

Promoting Lebanese Complex Exports Through Upgrading Productive Knowledge

Sami Atallah and Nancy Ezzeddine

About the authors

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Executive Summary

The Lebanese industrial sector has been challenged in the last five years facing a downfall in its exports. Even though most exports are of low and medium level of complexity, the industrial sector has been able to export sophisticated products. In fact, Lebanon has exported 38 out of the 100 most complex products in the world, signifying Lebanon's accumulation of sophisticated productive knowledge and know-how. This brief, which is part of a three policy briefs series on manufacturing exports, calls for supporting productive capacity in an attempt to improve the standing of the sector through promoting exports of complex products. This guarantees an increase in Lebanon's exports and a chance to penetrate new highly developed markets such as Europe and North America. To this end, we present two case studies from Lebanon's complex machinery and chemical sectors to identify potential within each and opportunity for growth. We argue that the government must develop a more nuanced export strategy that promotes research and development supportive of innovation within these sectors.

1
Atallah, S., N. Ezzeddine, and J. Mourad. 2019. 'Exports Must Be Part of Economic Growth Strategy.' Executive Magazine. <https://www.executive-magazine.com/economics-policy/exports-must-be-part-of-economic-growth-strategy>

2
Rodrik, D., R. Hausmann, and J. Hwang. 2006. 'What You Export Matters.' CEPR Discussion Paper No. 5444.

3
Harvard Center for International Development. 2017. 'The Atlas of Economic Complexity.' atlas.cid.harvard.edu.

Introduction

Promoting the manufacturing sector has the potential to increase economic growth, create jobs, and reduce the stress on the trade deficit.¹ Lebanese exports increased fivefold, from less than \$1 billion in 2000 to \$5 billion in 2012. More recently, the sector has been highly challenged by regional turmoil, political tensions, and loss of competitiveness, reversing the positive performance over the years and settling to \$3.9 billion in 2017.

Despite the recent downfall, the sector's standing remains prominent and salvageable. Specifically, the country's exports are well diversified, and its export basket remains impressive in its size, products, and market reach. In 2017, Lebanon exported a total of 1,147 products to 171 countries, from more than 15 sectors.

Furthermore, Lebanon produces and exports a number of complex products that require sophisticated production processes used by a limited number of countries in the world. This means that the country's industrial sector retains a large reservoir of productive knowledge or know-how that should be capitalized on to produce even more complex products. This, not only opens up new markets, but also creates more highly skilled jobs and sustains future economic growth. In fact, research based on international experience shows that enhancing the productive capabilities to make more sophisticated products is an 'integral' part of development, as it leads to structural transformation in the economy.² In other words, countries do not grow rich by making more of the same; they succeed instead through accumulating capabilities and know-how to produce more innovative and sophisticated products.

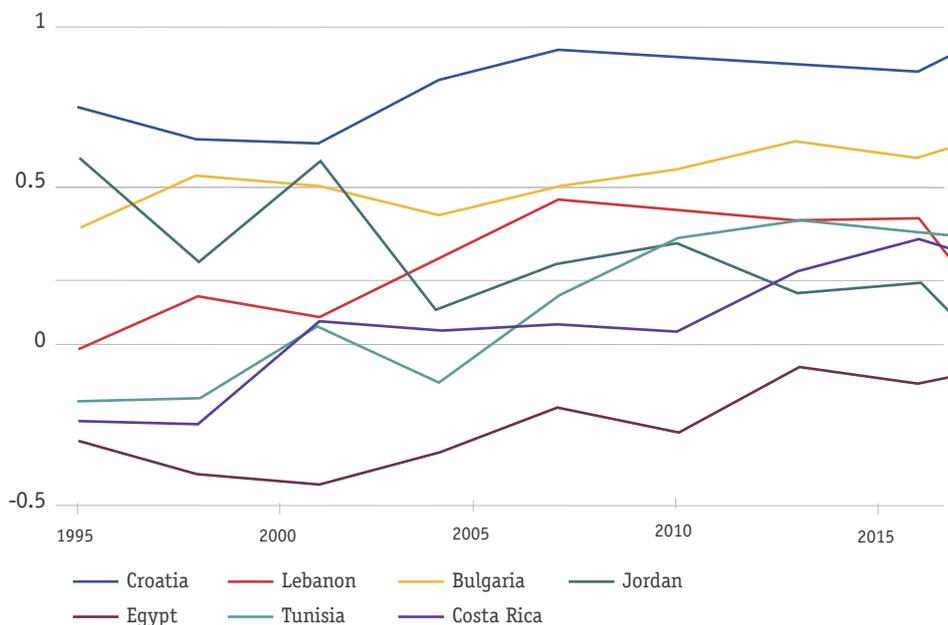
This brief is the second in a series of policy briefs that seek to identify potential to promote exports within the industrial sector. Capitalizing on existing productive knowledge and know-how to promote the exports of existing, new, and diversified complex products particularly in the sectors of machinery and chemicals, Lebanon's industrial sector can promote its exports through tapping into other, more developed import markets. To this end, support to the sector should prioritize investment in research and development, including facilitating access to technology and capacity that supports the production of these highly complex products.

