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Exporting for Growth: Identifying Leading Sectors for Egypt and Tunisia Using the Product Space Methodology

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Bonn, May 2018 Amirah El-Haddad

Abstract

The structural transformation of countries moves them towards more sophisticated, higher-value products. Network analysis, using the Product Space Methodology (PSM), guides countries towards leading export sectors. The identification process rests on two pillars: (1) available opportunities, that is, products in the product space that the country does not yet export which are more sophisticated than its current exports; and (2) the stock of a country's accumulated productive knowledge and the technical capabilities that, through spillovers, enable it to produce slightly more sophisticated products. The PSM points to a tradeoff between capabilities and complexity. The methodology identifies very basic future products that match the two countries' equally basic capabilities. Top products are simple animal products, cream and yogurt, modestly sophisticated plastics, metals and minerals such as salt and sulphur for Egypt; and slightly more sophisticated products such as containers and bobbins (plastics) and broom handles and wooden products for Tunisia, which is the more advanced of the two countries. A more interventionist approach steers the economy towards maximum sophistication, thus identifying highly complex manufactured metals, machinery, equipment, electronics and chemicals. Despite pushing for economic growth and diversification, these sectors push urban job creation and require high-skill workers, with the implication that low-skilled labour may be pushed into unemployment or into low-value informal jobs. A middle ground is a forward-looking strategy that takes sectors' shares in world trade into account. This approach identifies medicaments in the chemicals sector; seats (e.g. car and aeroplane seats) in the "other highly manufactured" sector; inflated rubber tyres in the chemicals community (plastics and rubber); containers, bobbins and packages of plastics also in the plastics and rubber section; and articles of iron and steel in the metals sector for Egypt. The top product for Tunisia is furniture in the highly manufactured and special purpose goods community, followed by three products in plastics and rubber in the chemicals community, and finally three machinery sectors.

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Abbreviations

COI	Complexity Outlook Index
ECI	Economic Complexity Index
EMP	Euro-Mediterranean Partnership
ERSAP	Economic Reform and Structural Adjustment Program
GDP	gross domestic product
IP	industrial policy
IS	import substitution
ISI	import substitution industrialisation
MENA	Middle East and North Africa
OG	opportunity gain
OV	opportunity value
PCI	Product Complexity Index
PSM	Product Space Methodology
RCA	revealed comparative advantage
TCV	thermostatically controlled valves
TFA	technology foresight approach

1 Introduction

Egypt and Tunisia are the only two countries that experienced the Arab spring of 2011 without then dissolving into civil war.[1] Yet, both countries are unable to meet their people's aspirations as they face growing economic challenges, such as youth unemployment and an inflated public sector.

Egypt and Tunisia provide particularly interesting cases since, despite their common political history and the similar paths they have taken in economic policy, they have achieved different results. Both also have a concentration of exports in hydrocarbons and a limited degree of complexity of their export baskets, especially Egypt. Despite these similarities, Tunisia achieved greater structural transformation, defined as long-term, persistent shifts in the sectoral composition of an economy (see Kuznets, 1971; Pasinetti, 1981; Ricardo, 1817; Rodrik, 2007). This process involves moving away from primary sectors such as agriculture and mining towards manufacturing or high-value services, including the diversification of the productive structure of the economy, towards more sophisticated production. There is an established positive relationship between export diversification and growth (e.g. de Ferranti, Perry, Foster, Lederman, & Valdés, 2005; Feenstra, Lipsey, Deng, Ma, & Mo, 2005), at least up to a lower bound of high-income countries (e.g. Brenton, Saborowski, Staritz, & von Uexkull, 2009; Cadot, Carrere, & Strauss Kahn, 2008; Klinger & Lederman, 2004; Sannassee, Seetanah, & Lamport, 2014). Export growth and structural transformation create viable opportunities for private-sector growth and expansion, and thereby employment, thus easing problems of youth unemployment.

The two countries' varying performance allow us to explore these differences. To what extent have Tunisia's initial steps towards diversification and upgrading enabled the country to take more ambitious steps in the future? This paper identifies Egypt and Tunisia's future advantages by using variants of the Product Space Methodology (PSM) of Hausmann et al. (see references in next paragraph). I also discuss some of the strengths and weaknesses of the approach.

Although there is consensus for the necessity of diversification and structural change, there is no consensus about how to steer the economy towards that change. Recent models have tried to predict the most productive patterns of diversification, and thus trade, to enhance growth. The Hausmann et al. approach uses a network analysis of the product space as the basis for an active industrial policy to steer the economy towards sectors that are similar in terms of the capabilities, skills and knowledge required for their production to those of currently exported products. These new sectors have slightly higher levels of sophistication and will therefore gradually lead the countries towards more sophistication in the future (Hausmann, Hwang, & Rodrik, 2005; Hausmann & Klinger 2006; Hausmann, Klinger, & Lopez-Calix, 2010; Hausmann et al., 2011; Hidalgo, Klinger, Barabási, & Hausmann, 2007).

By concentrating on the proximity of the currently exported products to the ones that will be potentially produced in the future, this approach contrasts with the unbalanced growth theory, which has long argued that developing countries should diversify, especially through

1 That is, from the main six countries where the upheavals were substantial, compared to the rest of the Arab Spring countries. These five countries are Tunisia, Egypt, Libya, Yemen, Syria and Iraq.

the development of forward and backward linkages (see Hirschman, 1969; Singer, 1958; Streeten, 1969). Such diversification for open economies has sometimes failed. Take, for example, two industries that are strongly linked in the garment value chain of production: raw cotton and textiles. Driven by Egypt's production of high-quality, long-staple cotton, the country has always tried to develop its textiles industry. With Egypt's accession to the World Trade Organization, which exposed the country to international competition, this industry has nearly vanished (El-Haddad, 2012), despite the obvious forward and backward linkages between the two. The PSM provides an explanation for this failure. It lies in the fact that the capabilities and skills required to produce raw cotton, such as climate and water, are very different from those required for the production of the capital-intensive textiles industry. Therefore, if a country produces cotton lint successfully, that does not automatically imply that it will successfully produce textiles. Indeed, high-quality Egyptian cotton lint has been turned into coarse yarns, which produce poorly woven fabrics. Once the import bans on textiles were lifted in 1998, and previously prohibitive import tariffs were substantially reduced from 2000 to 2004, the textiles industry collapsed as the country witnessed a surge of imported fabrics.

Thus, the PSM approach, which identifies the future natural export diversification structure of countries, diverges substantially from the standard approach, which treats industries as being vertically connected through forward and backward linkages.

The two countries' historical country contexts and the differences between the two economies are discussed in the following section. An introduction to the Product Space Methodology of Hausmann et al. and of the two countries' positions in that space is presented in Sections 3. Section 4 presents results of the PSM, as well as two of its variants. These results are followed by a discussion of potential shortcomings of the methodology. Section 6 concludes.

2 Contrasting Egypt and Tunisia

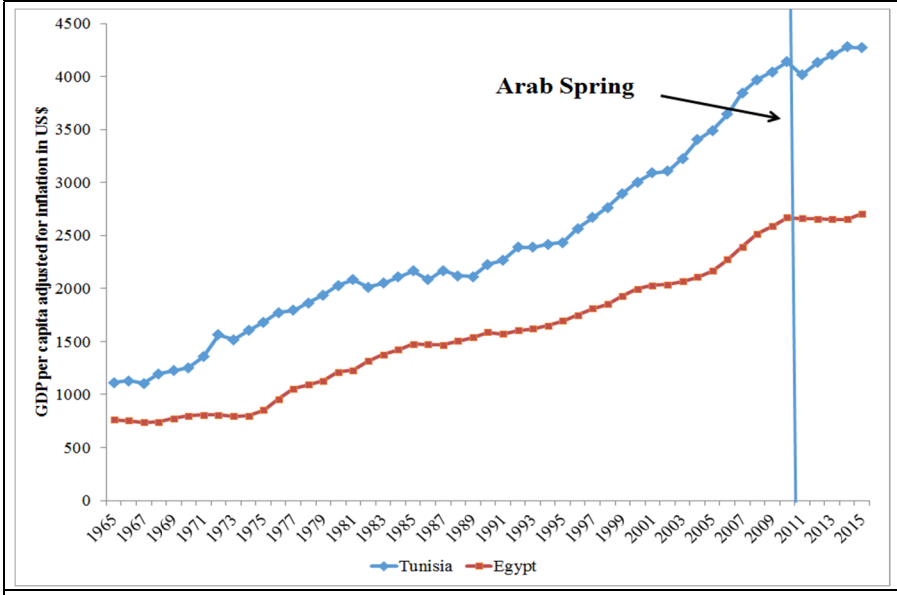
This section serves to briefly introduce the two countries in terms of their past economic policies. It also informs on the countries' economic structures in terms of diversification, concentration, ubiquity and complexity. These variables elucidate the degree of structural transformation in each country – the latter is not only important for productivity growth but also for providing future opportunities. Where a country is today determines where it will be tomorrow, or a country's position in the product space today determines its position in it tomorrow. As a result, these variables assist in positioning each country into the World Product Space for Exports and then later assist in understanding the results we obtain.

