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RISING PRODUCT DIGITALISATION AND LOSING TRADE COMPETITIVENESS

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UNITED NATIONS
New York and Geneva 2017

United Nations publication issued by the United Nations Conference on Trade and Development.

UNCTAD/GDS/ECIDC/2017/3

NOTE

This report was prepared by Unit on Economic Cooperation and Integration among Developing Countries, Division on Globalisation and Development Strategies, UNCTAD. The report was authored by Rashmi Banga.

All references to dollars ($) are to United States dollars, unless otherwise stated.

ACKNOWLEDGEMENTS

The author would like to thank Ambassador M.J. Kisiri, (Head, ACP Geneva Office), Professor Indira Rajaraman, Dr Safdar Sohail and an anonymous referee for comments on an earlier version of this paper. This paper was presented to the trade negotiators in the Workshop on E commerce, organised by South Centre and Centre for WTO Studies and in the WTO Public Forum, September 2017. The author is also grateful for the comments and suggestions received from the participants.

ABBREVIATIONS

AM	Additive Manufacturing
B2C	Business-to-consumer
B2G	Business-to-government
C2C	Consumer-to-consumer
GATT	General Agreement on Tariffs and Trade
GATS	General Agreement on Trade in Services
ET	Electronic Transmission
CAD	Computer Aided Design
CBEC	Cross Border E-Commerce
DPs	Digital Products
GAFAA	Google, Apple, Facebook, Amazon and Alibaba
LDCs	Least developed countries
SMEs	Small and Medium Enterprises
UNCTAD	United Nations on Conference and Development
WITS	World Integrated Trade Solutions
WTO	World Trade Organisation

CONTENTS

RISING PRODUCT DIGITALISATION AND LOSING TRADE COMPETITIVENESS

Abstract: The growing digitalisation of manufacturing products is creating new challenges for the developing and the least developed countries (LDCs). The paper estimates the shares of different countries in cross-border e-commerce and highlights the losing trade competitiveness of developing countries and LDCs in digital products. It further estimates the impact of WTO permanent moratorium of zero custom duties on Electronic Transmission (ET) products using SMART simulations. The results show that the imports of ET products will rise further in most of the developing countries making them net importers, with adverse implications for tariff revenues. However, the moratorium will not affect the imports of the developed countries but increase their exports. The paper highlights that with the rise of additive manufacturing (3D printing) the future ET products are still unknown. There is a need for developing countries to develop their national e-commerce sectors through digital industrialisation policies. For designing national digital industrial policies that match their existing level and pace of digital development, countries need to preserve the policy space in the WTO.

1. INTRODUCTION

Digital economy has become the buzz word of the 21st century for some very good reasons. In simple terms, digital economy can be defined as the sum of economic activities which function by means of digital technology, especially electronic transactions made using the internet. Many activities in almost all the sectors of the economy in most of the countries are increasingly being conducted using the digital technology, although the extent of use may differ vastly amongst developed, developing and least developed countries. Some of the more known sectors where digital technology is widely used include IT, communications, financial services, business services, retail services and health services. But apart from these services sectors, which have been largely digitalised and known as e-services, manufacturing sector is now being increasingly supported by the digital technology. The digitalised manufactured products are being called- Digital Products (DPs).

Literature has classified DPs into three categories- category (a) those tangible goods which are ordered through the internet (or e-commerce products), these fall under the goods framework of the WTO; category (b) electronically transmitted products which are defined at the WTO as those "content-based products that were formerly delivered in tangible form but now can be delivered in electronic form via internet download" (or Electronically Transmitted Products- ET-products). These are the ET products where the custom duties have been reduced to zero at the WTO and a permanent moratorium is being sought on zero custom duties; and category (c) remote additive manufacturing (AM) products, which operate by applying consecutive layers of a specific material onto a flat surface until those layers form a three-dimensional object (one of the forms of additive manufacturing is commonly referred to as 3-D printing). In simple words, AM is a technique which enables creation of complex 3-D products through the use of computer designs. Many manufacturing industries have started producing AM products which include manufactured products like motor vehicles, aerospace, machinery, electronics, and medical products1. These products are produced using Computer Aided Design (CAD) files.

While in the existing framework of the WTO, there is some clarity that the e-commerce products (category a) fall under the GATT framework and the e-services fall under the GATS framework. The debate will become much more challenging when it comes to ET-products and AM products2.

This paper estimates the size of the digital markets under the different categories of the DPs. It further traces the growth of trade in all categories of DPs and estimates the shares of different countries in the global trade in DPs in order to identify countries' trade competitiveness; the growth in AM products and the investments in additive manufacturing are reported along with its future growth and trade potential. The impact of permanent moratorium on trade in ET-products is estimated using SMART simulations. Some estimates are made in terms of implications of permanent moratorium on custom duties of ET products if AM products are included as ET products in the WTO; and finally the paper highlights the need for protecting policy space for the developing countries in order to allow them to design their digital industrialisation policies.

