BEYDER / 2018 13:1 (1-20)

HOW WILL ROBOTIZATION AFFECT RELATIVE MACROECONOMIC POSITIONS OF THE IDB MEMBER COUNTRIES?

Rasim ÖZCAN*

Abstract
Countries adopting robotization faster will be able to increase efficiency and productivity, hence gaining comparative edge over other countries. In this study, we focus on how robotization will affect the relative macroeconomic positions of Islamic Development Bank (IDB) Member Countries (MCs). i.e. relative economic resiliency of the IDB MCs to the robotization. To do this, we propose an index to rank economic resiliency of IDB MCs to robotization by employing two data sets. The first data set is Comtrade; MCs' exports data from 1995 to 2016. The second data set consists of the human capital intensity at detailed sectoral levels, and is called the Revealed Factor Intensity Indices database provided by United Nations Conference on Trade Development (UNCTAD). It gives a unique number indicating the factor intensity of a traded goods group according to SITC classification. By using these two data sets, we develop an index for each MC showing human capital intensity of the MC's exports sectors for a year. Then, ranking the proposed index value for each MC reveals the relative economic resilience of MCs: the higher the figure, the more resilient the MC economy to robotization. The results of this study help to understand how susceptible MCs' economies to robotization. In addition, they will provide a ground to policy makers to develop relevant policies in order to decrease the vulnerability against robotization.

Key Words: International trade, technological change, robotization, innovation.

Introduction

Changes in economic structure of a country might change the relative position of the country by either giving better competitive edge or causing to lose its competitive edge. One such structural change is caused by the introduction of robots. Everything from the way we produce to the way we consume, to the way we communicate has been changing as robots are introduced in. As robots change the production landscape, comparative advantages of countries change. Countries adopting robotization faster will be able to increase efficiency and productivity, hence gaining comparative edge over other countries. In this study, we focus on how robotization will affect the relative position of Islamic Development Bank (IDB) Member Countries (MCs). i.e. relative economic resiliency of the IDB MCs to the robotization. To do this, we employ two different data sets in order to construct an index to rank MCs' economic resiliency.

The first dataset is developed by Shirotori et. al. (2010) as a measure of revealed factor intensities of export products based on the Heckscher-Ohlin theory. i.e. "countries export goods intensive in the factor with which they are well-endowed relative to other factors" as stated by Pathikonda (2017). The implication, for example, is that a product exported largely by a country that is abundantly endowed with human capital would be revealed to be intensive in human capital. Following the methodology proposed by Hausmann et. al. (2007), Shirotori et. al. (2010) uses a modified version of revealed comparative advantage as weights in calculating what they call the Revealed Factor Intensity Indices (RFII). Usage of revealed comparative advantages as weights in calculating RFII filters out the scale effects in exports. The RFII

* Associate Prof., Economic Research and Policy Department, IDB, Jeddah, KSA, rozcan@isdb.org.
Gönderim/Kabul Tarihi: 2 Kasım 2017/9 Haziran 2018, Submitted/Accepted dates: November 2, 2017/Jun 9, 2018

database is provided by United Nations Conference on Trade Development (UNCTAD). The indices provide a unique number that indicates the factor intensity of a traded goods group according to SITC classification.

There is a growing number of studies using RFII database. Bahar et. al. (2014), for example, use the database in the context of knowledge diffusion in order to show that the probability for a product to be added to a country's export basket is higher if a neighboring country is a successful exporter of the same product as well. Lee (2018) studies spatial distribution of economic activity alteration by making use of the RFII database. Basu-Das (2011) show that the impact of higher skill level and technology related exports on GDP per capita is quite favorable. Parteka-Tamberi (2013) use the RFII database to measure quality content of traded goods. According to Diaz-Lanchas et. al. (2018), the skill intensity of a good measures the human capital needed to produce that good.

The second data set is from the United Nations Comtrade Database (Comtrade) for MCs' exports data from 1995 to 2016. Comtrade provides detailed export data whenever data is available for a country. For the purposes of this study, the annual data for export of goods by using all SITC (Revision 1) categories is used from Comtrade.

By combining these two data sets, we calculate a figure for each MC showing human capital intensity of the MCs' exports sectors for a year as described below. Then, ranking the calculated figures gives the relative economic resilience of MCs to robotization: the higher the figure, the more resilient a MC economy to robotization. To the best of our knowledge, this study is the first one in search of effects of robotization on relative positions of a group of economies by examining export contents.

According to the results, Malaysia occupies the first place with 8.7 average revealed human capital index (RHCI) figure. 2 Malaysia has a stable RHCI figure throughout the years. Turkey comes second with an average 8.3 RHCI; we observe an upward trend in Turkey's RHCI, i.e. Turkish economy is becoming more resilient over the years. Bahrain and Indonesia occupy the third and fourth positions, with somewhat stable RHCI figures. The last three positions are occupied by CÃ´te d'Ivoire, Nigeria and Iraq. The results of this study help to understand how susceptible MCs' economies to robotization. In addition, they will provide a ground to policy makers to develop relevant policies in order to decrease the vulnerability of their country.

This study is organized as follows: the next section lays down the motivation. It talks about why using exports is plausible for the purposes of comparing economic resiliency of MCs to robotization, and the link between human capital intensity and robotization. Section III gives the description and the summary statistics of the data. Section IV describes the methodology of constructing the index to compare MCs in terms of their economic resilience to robotization. Section V gives the results and Section VI concludes the study.

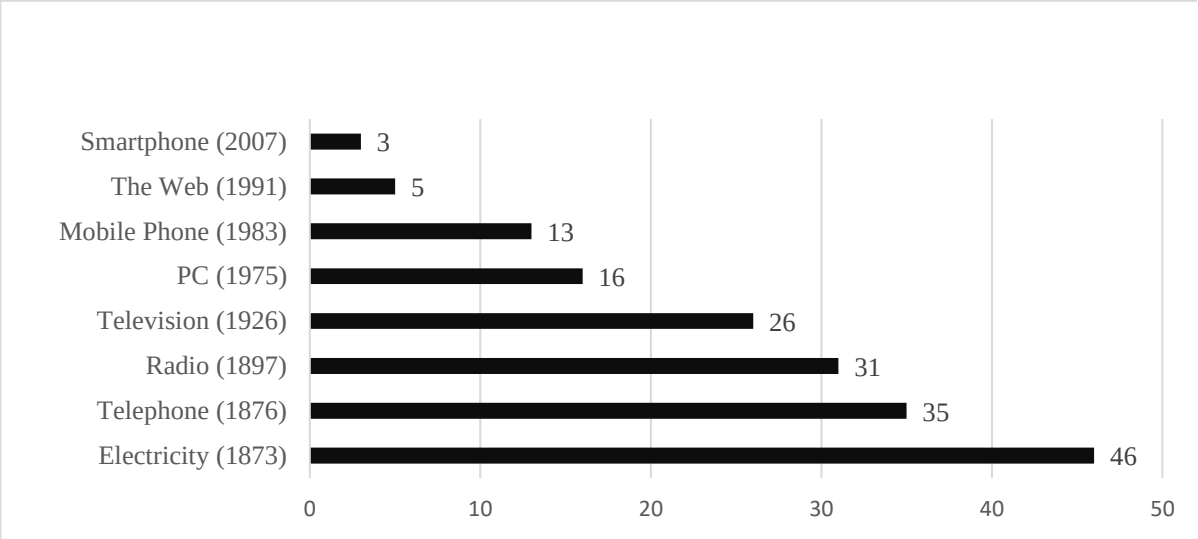
1. Motivation

Robots replace routine tasks. As such replacements of tasks might have adverse overall effects on labor, it is important to define a routine task. A routine task is a task that attend a well-defined procedure for which a software can be written for. It does not matter whether such a task is manual routine (like production jobs) or cognitive routine (like clerical work). Most of these tasks, if not all, can be done by robots. Hence, robotization is an automation type.

[2] This is the average of RHCI figures of an MC for the years 1995 to 2016.

