (ICT) goods in total trades around the world. *Total trades* are measured in terms of total merchandise imports and/or total merchandise exports of various economy labels, which will be explained further during data analysis. Retrieved from the *United Nations Conference on Trade and Development, Information Economy Database*, the data contains annual information on ICT goods imports and exports from 2000 - 2019.

Information and Communication Technologies (ICT) impacts every sector of the economy. Such rapidly involving, innovative technologies "facilitate the sharing of information and ensure more effective delivery of services while eliminating the barriers of time and distance"[1]. While the ICT sector includes various subsectors, it operates mainly in the production of goods and services. Although it is easy to view ICT goods and services as synonyms, they vary to a great extent in their definitions. In this project, data involving ICT goods will be the core focus. Definition of ICT goods is derived from the World Customs Organization's Harmonized System (HS). ICT goods must either be "intended to fulfill the function of information processing and communication by electronic means, including transmission and display, or use electronic processing to detect, measure and/or record physical phenomena, or to control a physical process"[2]. Categories of ICT goods based on HS 2017 from *UNCTAD Technical Notes on ICT for Development* are:

[1] Charron, N. (2007, November 26). International trade by the information and communication Technologies Sector. Retrieved from https://www150.statcan.gc.ca/n1/pub/11-621-m/11-621-m2007064-eng.htm

[2] Directorate, O. (n.d.). Oecd glossary of statistical terms - information, communication technology (ict) goods definition. Retrieved from https://stats.oecd.org/glossary/detail.asp?ID=6274

a. Computers and peripheral equipment (e.g., printing machines, cash registers, etc.),
b. Communication equipment (e.g., telephones, communication apparatus, etc.),
c. Consumer electronic equipment (e.g., loudspeakers, microphones, etc.),
d. Electronic components (e.g., circuits, tubes, magnetic media, etc.) and,
e. Miscellaneous (e.g., semiconductor media, lasers, etc.)

II. Obtaining Data

	A	B	C	D	E	F	G	H	I	J
1	Year	Economy	Economy Label	Partner	Partner Label	Flow	Flow Label	IctProductCategory	IctProductCategory Label	Percentage of total merchandise trade
2	2000	0	World	0	World	1	Imports	ICT00	Total ICT goods	16.05745
3	2000	0	World	0	World	2	Exports	ICT00	Total ICT goods	16.0222
4	2000	0	World	0	World	3	Re-exports	ICT00	Total ICT goods	29.61627
5	2000	0	World	0	World	24	Re-imports	ICT00	Total ICT goods	31.78913
6	2000	8	Albania	0	World	1	Imports	ICT00	Total ICT goods	3.33276
7	2000	8	Albania	0	World	2	Exports	ICT00	Total ICT goods	0.39067
8	2000	12	Algeria	0	World	1	Imports	ICT00	Total ICT goods	4.29957
9	2000	12	Algeria	0	World	2	Exports	ICT00	Total ICT goods	0.00649
10	2000	20	Andorra	0	World	1	Imports	ICT00	Total ICT goods	8.81431
11	2000	20	Andorra	0	World	2	Exports	ICT00	Total ICT goods	8.0681
12	2000	28	Antigua and Barbuda	0	World	1	Imports	ICT00	Total ICT goods	9.53298
13	2000	28	Antigua and Barbuda	0	World	2	Exports	ICT00	Total ICT goods	39.06442
14	2000	28	Antigua and Barbuda	0	World	3	Re-exports	ICT00	Total ICT goods	45.11872
15	2000	31	Azerbaijan	0	World	1	Imports	ICT00	Total ICT goods	8.16045
16	2000	31	Azerbaijan	0	World	2	Exports	ICT00	Total ICT goods	0.13639
17	2000	32	Argentina	0	World	1	Imports	ICT00	Total ICT goods	13.8058
18	2000	32	Argentina	0	World	2	Exports	ICT00	Total ICT goods	0.36296
19	2000	36	Australia	0	World	1	Imports	ICT00	Total ICT goods	15.06608
20	2000	36	Australia	0	World	2	Exports	ICT00	Total ICT goods	2.85219
21	2000	36	Australia	0	World	24	Re-imports	ICT00	Total ICT goods	5.35596
22	2000	40	Austria	0	World	1	Imports	ICT00	Total ICT goods	9.22115
23	2000	40	Austria	0	World	2	Exports	ICT00	Total ICT goods	6.15633
24	2000	44	Bahamas	0	World	1	Imports	ICT00	Total ICT goods	3.34165
25	2000	44	Bahamas	0	World	2	Exports	ICT00	Total ICT goods	0.41265
26	2000	44	Bahamas	0	World	3	Re-exports	ICT00	Total ICT goods	0.73709
27	2000	48	Bahrain	0	World	1	Imports	ICT00	Total ICT goods	2.42176
28	2000	48	Bahrain	0	World	2	Exports	ICT00	Total ICT goods	0.03349
29	2000	48	Bahrain	0	World	3	Re-exports	ICT00	Total ICT goods	2.53905
30	2000	50	Bangladesh	0	World	1	Imports	ICT00	Total ICT goods	2.66961