[1] See Wohlers, Terry (2012)

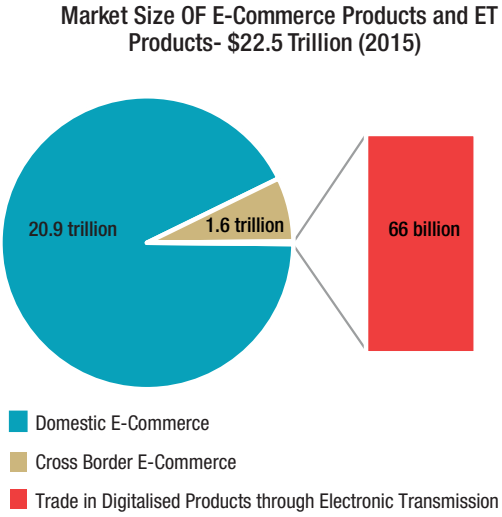
[2] Fleuter, Sam (2016)

2. SIZE OF THE DIGITAL ECONOMY

The size of the digital economy has been increasing at a geometric rate in the past few years. As per the Accenture study (Digital Disruption: the Growth Multiplier), launched in World Economic Forum in Davos in 2016, the digital economy is sized around $16.2 trillion amounting to 22% of global GDP (estimated at around $ 74 trillion by UN and the World Bank). Accenture's estimates are based on 11 advanced economies, where estimations are focused largely on technology used in sectors like infrastructure, IT and communications, e-commerce, and broadband penetration rates. UNCTAD, on the other hand, has estimated the size of the e-commerce market as $23 trillion, which amounts to around 32% of global GDP.

While various estimates have been made on the size of the digital market, these are grossly underestimated as they are unable capture the rapid digitalisation of the products that is taking place under AM market. The size of the digital economy needs to be estimated by summing up the size of the markets in e-products, e-services, ET products and AM products along with the rising use of internet in various manufacturing activities like designing, branding, advertising, etc. While making such an estimation is extremely difficult and would need developing different databases and using separate statistical tools, some estimates of growing trade in DPs can be made by summing the trade that is taking place in the three different categories of DPs.

Figure 1: Estimated Market Size of the E-Commerce Products and ET Products



Source: Author's estimates using ACAPTURE (2015)-various country reports

Using various country reports of ACATURE (2015), the market size in e-products and ET products is estimated to be approximately $22.5 trillion. Of this, around $21 trillion is estimated to be domestic e-commerce, i.e., buying and selling of e-products within the boundaries of the countries; $1.6 trillion is estimated as cross-border e-commerce, i.e., international trade in e-products where the products cross the national boundaries. Of $1.6 trillion, around $66 billion is expected to be international trade in ET products (Figure 1). These figures do not include size of the AM market.

3. THE GROWING SIZE OF REMOTE ADDITIVE MANUFACTURING (AM) MARKET

Different estimates are available on the size of the remote additive manufacturing market, which is still considered as a niche market in the international trade (Figure 2). However, given its growth trends and investments in research in this area, the AM products may soon flood the markets and change the way of manufacturing the products. This market has grown five-fold in the past six years according to Wohler's Report (2015).

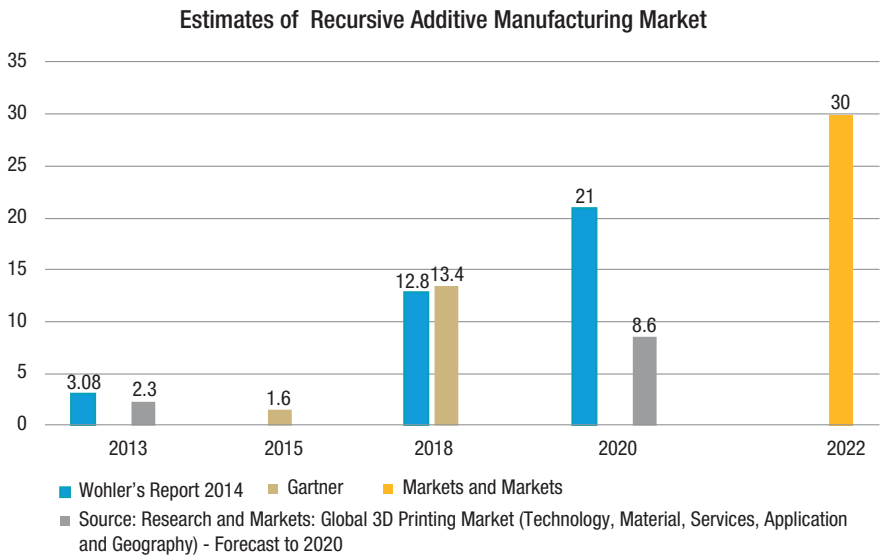
According to Wohlers Report (2014), the worldwide AM market is expected to grow from $3.07 billion in revenue in 2013 to $12.8 billion by 2018, and exceed $21 billion by 2020, while according to Market and Markets, it will reach $ 30 billion by 2022. However, while these figures may appear to be comparatively smaller than those of e-products, the growth is much higher and expected to increase many-folds once the research projects complete. Some examples of the research projects on the ground are- General Electric plans to mass-produce 25,000 LEAP engine nozzles with Additive Manufacturing (AM), and already have $22 billion in commitments[3]. Quick mass production and customisation at the same time is achievable by AM. For example, Ford Motor company is allowing its customers to customise their vehicles by choosing from a palette of online additively manufactured options[4].

Looking at some of the investments in AM, it appears that these estimates may be short term estimates and in a longer term, i.e., 2025 and beyond, the growth of market size of AM may rise exponentially. To develop their competitiveness in AM many countries are investing millions of US dollars. Ford (2014) details the investments undertaken by various countries. USA is working with both public and private sectors on

[3] LaMonica (2013).