Throughout the human history, we went through other forms of automation. However, robotization seems to be different than the previous waves of automation with its speed, scope and depth. As a result of the paramount potential robotization carries, naturally, there is a debate over the effects of robotization on employment.3 However, this debate would require a lengthy review of its own, which is beyond the scope of the current study. The main focus in this study is to compare IDB MCs in terms of their macroeconomic resilience to robotization.

Figure 1: Technology Adoption (Years until used by one-quarter of the US population)



Source: Kurzweil (2005).

Over centuries new technologies have emerged, and different groups, organizations, and countries have adopted them at varying speeds. Figure 1 presents the adoption speed of a few examples from the recent history. As Kurzweil (2005) argues, we observe that the adoption has been accelerating. i.e. more recent technologies being adopted by a wider share of the population faster than before. Compared to the 46 years for electricity, it took only 3 years for smart phones to have the same penetration rate, a quarter of the US population. This accelerating speed puts pressure on the changing skills set of labor that is required for an existing job or a newly formed one. In other words, as jobs landscape changes there is less demand for low-skilled labor and more demand for skilled labor. i.e. the lion's share of the burden is going to be on low-skilled labor rather than being uniformly distributed over skill classes.4 If this is translated into economic structure, sectors using low-skilled labor will be affected the most, and sectors requiring high-skilled labor will be affected less. In other words, higher human capital intensive sectors are less prone to effects of robotization.

In measuring the impact of robotization on an economy, the natural tendency could be to observe the Gross Domestic Product (GDP) of a country, as the GDP of a country is the monetary value of all the finished goods and services produced in that country. Note that the GDP has two components: one consumed domestically, and the other exported to other countries. For the domestically consumed part, the effect of robotization, however, is simply

[3] See Ozcan (2017a), Arntz et al.(2016), Frey-Osborne (2013), and Gorle-Clive (2013).
[4] See Ozcan (2017b).

redistribution through displacing production from one firm to a more efficient firm that has a higher robotization rate within the same country. The resulting effect would not change the position of a country vis-à-vis other countries. However, if a country is slow in robotization compared to other countries in its exporting sectors, this would harm its comparative advantage and may lead to the displacement of its exporting sectors' production to another country that is relatively faster in robotization. This can happen in the form of reshoring, which can be defined as the reverse process of offshoring, i.e. moving manufacturing from a low-labor-cost country to a higher-labor-cost country.

According to Sirkin et. al. (2011), reshoring has been started to put higher emphasis on automation and availability of skilled labor. According to Reshoring Initiative 2016 Data Report, skilled workforce was reported as a reason of reshoring at a much higher rate than in previous years. 5 The report also argues that the competitive advantage of having low labor cost (i.e. abundant low skilled labor) will gradually fade away as countries introduce more robots that automate such tasks. The movement of manufacturing from one country to another will become more evident over the coming years, especially as companies need to decide where to install new capacity.

To have an idea of the current reshoring trends, we can consult the figures for the US given by Reshoring Initiative 2016 Data Report. The reshoring (reshoring and related FDI) added 77,000 jobs in 2016. The cumulative number of manufacturing jobs brought from offshore for the years 2010 through 2015 is over 338,000. This report mentions the automation and skilled labor availability among the top factors for reshoring. Manufacturing can be done far more efficiently by the introduction of automation, high-tech equipment and streamlining tasks in a factory. This would require more high skilled labor to operate an updated factory. Hence, it is not surprising that skilled workforce availability/training and automation/ technology are among the top factors for reshoring. As a factor, the availability of skilled labor is reported at a much higher emphasis than previous years. The report also shows that reshoring is almost all from low wage/low skilled labor countries. Therefore, it is important to upgrade existing labor from low to high skilled for a country to be able to defend its comparative advantage in its exporting products.

For a country losing production in its exporting sectors to another country is an unwanted outcome, and can be described as a vulnerability for its overall economy. Therefore, we will focus on exports to find out relative resilience of a country's economy to robotization. Analyzing exports and human capital level of exporting sectors of a country will let us to draw conclusions about the countries' relative economic resilience to robotization.

2. Data

The human capital intensity at detailed sectoral levels is provided by the United Nations Conference on Trade Development (UNCTAD) and is called Database of Revealed Factor Intensity Indices (RFII).6 It provides a unique number that suggests the factor intensity of a traded good at the most disaggregated level of product classification (at Standard International Trade Classification (SITC) 5-digit and Harmonized Coding System (HS) 6-digit). This study makes use of the SITC index data as SITC provides longer years of trade statistics with fewer

[5] Reshoring Initiative (2017).
[6] Shirotori et. al. (2010).

revisions than the HS, thus has the advantage of giving maximum comparability over the sample period.

The RFII indices is calculated for products classified at the disaggregated level of the SITC (Revision 1) and the year coverage is from 1962 to 2007. The database consists of a mix of 4 and 5 digits in order to cover all the products as not every 4 digit is divided into five digits. Note that for the purposes of this study, the index at digit 3 rather than digit 4 or 5 is chosen to see happenings at the micro level rather than granular level. Hence, we calculated the index at the SITC digit 3 level as described in the methodology section below.

The export data of the IDB 57 Member Countries came from United Nations Comtrade Database (Comtrade). Comtrade provides detailed export data whenever data is available for a country. For the purposes of this study, the annual data for export of goods by using all SITC (Revision 1) categories is used from Comtrade for the 57 IDB MCs. Note that due to the lack of data for Uzbekistan, we have to drop it from the analyses. Other MCs have data for different time periods spanning from 1962 to 2016. As member countries in the central Asia got their independence in 1990s, we decided to focus on the data after 1995 to be able to include them in the comparison.

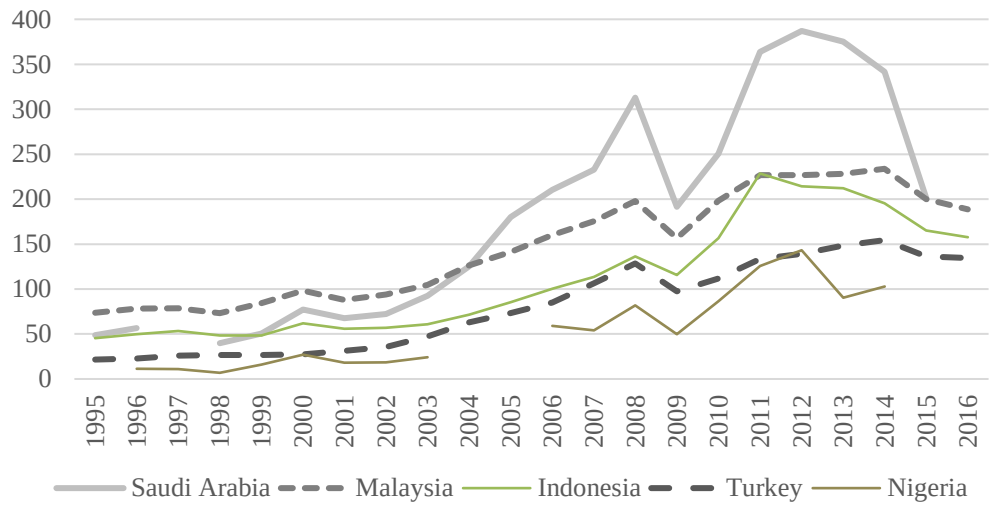
There are a number of missing points in the data after 1995. For example, Lebanese data starts from 1997; Bahrain has missing data for years 1997 through 1999; Qatar's 1997 and 2012 data are missing either. Furthermore, lack of data renders comparison not possible for some MCs; as a result we have to exclude them from the analyses. These MCs are Afghanistan, Libya, Chad, Djibouti, Guinea-Bissau, Sierra Leone, Somalia, Sudan, Tajikistan and Turkmenistan. In addition, Suriname's biggest exports item is "Special transactions not classd.accord.to kind" with more than 80% share throughout its data availability years; this class has no RHCI figure in the UNCTAD dataset; therefore we are compelled to exclude Suriname as well. Hence, a total of 12 from the 57 MCs are excluded from the analyses due to data availability issues.