Figure 1 - Table of the dataset (only the first 29 out of the 22, 143 rows are displayed)

The dataset was obtained from UNCTAD STAT Data Center's Digital economy folder (https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx). The dataset was accessible on the UNCTAD website as it was open for the public and download was permitted as a .csv file. The precise source of the data is as follows: *UNCTAD, Division on Technology and Logistics, the Information Economy Database, based on UN DESA Statistics Division, UN Comtrade.* The original dataset has 10 columns/attributes and 22,143 rows.

III. Cleaning Data

A data cleaning process that was completed was formatting the values under the “Percentage of total merchandise trade” column to ensure that the number of significant digits was consistent. For example, certain values have an accuracy of five decimal digits while some values have four decimal digits. All the values were rounded to four significant digits using the round() function. Having the same number of decimal digits for all values in the column would ensure that all values have the same level of accuracy. Some other approaches included removing unnecessary columns that were to be ignored for the visualization step (e.g., the “Partner” column had an integer 0 for all rows). Now, some of the procedures I went through to check that the data was clean include checking if there were any unnecessary spaces(e.g., leading and trailing whitespaces), checking columns of type chr to see if there are any strings that would make sense to be split into separate columns, and check the consistency in capitalizations of strings.

IV. Visualizing Data

Below are few graph visualizations from the cleaned dataset. All visualization processes were done using the R programming language. Please refer to the appendix for more detailed information on the corresponding R script.

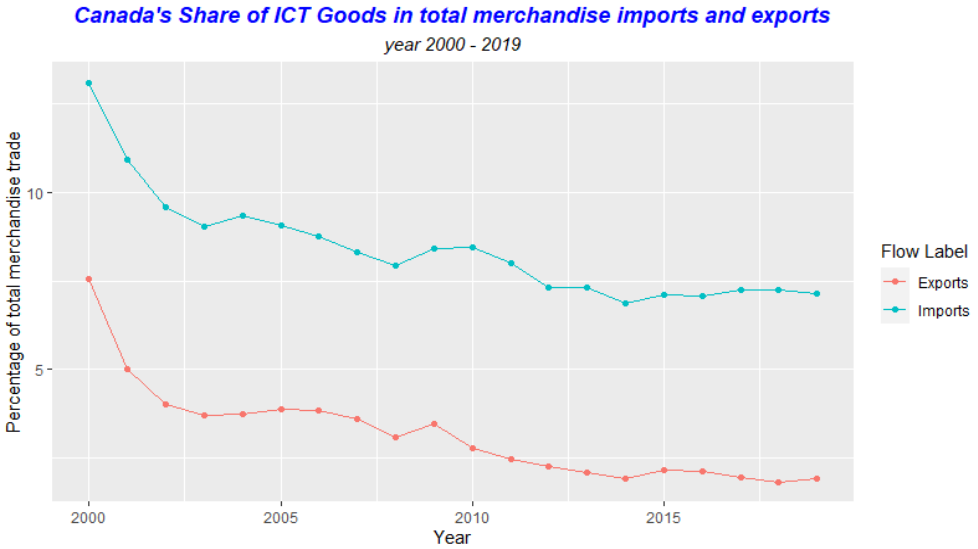

Figure 2 - Canada's Annual Share of ICT Goods as Percentage of Trade, with points

