November 2018

UNCTAD Research Paper No. 16 UNCTAD/SER.RP/2017/16/Rev.1

### Alain Mclaren United Nations International Computing Centre mclaren@unicc.org

## Mesut Saygili

Division on International Trade and Commodities, UNCTAD Mesut.Saygili@unctad.org

### Miho Shirotori

Division on International Trade and Commodities, UNCTAD

Miho.Shirotori@unctad.org

# Revealed Factor Intensity of Products: Insights from a New Database

### Abstract

The present paper provides descriptive statistics of the updated database of the RFI indicators of products classified at the HS 6-digit level, and the factor endowments consisting of physical capital, human capital and arable land. The RFI indicators and the endowment database can contribute to research in a wide array of topics such as export diversification patterns, export survival of firms, and natural-resource curse.

**Key words:** International trade, factor endowments, factor intensities, product classifications

The findings, interpretations, and conclusions expressed herein are those of the author(s) and do not necessarily reflect the views of the United Nations or its officials Member States. The designations employed and the presentation of material on any map in this work do not imply the expression of any opinion whatsoever on the part of the United Nations concerning the legal status of any country, territory, city, or area or of its authorities, or concerning the delimitation of its frontiers and boundaries.

This paper represents the personal views of the author(s) only, not the views of the UNCTAD secretariat or member States. The author(s) accept sole responsibility for any errors. Any citation should refer to the author(s) and not the publisher. This paper has not been formally edited.



### Contents

Acknowledgements	2
1. Introduction	3
2. The Endowment data	3
2.1 Physical capital	3
2.2 Human capital	5
2.3 Arable land	7
3. The RFI Indicators	8
3.1 Average RFI indicators through years	8
3.2 Average RFI indicators across products	10
3.3 Combining average RFI indicators by product	11
4. The RFI-Endowment Ratio	14
4.1 The RCI-endowment ratio and the productivity	15
4.2 The RFI-endowment ratio and economic growth	18
5. Conclusion	24

### Acknowledgements

The authors are grateful to: Alessandro Nicita, Marco Fugazza, Samuel Rosenow and Julia Seiermann for their comments on an earlier draft; Steve MacFeely and Onno Hoffmeister for uploading the RFI Indicators on UNCTADstat; Jenifer Tacardon-Mercado for processing and formatting the document; and Bonapas Onguglo for his support and guidance.

Any mistakes or errors remain the authors' own.

# 1. Introduction

Cadot, Shirotori et Tumurchudur (2010) developed a time-series database of a revealed factor intensity (RFI) indicators for over 5,000 products, classified at the 6-digit level of the Harmonized Commodity Description and Coding System (HS). Based on the idea that "a product exported predominantly by countries that are richly endowed with human capital is "revealed" to be intensive in human capital"), the RFI indicators of a product are estimated as a trade-weighted average of the factor endowments of countries that export the given product.

With the release of the Penn World Table (PWT) version 9.0 in 2017, UNCTAD has updated the RFI indicators to cover the period from 1988 up to 2014, and made them available on the UNCTADStats for download.<sup>1</sup>

This paper first presents descriptive statistics of the updated factor endowment data and the RFI indicators, then discusses areas of trade analysis where the RFI indicators could be a useful variable.

# 2. The Endowment data

The RFI indicators are based upon three factor endowments: (i) physical capital stock per worker; (ii) human capital stock; and (iii) arable land per worker. Annex 1 provides the source and technical information on endowment data.

Figure 1.1 presents the level of physical capital stock per worker in United States dollars based on 2011 purchasing power parity (PPP). Figure 1.2 compares the change in physical capital across countries between 1994 and 2014 and reveals a significant accumulation of physical capital in many developing countries, particularly those in Asia. Some of the Commonwealth of Independent States (CIS) and conflict-stricken countries in Africa however revealed a fall in capital stock.

### 2.1 Physical capital



Figure 1.1 Capital stock per worker in 2014 in United States dollars (PPP 2011)

<sup>&</sup>lt;sup>1</sup> for the period 1962-2014. The RFI indicators using the United Nations Standard International Trade Classification (SITC, Revision 1) at the 5-digit level and the endowment data, can be requested by writing to UNCTAD (TAB@unctad.org).

(b) Physical capital (emerging economies)



Figure 1.2 Percentage change of physical capital (1994-2014)

Figure 2 plots the change in the relative size of physical capital stock against the baseline level of relative endowment, during the period between the base year (1988) and 2014.