Lebanon Has the Potential to Produce Complex Products

One of the key prerequisites for a country's ability to sustain growth is the production of complex products. Economic complexity index (ECI) is a measure of the knowledge in a society as expressed in the products it makes. It is calculated based on the diversity of exports a country produces and their ubiquity, as in, the number of countries able to produce them.³ Hence, complex products will be less common because only countries that have all requisite knowledge will be able to make them. Products that require little knowledge should be more ubiquitous, as it is easier for many countries to produce them.

Most of Lebanon's exports are actually in the low to middle level of complexity. It produces many products that many countries export as well, which is why the country was ranked as the 60th most complex exporter in 2017, out of a total of 133. However, looking back in time, Lebanon experienced an increase in the level of ECI between 1995 and 2007 (figure 1). In comparison to other countries, it is still well situated among Arab countries but is underperforming in comparison to other upper middle income countries like Croatia and Bulgaria.

Figure 1

Economic Complexity Index, 1995-2017

Source [Harvard Atlas for Economic Complexity, 2017](#).

Lebanon's most complex productions can be easily identified through the Product Space, a visualization tool that maps the connectedness between products, based on the similarities of the know-how required to produce them. The Product Space maps out the paths that countries can take to better diversify.

Product Space details the connectedness of nearly 900 products, based on real world data of the experience of countries' diversification over the past 50 years. We are able to map Lebanon's location in the product space from its export basket to understand what it is able to make, what products are at a short distance from each other and that depend on similar know-how to be produced, and to define paths to industrial diversification. By using real export data over time, the shape of the product space teaches us how diversification works in practice: Countries move from things they know how to do, to things that are close or related, known as the adjacent possible. Each node represents

products and they are connected if the probability of being co-exported is high. The nodes are colored according to the product category that they belong to.

The irregularity of the space means that diversification occurs preferentially, where countries that have products in the dense middle of the product space have many nearby opportunities for diversification, as compared to those at the periphery. Products at the periphery require know-how that is less readily redeployed into many new industries, such as cultivating coffee or extracting oil from the ground. Adding know-how to produce men's shirts, for example, may open opportunities in several other textiles, like producing women's pants, but shows little relatedness to heavy machinery or chemical products.

Figure 2

Product Space of the world



Source [The Observatory of Economic Complexity, 2017](#).

The most complex products—that only a few countries can produce—include sophisticated machinery, electronics, and chemicals. Specialized machinery is, for instance, considered to be a complex product, as it requires a range of know-how in manufacturing, like the coordination of a range of highly skilled individuals' expertise. In comparison, the least complex products—that nearly all countries can produce—include raw materials and

simple agricultural products.

... [Lebanon's] ability to have a small presence within other more central and sophisticated sectors—like machinery, chemicals, and metals—indicates its existing productive capacity to make jumps to higher complexity productions

Despite Lebanon's largest presence in jewelry and agro-food productions, both located to the periphery of the product space, its ability to have a small presence within other more central and

sophisticated sectors—like machinery, chemicals, and metals—indicates its existing productive capacity to make jumps to higher complexity productions. Among other products with a significant share of Lebanon’s net exports, the metal rolling industry stands out. It finds itself in the machinery cluster, which contains high complexity products and could serve as a springboard for jumping into and developing those products.

Figure 3

Lebanon’s Product Space



Source The Observatory of Economic Complexity, 2017.

The country mostly produces low-complexity materials, that are located on the right side or periphery of the product space, making knowledge accumulation more difficult (figure 3). Like many developing countries, Lebanon has an important presence in the textile and agricultural industries (green and yellow nodes). Its most important export, precious stones and metal products, are located in the sparse part of the product space, meaning they do little to facilitate diversification into other products.

Despite this, Lebanon has been adding new products in industries with higher complexity, particularly in the machinery (blue), chemicals (purple), and construction materials (red) clusters of the product space. These sectors may prove central in the country’s future development.

In fact, based on the product complexity ranking—which ranks the level of complexity for each product produced in the world—Lebanon exported 38 out of the world’s 100 most complex products with an export value exceeding \$100,000 for each.⁴ Such

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⁴ Lebanon exported a total of 77 out of the 100 most complex products.

products include chemical preparations for photographic use and apparatus based on the use of X-rays. These complex products exhibit high potential for exports in general as they constitute the largest import markets in the world. For example, Lebanon exports paintings, drawings, and pastels, executed entirely by hand, ranked as the 6th most complex product exported globally. Table 1 lists the top 10 most complex Lebanese exports by rank.