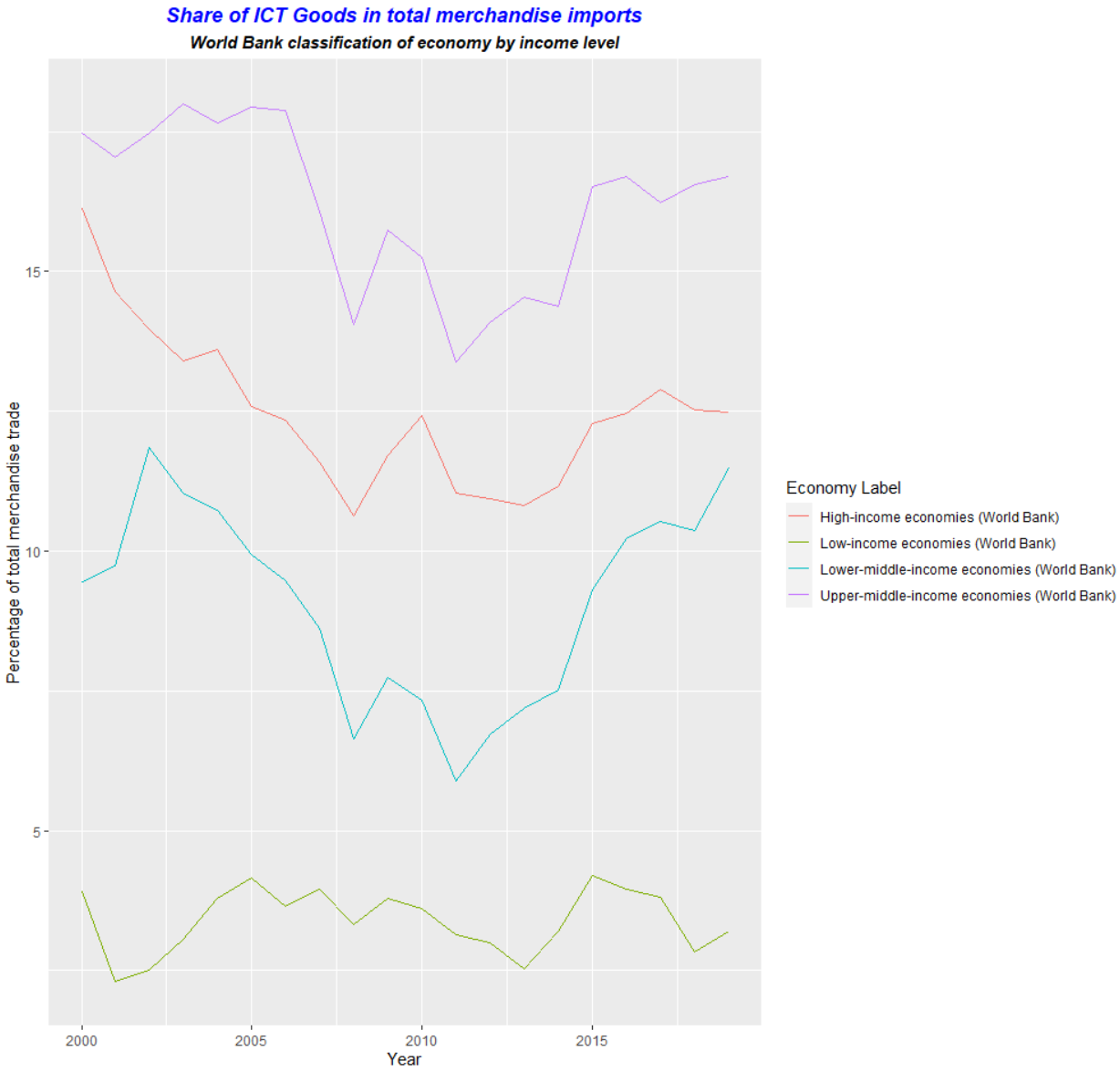

Figure 3 - Comparison of share of ICT Goods in Total Merchandise Imports across Different Classifications of Economy (by World Bank)