2.1 Main landmarks of Egyptian and Tunisian economic policies since independence

Egypt and Tunisia share much of the same policies rooted in their common approach to economic development. Both Gamal Abdel Nasser (1956-1970) in Egypt and Ahmed Ben Salah (1961-1969), Tunisia's minister of planning and finance under the country's first president, Habib Bourguiba, after independence, were committed to public-sector-led,

inward-looking, import-substitution industrial policies. Since the mid-1960s, the two countries have experienced similar growth rates (an average of 2.94 and 2.74 for Tunisia and Egypt, respectively, through the 1995-2010 period), with Tunisia's gross domestic product (GDP) per capita remaining approximately 50 per cent higher than that of Egypt's (Figure 1).

Figure 1: GDP per capita (1970-2015)



Source: Author, based on World Bank (2016a).

Around the same time, both countries reversed that model towards what was officially termed an "open door policy", or *infitah* – a mixed economy model spearheaded by President Anwar El-Sadat in Egypt (1971-1981) and Prime Minister Hedi Nouira (1970-1980) in Tunisia. This model combined import substitution with export promotion policies, though with more of the latter in Tunisia. For Egypt, reforms concentrated on the liberalisation of the foreign exchange market and consumer imports. Nevertheless, the two countries encouraged the private sector and foreign direct investment but tightly regulated market access and resource allocation, maintained their monopoly over public utilities and continued their support to the public sector through persistent, cheap state credit. Public-sector companies operated under a "soft budget constraint" and were bailed out when they ran into difficulties.[2] As a result, the public sector remained a large political and economic power, marking this phase as one of only partial liberalisation.

Following the two oil price shocks – in 1973 and 1979 – coupled with the consumption phase that dominated the 1970s and much of the 1980, pressure mounted on foreign exchange resources, budgetary deficits widened (18 per cent in Egypt but only 4.5 per cent in Tunisia) and debt largely accumulated. In Egypt external debt grew more than tenfold: from less than $2 billion (26 per cent of GDP) in 1970 to about $21 billion (92 per cent of

2 "Softening of the budget constraint occurs when the strict relationship between expenditure and earnings has been relaxed because excess of expenditure over earnings will be paid by some other institution, typically the state. A further condition of softening is that the decision maker expects such external financial assistance with high probability, and this probability is built firmly into his behavior" (Kornai, 1986). Kornai, the first one to use this terminology, argues that there are different ways to soften the budget constraints of the firm through: 1) soft subsidies, 2) soft taxation, 3) soft credit and 4) soft administrative prices (Kornai, 1986).

GDP) in just 10 years, and to roughly $50 billion (116 per cent of GDP) in the early 1990s. Being a much smaller country,[3] this value was much smaller for Tunisia but its external debt grew thirteenfold: from $0.6 billion (42 per cent of GDP) in 1970 to $7.7 billion (63 per cent of GDP) in 1990. A severe negative trade balance placed further pressure on foreign exchange resources.

In response to the growing severity of the economic situation, Tunisia pursued an Economic Reform and Structural Adjustment Program (ERSAP) in 1986, as did Egypt a few years later in 1991 under Bourguiba and Mubarak, respectively. Ben Ali carried on with the Tunisian ERSAP one year later after the coup of 1987. This period deepened the countries' integration into the international global market economy. The programmes contained the usual features of those supported by the international financial institutions: targeting macroeconomic stability of external accounts and state budgets while starting deeper reforms by promoting greater market orientation, both decentralising and liberalising the economy through a reduction of state interventions and price distortions. Trade liberalisation is a cornerstone of the reform process and was marked by the two countries' accession to the World Trade Organization in 1995. Whereas Tunisia was among the first wave of Arab countries to join the Euro-Mediterranean Partnership and sign the Association Agreements in the same year, Egypt followed some years later in 2001. It is during this phase that the countries' absolute GDP per capita started to diverge more markedly, perhaps on account of Egypt's delayed market access to Europe (Figure 1). Indeed, Tunisia's average growth rate of 3.5 per cent was substantially larger than Egypt's 2.7 per cent in the years of asymmetric market access[4] of the two countries (1995-2001).

The next stage, beginning in 2004, introduced more profound economic reforms that aimed to have lasting effects on any remaining import substitution strategies for both countries. The reforms included slashing customs and tariffs, and replacing politicians with techno-bureaucrats, that is, people with professional experience but with no particular political agenda. Despite greater efforts in Tunisia to maintain social cohesion in support of the neoliberal reforms and the presence of stronger and more independent trade unions (Erdle, 2011), the series of Arab revolutions, or the so-called Arab Spring, sparked there in 2010 and propagated to Egypt in 2011.

The most recent policy period since those uprisings has seen a return to state control for Egypt, most notably the increased role of the military in the economy, more protectionist measures coupled with increasing political repression – the latter justified by a severe foreign exchange and youth unemployment crisis (33 per cent); budget and current account deficits mounting to 12 per cent and 7 per cent of GDP, respectively; government debt exceeding the 100 per cent mark; and inflation reaching its highest level in seven years. Inflation was reported at over 15 per cent in August, climbing to 19 per cent by November 2016 (Central Bank of Egypt, 2016). On the political front, Tunisia is doing far better than Egypt. In contrast to Egypt, its military supported the country's transition to democracy. Additionally, the budget deficit is significantly lower (4.5 per cent of GDP), as is inflation, which is less than half that in Egypt (4.9 per cent compared to 9.4 per cent in Egypt in 2016 (World Bank, 2016c)). In

3 With more than 91 million people, Egypt has more than eight times the population of Tunisia.

4 So the two countries are allowed tariff-free access into the European Union, but the opposite is not true, which limits the competition from Europe.

contrast, the current account deficit is worse – 9 per cent in 2014 (World Bank, 2016a, 2016b) – and unemployment as well: 15.4 per cent; 36 per cent (youth); 22.6 per cent (women).

2.2 The structures of the Egyptian versus the Tunisian economies

Egypt and Tunisia have made some progress, albeit varying, towards developing more private-sector-orientated economies. The private sector in Tunisia is nearly double that of Egypt in terms of private investment (in relative terms), which has increased from just under 16 per cent of GDP (15.92 per cent) to about 21 per cent between 1991 and 2010 in Tunisia and from just 7.6 per cent in Egypt to 10.5 per cent in the same period. Similarly, the amount of credit offered to the private sector by Tunisia has been around double that of what Egypt has offered, both at the start of the ERSAP in 1991 and in 2010. Credit levels in Tunisia reached triple those of Egypt by 2015, with the percentage of credit to the private sector being 80 per cent, compared to just 27 per cent in Egypt (World Bank, 2016a). Public-sector employment is nearly a quarter of the labour force in both countries (approximately 25 per cent and 20 per cent of the labour force; 7 per cent and 6 per cent public employment per capita in 2016 in Egypt and Tunisia, respectively), which is a significant proportion when compared to the rest of the world (see Figure A1 in the Annex).

Unlike Tunisia, Egypt is poorly integrated into the global economy. Trade openness (the ratio of non-oil exports and imports of goods and services to GDP) continued to deteriorate for Egypt, from 48 per cent in 1991 to just 30 per cent in 2015 (and 41 per cent in 2010). In Tunisia openness has grown steadily, from 78 per cent in 1991 to 87.9 per cent by 2014, way above all countries in the Middle East and North Africa (MENA), which currently average 52 per cent. More generally, the gap between Tunisia's and Egypt's GDPs per capita has widened over time. Just before the Arab Spring, by 2010 Tunisian GDP per capita had peaked much higher than Egypt's – to $4,177 (Figure 1). This is not merely a country-size effect but also reflects the varying industrial and economic policies of the two countries.