Table 1 gives the total exports of MCs in billion US$ between 1995 and 2016. The table is sorted by total exports in 2010 as it is the latest year with most complete data. According to the table, Saudi Arabia has the highest exports figure among MCs. Malaysia comes second; Indonesia is the third and Turkey is the fourth largest exporter. As seen from Figure 2, after the oil price crash, Saudi Arabia's exports declined considerably. Oil exporting IDB MCs all follow a similar pattern. However, Malaysia, Indonesia and Turkey have an upward trend although they have short term fluctuations in their exports depending on global and their domestic economic and political situations.

Looking at aggregate exports data reveals only very limited information. Therefore, we look at the disaggregation of these exports across sectors. For Saudi Arabia, the exports are concentrated in two sectors, "petroleum, crude and partly refined," and "petroleum products." These two sectors constitute more than 83 percent of Saudi Arabia's exports in 2010. On the other hand, Malaysia has considerably less concentrated exports; its top two export classes, "other electrical machinery and apparatus" and "office machines," form around 29 percent of its overall exports. Indonesia and Turkey have even less concentrated export structures. Top two export classes for Indonesia and Turkey form about 22 percent of their exports in 2010. Indonesia's top two classes are coal, coke briquettes and other fixed vegetable oils. "Road motor vehicles" and "clothing except fur clothing" are the top two in Turkey's 2010 exports.
In order to generalize the analyses across all MCs, we look at the Concentration Ratio 5 (CR5). i.e. total ratio of the top 5 exports groups (in this study groups at digit 3 level) of each country.

Concentration ratios, usually CR5, are one of the most common measures of an industry's competitiveness in the industrial organization literature. The theory suggests that the lower the concentration ratio, the higher the competitiveness in that industry.

Figure 2: Top 5 Exporting IDB MC by 2010 (in bn. US$)



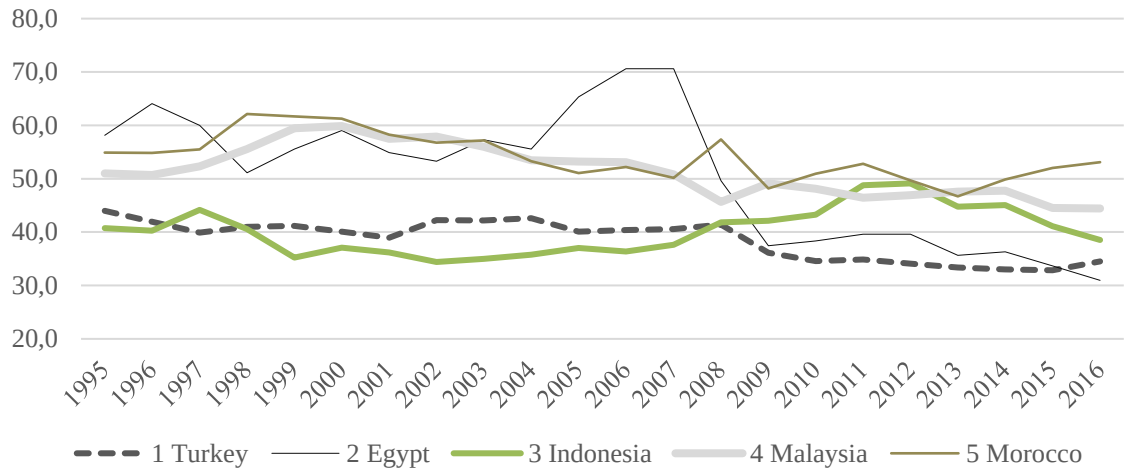
Data Source: Comtrade

In the context of this study, concentration ratios show how resilient an economy is; a lower concentration ratio of exports for an economy imply higher diversification in the economic structure of the exporting country hence a higher resilience to changes in individual sector's international competitiveness levels. A higher concentration ratio, like the CR5 figures for the mainly oil and gas exporting countries, imply dependency on those few industries, hence, less resilience to potential adverse effects of industries on the overall resiliency of the economy.

Table 2 gives CR5 for the MCs whose exports are more than 10 bn. US$. The table shows that mostly oil and gas related products exporting MCs appear with high CR5. On the other hand, some high-exporting MCs appear among the least CR5-level countries. Figure 3 shows the data for the five countries with the lowest CR5 -Turkey, Egypt, Indonesia, Malaysia, and Morocco, and the historical evolution of their concentration ratios.

As discussed earlier, the lower the CR5, the better diversified the economy is over different sectors. The overall trend in Figure 3 is downward, meaning the economies of the most diversified MCs are getting even more complex, more diversified over time. i.e. they have been managed to move their economic structure to a healthier base in time.

Figure 3: Concentration Ratio **5 (Lowest 5 MCs)**



Data Source: Comtrade

It is entirely possible that an economy has a high CR5, and yet these five sectors are all high-human-capital-intensive industries, rendering the economy quite resilient against any adverse effects of robotization. Therefore, the analyses of CR5 in the export industries is just a step we use in the deeper study of the human capital intensity of the countries. In an effort to get at the human capital intensity of exporting sectors, which in turn, enables the analyses of the effect of robotization on the MC economies, we conduct an intensive data collection effort by merging the data for exports and RFII. In the next section, we discuss the methodology of the analysis.

3. Methodology

In order to study how robotization affect relative economic resiliency of IDB MCs, we use data from two sources. The first source is the revealed human capital index, RHCI, from the RFII for SITC (Rev-1) digit 4 and 5. The second is the SITC (Rev-1) digit 3 exports data of MCs from Comtrade.

In order to make two data sets compatible, we first make RHCI digit-5 figures into digit-4, by taking simple averages for sub-groups of a digit-4 item. Then, by taking simple average of digit-4 sub-groups of digit-3 items, the RHCI figure at digit-3 level is calculated. The construction is done with the following formula

$$\text{RHCI (i)} = \frac{\sum_{k}^{n_i}\left(\frac{\sum_{l}^{n_k} RHCI(l)}{n_k}\right)}{n_i},$$

where n_k is the number of product subgroups at SITC digit-5 for the group kth SITC digit-4 product group, n_i is the number of product subgroups at SITC digit-4 for the group ith SITC digit-3 product group.

The export data set has the export figures for MCs at SITC (Rev-1) digit 3 level. Hence, by using digit-3 product definitions, we merge two data sets. As one can imagine, the total exports

of a country are not uniformly distributed over the digit-3 product codes; a country exports some items more than the others depending on the economic structure of that specific country. In order to reflect the structure of individual countries on calculated RHCI figures, we use the weighted average of RHCI of SITC Digit-3 product groups (weighting RHCI figures with export shares filters out the scale effects). i.e. for a country j,

$$\text{RHCIj} = \frac{\sum_i \ export(i) * RHCI(i)}{\sum_i \ export(i)},$$

where i runs over the SITC Digit-3 product codes. Note that any SITC Digit-3 product code is excluded from the calculations if there is no RHCI figure. These excluded product codes are listed in Table 3. Exports excluded due to lack of RHCI figure amount to 2.8% of total exports of all MCs. Hence, it has minimal effect on the results, if there is any.

For each year that the analyses focused on, there is an RHCIj figure for country j. This allows to make two lines of analyses.

The first line of analyses is comparing the MCs for a given year. An RHCIj figure for an MCj does not give us an absolute meaning. Rather, it would show the relative resilience of MCj compared to other MCs. In addition, being less resilient does not mean that MCj is immune to any effects of robotization; it only means that specific MCj is expected to be less affected relative to other MCs that have lower RHCI figures.

The second is the evolution of RHCI figure for a specific MC over time. The changes in RHCI figures of an MCj show the evolution of the economic structure of the MCj over time. If MCj's RHCI figure is rising, MCj becomes more human capital intensive economy. Whereas, if it is decreasing, MCj becomes less human capital intensive economy. Given that higher human capital is needed for developing technologies that produce higher value added, if MCj has an increasing RHCI figure over time, MCj has been developing in the right direction and vice versa.[7]

The next section discusses the results in depth.

4. Results

The results of RHCI calculations are given in Table 4. The data is truncated at 1995 to make comparison possible across the highest number of MCs. Table 4 is sorted according to 2010 figures.