Table 1

List of most complex Lebanese exports, 2017

Global Rank	HS4 Code	Product Name	Lebanon Exports (thousand of USD)	Total Global Imports	Top Importers
5	8456	Machine tools for working any material by removing of material, by laser or other light or photon beam	116	>\$14.6 B	China, South Korea, United States
6	9701	Paintings, drawings, and pastels, executed entirely by hand	2,531	>\$13 B	United States, United Kingdom, Switzerland
7	8457	Machining centers, unit construction machines, and multistation transfer machines	4	>\$8.66 B	China, United States, Germany
8	9010	Apparatus and equipment for photographic laboratories	74	>\$70.5 M	Germany, France, United States
9	3707	Chemical preparations for photographic uses (other than varnishes, glues, adhesives, and similar preparations)	31	>\$6.38 B	China, United States,
10	8461	Machine tools for planning, shaping, slotting, broaching, gear cutting, gas	322	>\$92.3 M	Germany, United States, Thailand, China

Global Rank	HS4 Code	Product Name	Lebanon Exports (thousand of USD)	Total Global Imports	Top Importers
		grinding or gear finishing			
13	9022	Apparatus based on the use of z beta, or gamma radiations	431	>\$21 B	China, United States, Japan
14	2929	Compounds with other nitrogen function	250	>\$444M	United States, Germany, Singapore
15	8515	Electric laser or other light of photon beam	407	>\$2.28 B	United States, China, Mexico
18	9027	Instruments and apparatus for physical or chemical analysis	756	>38.9 B	United States, China, Germany

M = million, B = billion

Source Author's calculations.

Diversification Opportunities

The process by which diversification occurs is rife with market failures and is indicative of a very rich structure that makes it predictable. The Product Space captures the ability to make things evolve by moving from the current set of goods to others that are nearby.⁵ It has helped make it clear that the products a country makes now condition the products it can make in the future.

The community with the greatest number of target products (i.e. products that can be easily produced given existing productive knowledge and capabilities) is the machinery/electrical cluster,

The community with the greatest number of target products ... is the machinery/electrical cluster, with 21 products

with 21 products (table 2). The group is harder to develop based on the present productive knowledge in the country, but has high potential for the industrial sector as a whole.⁶ The other clusters with the highest number of target products are the textile (with 14 products) and foodstuff communities (7), whose products are easier to diversify into in terms of the country's productive knowledge and capabilities, but have on average lower complexity. In between these two clusters are a few strategic products in the chemical community, which are easier to develop than most machinery products, but have higher complexity and potential for the sector than the textile cluster has.

⁵ Bustos, S. and M. A. Yildirim. 2017. 'Arab Country Product Space Report Introduction and Methodology.' Lebanese Center for Policy Studies.

⁶ New products belonging to this cluster would increase the average complexity of Lebanon's export basket, compensating for the cost of developing them.

Table 2

Key target sectors

HS2	Product name	Product Targets	Product World Exports (in billions of USD)
	Machinery/Electrical sector	21	
84	Machinery and Mechanical Appliances, Computers, Boilers, Nuclear Reactors	13	1,470
85	Electrical Machinery	8	1,520
	Textiles sector	14	
61	Articles of Apparel and Clothing Accessories Knitted/Crocheted	6	117
63	Made-Up Textile Articles Nesoi, Needlecraft Sets, Worn Clothing, Rags	2	15
59	Impregnated, Coated, Covered, or Laminated Textile Products	2	20
62	Articles of Apparel and Clothing Accessories-Not Knitted/Crocheted	2	33
56	Wadding, Felt and Nonwovens, Special Yarns, Twine, Cordage, Ropes and Cables and Articles	1	17
54	Man-Made Filaments, Including Yarns and Woven Etc.	1	41
	Foodstuffs sector	7	
21	Miscellaneous Edible Preparations	2	11
16	Ed. Prep of Meat, Fish, Crustaceans, Etc.	2	30
23	Food Industries Residue and Animal Feed	2	69
24	Tobacco and Manufactured Tobacco Substances	1	27
	Chemicals and Allied Industries sector	4	
30	Pharmaceutical Products	2	452
38	Miscellaneous Chemical Products	1	113
31	Fertilizers	1	44
	Plastics/Rubbers sector	3	
40	Rubbers and Articles Thereof	2	197
39	Plastic and Articles Thereof	1	186
	Transportation sector	2	
87	Vehicles other than Rail/Tramway Rolling Stock	2	1,090
	Footwear/Headgear sector	1	
64	Footwear/Gaiters and Such	1	55
	Miscellaneous	3	
94	Furniture, Bedding, Lighting, Prefabricated Buildings	2	78
90	Optical, Photo/Cinematographic, Medical Instruments and Accessories	1	481

Source **Bustos, S. and M. A. Yildirim. 2017. 'Lebanon's Manufacturing Sector: Inaction and Untapped Potential.'** Lebanese Center for Policy Studies.

A few products in the chemical and machinery communities stand out given the world trade figures in those product categories. The product with the largest potential market is packaged medicaments whose world trade for 2012 was over \$300 billion. In the machinery community, on the other hand, there are four products with a world trade of over \$50 billion, including appliances for thermostatically controlled valves, apparatus protecting electrical circuits, pumps for liquids, and parts for use for hoist and excavation machinery.