Tunisia is also better diversified away from hydrocarbon exports. The share of hydrocarbons in total exports was just 8.9 per cent in 2015 in Tunisia, compared to nearly triple that number for Egypt (25.7 per cent) (WITS [World Integrated Trade Solution], 2016), pointing to Egypt's greater reliance on resource-based sectors. Before the decline in oil prices, however, this share reached as high as 35 per cent in 2010 (15.9 per cent for Tunisia). This limited diversification is reflected in the Herfindahl-Hirschman product concentration index, which has steadily worsened for Egypt but improved for Tunisia. The gap has widened – with Egypt's score doubling before being 3.5 times that of Tunisia's by 2015 (0.046 for Egypt, compared to 0.026 for Tunisia in 2010; increasing for Egypt to 0.069 and declining for Tunisia to just under 0.02 by 2015, Table 1). Thus, Egypt is quite vulnerable to trade shocks from changes in hydrocarbon prices.

Table 1: Herfindahl-Hirschman product concentration index (selected years)

	2010	2012	2013	2014	2015
Egypt	0.046	0.071	0.067	0.068	0.069
Tunisia	0.026	0.025	0.025	0.021	0.020

Note: Herfindahl-Hirschman product concentration index is a measure of the dispersion of trade value across an exporter's products. A county with a preponderance of trade value concentrated in a very few products will have an index value close to 1. Thus, it is an indicator of the exporter's vulnerability to trade shocks. Measured over time, a fall in the index may be an indication of diversification in the exporter's trade profile. Range of values: 0 to 1. A higher index indicates that exports are concentrated in fewer sectors, whereas a country with a completely diversified portfolio will have an index close to 0.

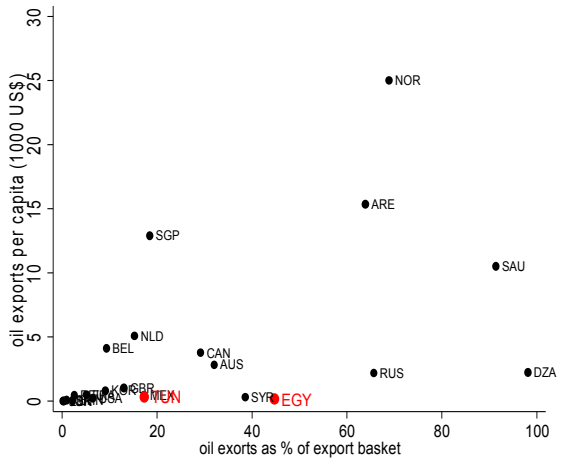
Source: WITS (2016) database, mirror data

Egypt's oil endowment is not even large enough for the entire population to enjoy higher standards of living. In fact, Egypt's oil reserves per capita are only a fraction of the reserves of other countries that are less specialised in the oil sector, such as Singapore, Canada, the Netherlands, Australia and Belgium. Egypt's economy is heavily reliant on oil compared to other countries with similar oil exports per capita, such as China, India and the United States (Figure 2a). With the exception of Algeria (DZA), all other selected MENA countries with similar hydrocarbon endowment levels have lower concentrations in hydrocarbons compared to Egypt. Egypt's concentration is even greater than Syria's. Tunisia is also doing poorly in comparison to industrialised countries with similar – or even greater – endowment levels, but even in comparison to other MENA countries such as Israel, Jordan and Lebanon, which lay to the left of both countries. However, Tunisia is certainly doing a lot better than Egypt.

The situation has changed since the decline in oil prices starting in 2013, since when oil exports as a percentage of the export basket for the two countries nearly halved (Figure 2b). However, there remain plenty of countries with similar endowment levels but less concentration.

Figure 2: Per capita oil exports and oil exports as percentage of total exports in selected countries

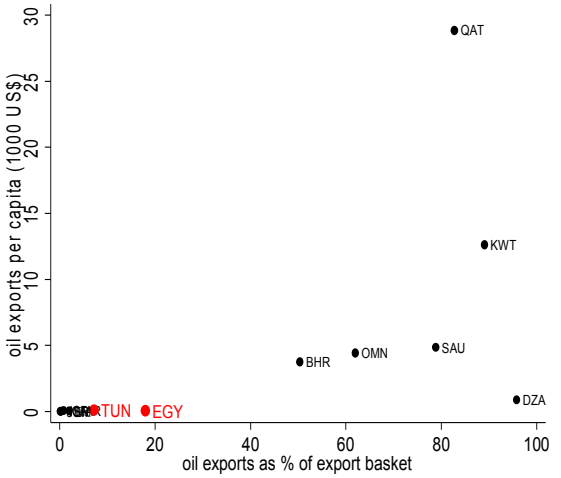
Figure 2a: 2008



Note: Included MENA countries: United Arab Emirates, Algeria, Egypt, Israel, Jordan, Lebanon, Saudi Arabia, Syria and Tunisia

Source: Author's calculations, based on World Bank (2016a) and WITS (2016) database

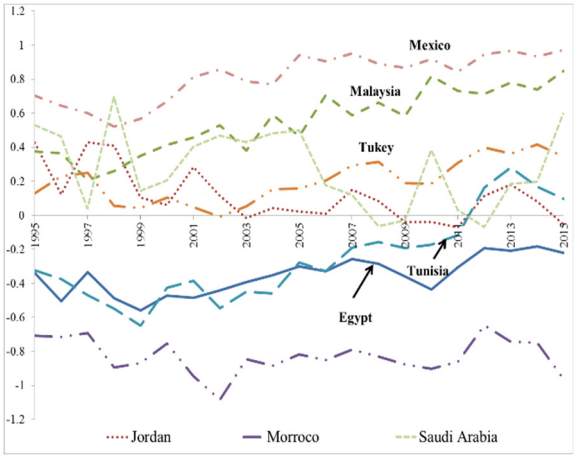
Figure 2b: 2015



Note: Included MENA countries: Bahrain, Algeria, Egypt, Israel, Jordan, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, Tunisia and Yemen

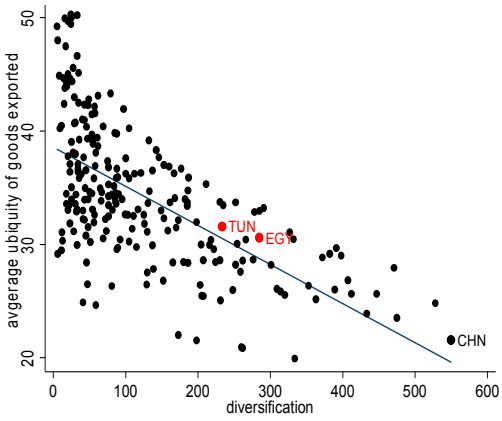
Source: Author's calculations, based on World Bank (2016a) and WITS (2016) database

Figure 3: Economic Complexity Index, 1995-2015



Source: Author, based on Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)[5]

Figure 4: Diversification and ubiquity (2015)



Source: Author, based on Atlas of Economic Complexity data (Center for International Development at Harvard University, 2016)

Hausmann et al. (2005) have introduced an index to measure export complexity, which is called the Economic Complexity Index (ECI). It combines information about a country's level of diversification and the ubiquity of the products it produces (Figure 3). Countries that are fairly diversified and export large numbers of products make products that are produced by few other countries, that is, they produce products that are less ubiquitous or common (Figure 4). Compared to all other countries, Egypt and Tunisia are average in their