[4] Sharon L. N. Ford (2014).

Figure 2: Estimates of Size of the Recursive Additive Manufacturing Market



Source: Author's estimates using ACAPTURE (2015)-various country reports

various projects developing AM. For EU, AM has been identified as a priority area with €160 million invested in research. Singapore has invested $ 500 million for 4 years since 2013. China, according to Ford, has been investing in AM since early 1990s and in 2013, the Chinese government pledged 1.5 billion yuan ($245 million) to a seven-year project.

4. GROWING PRODUCT DIGITALISATION: *WHO BENEFITS?*

Although the global trends in digitalisation of the products show a geometric growth, this growth has not been evenly distributed and can therefore have serious implications for future trade competitiveness of the developing countries.

In terms of the size of the digital economy, USA leads the world. According to Accenture (2016), the digital economy in the USA is valued around $5.9 trillion, which equals 33% of its GDP with 43% of employment in the USA's workforce being digital. The USA's digital capital stock, i.e., accumulated investments in software, hardware and communications equipment is around 28% of total capital stock. This is followed by UK with size of the digital economy being 30% of GDP, Australia (28% of GDP), France and Germany (25% of GDP). Amongst the developing countries Brazil figures with around 22% and China with around 10%. However, amongst the 11 countries analysed, the compound growth rate in digitalisation of the economy is predicted to be highest in China for the period 2015 to 2020.

4.1 Internet Penetration Rates

For most of the developing and least developed countries, given the paucity of data, it is difficult to estimate the size of their digital economy in terms of their GDP. However, the extent of internet penetration, which is the basic requirement for digitalisation of the economy, can reveal important differences. There are 18 countries which have internet penetration rate between 90% to 100%. These include mostly developed countries like the UK, Japan, Finland and Sweden. There are 39 countries with internet penetration between 90% to 70%, which include countries like USA, Canada, New Zealand, Germany, Switzerland and Hong Kong. Most of the developing countries with relatively higher income levels fall under the list of countries with internet penetration rate between 60% to 50%. However, low income developing countries and least developed countries are all included in the list of countries with internet penetration rate of less than 40%. There are 24 countries with internet penetration rate of less than 10% and 25 countries between 10% to 20% (Table 1). All these countries with less than 10% internet penetration are Asian, African and Pacific countries. This indicates the lack of capacity of the developing and least developed countries in terms of developing trade competiveness when it comes to digitalised trade, especially trade in DPs including ET products and AM products.

Table 1: Countries with Internet Penetration between 40% - 20%; 20%-10%; and less than 10%.

S.No	Country	Internet Penetration 20% to 40%	S.No	Country	Internet Penetration 10%-20%	S.No	Country	Internet Penetration Less than 10%
1	Guyana	39.60%	1	Algeria	19.70%	1	Solomon Islands	9.80%
2	Grenada	38.80%	2	Nicaragua	19.40%	2	Liberia	8.60%
3	El Salvador	38.30%	3	Uganda	19%	3	Congo	7.50%
4	Bhutan	36.90%	4	Zambia	19%	4	Togo	7.30%
5	Mongolia	35.60%	5	Tajikistan	18.70%	5	Comoros	7.30%
6	India	34.80%	6	Cameroon	18%	6	Afghanistan	6.80%
7	Kyrgyzstan	34.40%	7	Pakistan	17.80%	7	Malawi	6.50%
8	Egypt	33%	8	Nepal	17.20%	8	Mozambique	6.40%
9	Cuba	32.40%	9	South Sudan	17.10%	9	Benin	5.60%
10	Micronesia	31.20%	10	Mauritania	17.10%	10	Tanzania	5.30%
11	Vanuatu	30.60%	11	Gambia	16.90%	11	Central African Republic	4.50%
12	Syria	29.60%	12	Laos	15.70%	12	Madagascar	4.30%
13	Sri Lanka	29.30%	13	Namibia	15.60%	13	Ethiopia	4.20%
14	Samoa	29%	14	Turkmenistan	14.50%	14	DR Congo	3.90%
15	Ghana	28.40%	15	Bangladesh	13.20%	15	Guinea-Bissau	3.50%
16	Swaziland	27.80%	16	Iraq	13%	16	Chad	2.70%
17	Guatemala	26.50%	17	Kiribati	12.90%	17	Myanmar	2.50%
18	Sudan	26.40%	18	Rwanda	12.40%	18	Sierra Leone	2.40%
19	Sao Tome and Principe	25.60%	19	Mali	12.20%	19	Niger	2.10%
20	Yemen	24.70%	20	Haiti	12.10%	20	Guinea	1.80%
21	Senegal	23.40%	21	Papua New Guinea	11.70%	21	Somalia	1.70%
22	Angola	23%	22	Djibouti	11.70%	22	Burundi	1.50%
23	Côte d'Ivoire	22%	23	Cambodia	11.10%	23	Timor-Leste	1.20%
24	Honduras	21.50%	24	Gabon	10.30%	24	Eritrea	1.10%
25	Botswana	21.40%	25	Burkina Faso	10.20%			
26	Libya	21.10%						
27	Zimbabwe	21%						
28	Equatorial Guinea	20.90%						
29	Lesotho	20.60%						
30	Indonesia	20.40%						
31	Marshall Islands	20.20%						

Source: International Telecommunication Union, United Nations Population Division, Internet & Mobile Association of India, World Bank.