Table 3

Products recommended for Lebanon

HS4	Product name	RCA-2012	Distance	PCI	Target Rank	World Trade (USD)	Top Importers	Top Exporters
8419	Machinery, plant or laboratory equipment involving a change of temperature such as heating, cooking, roasting	0.6	0.9	3.7	1	37 B	USA CHN DEU	DEU USA CHN
3004	Medicaments, packaged	0.9	0.9	1.5	2	331 B	USA DEU BEL	DEU USA CHE
2105	Ice cream	0.4	0.8	0.6	3	3 B	GBR FRA DEU	DEU FRA BEL
1601	Sausages	1.0	0.9	1.4	3	4 B	GBR DEU JPN	DEU USA ITA
8424	Mechanical appliances for dispersing liquids or powders; fire extinguishers; spray guns; steam or sand blasting machines	0.4	0.9	3.5	5	17 B	USA CHN DEU	CHN DEU USA
3922	Baths, shower baths, sinks, washbasins, bidets, lavatory pans, seats and covers	1.0	0.9	1.3	6	3 B	DEU FRA GBR	CHN DEU ITA
8530	Electric signal, safety and traffic controls, railways, waterways, parking, or airfields	0.6	1.0	3.7	7	2 B	USA CHN DEU	DEU SWE ESP
8416	Furnace burners for liquid fuel	0.4	1.0	4.0	8	2 B	CHN RUS FRA	DEU ITA CHN
8481	Appliances for thermostatically controlled valves	0.3	1.0	4.3	9	82 B	USA CHN DEU	CHN DEU USA
9402	Medical, surgical, dental, or veterinary furniture	1.0	0.9	3.5	10	3 B	USA DEU RUS	CHN DEU USA
8716	Trailers and semi-trailers	0.4	0.9	1.1	11	22 B	CAN USA DEU	DEU USA CHN
8434	Milking and dairy machines	0.4	0.9	2.5	12	2 B	DEU FRA BLR	DEU NLD SWE
3005	Wadding, gauze, and bandages	0.2	0.9	1.1	13	7 B	USA DEU FRA	CHN USA DEU
5402	Synthetic filament yarn	0.0	0.9	0.1	14	18 B	TUR USA CHN	CHN TWN IND
2309	Preparations of a kind used in animal feeding	0.0	0.9	0.4	14	23 B	DEU USA JPN	NLD USA FRA
6108	Women's undergarments	0.5	0.8	-2.4	16	11 B	USA JPN DEU	CHN IND KHM
3105	Mineral or chemical fertilizers, mixed	0.4	0.8	-0.9	16	24 B	IND BRA THA	RUS USA CHN
5911	Textile fabric for card clothing, technical use	0.3	1.0	3.8	18	4 B	USA DEU CHN	DEU USA CHN
9404	Mattress supports: articles of bedding	0.6	0.8	-1.1	18	13 B	USA JPN DEU	CHN POL DEU

HS4	Product name	RCA-2012	Distance	PCI	Target Rank	World Trade (USD)	Top Importers	Top Exporters
8432	Agricultural, forestry machinery for soil preparation	0.2	0.9	1.5	20	8 B	USA FRA RUS	DEU USA ITA
8536	Apparatus protecting electrical circuits for <1k volts	0.7	0.9	2.3	21	84 B	USA CHN HKG	CHN DEU JPN
8403	Central heating boilers	0.1	1.0	3.2	22	7 B	DEU GBR FRA	DEU ITA FRA
6406	Parts of footwear	0.4	0.8	-2.2	23	7 B	ITA DEU RUS	CHN ITA IND
8413	Pumps for liquids	0.6	0.9	2.9	23	62 B	USA DEU CHN	DEU USA CHN
8538	Parts for use with apparatus for protecting electrical circuits	0.8	1.0	3.2	25	32 B	CHN USA MEX	DEU CHN JPN
8431	Parts for use with hoists and excavation machinery	0.3	0.9	0.9	26	59 B	USA DEU CHN	CHN DEU USA
6306	Tarpaulins, awnings and sunblinds	0.5	0.8	-2.4	26	3 B	USA DEU FRA	CHN DEU PAK
6104	Women's suits	0.9	0.8	-3.6	28	27 B	USA DEU JPN	CHN TUR VNM
2101	Extracts of coffee, tea or matte	0.9	0.8	-1.3	28	8 B	USA DEU RUS	DEU BRA MYS
2402	Cigars	0.4	0.8	-2.0	31	22 B	ITA FRA JPN	DEU NLD POL
6106	Women's shirts	0.9	0.8	-3.7	31	6 B	USA DEU GBR	CHN TUR BGD
8705	Special purpose motor vehicles	0.9	0.9	-0.8	31	14 B	CAN RUS USA	DEU USA CHN
6305	Sacks and bags, used for packing goods	0.6	0.8	-4.1	33	4 B	USA JPN DEU	CHN IND TUR
2306	Cotton seed oilcake	0.9	0.8	-1.6	34	7 B	USA NLD ESP	CAN UKR IDN
6107	Men's undergarments	0.8	0.8	-3.6	35	6 B	USA JPN GBR	CHN IND VNM
6201	Men's overcoats, not knit	0.1	0.8	-2.9	36	12 B	USA JPN DEU	CHN VNM ITA
9028	Gas, liquid, or electricity supply, or production meters	0.1	0.9	1.7	38	6 B	USA DEU GBR	CHN USA MEX
6110	Sweaters, pullovers, sweatshirts, etc.	0.8	0.8	-4.0	38	50 B	USA JPN DEU	CHN BGD ITA
4012	Retreated or used pneumatic tires of rubber	0.4	0.9	1.5	38	3 B	USA DEU FRA	LKA DEU CHN
1604	Prepared or preserved fish	0.8	0.8	-3.0	40	16 B	USA JPN ITA	THA CHN ECU
4011	New pneumatic tires, of rubber	0.6	0.9	0.7	40	86 B	USA DEU FRA	CHN JPN DEU
6202	Women's overcoats, not knit	0.5	0.8	-2.6	43	14 B	USA JPN DEU	CHN VNM ITA
8512	Electrical lighting or signalling equipment used for motor vehicles	0.2	1.0	3.8	43	19 B	DEU USA CHN	CHN DEU JPN
8514	Industrial or laboratory electric furnaces	0.8	1.0	3.0	43	5 B	CHN USA KOR	DEU JPN USA
8507	Electric storage batteries	0.6	0.9	-1.2	45	32 B	USA CHN HKG	CHN JPN KOR
8433	Harvesting or agricultural machinery	0.1	1.0	3.8	45	20 B	FRA DEU USA	USA DEU CHN
6102	Women's overcoats	0.4	0.8	-4.0	47	3 B	USA DEU GBR	CHN VNM KHM
8546	Electrical insulators of any material	0.0	0.9	1.9	48	3 B	USA CHN DEU	CHN DEU ITA
5903	Textile fabrics impregnated with plastics	0.4	0.9	1.6	49	9 B	CHN USA MEX	CHN KOR DEU
8409	Parts suitable for use with spark-ignition engines	0.4	1.0	4.6	49	67 B	USA DEU GBR	DEU JPN USA