5 ECI is a scale that uses the theory of – and calculations for – economic complexity to rank countries according to their levels of complexity. Hausmann, Hidalgo et al. (2014) have shown that when a country produces complex goods in addition to a high number of products, it is typically more economically developed or can be expected to experience fast economic growth in the near future. Consequently, ECI levels can be used as a measure of economic development. To determine the ECI level, they take a country's diversity level (how many different products it can produce) and divide by the ubiquity of those products (the number of countries able to make those products). To generate a more accurate measure of economic complexity, they correct the information that diversity and ubiquity levels carry by using each to correct the other. For countries, this requires the calculation of the average ubiquity level of the products that it exports, the average diversity level of the countries that make those products, and so forth.
$k_{c,n} = \frac{1}{k_{c,0}} \Sigma_p M_{cp} . k_{p,n-1}$ (1) For products, this requires the calculation of the average diversity level of the countries that make them, and the average ubiquity level of the other products that these countries make.
$k_{p,n} = \frac{1}{k_{p,0}} \Sigma_c M_{cp} . k_{c,n-1}$ (2) By inserting (2) into (1) $k_{c,n} = \frac{1}{k_{c,0}} \Sigma_p M_{cp} \frac{1}{k_{p,0}} \Sigma_{c'} M_{c'p} k_{c',n-2} = \Sigma_{c'} k_{c',n-2} \Sigma_p \frac{M_{c'p} M_{cp}}{k_{c,0} k_{p,0}} = \Sigma_{c'} k_{c',n-2} \widetilde{\mathrm{M}}_{cc'}$ (3) Where: $\widetilde{\mathrm{M}}_{cc'} \equiv \sum_p \frac{M_{c'p} M_{cp}}{k_{c,0} k_{p,0}}$ (3) is satisfied when $k_{c,n} = k_{c,n-2} = 1$. This corresponds to the eigenvector of $\widetilde{M}^{C}_{c,c'}$ which is associated with the largest eigenvalue. Since this eigenvector is a vector of ones, it is not informative. We look, instead, for the eigenvector associated with the second-largest eigenvalue. This is the eigenvector that captures the largest amount of variance in the system and is our measure of economic complexity. Hence, the Economic Complexity Index is defined as:
$ECI = \frac{\vec{\mathrm{k}} - < \vec{\mathrm{k}} >}{stdev\,(\vec{\mathrm{k}})}$ Where <> represents an average, stdev is the standard deviation and $\vec{\mathrm{K}}$ is the eigenvector of $\widetilde{\mathrm{M}}_{cc'}$ associated with the largest eigenvalue (Hausmann, Hidalgo et al., 2014).

levels of diversification and produce products that are in the middle of the ubiquity distribution range. In comparison, China is the most diverse country in the world and, at the same time, the least ubiquitous, producing all sorts of non-common products that one can think of. Being located on top of the regression line means that, for their level of diversification, the country could do better in terms of ubiquity, and vice versa. Overall, the two countries' ECI levels do not compare favourably to those of other oil exporters, such as Saudi Arabia, Mexico and Malaysia, which have upgraded their non-oil exports. Since 2006 Tunisia has maintained greater ECI levels compared to Egypt, though both have had mostly negative ECI levels, with Tunisia's only turning positive after 2011. Using UN COMTRADE data for 2015, Egypt ranked as the 137th (Tunisia 109th) most complex out of 234 countries in the world – a bit worse than the middle of the distribution – with Tunisia ranking a bit better. Within MENA, Egypt ranked 9th (Tunisia 7th) out of MENA's 19 countries. Despite being the better performer of the two more recently, there is still room for improvement by Tunisia.

3 The Product Space Methodology

The previous analysis identified a relatively large degree of hydrocarbon concentration of exports and a limited degree of complexity of the export baskets of both Tunisia and Egypt, with Egypt being worse of the two. The sophistication and diversification of exports are distinct goals to any active industrial policy, simply because there is an established positive relationship between export diversification and growth (e.g. de Ferranti et al., 2005; Feenstra et al., 2005); because exports boost economies of scale, they tend to become the activities with the highest productivity levels in the country. The Product Space methodology is a recent approach that guides countries as to what sectors to pick for support as engines of export growth, and in turn for overall growth and development. The next section describes the methodology, then moves on to the resulting policy prescriptions of this analysis for Egypt and Tunisia.

3.1 Product Space Analysis

This approach is the outcome of the combined efforts of the following scholars: Hausmann et al. (2005), Hausmann and Klinger (2006), Hidalgo et al. (2007), Hidalgo and Hausmann (2009), Hausmann et al. (2010) and Hausmann et al. (2011). Drawing on the tools of network analysis, they empirically map the product space for exported products. Since the set of capabilities requisite for one existing industry is easily redeployed to another new industry, spillover effects are at the heart of the analysis. It is more likely that a country producing asparagus will be able to produce artichokes as well, because there will be rural infrastructure in the appropriate climatic zones suitable for both products in addition to cold storage transportation systems, customs and regulatory regimes, and services that support the export of fresh produce, for example product approval and phytosanitary permits. Thus, it is easier to embark upon establishing an industry when a similar one already exists, as the set of requisite capabilities can be easily deployed to another new industry. The same is not true of an advanced crude oil production industry. Engineers, gravimeters, magnetometers, drilling rigs and pipelines used in oil extraction and transport are much less suited for artichokes and more difficult to redeploy for their cultivation and export (Hausmann et al., 2010). Artichoke and oil production are therefore far away from each other in the product space, whilst

artichoke and asparagus are not. This way of looking at things implies path dependence, meaning that what a country produces today affects what it could produce tomorrow.

In Hausmann and Klinger (2006), Hausmann and Hidalgo (2007), Hausmann et al. (2005; 2009; 2010; 2011), the product space is constructed by connecting each exported product to its nearest neighbour in terms of proximity. Proximity here measures the closeness of capabilities and embedded knowledge of one product in relation to another in the product space. Formally, it is thus the probability that, if a product is exported, the other is exported as well; it is measured as the minimum of the pairwise conditional probability of having comparative advantage (as the conditional probability goes from each product to the other). This probability is calculated for successfully exported products only,[6] for all countries in the world at any year t (Hidalgo et al., 2007).[7] The presentation of the space (Figure 5)[8] shows that this space is heterogeneous, a core periphery with a densely connected structure to which two types of products are connected: the first, the peripheral products that are only weakly connected to the core, such as oil; second, groupings of peripheral products that, despite being strongly connected to each other, are weakly connected to the core, such as the dense, compact, green garment cluster to the left of the network. Because garments and textiles require different types of productive knowledge – that is, the proficiencies required to competitively make textiles are quite distinct from those required to make garments – these two belong to two distinct communities in the product space, despite being very closely connected in the value chain, hence the divergence of vertical chains of operation, forward and backward linkages, or input-output table concepts to that of the product space. The core is located in the centre of the network and is made up of the densely connected blue product cluster of machinery and other capital-intensive goods. The light turquoise cluster of electronics in the lower right corner is also strongly connected to the core.

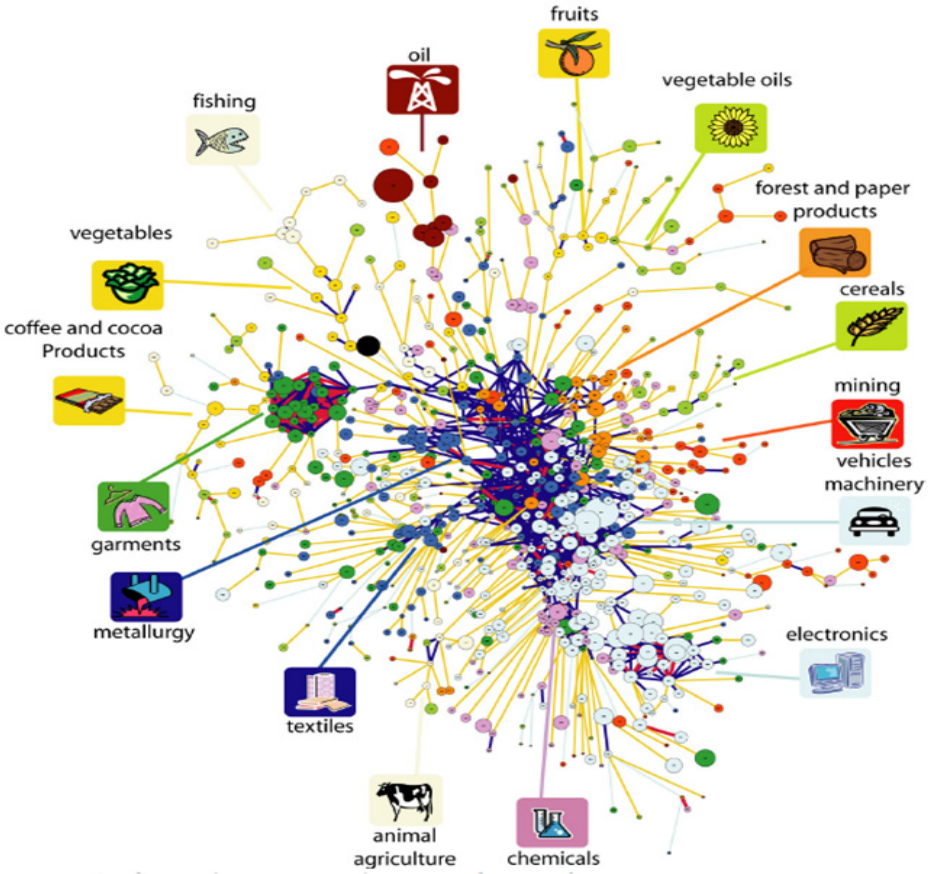
6 That is, it is calculated for all exports with a revealed comparative advantage (RCA) greater than 1. RCA is an index used to calculate the relative advantage or disadvantage a country has in the export of a certain good. A more technical definition can be found in footnote 15.