4.2 Shares in Domestic E-Commerce

Domestic e-commerce has developed steadily in the developed countries while most of the developing and least developed countries are still lagging far behind. E-commerce penetration indicates the extent of development of the domestic e-commerce sector. With low internet penetration rates majority of developing and least developed countries cannot hope to have above average e-commerce penetration rate. Using four indicators of e-commerce preparedness, namely, internet users, secure servers, credit card penetration and postal reliability score, UNCTAD has created an e-commerce index for 2015. Out of 130 countries, only 5 developing countries figure in the list of top 50. The lowest ranking country, i.e., Niger, has the index valued at 6.5 as compared to 89.7 of the highest ranking country, namely, Luxemburg. These low e-commerce penetration rates culminate to low levels of cross-border e-commerce.

4.3 Shares in Cross Broder E-Commerce Market

Low internet penetration and low e-commerce penetration is bound to lead to low trade competitiveness for the developing and least developed countries as compared to the developed countries. This comes out clearly when the country shares in global trade via e-commerce is measured.

International trade via e-commerce is called cross-border ecommerce, i.e., when consumers buy online from merchants, located in other countries and jurisdictions. Although no official comprehensive statistics are available which encompasses all forms of Cross Border E-Commerce (CBEC), what emerges from the available statistics is that CBEC is rapidly expanding. The average annual growth rate of CBEC is expected to outstrip that of the global GDP as well as the growth rate of domestic e-commerce.

According to Universal Parcel Services' forecast, between 2013 to 2020, while annual growth rate of global GDP will be 3.7%, retail will grow at 5.8% and domestic e-commerce by 16.5%, CBEC will grow at the rate of 26.6%! Consequently, the CBEC has increased both in terms of percentage of retail sale as well as percentage of global exports, rising from 5% in 2013 to 7% of retail sale and from 6% to 10% of global exports in this period. There are four categories of CBEC which include Business-to-business (B2B)[5]; Business-to-consumer (B2C)[6]; Consumer-to-consumer (C2C)[7]; and Business-to-government (B2G)[8]. While there are no category-wise statistics available at the country level, what does emerge from the available statistics is that the maximum growth is taking place in B2C and B2B, followed by C2C and B2G. Estimating the regional shares in CBEC, Figure 3 shows that the highest share of CBEC sales goes to Asia-Pacific (51%); followed by Europe (24%); and North America (23%).

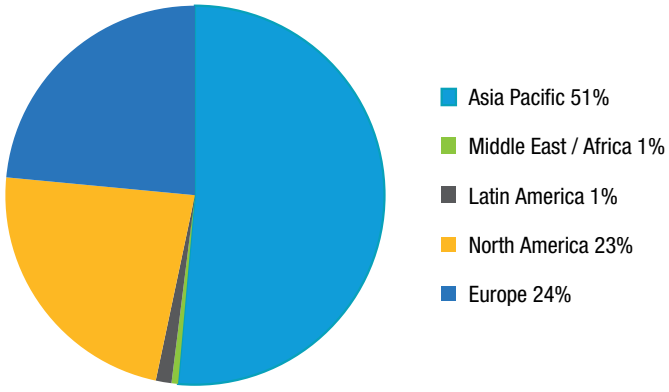
5 B2B can involve online versions of traditional transactions related to goods that are subsequently sold to consumers via retail outlets. It can also involve the provision of goods and services to support other businesses, for example because of outsourcing and offshoring.

6 B2C involves sales by e-commerce enterprises to consumers and by retail or manufacturing firms that add an online sales channel.

7 C2C e-commerce covers online marketplace platforms (e.g. eBay), and sales within online communities, consumer blogs and chat rooms.

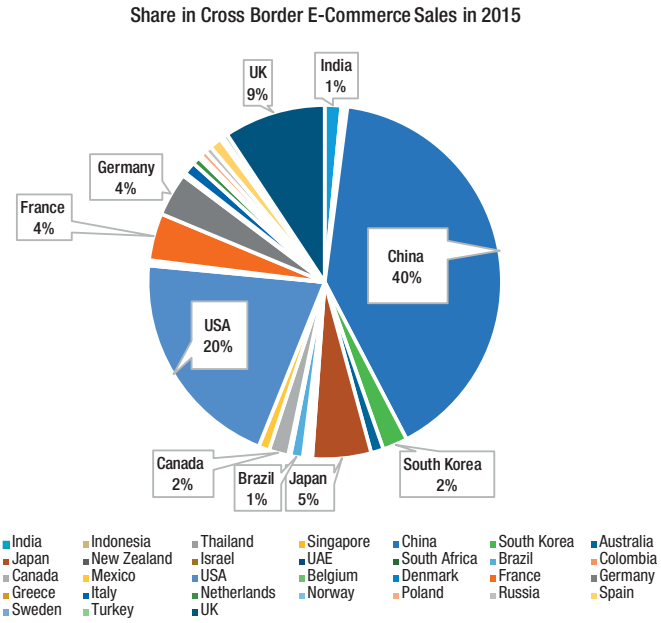
8 B2G transactions are similar to B2B, except that the buyer in this case is a government entity, such as when it makes requests to bid through public e-procurement.