B = billion

Source Bustos, S. and M. A. Yildirim. 2017. 'Lebanon's Manufacturing Sector: Inaction and Untapped Potential.' Lebanese Center for Policy Studies.

Lebanon Must Support Machinery and Chemical Sectors

Diversification requires proper coordination and accumulating the missing productive knowledge, which is often a slow and path-dependent process. It is easier for countries to move into industries that share capabilities and productive knowledge with industries already present, since this will require less effort to make the leap.

The existing productions within the machinery and chemical sectors, and the high potential both sectors present to diversifying Lebanon’s export basket and further develop the industrial sector in the long term, are interesting to look at. Both sectors are valuable for the Lebanese industry, with the machinery sector representing 15% of total exports, and the chemical sector, 9%.

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Lebanese machinery exports were worth \$599 million in 2017, with the top exports including electric generating sets, electrical transformers, and other food preparation machinery (figure 4). The chemical sector, however, on average has been witnessing a slow but steady shrinkage over the past five years. Exports dropped from \$359 million in 2012, to \$342 million in 2017. Top exports included packaged medicaments, fertilizers, and paints (figure 5). Despite the chemical sector’s shrinkage, a number of its products have been performing well, with fertilizers and medicaments as the fastest growing chemical products.

Figure 4
Composition of machinery exports in Lebanon

Electric Generating Sets 22%	Refrigerators 6.6%	Spark-Ignition... 5.7%	Centrifuges	Integrated Circuits	Computers	Washing and Bottling Machines	Telephones		
			1.9%	1.7%	1.5%	1.5%	1.4%		
	Insulated... 6.3%	Industrial Food Preparation Machinery 5.8%	Lifting Machinery 2.5%	Other Paper Machinery	Electric Motor Parts	Papermaking Machines	Excavation Machinery	Mill Machinery	
				1.2%	1.2%	1.1%	1.1%	1.1%	
				Electrical Control Boards	0.88%	0.67%			0.95%
				Stone Processing Machines	0.86%				
Electrical Transformers 10%		Electric Motors 1.9%	Industrial Furnaces	Audio Alarms	Engine...				
			0.82%						
			Air Pumps	Valves	Boat Propellers				
			Rubberworking Machinery	Liquid Pumps	Stone...				
			0.73%						

Source Atlas of Economic Complexity, 2016.

Figure 5

Composition of chemical exports in Lebanon



Source *Atlas of Economic Complexity*, 2017.