7 Proximity is the inverse measure of distance between goods i and j in year t and equals

$\phi_{i,j,t} = \min \{P(x_{i,t} \mid x_{j,t}), P(x_{j,t} \mid x_{i,t})\}$ where for any country c $x_{i,c,t} = \begin{cases} 1 \; if \; RCA_{i,c,t} > 1 \\ 0 \quad otherwise \end{cases}$

8 For a more detailed view of the space, see Figure A3 in the Annex.

Figure 5: The global product space and Leamer clusters (2006-2008)



Note: 1) Each node is a product, 2) node size reflects product's size in world trade, 3) proximity as explained above is expressed by the colour-coded links between pairs of products according to linkage strength, 4) specifically light blue links indicate proximity less than 0.4, beige links proximity of 0.40-0.55, dark blue proximity of 0.55-0.65 and finally a red link depicts proximity greater than 0.65. Hierarchically clustered proximity matrix represents the 775 SITC-4 product classes exported in the 1998-2000 period. This network representation of the product space is laid out using a force spring algorithm and is retouched by hand.

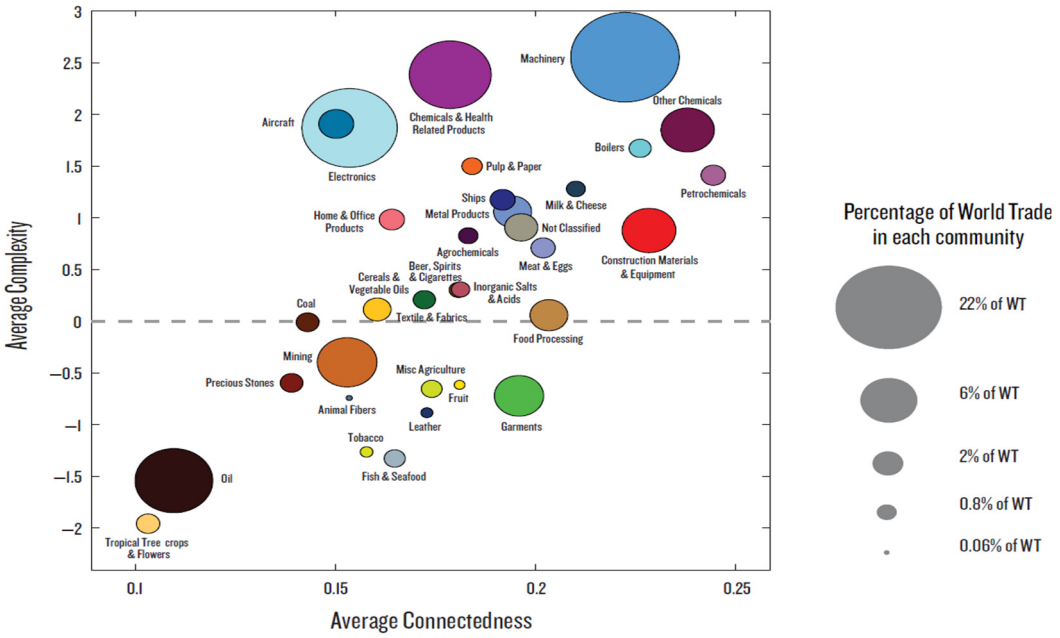
Source: Hidalgo et al. (2007, Figure 1, p. 8)

3.2 Complexity and connectedness

The overall complexity index of a country (ECI) is the joint outcome of the different levels of complexity of every product that that country exports. At the product level, a product's complexity reveals the amount of productive knowledge that product requires. Complexity and connectedness go hand in hand, that is, the more complex the community, the more connected it is (Figure 6). As Hausmann, Hidalgo et al. (2014) put it, as countries diversify into more complex products, they also increase their opportunities for further diversification, which is referred to as the "opportunity value" of their location in the space. Machinery and the various chemicals communities are by far the most complex communities and also the most connected. Their connectedness can be seen in the map of the product space (Figure 5), as these communities are located in the most central and dense areas of the network. Oil, on the other hand, is the least connected and also one of the least complex. Since the sizes of the bubbles representing the communities indicate their share in

world trade, it is easy to visualise which communities offer greater access to global demand and international markets. Machinery and electronics represent the top in world trade.

Figure 6: Community characteristics



Source: Hausmann, Ricardo, César A.Hidalgo, Sebastián Bustos, Michele Coscia, Alexander Simoes, and Muhammed A. Yildirim., The Atlas of Economic Complexity (2014, Figure 5.3, p. 54).

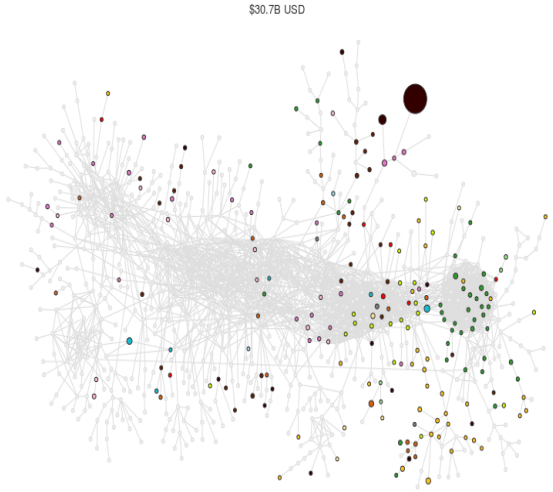
3.3 Egypt and Tunisia in the product space

The current state

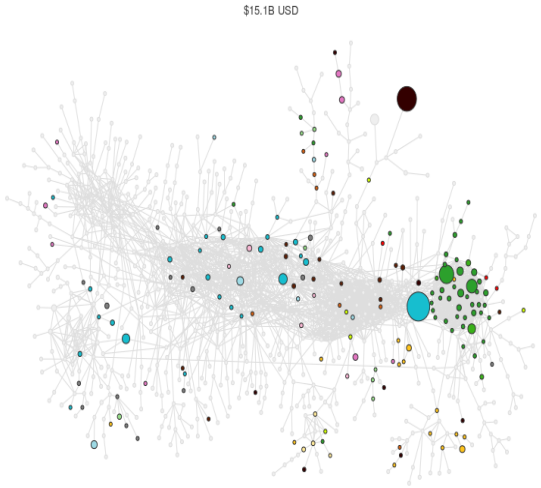
Figures 7a-d depict the structural differences between the two countries in 2014. Although both have a relatively large presence in the hydrocarbon sector, as established above, Egypt has a relatively larger one. The hydrocarbon sector is exclusively linked to itself and to the core with beige coloured lines (Figure 5), and therefore poorly connected to the rest of the space, as also shown in Figure 6 above. That is, if you export oil, you are less likely to export other products, or, in general, at least it is more of a challenge to do so. This is reflected in the current export structure of the two countries.