The relative size of a factor endowment of each country is calculated by dividing the value of actual factor endowment of a country by the world average. For example, if a country's "baseline" relative size of physical capital is 1.5 and the "change" is -0.2, it means that: (i) the country's physical capital stock in the year 1988 was 1.5 times greater than the world average; and (ii) the relative size has decreased by 0.2 to become 1.3 in 2014.

#### Figure 2. Relative changes in physical capital stock (1988-2014)



(a): Physical Capital (all countries)

The baseline level of physical capital stock and the subsequent changes are negatively related (Figure 2 (a)). That is, the smaller the relative size of factor endowment is in the baseline year, the greater the increase in the factor endowment relative to other countries.

Countries in Figure 2 (a) can be separated into four groups. **The first group** in the upper left quadrant consists of countries whose relative size of physical capital in the baseline period was smaller than the world average, then had a greater-than-average increase in the subsequent period. Among those countries, the Republic of Korea's relative size of physical capital increased by 1.13 from the baseline value of 0.67, which was the highest increase among all countries. Then there are countries whose relative size of physical capital increased by the values between 0.1 and 0.5 as shown in Figure 2 (b), which gives a magnified view of the blue circle in Figure 2(a). China experienced the highest increase in the relative physical capital stock within the group by 0.41 points from its baseline value of 0.08. China is followed by Chile whose relative capital stock increased by 0.39 points, then Argentina (0.35), and Thailand (0.32).

The countries in **the second group** in the upper-right quadrant are those whose relative physical capital stock in the baseline year was above average, then had a greater-than-average increase in the subsequent period. The relative capital stock of Spain in the baseline year was 1.60, which then increased by 0.83 points in the subsequent period. Other countries in this group include Ireland (1.76, 0.80), Austria (1.85, 0.47) and Italy (2.04, 0.40) which increased their capital stock significantly after the establishment of the European Single Market in 1993.

Countries in **the third group** in the lower-right quadrant had a less-than-average increase in the relative size of physical capital stock from the above-average level in the baseline year. Switzerland for example experienced a fall in the relative size of physical capital stock by 1.14 from the baseline value of 3.57.

**The fourth group** in the lower-left quadrant consist of African countries, whose baseline physical capital level was below average, and had a less-than-average growth in the subsequent period. Countries in this group include Niger, Cameroon, Côte d'Ivoire, Malawi, Kenya, Ghana, and the United Republic of Tanzania.

### 2.2 Human capital

Human capital is measured as a composite of average schooling years and the return on education. Figure 3.1 suggests that countries in Africa reveal relatively low levels of human capital in 2014. The growth pattern of human capital (Figure 3.2) however is much more homogeneous than that of physical capital stock. The majority of African countries showed an increase of human capital of over 20 per cent between 1994 and 2014.

The change in the relative size of human capital is presented in Figure 4. The relative size of human capital has been converging to 1, indicating that the difference in human capital case across countries has become less pronounced than it had been in the baseline year. Countries that had lower-than-average (i.e. less than 1) baseline level of human capital made a greater-than-average increase in the subsequent years. This is only natural as the definition of human capital used for the RFI estimation includes the years of schooling, which has the maximum value of around 20 years. That is, countries whose baseline average years of schooling was low, say 6 years, have a greater potential to increase the relative size of human capital in the subsequent years than countries whose baseline schooling years was already high, say over 10 years.



### **Figure 3.1** Human capital index per person in 2014

Figure 3.2 Percentage change of human capital (1994-2014)





### 2.3 Arable land

Figure 5.1 presents arable land in hectares per worker in 2014. Between 1994 and 2014, the size of arable land per worker has fallen in most countries (Figure 5.2). This may be due to population increases against the total size of arable land, which is mostly fixed.<sup>2</sup> The highest decrease is observed in the Middle East, Northern Africa, and the Pacific rim of South America. We observe less of a relationship between the baseline level of arable land and the subsequent change (Figure 6).



<sup>&</sup>lt;sup>2</sup> This may not be the case if the number of workers stayed perfectly stable when population size changes, or that the workforce decreased simultaneously to a population increase, both of which would be highly unlikely.





Figure 6. Relative changes in arable land per worker (1988-204)



# 预览已结束, 完整报告链接和二维码如下:



https://www.yunbaogao.cn/report/index/report?reportId=5\_9000