Figure 3: Regional Shares in Cross Border E-Commerce Sales in 2015



Source: E-Marketers; Paypers; ACAPTURE (2015)-various country reports

Figure 4: Country Shares in CBEC Sales in 2015



Source: E-Marketers; Paypers; ACAPTURE (2015)-various country reports

However, a closer look at the country shares shows that three countries together capture 69% of the CBEC market, namely China (40%); USA (20%); and UK (9%) (Figure 4). This is followed by Japan (5%); Germany (4%) and France (4%). Thus, six countries capture more than 85% of the CBEC market.

4.4 Shares in Cross Border Trade in ET Products

The declaration of WTO 1998 Ministerial Conference included a moratorium on charging zero custom duties on "electronic transmissions" (i.e., ET products), which has been extended several times. These ET products include things like music files, e-books, digitally downloaded movies, etc. In 2017, some proposals have been submitted in the WTO for making this moratorium permanent. However, it is interesting to note that many products which were not thought to be electronically transferable a decade back, have now become ET-products. In the existing literature, there is as yet no final consensus on whether to classify these ET products under GATT/GATS framework.

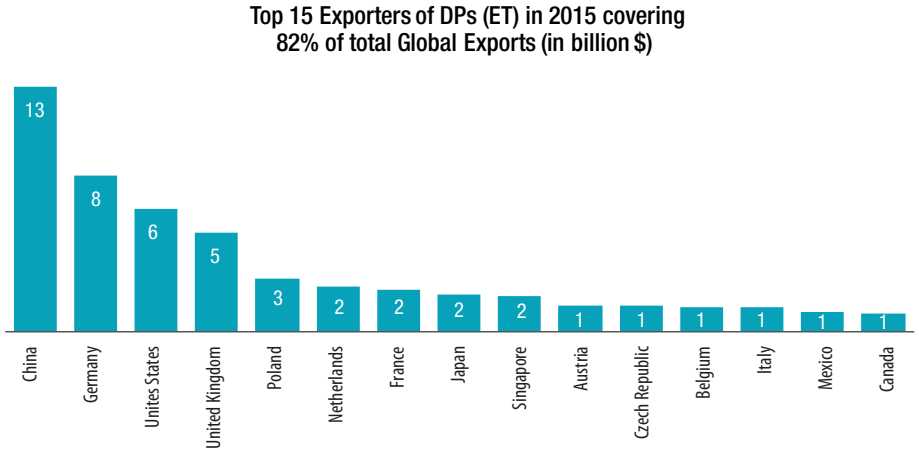
Due to rapid changes in the technology, many products can now be classified as ET-products. UNCTAD (2000) identified four chapters in HS 1996 codes. These were namely, chapters- 37 (films); 49 (printed matter); 8524 (sounds and media); 8524 (software); 9504 (video games). Using the concordance matrices between HS1996-2007-2012, at HS 6-digit codes, 38 products can be identified as ET-products.

Based on these 38 products, it is estimated that the global sales of ET products amounted to $ 63 billion in 2015. Top 15 exporters of ET products were from developed countries, except for China. Together these countries exported 82% of total global exports of ET products. China exported ET products of amount $13 billion, followed by Germany ($8 billion); US ($ 6 billion); and UK ($ 5 billion) (Figure 5).

Global exports of China and the US have been rising steadily over the years. China's global exports increased from less than half a million dollars in 1996 to $ 12 billion in 2015. Top exports of China in ET-Products is of video games (HS 950410) which amounted to $ 8.4 billion in 2015, while for the US, top ET products for global exports comprised printed books (HS 490199), CD-films, sound and music (HS 852439) (Figure 6).

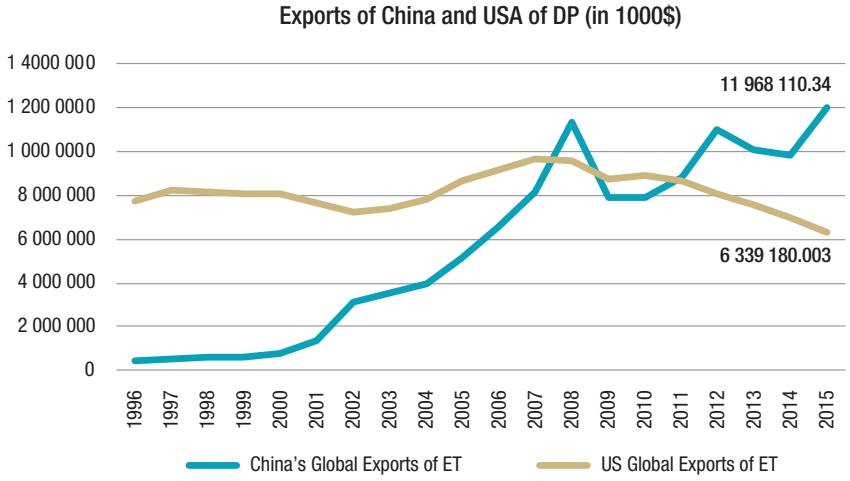
While top 15 exporters of ET-products are mostly from the developed countries, most of the developing countries are found to be net importers of ET Products. Together developing countries export $ 4 billion and import more than double of their exports, i.e., around $11 billion of ET products. This is indicative of the fast losing trade competitiveness of most of the developing countries as well as LDCs in ET-products (Table 2).

Figure 5: Exports of ET Products in 2015.