Figure 7: Egypt and Tunisia in the product space (2014)

a. 2014 Egypt



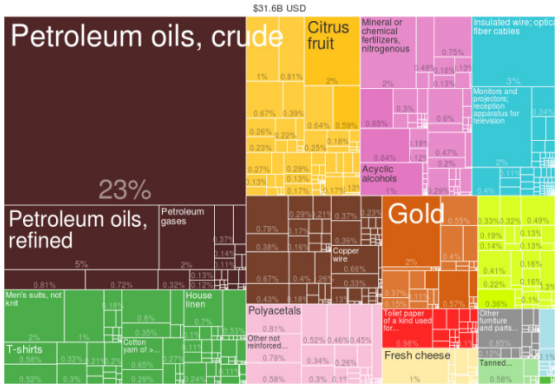
b. 2014 Tunisia



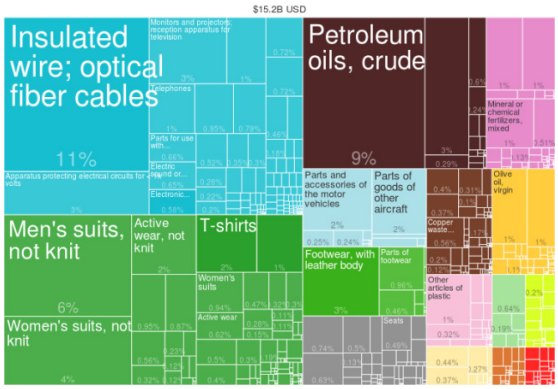
Note: Each node is a product: The size of the node is determined by the product's share in country trade. Coloured nodes are the major sectors (at the two-digit levels) in which the country has comparative advantage in that year, that is, RCA>1. Size of node indicates product's share in country trade.

Source: Author, based on The Atlas of Economic Complexity (Center for International Development at Harvard University, 2016), drawn from UN-COMTRADE four-digit level H0 (1988/1992)-HS classification version

c. 2014 Egypt's exports



d. 2014 Tunisia's exports



Animal and Animal Products | Vegetable Products | Foodstuffs | Mineral Products | Chemicals and Allied Industries | Plastics/Rubber | Raw Hides, Skins, Leathers, and Furs | Textiles | Footwear/ Headgear | Wood & Wood Products | Stone/Glass | Metals | Machinery/Electronics | Transportation | Miscellaneous | Services

Source: Author, based on The Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)

Tunisia has a significant export presence in (i) garments (the dark green dots and rectangles), (ii) electronics and machinery sectors (blue), and (iii) transportation (light blue). The largest share of exported products for Tunisia is comprised of wires, cable and other insulated

electric conductors (the largest blue dot in 7b, and the rectangle in 7d),[9] which explains an RCA (17.1) four times as large as that of Egypt's for that product. Tunisia's machinery/electronics sector exports are nearly as large as Egypt's entire exports of mineral products[10] (29 per cent versus 33 per cent of total exports, respectively).

The size of Egypt's non-hydrocarbon trade,[11] on the other hand, is relatively small (73 per cent). Egypt has a relatively large presence, first in the chemicals community and then in the plastics and rubber communities (dark and light pink dots and rectangles in 7a and d), both more or less derivatives of hydrocarbon. The greater presence of dark brown and yellow dots and rectangles illustrates that many of Egypt's exports rely heavily on natural resources as well as primary agricultural products, notably so when compared to Tunisia (see also El-Haddad (2015) for detailed structural transformation trends in Egypt over the past 60 years).

The many nodes in 7a are approximately of equal size and equally sparse with no clear clusters, indicating that Egypt is exporting competitively in a larger number of sectors, albeit with limited specialisation, in contrast to Tunisia. The latter is clearly better specialised in the few sectors indicated above. The many nodes Tunisia has in the electronics sector – and the few it has in machinery – are bigger, indicating greater specialisation for a number of its export products other than oil, compared to Egypt.

Structural transformation over time

Structural transformation here refers to persistent long-term shifts in the sectoral composition of the economy away from primary sectors, such as agriculture, hydrocarbons and mining, towards manufacturing or high-value services, or, alternatively, the move away from light to heavy industries or from labour- to capital-intensive sectors. Egypt has experienced some – albeit limited – structural transformation during the past 20 years (Figure 8). This transformation has seen hydrocarbon exports increase in absolute terms, but also the emergence of some other more processed sectors.

Some growth in exports of mineral products and chemical fertilisers in the chemicals cluster – building on the weak links with oil (the largest dark pink dot) – took place as well as growth in copper plates, sheets and strips (light brown dot to the left of the space) and in gold, both unwrought and semi-manufactured (the orange dot towards the lower right corner). Whilst Egypt has managed to reduce the share of primary products over time, these products still occupy just under half of all Egyptian exports of tradable goods (the share of mineral, vegetable and animal products combined has dropped from 58 per cent in 1995 to 45 per cent in 2014).

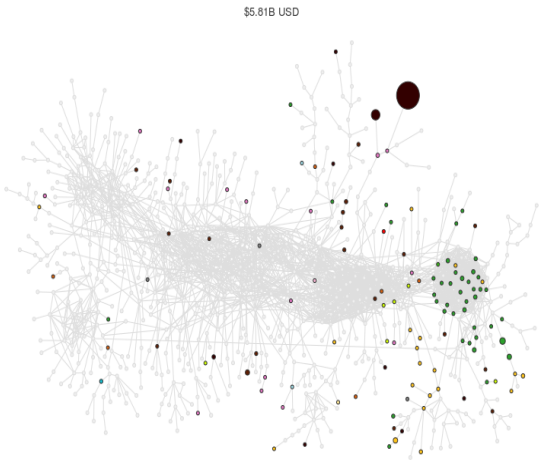
9 The other three significant exported sectors are switches, relays, fuses, surge suppressors, plugs, sockets, lamp holders, electric motor generators, and monitors and projectors. The largest transport sector items are parts and accessories of motor vehicles.

10 Tunisia's hydrocarbon exports amount to approximately 7.4 per cent of all exports.

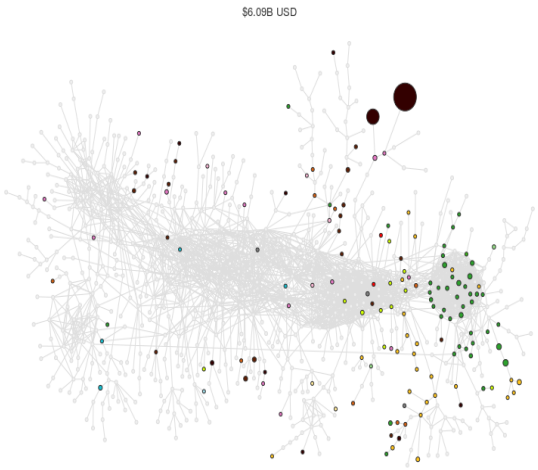
11 Based on the exports of chapter 27.

Figure 8: Evolution of Egypt's position in the product space

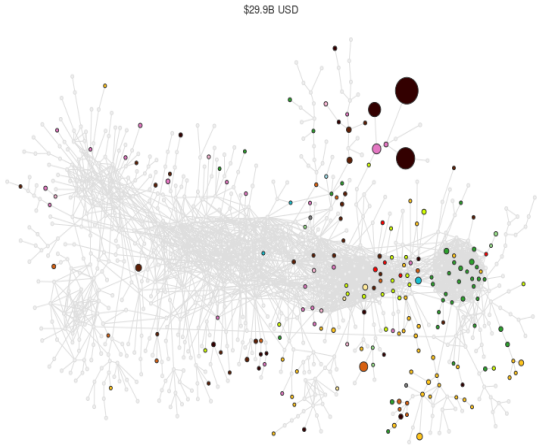
a. 1995



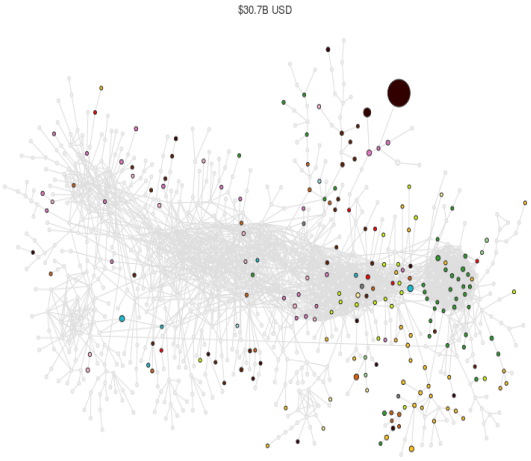
b. 2000



c. 2010



d. 2014



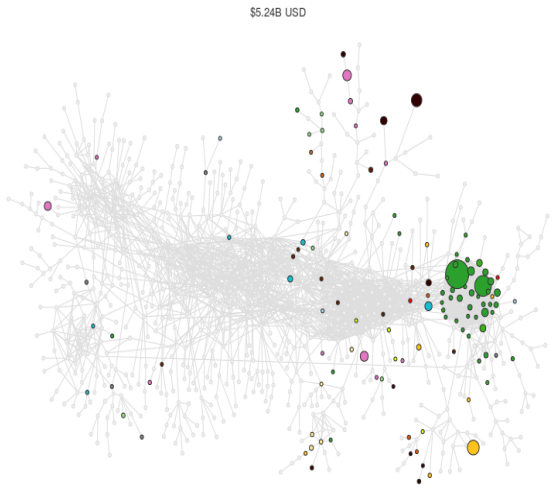
Note: Each node is a product: The size of the node is determined by the product's share in country trade. Coloured nodes are the major sectors (at the two-digit levels) in which the country has comparative advantage in that year, that is, RCA>1. Animal and Animal Products Vegetable Products Foodstuffs Mineral Products Chemicals and Allied Industries Plastics/Rubber Raw Hides, Skins, Leathers, and Furs Textiles Footwear/ Headgear Wood & Wood Products Stone/Glass Metals Machinery/Electronics Transportation Miscellaneous Services