Some of the small economies may seem to have higher rankings than expected. A closer look at the data for these countries reveals the underlying reasons. For example, one may wonder Lebanon's ranking as second among MCs. This result is mainly driven by the size of total exports (US$ 2.95 billion in 2014) and relatively narrow export items list. Export items "Inorg.chemicals elems.,oxides,halogen salts," "Printed matter," "Electric power machinery and switchgear," "Printed matter," "Non ferrous metal scrap," "Perfumery, cosmetics,

[7] One may raise the question of speed of development even if an MC has an increasing RHCI figure in time. This is a second order question for the current study, and hence is beyond its scope.

dentifrices, etc." and to some extend "Electric power machinery and switchgear" produce a high RHCI figure for Lebanon.

Another interesting point is the ranking of the State of Palestine. Again, the ranking is driven by sparsity of sectors. The total exports level was US$ 957 million in 2015, which is mainly created by "Furniture" (around 10%), "Articles of artificial plastic materials nes" (around 6%) and "Lime, cement & fabr.bldg.mat. Ex glass/clay mat" (around 18%). Similarly, Kyrgyzstan had US$ 721 million in 2016. Similarly, Kyrgyzstan's RHCI figure is mainly due to "Organic chemicals," "Electric energy," "Miscell.non ferrous base metals," "Silver & platinum ores," and "Other electrical machinery and apparatus." Mozambique with its total exports of US$ 3.1 billion in 2015 is yet another example, with the RHCI figure being driven by "Electric energy" (around 18%) "Aluminum," (more than 15%) and "Coal, coke & briquettes" (more than 10%).

These countries provide the evidence that the RHCI figures are affected by the sparsity of export sectors. Therefore, we focus on countries with exports of more than 10 bn. US$. That leaves 21 MCs in the list whose RHCI figures are given in Table 5. The table is sorted according to the figures in the last column, simple average of RHCI figures of an MC over 1995-2016.

According to the results, Malaysia occupies the first place with 8.7 RHCI average between 1995 and 2016. Although the within-country ranking changes from year to year, Malaysia's top 5 exporting product groups are other electrical machinery and apparatus, office machines, telecommunications apparatus, gas (natural and manufactured), and petroleum (crude and partly refined). Hence, Malaysia's figures are stable over the years implying that either it has not taken further steps to improve its economic structure to higher human capital intensive stages, or that the steps taken were not effective.

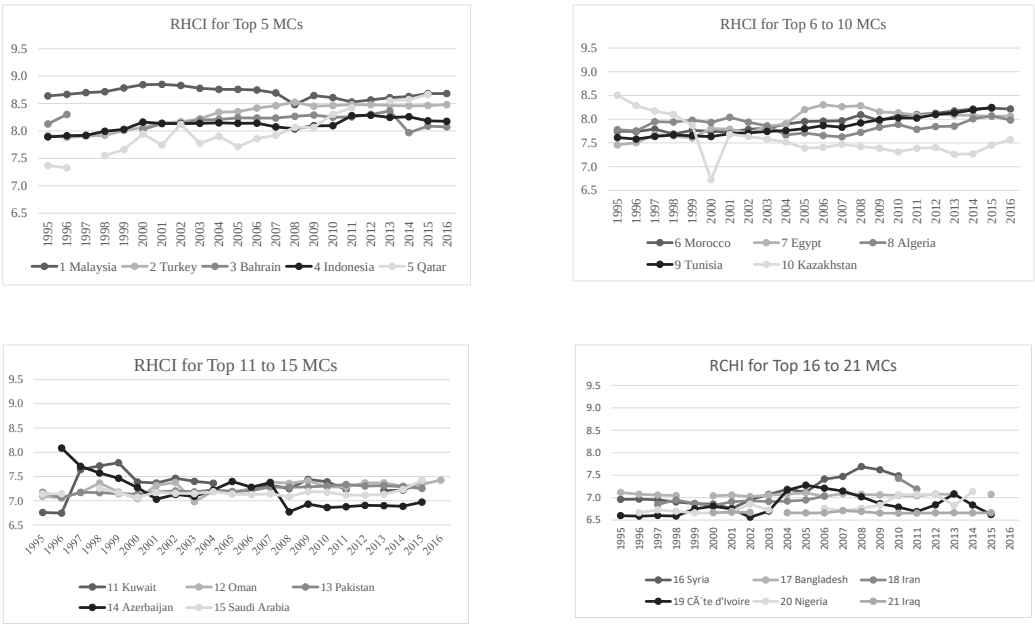
The second position is occupied by Turkey, whose average RHCI is 8.3. In 1995, Turkey starts with an RHCI of 7.9 and through years it has managed to increase to 8.5. This increase in human capital intensity of exports implies improvements in the Turkish economic structure. This change is also apparent at the top 5 exporting product groups. Clothing was the top exporting product group in 2000 with more than 24 percent share, and lost its share in 2005 to around 16 percent and its ranking to road and motor vehicles product group in the following years. In addition, although machinery and appliances non electrical parts product group was not in top 5 list, it became part of the list and went up to the 3rd position in 2015.

Bahrain and Indonesia occupy the third and fourth positions with somewhat stable RHCI figures respectively. The fifth position is occupied by Qatar whose figures seem to have increased considerably. However, Qatar's CR5 figures in Table 2 shows its economy is becoming more and more concentrated over the same period. A detailed look at its top exports product groups reveals that the share of gas exports increases at the expense of the share of petroleum exports. Since the former has higher RHCI figure than the latter, the country's overall RHCI figure increases without any diversification in the underlying economic structure.

The evolution of the RHCI figures can also be observed in Figure 4 for MCs with more than 10 bn. US$ in exports. To see the changes, we divide the MCs into 4 groups, (3 graphs with 5 countries and the last one with 6 countries). From this figure, we observe that only a handful of countries, including Turkey, Egypt, and Tunisia, show a visible upward trend. i.e. a visible increase in human capital density in exports. On the other hand, many countries exhibit a relatively stable RHCI level, including Malaysia from the top 5, and Kazakhstan and many others that rank between 11 and 21. The graphs at the bottom of Figure 4 show that some MCs

struggled to increase their RHCI figures, and others managed to have some improvement in their RHCI figures.

Figure 4: RHCI Figures for MCs whose exports are more than 10 bn. US$



Data Source: UNCTAD, Comtrade

The relationship between a country's concentration in export sectors and its human capital intensity is another interesting question worth to explore. Theoretically if a country can diversify its exports into different product groups, it might attains improved economic structure, hence, a higher RHCI figure is probable.8 Therefore, a negative correlation between RHCI and CR5 is expected for an economy that is becoming more complex. The negative correlation between an MC's RHCI and CR5 figures in Table 6 shows that most of the MC economies got more complex over the sample period. The ones having higher negative correlation figures are the ones that diversified more compared to others. Kazakhstan, Iran, Syria (before the civil war), Tunisia, Azerbaijan and Pakistan have negative correlations higher than 0.90. Lower negative correlation implies there is somewhat improvement in the complexity of its economic structure, though most of the improvement in CR5 is originated from sectoral shifts. CÃ´te d'Ivoire, Algeria and Egypt are examples of such economies. On the other hand, it might be the case that CR5 does not change much or does not change at all, but RHCI figures of an MC can increase or decrease due to the compositional changes in an MC's exports (increasing ratio of higher RHCI product group at the expense of lower RHCI product group without much changing CR5). This happens for some of the MCs like Qatar, Bahrein, Indonesia and Malaysia whose correlations turn out to be positive.

[8] For a discussion of export diversification and economic growth, see Hesse (2008) and Parteka-Tamberi (2013).

Conclusion

Robotization has started to change production, consumption, communication, and virtually every other aspects of human life. This has effects on economies and their relative positions. i.e. comparative advantages of an economy. The faster the robotization adoption, the more ground at the comparative advantage front. Therefore it is important to understand how an economy is affected by robotization. This study focuses on how robotization will affect relative positions of IDB Member Countries.

We first establish that despite GDP being a good indicator for the overall economic activity of a country, using exports is more relevant to measuring the relative macroeconomic resiliency of a country to the effects of robotization.