Source: World Integrated Trade Solutions, COMTRADE

Figure 6: Global Exports of China and US of ET Products



Source: World Integrated Trade Solutions, COMTRADE

Table 2: Net Exports of Developing Countries of ET-Products

Net Exports of DPs in 2015 (in 1000USD)		Net Exports of DPs in 2015 (in 1000USD)	
Reporter Name	Net Exports	Algeria	-215,500
Saudi Arabia	-632,815	Kuwait	-215,492
Mexico	-585,758	Portugal	-203,004
Norway	-575,638	Philippines	-193,815
Other Asia, nes	-358,170	Argentina	-192,381
Thailand	-257,227	India	-191,609
Turkey	-254,141	Kazakhstan	-163,716
South Africa	-235,457	Paraguay	-161,014
Brazil	-228,192	Guatemala	-144,285
Chile	-225,229	Peru	-118,085

Table 2: Net Exports of Developing Countries of ET-Products

Net Exports of DPs in 2015 (in 1000USD)	
Colombia	-107,962
Luxembourg	-101,839
Morocco	-100,610
Vietnam	-95,629
Qatar	-94,512
Costa Rica	-92,608
Oman	-85,955
Bermuda	-85,682
Egypt, Arab Rep.	-85,310
Pakistan	-78,525
Indonesia	-77,318
Panama	-70,715
Israel	-69,532
Malawi	-69,240
Ethiopia(excludes Eritrea)	-63,837
Belarus	-58,699
Ecuador	-58,441
Dominican Republic	-52,925
Greece	-52,717
El Salvador	-52,239
Nicaragua	-50,307
Jamaica	-49,677
Mozambique	-47,533
Bolivia	-47,057
Bahrain	-45,066
Romania	-36,263
Zimbabwe	-35,309
Cote d'Ivoire	-30,741
Jordan	-28,634
Cyprus	-28,473
Russian Federation	-28,084
Cameroon	-27,642
Iceland	-25,800
Azerbaijan	-24,850
Tunisia	-23,954
Macao	-23,495
Cambodia	-23,417
Madagascar	-22,911
Tanzania	-20,569
Botswana	-20,040
Uganda	-19,851

Net Exports of DPs in 2015 (in 1000USD)	
Nepal	-19,363
Georgia	-18,944
Brunei	-17,442
Uruguay	-16,143
Bosnia and Herzegovina	-15,454
Bahamas, The	-15,248
Senegal	-15,106
New Caledonia	-13,953
Moldova	-11,543
Kyrgyz Republic	-11,385
Fiji	-11,379
Montenegro	-11,008
French Polynesia	-9,936
Solomon Islands	-9,845
Barbados	-9,546
Albania	-8,606
Macedonia, FYR	-8,605
Yemen	-8,456
Niger	-8,350
Rwanda	-7,816
Armenia	-7,667
Guyana	-7,361
Aruba	-6,878
Burkina Faso	-6,850
Occ.Pal.Terr	-5,105
Mongolia	-5,026
Bulgaria	-4,915
Sierra Leone	-4,803
Burundi	-4,772
Belize	-4,686
Cape Verde	-4,536
Seychelles	-4,134
Sri Lanka	-4,106
Togo	-3,679
Benin	-3,393
Antigua and Barbuda	-3,173
Greenland	-3,078
St. Vincent and the Grenadines	-2,850
Samoa	-1,199
Palau	-926
Sao Tome and Principe	-519

Source: World Integrated Trade Solutions, COMTRAD

5. IMPLICATIONS OF A PERMANENT MORATORIUM OF ZERO CUSTOM DUTIES OF ET-PRODUCTS

A permanent moratorium of zero custom duties on ET-Products would imply further rise in imports of the developing countries of ET products, as more and more of these products are digitalised. For example, in case of video games and book, these products have been largely digitalised and can be exported by electronic transmission but there still exists exports under these categories which are not through electronic transmissions.

To estimate the implication of permanent moratorium of zero custom duties on these products and the subsequent per annum increase in imports of the developing countries, we undertake tariff simulation analysis using SMART simulations of WITS.

The results of the simulation exercise show that if permanent moratorium of zero custom duties is applied to ET products, then there will be a further rise in imports of ET-Products by the developing countries while imports of the developed countries will remain unaffected, as their duties are already zero. The change is applied on the bound duties. In many cases, not all imports in this category are electronic transmissions, for example, in the case of music CDs there are still some imports which are not ET. As product digitalisation rises, more of these products will fall under the ET category. The rise of imports of ET-products, which are currently under this category, will be highest in absolute terms for China, followed by India, Russia and Brazil (Table 3).

6. ET-PRODUCTS OF THE FUTURE

Although in absolute terms, per annum increase in imports and associated tariff loss subsequent to a permanent moratorium on custom duties does not appear to be a huge amount, the possibility of AM products being largely electronically transmitted in near future cannot be ignored, which can escalate these figures exponentially.

According to UPS (2017)[9] the 3D printing market has grown by 30% per annum since 2012 and Western countries account for more than two-thirds (68%) of the market revenue. Consumer electronics and automotive industries are rapidly increasing their use of this technology. 98% of hearing aids worldwide are being manufactured using 3D printing. The exports of these products is done by electronic transmission of the computer files/software. The forecast for 3D printing technology in terms of capturing global manufacturing capacity is around 5%, i.e., which will make 3D printing a $640 billion industry[10].