Source: Author, based on The Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)

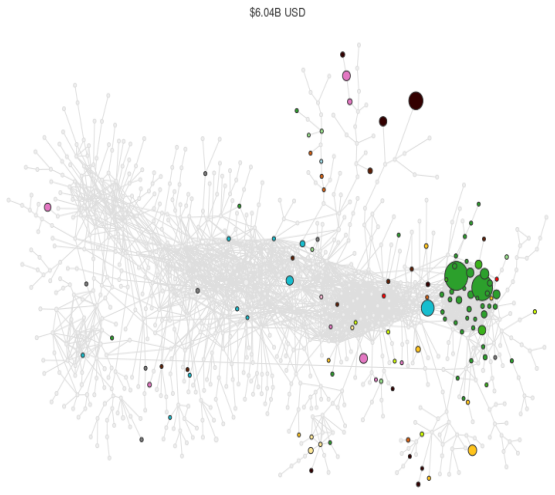
Tunisia, on the other hand, exhibited better structural transformation during the same 20-year period. This transformation is reflected in the relative shrinkage in its major light industry exports, garments and textiles exports (the green dots); and to a lesser extent in olive oil (yellow dot at the far lower right corner for 1995); and a growth in metallurgy (light brown) and other dispersed machinery (dark blue); and electronics sectors (light blue, Figure 9). Overall, it has reduced the share of its natural resources and primary agricultural products from 20 to 18 per cent of all exports, which is less than half the level in Egypt's basket (40 per cent of it).

Figure 9: Tunisia in the product space

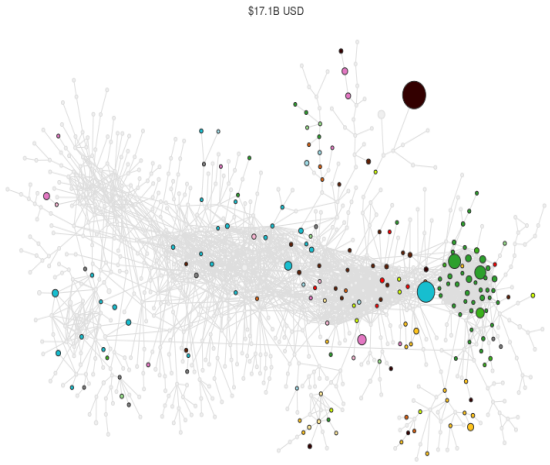
a. 1995



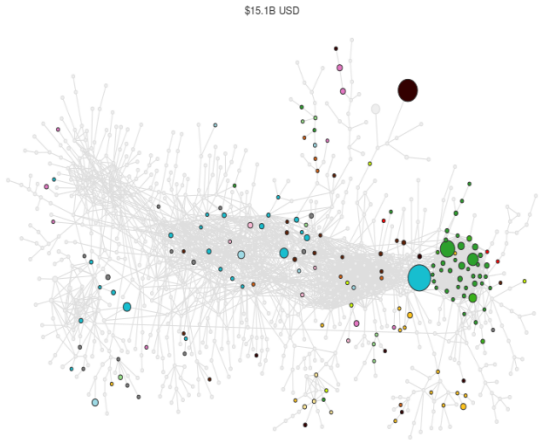
b. 2000



c. 2010



b. 2014



Note: Each node is a product: The size of the node is determined by the product's share in country trade. Coloured nodes are the major sectors (at the two-digit levels) in which the country has comparative advantage in that year, that is, RCA>1. Animal and Animal Products, Vegetable Products, Foodstuffs, Mineral Products, Chemicals and Allied Industries, Plastics/Rubber, Raw Hides, Skins, Leathers, and Furs, Textiles, Footwear/ Headgear, Wood & Wood Products, Stone/Glass, Metals, Machinery/Electronics, Transportation, Miscellaneous, Services

Source: Author, based on The Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)

Location opportunities: cross-country comparisons

According to Hausmann et al. (2011), diversification of a country into *much* more sophisticated export activities is inhibited because these considerably more sophisticated activities are still very far from the established production structures of the country, and thus require a completely new set of capabilities. Over time, as countries produce increasingly sophisticated products, their set of existing capabilities evolves, which allows them to then increase their sophistication levels. Therefore, it is not of great surprise that, for the time being, the two countries have limited sophistication levels and little economic complexity (Figure

3), which is a reflection of their existing capabilities associated with their most recent production/export structures. Tunisia, which recently has had a smaller oil sector but larger garments and textiles sector, managed to diversify into more complex metals and then, later into closely connected. The larger hydrocarbon sector has partly made export sophistication more of a challenge for Egypt. This is because the conditional probability of exporting any one sophisticated product declines when oil is exported as well,[12] therefore the distances between these two products increase, which, in turn, limits the possibilities for sophistication. The negative relation between distance and sophistication is illuminated below, where the concept of opportunity value is introduced. Countries move towards nearby activities over time; it is rare to see big jumps across the product space (Hausmann & Klinger, 2007; Hidalgo et al., 2007).

What exactly are the two countries' prospects for greater sophistication? Hausmann et al. (2011) construct a measure they call opportunity value (OV). OV is a unique measure for each country that represents the benefit of a country's location in the product space. Specifically, it measures how many other more sophisticated products are near a country's current set of productive capabilities. In brief, it is a very simple measure that increases as the distance to relatively more sophisticated products that the country is not currently exporting decreases. It also increases as the number of relatively more sophisticated products the country is not currently exporting increases.[13]

In other words, OV depends on two parts: (1) an opportunity part, represented by products a country has yet to produce and export that are more sophisticated than current products; and (2) a capability part, which is often described as having more available letters in a scrabble game; this allows the player to put together more words, that is, countries have the technical ability to produce more sophisticated products, which is represented by the distance in the equation in footnote 13. The final value of the OV indicator thus depends on the interaction of these two parts. Hence, OV is a strong predictor of a country's future potential of moving into new, more sophisticated activities over time.

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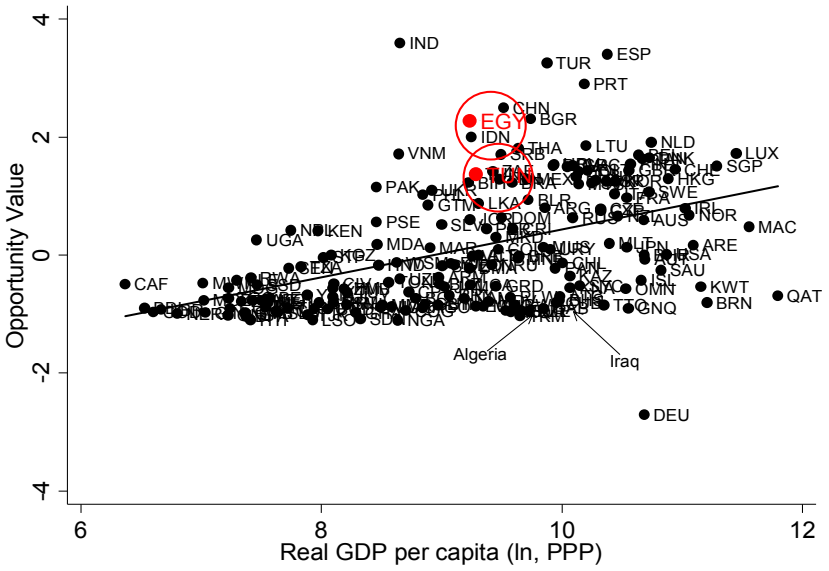
12 Note that this methodology works out its results based on observed export trends across the world. Those trends made it clear that the more oil produced and exported in a country, the less likely other more sophisticated products would be produced and exported. Economic theory has explained this with Dutch disease, which, in the presence of rents, including oil rents, makes the tradable sector of countries less profitable, diverting the production structure of the economy towards more non-tradable activities (of which sophisticated export products are a part).