We then propose and calculate a measure of relative economic resiliency of a country based on its exports and the human capital intensity of its exporting sectors. We calculate this measure by constructing an index that shows the relative economic resilience of IDB MCs based on revealed human capital level of exporting sectors of an MC. To accomplish this, we use two different data sources: IDB MCs' exports data are taken from Comtrade, and the revealed factor intensity index data that show sectoral level human capital intensity from the United Nations Conference on Trade Development.

We first document the composition of the MC countries' exports into various sectors, with some having a very high concentration, such as Saudi Arabia, while others having low sectoral concentration in exports, such as Malaysia and Turkey. Then, we argue that the sectoral composition can be the result of many factors, and we discuss the need for deepening the analyses using the human capital intensity of export sectors, and propose to construct an index in order to be able to make comparison between the IDB MCs.

The results show that Malaysia is economically the most resilient MC, followed by Turkey, with Turkey having an upward trend in its resiliency. Bahrein and Indonesia follow them on the third and fourth positions respectively according to the average resiliency between the years 1995 and 2016. The most vulnerable three MCs are CÃ´te d'Ivoire, Nigeria and Iraq.

The results of this study can be used as a starting point and a base to understand how susceptible MCs' economies to robotization. In addition, policy makers can build relevant policies, like setting up or reconfiguring incentives for education/training of labor -to acquire new skills required by the changing work landscape - or investment in certain sectors, in order to improve their countries relative position against the probable adverse effects of robotization.

References

Arntz, Melanie - Terry Gregory - Ulrich Zierahn (2016) "ELS Issues in robotics and steps to consider them," **Centre for European Economic Research**, Mannheim, Germany.

Bahar, Dany - Ricardo Hausmann - Cesar A. Hidalgo (2014), "Neighbors and the evolution of the comparative advantage of nations: Evidence of international knowledge diffusion?" **Journal of International Economics**, Vol. 92.

Basu, Sudip Ranjan - Monica Das (2011), "Export Structure and Economic Performance in Developing Countries: Evidence from Nonparametric Methodology," **Policy Issues in International Trade and Commodities Study Series No. 48**, UNCTAD, New York and Geneva.

Díaz-Lanchas , Jorge - Carlos Llano - Asier Minondo - Francisco Requena (2018) "Cities export specialization," **Applied Economics Letters**, 25.

Frey, Carl Benedikt-Michael A. Osborne (2013) "The Future of Employment: How Susceptible are Jobs to Computerization?," **University of Oxford**.

Gorle, Peter-Andrew Clive (2013) "Positive Impact of Industrial Robots on Employment," **International Federation of Robotics**.

Hausmann, Ricardo - Jason Hwang - Dani Rodrik (2007), "What you export matters," **Journal of Economic Growth**, Vol. 12.

Hesse, Heiko (2008). "Export Diversification and Economic Growth," Working Paper No. 21, **World Bank Commission on Growth and Development**, Washington, DC.

Kurzweil, Ray (2005), *The singularity is near: When humans transcend biology,* New York: Viking.

Lee, Yong Suk (2018) "International isolation and regional inequality: Evidence from sanctions on North Korea," **Journal of Urban Economics**, Vol. 103.

Ozcan, Rasim (2017a), "Robots Replacing Humans Creative Destruction or Total Annihilation?," **IDB Chief Economist Complex Policy Brief** No.10. Available at SSRN: https://ssrn.com/abstract=3144331

Ozcan, Rasim (2017b), "Robots, Skills and Income," **IDB Chief Economist Complex Policy Brief** No.13. Available at SSRN: https://ssrn.com/abstract=3144362

Parteka, Aleksandra - Massimo Tamberi (2013), "Product diversification, relative specialization and economic development: Import–export analysis," **Journal of Macroeconomics**, Vol. 38.

Pathikonda , Vilas - Thomas Farole (2017) "The Capabilities Driving Participation in Global Value Chains," **Journal of International Commerce, Economics and Policy**, Vol. 8.

Reshoring Initiative (2017) "Reshoring Initiative 2016 Data Report: The Tide has Turned." http://www.reshorenow.org/

Shirotori, Miho - Bolormaa Tumurchudur - Olivier Cador (2010) "Revealed Factor Intensity Indicies mat the Product Level," **Policy Issues in International Trade and Commodities Study Series No. 44**, UNCTAD, New York and Geneva.

Sirkin, Harold L.-Michael Zinse- Douglas Hohner (2011) "Made in America Again, Why Manufacturing will Return to the US," **The Boston Consulting Group**.

Appendix

Table 1: Total Exports of IDB MCs (in bn. US$) (Sorted by 2010)

Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Saudi Arabia	48.6	56.5		39.8	50.7	77.2	67.6	72.1	92.6	125.3	180.1	210.3	232.7	312.7	191.3	250.4	363.8	387.0	375.2	341.6	201.2	
Malaysia	73.7	78.3	78.6	73.2	84.4	98.1	87.9	94.0	104.5	126.4	141.4	160.1	175.6	198.0	156.5	198.3	226.6	226.8	228.0	233.7	199.9	188.8
Indonesia	45.4	49.7	53.2	48.4	48.3	61.7	55.9	56.9	60.8	71.3	85.4	100.3	113.4	136.2	115.6	156.6	228.5	214.2	212.3	195.3	165.0	157.6
Turkey	21.6	22.8	26.0	26.6	26.6	27.5	31.3	35.7	47.2	63.0	73.3	84.9	106.3	128.4	97.5	111.8	133.4	139.1	148.5	154.4	136.5	134.4
Nigeria		11.4	11.2	6.9	16.1	27.1	18.0	18.6	24.1			59.2	54.0	81.8	49.9	86.6	125.6	143.2	90.6	102.9		
Iran			18.4	13.2	20.0	28.3	23.9	28.2	33.8	44.6	60.0	63.2				83.8	130.5					
Qatar	3.6	3.8		5.0	7.2	8.8	10.7	8.2	13.4	18.7	25.8	34.1	42.0	67.3	48.0	75.0	114.4		136.9	131.6	78.0	
Kuwait	12.9	14.9	14.1	9.5	12.1	19.4	16.2	15.4	20.6	28.6		56.0	62.7	87.5	51.9	62.7	102.7		114.4	101.1	55.2	
Algeria	9.4	11.1	13.9	9.8	12.5	22.0	19.1	18.8	24.7	32.1	46.0	54.6	60.2	79.3	45.2	57.0	73.4	71.9	66.0	60.4	34.8	30.0
Kazakhstan	5.0	5.7	6.1	4.8	5.5	8.7	8.4	9.5	12.8	19.9	27.6	37.8	47.3	70.6	42.5	56.4	87.1	91.4	84.2	79.2	45.7	36.8
Iraq						20.4	16.5	13.2		18.5	19.8	28.8	41.7	61.5	41.9	52.5	83.2	94.4	89.7	84.5	49.4	
Oman	5.9	7.2	7.6	5.5	7.2	10.8	11.0	11.1	12.2	13.4	18.7	21.6	24.7	37.7	27.6	36.6	47.1	52.1	55.5	50.7	31.9	24.4
Egypt	3.4	3.5	3.9	3.2	3.5	4.7	4.1	4.6	6.1	7.7	10.6	13.5	16.1	26.0	23.3	25.3	29.9	28.1	27.9	26.2	21.3	19.9
Pakistan	8.2	9.3	8.7	8.5	8.4	9.2	9.2	9.9	11.9	13.4	16.1	16.9	17.8	20.3	17.6	21.4	25.3	24.6	25.1	24.7	22.1	
Azerbaijan		0.6	0.8	0.6	0.9	1.7	2.3	2.2	2.6	3.6	4.3	6.4	6.1	47.8	14.7	21.3	26.5	23.8	23.9	21.8	11.3	
Bangladesh	3.4	3.5	4.0	5.1		5.5	5.4	5.4	6.4	8.3	9.3	11.7	13.1	15.5	15.6	19.2	24.3	24.5	24.5		31.7	
Morocco	4.7	4.7	4.7	7.2	7.5	7.4	7.1	7.8	8.8	9.9	11.2	12.5	14.6	20.3	14.0	17.6	21.6	21.4	21.9	23.7	21.9	22.7
Tunisia	5.5	5.5	5.6	5.7	5.8	5.9	6.6	6.9	8.0	9.7	10.5	11.7	15.2	19.3	14.4	16.4	17.8	17.0	17.1	16.8	14.1	
Bahrain	3.5	1.5				6.2	5.6	5.8	6.6	7.5	10.2	11.7	13.7	13.1	8.4	16.1	22.6	16.6	20.0	23.7	16.7	12.9
Syria	4.0	4.0	3.8	2.8	3.4	4.6	5.0	6.5	5.7	5.4	6.4	10.9	11.5	14.4	9.7	11.4						
CÃ´te d'Ivoire	3.7	4.2	4.1	4.4	4.3	3.6	3.6	4.9	5.3	6.6	7.2	8.1	8.0	9.7	10.1	10.1	10.5	10.2	11.5	12.3	11.1	
Jordan	1.8		1.6	1.4	1.8	1.3	2.3	2.2	2.9	3.8	4.3	4.9	5.7	7.7	6.1	6.8	7.7	7.7	7.9	8.4	7.8	7.4