Some Potential to Progress

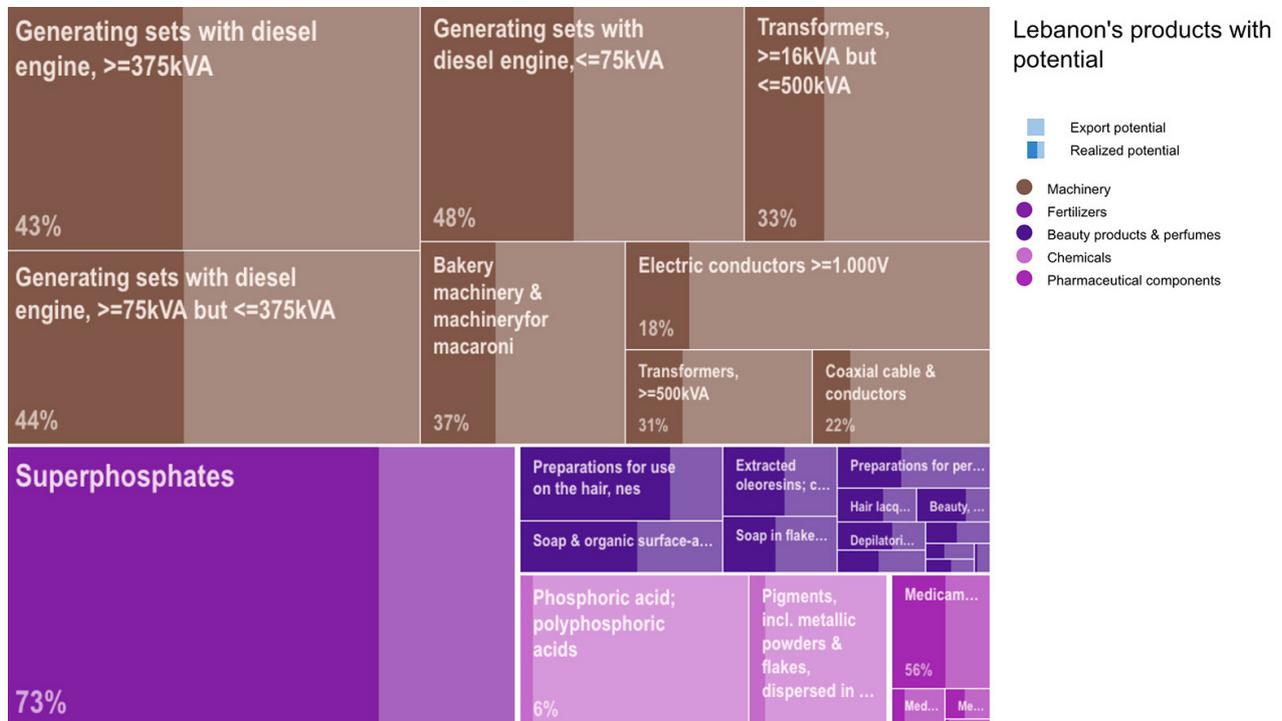
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(figure 6). Machinery's actual exports are considered to have achieved a mere 36% of the total potential, while chemicals are at 50%. Products with the largest untapped potential

are wide-ranging: They include generating sets (untapped potential of \$75 million), superphosphates (\$20.4 million), bakery machinery (\$13.7 million), transformers (\$20.8 million), electric conductors (\$17 million), phosphoric acid (\$18 million), and pigments (\$10 million).

Figure 6

Untapped potential in the chemicals and machinery sectors

Source International Trade Center Export Potential Map, 2017.

The two sectors also present the opportunity to penetrate new markets, and with that, diversify Lebanon's export market reach. Figures 7 and 8 map out untapped potential in market reach for both chemicals and machinery

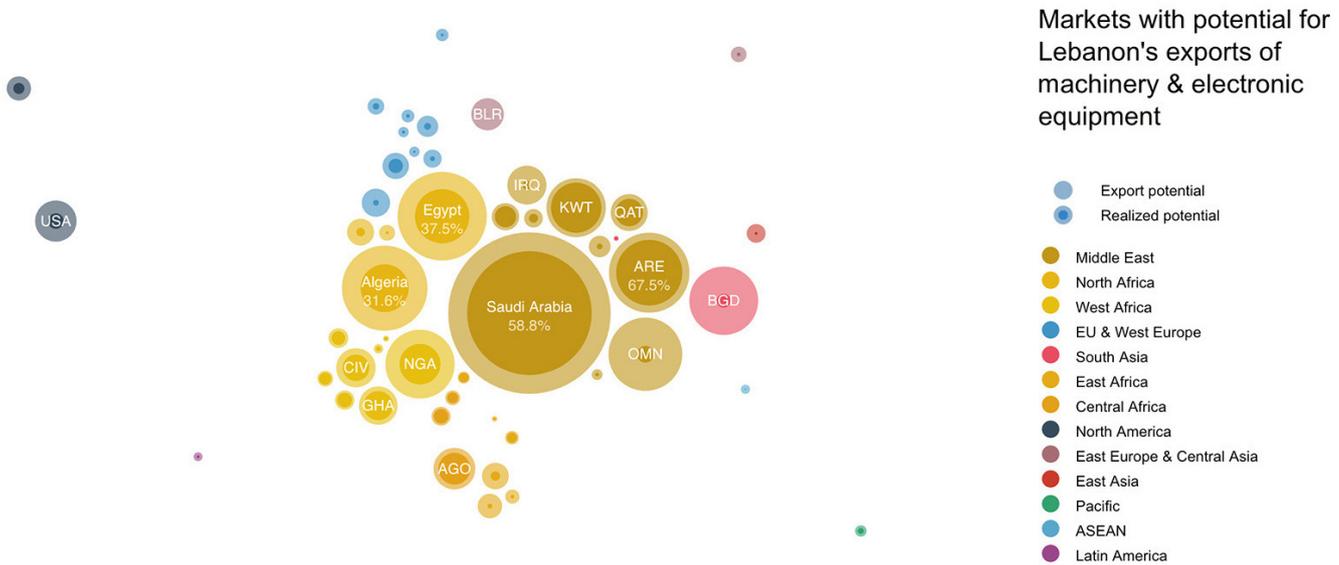
sectors. The machinery sector is considered to have a larger untapped potential, worth a total of \$205.9 million, distributed across all regions in the world. The greatest potential exists in