North America is expected to account for the largest share of the 3D printing market due to increased government support in this area. The major players in the 3D printing market include 3D Systems Corporation (U.S.), Stratasys Ltd. (U.S. & Israel), the ExOne Company(U.S.), Voxeljet AG (Germany), Arcam Group (Sweden), SLM Solutions Group AG (Germany), EOS GmbH (Germany), EnvisionTEC GmbH (Germany), Materialise NV (Belgium), Sciaky Inc. (U.S.), Concept Laser GmbH (Germany), Autodesk, Inc. (U.S.), Hoganas AB (Sweden), Renishaw PLC. (U.K.).

This disruptive technology will change the way the products are being manufactured. Instead of raw materials being shipped around the world, the files will be simply transmitted electronically to 3D printers in strategic locations to manufacture products. Over a longer period, this disruptive technology has the potential to shift the competitive advantage away from high volume low cost manufacturers toward those who own customer networks. These can lead to huge job losses in the developing countries as well as LDCs which rely on exports for their employment growth. These will in turn create regulatory dilemmas. New digital industrialisation policies will need to be designed in order to be able to sustain the disruptive impacts of this technology. In order to do so, governments will need to preserve their policy space to design e-commerce policies and regulate the customer networks.

The real concern, in terms of the WTO framework arises when it comes to classification of goods and services. While 3D printer itself will be treated as a good, the CAD files that can be used to print and produce products using the 3D printer and can be electronically transmitted might be treated as an ET-product[11]. A permanent moratorium on the custom duties being zero on these kind of files would imply that effectively the countries are agreeing on reducing tariffs to zero on almost all of their non-agricultural manufactured products. Additive manufacturing can be used to produce everything “from a lithium-ion micro battery to a human kidney, and can print in materials like plastic, metal, ceramic, cement,

[9] United Parcel Services and Consumer Technology Association (2017), ‘3D Printing: The Next Revolution in Industrial Manufacturing’, UPS

[10] Wohler report (2015), http://www.wohlersassociates.com/2015report.htm

[11] See Fleuter (2016)

Table 3: Impact of Permanent Moratorium of Zero Custom Duties on ET products on Imports of Countries of ET Products

	Global Imports of ET Products in 2015 (in 1000USD)	Per Annum Increase in imports of ET-Products post Permanent Moratorium (in 1000USD)	Percentage Change in Imports of ET Products	Tariff Revenue loss (in 1000USD)
China	3,448,295	86,483	2.5	-81,106
India	596,873	53,551	9	-38,788
Russian Federation	553,010	30,122	5.4	-18,349
Argentina	170,796	18,874	11.1	-18,160
Brazil	273,750	79,056	28.9	-17,652
Australia	1,020,048	15,192	1.5	-13,074
EU	4,767,085	14,466	0.3	-12,387
Vietnam	161,758	7,405	4.6	-9,191
Thailand	923,206	6,553	0.7	-8,377
Mexico	1,079,472	8,127	0.8	-7,758
United Arab Emirates	764,822	8,390	1.1	-5,782
Malawi	91,022	4,930	5.4	-5,720
Malaysia	395,378	4,248	1.1	-5,338
Pakistan	86,485	8,003	9.3	-5,205
Zambia	54,839	4,359	7.9	-4,749
Korea, Rep.	1,195,401	4,553	0.4	-4,625
Philippines	184,672	3,117	1.7	-4,013
Sri Lanka	49,761	2,695	5.4	-2,886
Canada	3,176,141	4,745	0.1	-2,825
Israel	156,243	2,804	1.8	-2,475
Fiji	16,744	1,444	8.6	-2,017
Saudi Arabia	339,886	1,854	0.5	-1,818
Indonesia	82,953	2,506	3	-1,476
Egypt, Arab Rep.	83,204	1,532	1.8	-1,201
Jamaica	37,599	1,027	2.7	-1,102
South Africa	294,955	1,128	0.4	-1,029
Tanzania	22,319	967	4.3	-942
Cambodia	993,154	867	0.1	-801
Kuwait	201,431	2,221	1.1	-681
Qatar	114,238	836	0.7	-658
Mozambique	46,376	498	1.1	-495
Uganda	20,374	363	1.8	-400
Turkey	336,977	199	0.1	-199
United States	5,848,649	0	0	0
Hong Kong, China	1,664,828	0	0	0
Japan	1,442,242	0	0	0
Singapore	708,091	0	0	0
New Zealand	291,939	0	0	0
Total	31,695,016	383,115		-281,279

Source: Author's estimations using SMART simulations

Methodology to Estimate the Impact of Permanent Moratorium on Custom Duties of ET-Products

In order to estimate the rise in imports that may occur per annum in ET-Products if the tariffs are brought down to zero permanently, we use a World Integrated Trade Solutions (WITS) simulation model – namely specific, measurable, assignable, realistic and time-related (SMART) – estimations. This model estimates the impact of tariff liberalisation (zero tariffs) on imports of the countries. The model undertakes the estimations and impact at HS six–digit product disaggregation. Such a disaggregated product-level estimation of tariff liberalisation is not possible in any other model. The model not only estimates the extent of imports that may arise from the tariff cuts of members, but is also able to provide results at the product level of increased imports along with the subsequent tariff revenue loss. In the simulations undertaken, bound tariffs are brought down to zero and wherever bound tariffs are not available, applied tariffs have been used. To that extent, these are under-estimated figures.

wood, food and human cells."[12] The industrial uses of additive manufacturing are countless. General Electric uses additive manufacturing to make jet engines and medical devices while 10 houses were built by a Chinese company using AM[13]

7. THE RISING POWER OF GAFAA

The rising control of the advanced countries over the future manufacturing processes through AM becomes a matter of greater concern when seen along with the rising monopolistic power of GAFAA (Google, Apple, Facebook, Amazon and Alibaba). They are among the richest companies in the world, with a combined market capital of around $1.5 trillion, almost four times the size of the five largest media conglomerates. GAFAA are now seen as the drivers of future digital economy and also called the disrupters. With Google, Apple, Facebook and Amazon based in the USA, even European countries feel threatened by the shifting of future digital power to the USA and have started to think of regulating USA's internet giants and encourage home grown companies to overtake GAFAA[14].