Yemen	1.9	3.2	2.5	1.5	2.4	4.1	3.1	3.1	3.7	4.1	5.6	6.6	6.3	7.6	6.3	6.4	6.9	7.1	7.1	2.4	0.5	
Cameroon	1.5	1.8	1.9			1.8	1.7	1.8	2.3	2.5	2.8	3.6	4.2	2.1	1.7	3.9	2.1	4.3	4.5	5.2	4.1	
Lebanon			0.6	0.6	0.6	0.7	0.8	0.9	1.2	1.6	1.8	1.8	2.5	3.2	2.6	3.4	3.1	3.1	3.4	2.9		
Mozambique	0.2	0.2	0.2		0.3	0.4	0.7	0.8	1.0	1.5	1.7	2.4	2.4	2.6	2.1	2.2	3.6	3.5	4.0	4.7	3.2	
Senegal		0.4	0.3	0.5	0.5	0.7	0.8	0.7	1.2	1.3	1.5	1.5	1.5	2.1	1.8	1.9	2.3	2.2	2.3	2.4	2.4	2.3
Uganda	0.5	0.7	0.4	0.5	0.5	0.4	0.4	0.4	0.5	0.6	0.7	0.8	1.3	1.7	1.6	1.6	2.2	2.3	2.4	2.3	2.2	
Albania		0.2	0.1	0.2	0.4	0.3	0.3	0.3	0.4	0.6	0.7	0.8	1.1	1.4	1.1	1.5	1.9	2.0	2.3	2.4	1.9	2.0
Kyrgyzstan	0.4	0.5		0.3	0.5	0.3	0.3	0.3	0.3	0.4	0.7	0.6	0.9	1.2	0.6	0.8	1.0	1.1	1.0		0.8	0.7
Togo	0.3	0.4	0.3	0.4	0.3	0.2	0.2	0.3	0.5	0.4	0.4		0.3	0.6	0.6	0.6	0.8	0.9	1.1	0.8	0.7	0.7
S. of Palestine						0.4	0.3	0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.5	0.6	0.7	0.8	0.9	0.9	1.0	
Guyana			0.4	0.4	0.5	0.4	0.4	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.5	0.6	0.7	0.7	0.7	0.7	0.9	0.8
Benin	0.3	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.3	0.4	0.4	0.5	0.4	0.4	0.6	0.9	0.6	0.4
Mauritania	0.5	0.5				0.3	0.3	0.3	0.3	0.4	0.6		1.3	1.5	1.2	0.5	2.1	2.3	2.1	1.8		1.4
Mali		0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.4	0.5	0.4	0.4	0.4	0.5		0.4	0.7	0.9				
Burkina Faso	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.4	0.3		0.4	0.3	0.4	0.4	0.5	0.8	1.2	1.4	0.8	
Niger	0.3	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.6	1.0	0.6	0.4	1.1	1.4	1.3	1.0	0.7	0.9
Maldives	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1
Gambia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1		
Comoros	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
UAE					26.4	37.7	32.0				112.5		151.0	200.9				316.1	356.3	367.9		
Brunei D.			2.7	2.3			3.5	3.6	4.1	5.1		7.6						13.0	11.4	10.5	6.4	
Gabon		3.1	2.6	2.6	2.1	2.6	2.5	2.4	0.3	2.8	5.1	6.0	6.3	9.6	5.4							
Guinea	0.7	0.7	0.7	0.5	0.4	0.4	0.5	0.4		0.6	0.7	0.8	0.9	1.0					0.8	1.0	0.9	

Table 2: Concentration Ratio-5 of IDB MCs' Exports (Sorted by 2010)

Rank	Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average
1	**Turkey**	44.0	42.0	39.9	41.0	41.1	40.1	38.9	42.3	42.2	42.6	40.1	40.4	40.6	41.4	36.1	34.6	34.8	34.1	33.4	33.0	32.9	34.5	38.6
2	**Egypt**	58.1	64.1	60.0	51.1	55.5	59.0	54.9	53.3	57.3	55.5	65.3	70.6	70.6	49.6	37.5	38.4	39.6	39.6	35.6	36.3	33.7	31.0	50.8
3	**Indonesia**	40.7	40.3	44.2	40.5	35.2	37.1	36.2	34.4	35.0	35.8	37.0	36.4	37.6	41.9	42.1	43.3	48.8	49.1	44.8	45.1	41.1	38.5	40.2
4	**Malaysia**	51.0	50.7	52.3	55.6	59.5	59.9	57.5	57.9	56.0	53.5	53.2	53.1	50.8	45.7	49.2	48.1	46.4	46.9	47.6	47.8	44.5	44.4	51.4
5	**Morocco**	54.9	54.8	55.5	62.1	61.7	61.3	58.3	56.8	57.2	53.3	51.1	52.2	50.1	57.4	48.2	50.9	52.8	49.7	46.7	49.9	52.0	53.1	54.1
6	**Tunisia**	62.6	65.0	62.4	62.1	62.5	62.0	60.4	59.1	58.2	58.6	55.6	52.1	51.6	52.6	50.2	51.2	53.4	48.1	47.7	47.6	46.0		55.7
7	**Syria**	80.5	82.5	81.9	79.1	82.8	86.4	93.1	83.6	80.3	78.2	76.2	59.2	58.7	54.8	52.3	61.1							74.4
8	**Pakistan**	70.0	70.4	71.7	70.1	71.3	69.7	69.3	68.5	69.5	67.2	69.4	70.1	65.0	64.3	63.4	62.4	59.1	58.0	61.6	63.5	66.6		66.7
9	**CÃ´te d'Ivoire**	66.6	66.8	65.6	64.8	62.2	66.7	62.0	69.3	60.6	62.2	65.2	68.4	66.3	72.0	71.4	72.7	77.9	74.1	71.6	68.6	73.0		68.0
10	**Iran**			91.1	89.3	91.7	92.7	89.6	89.3	88.7	89.4	88.2	86.0				78.3	85.0						88.3
11	**Kazakhstan**	50.4	49.8	57.1	58.9	65.7	98.0	72.2	73.3	74.1	75.1	77.9	77.5	74.3	76.1	76.5	79.5	78.4	77.7	82.0	80.7	76.3	71.2	72.8
12	**Oman**	90.2	90.6	87.9	82.7	86.8	90.4	89.4	88.2	97.0	89.8	91.1	91.4	89.6	89.3	84.0	86.1	86.7	86.2	85.2	88.6	81.1	78.5	87.8
13	**Bangladesh**	80.5	83.9	84.5	87.7		90.3	91.2	90.3	91.4	88.7	86.1	87.3	84.2	87.9	88.6	88.5	89.7	88.6	89.7		91.9		87.9
14	**Bahrain**	84.8	76.7				93.4	92.9	92.7	91.6	92.3	93.2	94.4	93.2	86.9	83.7	91.4	91.3	83.4	75.6	75.1	64.4	67.4	85.5
15	**Nigeria**		98.2	99.5	99.1	99.5	99.8	99.9	97.9	99.7			99.4	96.3	95.9	94.8	92.1	96.0	93.3	92.5	94.8			97.0
16	**Saudi Arabia**	95.0	94.4		92.3	94.1	96.2	94.5	94.2	94.1	93.7	94.9	94.2	93.1	93.8	90.8	93.2	94.3	94.2	93.5	92.5	87.9		93.5
17	**Azerbaijan**		80.9	77.9	78.8	82.6	89.0	93.2	91.1	89.8	89.1	88.0	89.7	86.9	97.7	94.8	96.0	95.9	95.1	94.6	94.4	90.7		89.8
18	**Kuwait**	97.3	97.2	95.9	94.2	95.6	98.0	97.8	97.5	97.3	97.7		97.6	97.3	96.5	96.1	96.3	97.4		96.9	96.2	93.2		96.6
19	**Algeria**	95.9	94.5	97.7	97.6	97.7	98.4	98.0	97.6	98.5	98.6	98.8	98.5	98.7	98.6	98.8	98.7	98.9	99.0	98.8	98.2	97.2	96.8	98.0
20	**Qatar**	89.2	91.3		91.5	93.5	94.2	96.1	92.5	95.1	92.4	97.8	95.0	94.9	99.4	92.5	99.6	99.5		99.6	99.8	94.9		95.2
21	**Iraq**						99.6	99.4	99.6		99.9	99.9	99.9	100.0	100.0	99.9	100.0	99.9	100.0	100.0	100.0	100.0		99.9