Saudi Arabia (\$25 million), Oman (\$15 million), Algeria (\$13.8 million), Bangladesh (\$13.6 million), Egypt (\$13.5 million), and Nigeria (\$9.3 million). However, significant untapped potential (higher than \$2 million) exists to more than 28 countries: Middle East (8 countries), Europe (7 countries), Africa (7 countries), North America (2 countries), and Central Asia (2 countries).

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Figure 7

Market potential of machinery products



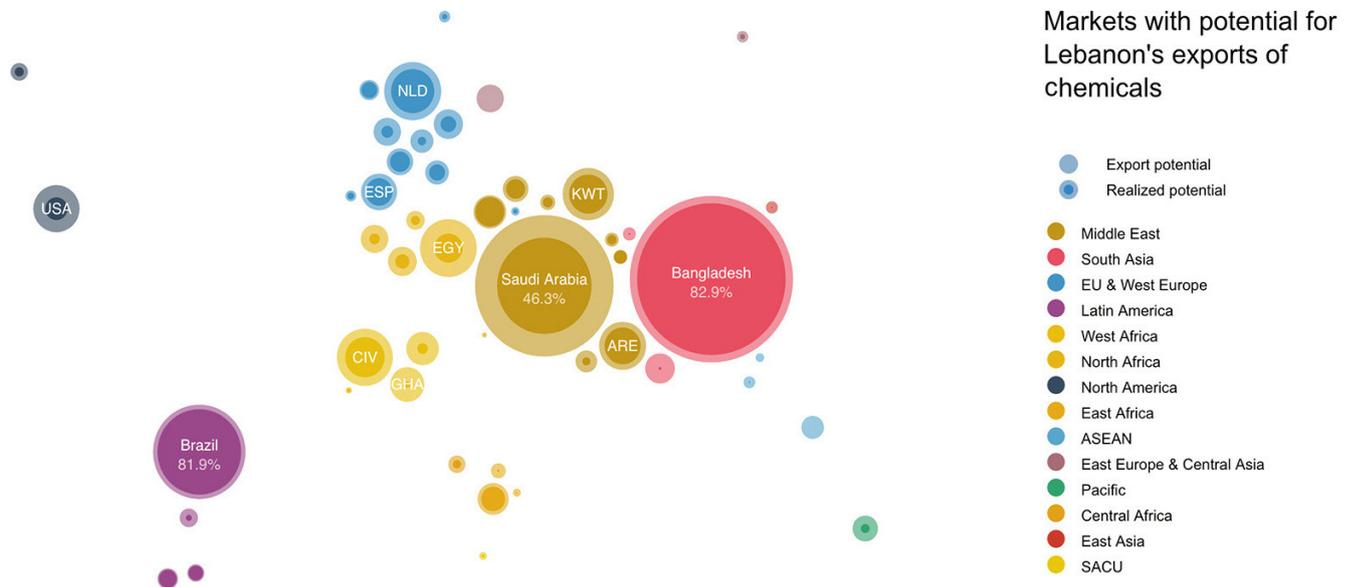
Source International Trade Center Export Potential Map, 2017.

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Chemical products retain a total untapped potential worth \$91.8 million, and exports provide the opportunity to diversify market reach by penetrating markets such as Bangladesh, Brazil, and the Netherlands (figure 8). The

largest untapped potential for chemical products remains in some Arab countries—Saudi Arabia (\$16.9 million), Egypt (\$4.8 million), and Kuwait (\$2.4 million)—but opportunity exists also in penetrating Western Africa (Ivory Coast with \$3.2 million, Ghana \$2.7 million, and Nigeria \$2.4 million), Europe (the Netherlands \$2.8 million, Belgium \$1.7 million, and Spain \$1.4 million), Asia (Bangladesh \$7.3 million, India \$2.3 million, and Indonesia \$1.6 million), the United States (\$3.5 million), Brazil (\$2.7 million), and other countries.