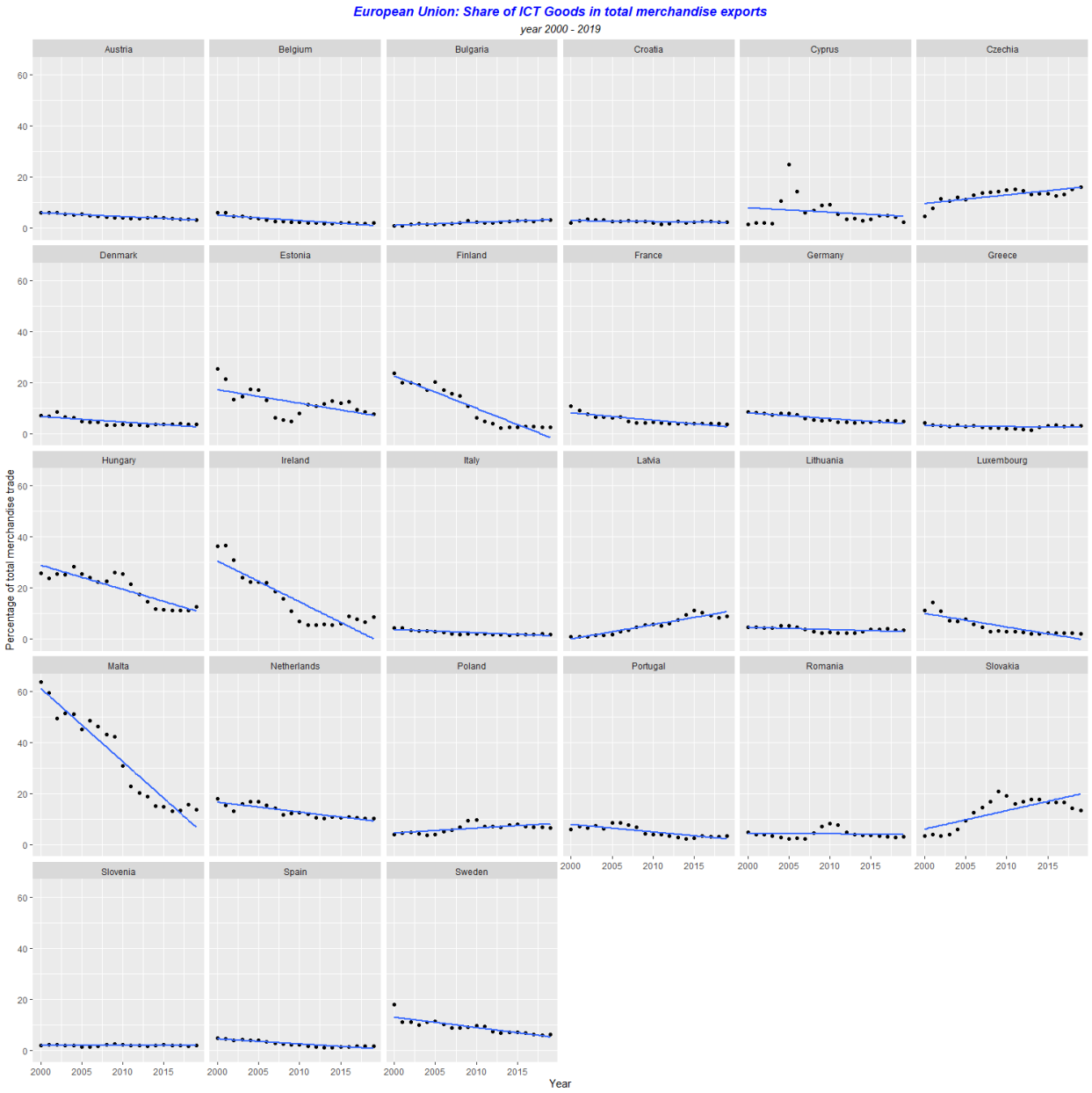

Figure 4 - Comparison of Share of ICT Goods in Total Merchandise Exports across the EU nations (membership as of 2020-)[3]

[3] If you zoom in, then the texts and the points for each subplot is legible.

V. Appendix

GitHub repository for the project:

https://github.com/alexislee1/UNCTAD-DIGITAL-ECONOMY

Please refer to the GitHub repository for this project to view the R script and the dataset.

Although not included in the report, the R script contains basic statistical analysis of the dataset.