Table 3 Product Groups without RHCI Figure
Groups that have to be excluded due to missing RHCI figures in RFII database

Special transactions not classd.accord.to kind
Developed cinematographic film
Hoop and strip of iron or steel
Postal packages not classified accord.to kind
Sugar confy, sugar preps. Ex chocolate confy.

Source: Comtrade and RFII.

Table 4. RHCI figures of IDB MCs.
The data is truncated at 1995 to make comparison possible for most of the MCs. Table is sorted according to 2010 figures.

Rank	Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1	**Malaysia**	8.6	8.7	8.7	8.7	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.7	8.7	8.5	8.6	8.6	8.5	8.6	8.6	8.6	8.7	8.7
2	**Lebanon**			8.1	8.1	8.1	8.2	8.1	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.5	8.6	8.4	8.4	8.4	8.4		
3	**Turkey**	7.9	7.9	7.9	7.9	8.0	8.1	8.1	8.2	8.2	8.3	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
4	**S. of Palestine**						8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.4	8.4	8.5	8.3	8.3	8.3	8.3	
5	**Qatar**	7.4	7.3		7.6	7.7	7.9	7.7	8.1	7.8	7.9	7.7	7.9	7.9	8.1	8.1	8.3	8.4		8.6	8.6	8.7	
6	**Jordan**	8.2		8.2	8.2	8.4	8.5	8.4	8.1	8.2	8.1	8.1	8.1	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.2	8.2	8.3
7	**Bahrain**	8.1	8.3				8.0	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.2	8.3	8.3	8.4	8.0	8.1	8.1
8	**Egypt**	7.5	7.5	7.7	7.7	7.6	7.8	7.8	7.7	7.9	7.9	8.2	8.3	8.3	8.3	8.2	8.1	8.1	8.1	8.1	8.1	8.1	8.1
9	**Suriname**	8.5	8.3	8.6	7.7	8.7	8.2	8.1	8.0	8.2	8.3	8.7	8.3	8.2	8.2	8.2	8.1	8.3	8.0	8.2	8.1		
10	**Indonesia**	7.9	7.9	7.9	8.0	8.0	8.2	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.0	8.1	8.1	8.3	8.3	8.2	8.3	8.2	8.2
11	**Morocco**	7.7	7.7	7.8	7.7	7.8	7.7	7.7	7.8	7.8	7.9	8.0	8.0	8.0	8.1	8.0	8.1	8.1	8.1	8.2	8.2	8.2	8.2
12	**Senegal**		8.1	8.1	8.2	8.4	7.6	7.7	8.2	7.9	7.8	8.0	7.9	7.9	8.2	8.1	8.1	8.1	8.1	8.0	7.9	7.9	7.9
13	**Tunisia**	7.6	7.6	7.6	7.7	7.6	7.6	7.7	7.7	7.7	7.8	7.8	7.9	7.8	7.9	8.0	8.0	8.0	8.1	8.1	8.2	8.2	
14	**Togo**	7.0	7.0	6.8	7.0	7.0	7.1	7.6	7.4	7.6	7.4	7.7		7.8	7.9	7.9	7.9	7.8	7.9	7.9	7.8	7.7	8.1
15	**Algeria**	7.8	7.8	7.9	7.9	8.0	7.9	8.0	7.9	7.9	7.7	7.7	7.7	7.6	7.7	7.8	7.9	7.8	7.8	7.9	8.0	8.1	8.0
16	**Kyrgyzstan**	8.0	7.9		7.6	7.4	7.5	7.6	7.5	7.7	7.8	7.9	8.0	8.1	8.0	7.9	7.9	8.0	8.1	8.3		8.4	8.3
17	**Mozambique**	7.0	7.4	6.9		7.2	7.2	7.7	7.6	7.8	7.9	7.9	7.9	8.0	7.7	7.4	7.8	7.9	8.0	8.0	8.1	7.9	
18	**Albania**		7.7	7.8	7.6	7.8	7.8	7.7	7.8	7.8	7.9	7.8	7.8	7.7	7.8	7.7	7.8	7.7	7.6	7.6	7.6	7.7	7.7
19	**Gambia**	7.5	7.0	7.9	7.0	7.0	6.9	7.0	7.3	7.5	8.0	7.7	7.1	7.3	7.5	7.8	7.6	7.7	7.8	7.9	7.9		
20	**Niger**	7.5	7.8	7.8	7.8	7.7	7.6	7.5	7.4	7.4	7.6	7.7	7.7	7.5	7.5	7.5	7.5	7.4	7.6	7.6	7.7	7.6	7.3
21	**Syria**	7.0	7.0	7.0	6.9	6.9	6.9	6.8	7.0	7.1	7.2	7.1	7.4	7.5	7.7	7.6	7.5						
22	**Iran**			6.8	7.0	6.9	6.8	6.9	6.9	6.9	6.9	6.9	7.0				7.4	7.2					