GAFAA is gaining power through artificial intelligence, cloud computing, augmented reality and other such advance technologies which will make developing countries fast lose their competitive edge in manufactured products. For example, Google has bought YouTube which has the power of impacting the purchasing pattern of the consumers in the developing world. In 2016, YouTube valued at around $70 billion. Google's businesses cover life sciences, self-driven cars, internet services provided via balloons, etc. Apple, on the other hand, is soon launching Apple car. Facebook's 10-year plan includes artificial intelligence and drone-delivered internet service which will include leveraging their social platforms and pushing live videos and e-commerce. Amazon, which was once an online bookseller is now an e-commerce giant. It is building a fleet of drones to deliver products.

SMEs and other big firms in the developing countries or LDCs can in no way preserve their trade competitiveness in this fast digitalising world, which is using increasingly advanced technologies and digitalised intelligence, giving an ever-rising competitive edge to the developed countries. This will require interventions at the national policy level in order to build the capacities of SMEs in e-commerce. A comprehensive approach at the national level is needed which should include improving internet penetration, strengthening the national trade portals, improving the capacity of postal services as well as developing strategic action plans to boost cross-border e-commerce.

8. CONCLUSION

Digital economy and the associated e-commerce has been posed as a rising opportunity for the SMEs in the developing countries. However, given the recent trends in digitalisation and the growing power of digital giants along with the growing share of few developed countries in e-commerce trade, SMEs in developing countries are facing new challenges. Manufacturing activities are becoming increasingly digitalised and the manufactured digital products are fast raising the trade competitiveness of the developed countries. Given low levels of internet penetration rates as well as e-commerce penetration rates, the probability of domestic e-commerce to grow in the developing countries and benefit their SMEs appears to be low.

The size of the digital economy is estimated to be around 32% of global economy, amounting to around $ 23 trillion. Of this, around $ 1.6 trillion is estimated to be the share of cross border e-commerce. Estimating the shares of countries in the cross-border e-commerce market, it is found

[12] See Tran (2015)

[13] https://www.washingtonpost.com/news/innovations/wp/2015/02/05/yes-that-3d-printed-mansion-is-safe-to-live-in/?utm_term=.1c005f4375bf

[14] http://economictimes.indiatimes.com/news/international/business/google-apple-facebook-amazon-gafa-europes-term-for-americas-evil-internet-empire/articleshow/47083612.cms

that only three countries, namely China, USA and UK have captured around 70% of the cross-border e-commerce market.

The electronically transmitted products (ET-products) have been valued to around $ 66 billion. Identifying the HS codes for these products, it is found that most of these products are classified under HS chapters- 37 (films); 49 (printed matter); 8524 (sounds and media); 8524 (software); and 9504 (video games). In 2015, almost all developing countries, with exception of China, are found to be net importers of ET-products. Given the proposal in the WTO on a permanent moratorium on custom duties to be zero on ET-products, a simulation exercise has been carried out to estimate the impact on per annum imports of ET-products in different countries and the subsequent tariff revenue loss. It is found that imports will rise in almost all developing countries while there will be little impact on the imports of the developed countries as their bound duties are already very low.

More than the prevailing situation on ET-products, what the developing countries and LDCs need to worry about is the future of ET-products. Disruptive technologies like remote additive manufacturing or 3D printing may in near future manufacture products through computer-aided design (CAD) files which can be transmitted electronically. These AM technologies have the potential to change the way the products are manufactured. Instead of raw materials being shipped around the world, the CAD files will be electronically transmitted and used in the 3D printers to manufacture products. Over a longer period, these disruptive technologies can entirely shift the competitive advantage away from high volume low cost manufacturers in developing countries towards advanced countries which are fast digitalising. Some of the industries which are already facing competition from these disruptive technologies include consumer electronics and automotive industries. It is interesting to note that 98% of hearing aids worldwide are being manufactured using 3D printing. A permanent moratorium of zero custom duties on ET-products can have serious implications for developing countries making them completely lose control over their manufacturing processes.

The rising powers of digital giants like Google, Apple, Facebook, Amazon and Alibaba will further create regulatory dilemmas. There is an urgent need for the developing countries to develop their digital capacities for facing the growing challenges of digital trade. This will require developing national level digital industrial policies which match the level and pace of their digital development. However, for designing such policies it will be extremely important to preserve policy and regulatory space in the international rule making platforms like the WTO. South-south cooperation on digital industrialisation can be an important step forward in meeting the growing digital challenge.

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Layout and Printing at United Nations, Geneva – 1734605 **(E)** – November 2017 – 636 – **UNCTAD/GDS/ECIDC/2017/3**