Figure 8

Market potential of chemical products

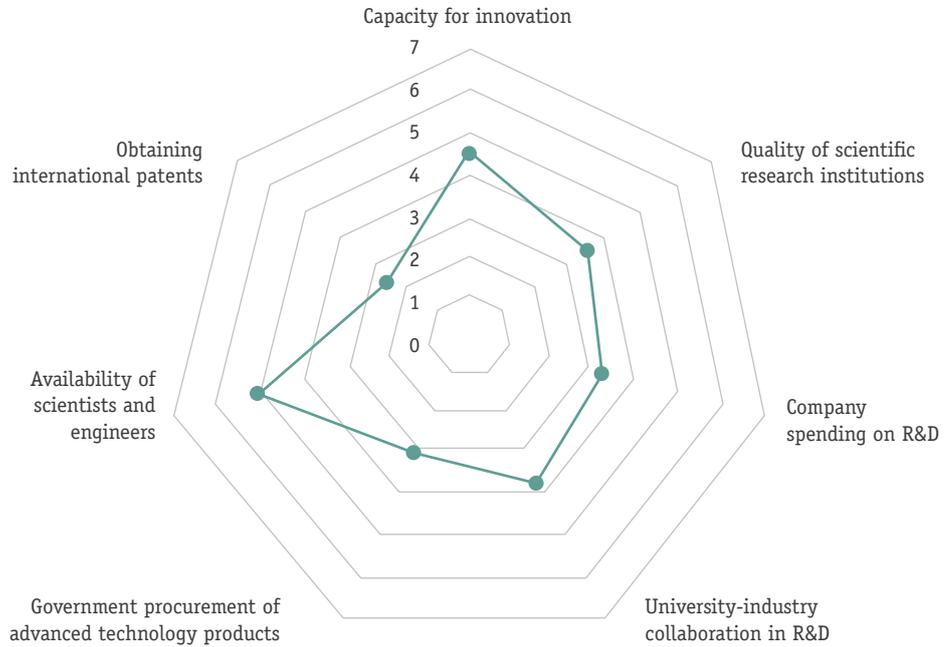
Source [International Trade Center Export Potential Map, 2017](#).

Conclusion and Recommendations

Diversifying into complex productions is a long process. It requires supporting existing industries to reach their maximum potential and accumulate productive knowledge and capacity, to facilitate further innovation and diversification into 'similar' products. Lebanese industries require extensive support to be able to attain such potential and promote innovation and development. Industrialists face a wide range of challenges, in addition to high costs of production.

According to The World Economic Forum's Competitiveness Report, Lebanon is ranked 61st out of 140 countries, scoring 38.5 out of a 100 on innovation (figure 9). Despite high capacity for innovation (score 5 out of 7) and high availability of scientists and engineers (score 5), Lebanon lacks support in research and development (R&D): it scored low on company spending on R&D (score 2), it has limited university-industry collaboration in it (score 2.5), and little government procurement of advanced technology products (score 2). Support to the sector's innovation should therefore focus on facilitating research and development as well as access to new technology.

Figure 9

Innovation pillars for Lebanon

Source [World Economic Forum Global Competitiveness Report, 2018](#).

Research and Development

The rates of local R&D activity within the Lebanese industrial sector are quite low. A number of companies invest in market research and business development, but very few venture into product development and innovative scientific research activities. Moreover, there are no education institutes providing technical studies on chemical manufacturing in Lebanon and important investments are still needed in this field. Accordingly, diversification within the sector has been limited and has remained confined to a transformative sector. To diversify and compete with international markets, a comparative advantage of expertise and laboratories is required. Therefore, various parties such as the Ministry of Interior and Ministry of Agriculture, syndicates, universities, and research centers, should collaborate to produce specialized studies about different products and industries within the chemicals and machinery sector.

Technological development

Technological development is a major driver of long-term productivity improvements. Obsolete SMEs can benefit from the advanced technologies available in other industrialized sectors through the transfer of technologies and their diffusion within their business, and this improves all economies' access to a wider array of knowledge. Developing high-quality secondary education and vocational training are important to have the right skilled labor to achieve technological and industrial advancement. Technical education and

training at the tertiary level, particularly skills in research and development, are also needed to adopt more complex and sophisticated technologies.

Attract foreign direct investment (FDI)

Even though studies examining the importance of FDI can produce contradictory findings in some cases, most empirical evidence suggests that such inward investment boosts growth. There are a number of reasons why companies engage in FDI: To gain access to new markets or resources, to relocate some of their production to countries that are either more technologically advanced or have a substantial pool of skilled workers, or to reap cost and specialization benefits. This should include additional spending on R&D, workforce training and skills, high-quality infrastructure, political and macroeconomic stability, and the containment of unit labor costs.

Investment in human capital

A skilled workforce is essential for any industrial sector that wants to consistently develop high-quality and innovative products and services. This applies not just to engineers and other university graduates, but also to master craftsmen, technicians, and similar skilled workers. Consequently, the prime objective should not be to achieve the highest possible percentage of people studying at university. Instead, policymakers should be focusing on the question of what sort of training and education can best equip young people for the workplace.

Decrease energy prices

Energy-efficient manufacturing processes and products are increasingly becoming a key factor in international competition. Providing energy benefits and good energy infrastructure is vital to facilitating technology transfer and innovation within the industrial sector. This should be assessed and supported directly by the government.

LCPS

About the Policy Brief

A Policy Brief is a short piece regularly published by LCPS that analyzes key political, economic, and social issues and provides policy recommendations to a wide audience of decision makers and the public at large.

About LCPS

Founded in 1989, the Lebanese Center for Policy Studies is a Beirut-based independent, non-partisan think-tank whose mission is to produce and advocate policies that improve good governance in fields such as oil and gas, economic development, public finance, and decentralization.

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