23	**Kuwait**	6.8	6.7	7.6	7.7	7.8	7.4	7.4	7.5	7.4	7.4		7.3	7.3	7.3	7.4	7.4	7.2		7.2	7.2	7.4	
24	**Guyana**			7.4	7.3	7.4	7.4	7.4	7.5	7.7	7.5	7.6	7.7	7.6	7.4	7.4	7.3	7.4	7.3	7.3	7.3	7.9	7.8
25	**Kazakhstan**	8.5	8.3	8.2	8.1	7.9	6.7	7.7	7.6	7.6	7.5	7.4	7.4	7.5	7.4	7.4	7.3	7.4	7.4	7.3	7.3	7.5	7.6
26	**Uganda**	6.0	6.2	6.4	6.1	6.0	6.3	6.5	6.5	6.7	6.6	6.8	7.0	7.2	7.3	7.4	7.3	7.2	7.4	7.3	7.3	7.3	
27	**Pakistan**	7.2	7.1	7.2	7.2	7.1	7.1	7.2	7.2	7.2	7.2	7.2	7.2	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	
28	**Oman**	7.1	7.1	7.2	7.4	7.2	7.0	7.3	7.4	7.0	7.2	7.2	7.2	7.4	7.4	7.4	7.3	7.3	7.4	7.4	7.3	7.3	7.4
29	**Benin**	6.6	6.3	6.7	6.0	5.2	5.4	5.6	6.1	5.5	5.6	5.9	6.5	6.3	6.7	7.0	7.2	7.0	6.8	6.6	7.3	6.5	6.3
30	**Yemen**	6.8	6.9	6.8	6.9	6.8	6.8	6.7	6.7	6.7	6.8	6.9	6.9	7.0	7.0	6.9	7.2	7.3	7.1	7.8	7.5	8.0	
31	**Saudi Arabia**	7.1	7.1		7.3	7.2	7.1	7.2	7.2	7.1	7.2	7.1	7.1	7.1	7.1	7.2	7.2	7.1	7.1	7.1	7.2	7.4	
32	**Nigeria**		6.7	6.7	6.7	6.7	6.7	6.7	6.9	6.7			6.8	6.7	6.8	6.8	7.1	7.1	7.1	6.8	7.1		
33	**Bangladesh**	7.1	7.1	7.1	7.0		7.0	7.1	7.0	7.1	7.1	7.1	7.0	7.1	7.1	7.1	7.1	7.0	7.1	7.1		7.1	
34	**Cameroon**	6.8	6.7	6.8			6.8	6.8	6.6	6.7	6.7	6.9	7.0	7.2	7.3	6.8	6.9	7.0	7.0	6.9	6.9	6.7	
35	**Comoros**	6.6	6.7	6.8	6.9	6.4	6.4	6.4	6.3	6.4	6.4	6.6	6.5	6.6	6.7	6.7	6.9	6.8	6.6	6.7			
36	**Mauritania**	7.4	7.5				7.7	7.8	7.8	7.7	7.7	7.8		7.4	7.5	6.8	6.9	6.8	7.5	7.7	7.6		7.4
37	**Azerbaijan**		8.1	7.7	7.6	7.5	7.3	7.0	7.1	7.1	7.2	7.4	7.3	7.4	6.8	6.9	6.9	6.9	6.9	6.9	6.9	7.0	
38	**Maldives**	7.1	7.0	7.0	7.0	6.9	7.0	6.9	6.9	6.9	7.3	7.3	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
39	**CÃ´te d'Ivoire**	6.6	6.6	6.6	6.6	6.7	6.8	6.7	6.6	6.7	7.2	7.3	7.2	7.1	7.0	6.9	6.8	6.7	6.8	7.1	6.8	6.6	
40	**Mali**		5.6	4.9	5.2	5.4	5.3	6.8	6.0	5.3	5.5	5.6	5.9	6.2	6.7		6.8	7.0	6.6				
41	**Iraq**						6.7	6.7	6.7		6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	
42	**Burkina Faso**	5.8	5.8	5.9	5.7	5.7	6.0	5.9	5.8	5.4	5.3	5.3		5.4	5.8	5.7	5.8	5.9	6.8	6.5	6.7	6.5	
43	**Brunei D.**			8.0	8.2			7.9	7.8	7.8	7.6		7.4						7.9	8.0	8.1	8.2	
44	**Gabon**		6.8	6.8	6.8	6.9	6.8	6.8	6.8	7.6	6.9	6.8	6.8	6.8	6.8	6.8							
45	**Guinea**	7.4	7.4	7.5	7.4	7.4	7.5	7.6	7.6		7.4	7.1	6.9	7.2	7.7					7.8	7.5	7.5	
46	**UAE**					7.5	7.4	7.6				7.6		7.6	7.5				7.9	8.0	8.1		

Table 5: Calculated Revealed Human Capital Index Figures for MCs
(with more than 10 bn. US$ exports)

Ranking	Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average
1	**Malaysia**	8.6	8.7	8.7	8.7	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.7	8.7	8.5	8.6	8.6	8.5	8.6	8.6	8.6	8.7	8.7	8.7
2	**Turkey**	7.9	7.9	7.9	7.9	8.0	8.1	8.1	8.2	8.2	8.3	8.4	8.4	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.3
3	**Bahrain**	8.1	8.3				8.0	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.2	8.3	8.3	8.4	8.0	8.1	8.1	8.2
4	**Indonesia**	7.9	7.9	7.9	8.0	8.0	8.2	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.0	8.1	8.1	8.3	8.3	8.2	8.3	8.2	8.2	8.1
5	**Qatar**	7.4	7.3		7.6	7.7	7.9	7.7	8.1	7.8	7.9	7.7	7.9	7.9	8.1	8.1	8.3	8.4		8.6	8.6	8.7		8.0
6	**Morocco**	7.7	7.7	7.8	7.7	7.8	7.7	7.7	7.8	7.8	7.9	8.0	8.0	8.0	8.1	8.0	8.1	8.1	8.1	8.2	8.2	8.2	8.2	7.9
7	**Egypt**	7.5	7.5	7.7	7.7	7.6	7.8	7.8	7.7	7.9	7.9	8.2	8.3	8.3	8.3	8.2	8.1	8.1	8.1	8.1	8.1	8.1	8.1	7.9
8	**Algeria**	7.8	7.8	7.9	7.9	8.0	7.9	8.0	7.9	7.9	7.7	7.7	7.7	7.6	7.7	7.8	7.9	7.8	7.8	7.9	8.0	8.1	8.0	7.9
9	**Tunisia**	7.6	7.6	7.6	7.7	7.6	7.6	7.7	7.7	7.7	7.8	7.8	7.9	7.8	7.9	8.0	8.0	8.0	8.1	8.1	8.2	8.2		7.8
10	**Kazakhstan**	8.5	8.3	8.2	8.1	7.9	6.7	7.7	7.6	7.6	7.5	7.4	7.4	7.5	7.4	7.4	7.3	7.4	7.4	7.3	7.3	7.5	7.6	7.6
11	**Kuwait**	6.8	6.7	7.6	7.7	7.8	7.4	7.4	7.5	7.4	7.4		7.3	7.3	7.3	7.4	7.4	7.2		7.2	7.2	7.4		7.3
12	**Oman**	7.1	7.1	7.2	7.4	7.2	7.0	7.3	7.4	7.0	7.2	7.2	7.2	7.4	7.4	7.4	7.3	7.3	7.4	7.4	7.3	7.3	7.4	7.3
13	**Pakistan**	7.2	7.1	7.2	7.2	7.1	7.1	7.2	7.2	7.2	7.2	7.2	7.2	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3		7.2
14	**Azerbaijan**		8.1	7.7	7.6	7.5	7.3	7.0	7.1	7.1	7.2	7.4	7.3	7.4	6.8	6.9	6.9	6.9	6.9	6.9	6.9	7.0		7.2
15	**Saudi Arabia**	7.1	7.1		7.3	7.2	7.1	7.2	7.2	7.1	7.2	7.1	7.1	7.1	7.1	7.2	7.2	7.1	7.1	7.1	7.2	7.4		7.2
16	**Syria**	7.0	7.0	7.0	6.9	6.9	6.9	6.8	7.0	7.1	7.2	7.1	7.4	7.5	7.7	7.6	7.5							7.1
17	**Bangladesh**	7.1	7.1	7.1	7.0		7.0	7.1	7.0	7.1	7.1	7.1	7.0	7.1	7.1	7.1	7.1	7.0	7.1	7.1		7.1		7.1
18	**Iran**			6.8	7.0	6.9	6.8	6.9	6.9	6.9	6.9	6.9	7.0				7.4	7.2						7.0
19	**CÃ´te d'Ivoire**	6.6	6.6	6.6	6.6	6.7	6.8	6.7	6.6	6.7	7.2	7.3	7.2	7.1	7.0	6.9	6.8	6.7	6.8	7.1	6.8	6.6		6.8
20	**Nigeria**		6.7	6.7	6.7	6.7	6.7	6.7	6.9	6.7			6.8	6.7	6.8	6.8	7.1	7.1	7.1	6.8	7.1			6.8
21	**Iraq**						6.7	6.7	6.7		6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7		6.7

Table 6: Correlation between an MC's RHCI and CR5 figures

Country	Correlation	Country	Correlation
Kazakhstan	-0.99	**Turkey**	-0.64
Iran	-0.98	**Bangladesh**	-0.58
Syria	-0.97	**Kuwait**	-0.41
Tunisia	-0.96	**Egypt**	-0.25
Azerbaijan	-0.93	**Algeria**	-0.16
Pakistan	-0.90	**CÃ´te d'Ivoire**	-0.04
Saudi Arabia	-0.88	**Bahrain**	0.20
Nigeria	-0.74	**Indonesia**	0.27
Morocco	-0.71	**Qatar**	0.68
Oman	-0.70	**Malaysia**	0.84