13 To quantify the OV or Complexity Outlook Index (COI) of a country's unexploited prospects, we sum the "closeness", that is, 1 minus the distance, to the products that the country is *not* currently producing, weighted by the level of complexity of these products. We can write this mathematically as:

$$\mathrm{COI}_c = \sum_{p'} \left(1 - d_{cp}\right)\left(1 - M_{cp'}\right) \mathrm{PCI}_{p'}$$

PCI is the product complexity index of product p', *Mcp* is a matrix, that is, 1, if country $\boldsymbol{c}$ produces product $\boldsymbol{p}$ and 0 (see elaborate definition in footnote 15 below). Thus, the term $1-Mcp'$ ensures that we count only the products that the country is not currently producing. A Higher Complexity Outlook implies being in the neighbourhood of more products and/or products that are more complex (Hausmann, Hidalgo et al., 2014). The index measures the position of a country in the product space. A country with a higher COI is closer to more complex products that it is not currently making than a country with a lower COI. A country with a higher COI should have an easier time solving the "chicken and egg" problem associated with coordinating the development of new industries and the accumulation of their required capabilities. Industries that are closer to a country's current capabilities should have fewer coordination failures to resolve and, hence, provide an easier path to the accumulation of capabilities (Hausmann, Hidalgo et al., 2014).

Figure 10: Opportunity value and GDP per capita, 2015 (all countries)



Note: EGY= Egypt, TUN=Tunisia, DZA=Algeria

Source: Author's calculations based on the Atlas of Economic Complexity data (Center for International Development at Harvard Unversity, 2016) and World Bank (2016a).

Figure 10 is the cross-country scatter plot of OV against GDP per capita. The figure shows the following. First, despite Tunisia's higher Economic Complexity Index, after controlling for initial income and growth in natural-resource exports, Egypt has a more favourable OV compared to that of Tunisia, given its level of real GDP per capita. This seemingly puzzling result is explained by the fact that countries which have a larger number of more sophisticated, "unsuccessfully exported"[14,15] products will have a greater OV, as they still

14 "Unsuccessfully exported" refers to products that are either entirely unexported or exported with no comparative advantage (i.e. with RCA<1). See the following footnote for a definition of RCA.

15 More accurately, this refers to either entirely non-exported products or exports with no revealed comparative advantage for which RCA<1. RCA is an index used to calculate the relative advantage or disadvantage a country has in the export of a certain good. We use Balassa's definition of RCA, which says that a country has RCA in a product if it exports more than its "fair share", or a share that is equal to or greater than the share of total world trade that the product represents. For example, in 2010, soybeans represented 0.35 per cent of world trade, with exports of $42 billion. Of this total, Brazil exported nearly $11 billion, and since Brazil's total exports for that year were $140 billion, soybeans accounted for 7.8 per cent of Brazil's exports. Because 7.8/0.35 = 22, Brazil exports 22 times its "fair share" of soybean exports, so we can say that Brazil has a high RCA in soybeans. Formally, if Xcp represents the export of product $\boldsymbol{p}$ by country $\boldsymbol{c}$, we can express the RCA that country $\boldsymbol{c}$ has in product $\boldsymbol{p}$ as

$$\mathrm{RCA}_{\mathbf{cp}} = \frac{X_{cp}/\sum_c X_{cp}}{\sum_p X_{cp}/\sum_c \sum_p X_{cp}}$$

We can use this measure to construct a matrix that connects each country to the products that it makes. Mcp is the matrix summarising which country makes what, where rows represent different countries and columns represents different products. It is used to construct the product space and our measurements of economic complexity for countries and products. Entries in the matrix are 1 if country $\boldsymbol{c}$ exports product $\boldsymbol{p}$ with RCA greater than 1, otherwise 0. Formally, we define this as the Mcp matrix, where

$$M_{cp} = \begin{cases} 1 & \mathrm{RCA}_{cp} \geq 1 \\ 0 & \text{otherwise} \end{cases}$$

(Hausmann, Hidalgo et al., 2014).

have a rich "unexploited" neighbourhood of highly connected and/or complex products. In other words, they have not yet fulfilled much of their full potential.

Because of its greater degree of specialisation, Tunisia has a larger number of unsuccessfully exported products compared to Egypt: 1006 and 954, respectively (Table 2). There are two elements that explain Egypt's higher OV.[16] First, with a higher ECI value, Tunisia produces overall more complex products compared to Egypt. But the more a country produces complex products, the less complexity that remains; more accurately, this means that fewer new, potentially *more complex* products remain unexploited. This pushes the OV down. Indeed, Tunisia is left with a larger number of unsuccessfully exported products but, of those, only 695 are more complex than Tunisia's average level of complexity (i.e. its ECI level). By contrast, Egypt has 726. This implies that, given their different positions in 2015, Egypt has a better chance of diversifying its current export basket. Put differently, Egypt has a greater unfulfilled potential for diversifying into more sophisticated products.

Second, Tunisia better exhausted its *nearby* complex products, whereas Egypt has not (yet) done so. But the more a country produces in its neighbourhood, the greater the remaining average unexploited distance is.[17] Tunisia's remaining average distance is greater than Egypt's 0.82 (Table 2). This drives down the OV as well.

The second message of Figure 10 is that both countries have relatively high levels of connectedness for their levels of GDP per capita, compared to other oil-exporting countries from the region and elsewhere. Compare, for example, Algeria and Iraq, which both show clear signs of oil curse: higher levels of GDP per capita and much lower OV. This follows from much larger distances to their very large number of more sophisticated, unsuccessfully exported products (1049 for Algeria and 1190 for Iraq). In other words, their more sophisticated products are very far from the countries' current set of productive capabilities.

Finally, the results are mixed when looking at some high-growth economies. Egypt has greater opportunities than Indonesia, despite having identical incomes per capita and shares of hydrocarbon exports. The number of more sophisticated, unsuccessful exports is considerably larger for Indonesia than either Egypt or Tunisia, but its average distance is greater than Egypt's (Table 2). With nearly half of Egypt's income per capita and a much higher OV (3.59), India has considerable value in its location. Its set of productive knowledge lies closer to the fewer, more sophisticated, unsuccessfully exported products (621). Vietnam is another remarkable example: It has just half of Tunisia's income per capita but a higher OV on account of its relatively more advanced, accumulated productive knowledge. Pakistan also has relatively advanced prospects. Similarly, Bosnia and Ukraine also have good prospects. But these are all countries with no – or very limited – exports of hydrocarbons, particularly in their crude form, compared to Egypt and, to a lesser extent, Tunisia. Therefore, they are more easily able to be relatively connected to the rest of the product space.

16 It lies above the regression line of GDP per capita growth and the Economic Complexity Index *after* controlling for initial income and growth in natural resource exports (Figure A2 in the Annex).

17 Average distance for the more complex, unsuccessfully exported products.

Table 2: Opportunity value for comparable countries, 2015

	GDP per capita, PPP (constant 2011)	GDP per capita relative to Egypt's	Opportunity value	Hydrocarbons export share	No. unsuccessfully exported (RCA<1)	No. of unsuccessfully exported products with $PCI_{product}>ECI_{country}$	Average distance of unsuccessfully exported products with $PCI_{product}>ECI_{country}$
India	5,733	56%	3.59	11.6%	876	621	0.74
China	13,572	124%	2.49	1.5%	689	346	0.59
Egypt	10,913	100%	2.27	23.5%	954	726	0.79
Indonesia	10,385	101%	2	23.1%	980	762	0.82
Vietnam	5,667	55%	1.72	3.1%	987	768	0.82
Tunisia	11,467	105%	1.37	7.4%	1,006	695	0.82
Bosnia and Herzegovina	10,119	99%	1.23	7.0%	1,004	663	0.82
Pakistan	4,706	46%	1.15	2.7%	1,021	869	0.85
Ukraine	7,457	73%	1.1	2.3%	1,023	637	0.84
Philippines	6,938	68%	1.02	2.5%	1,032	633	0.86
Japan	37,872	374%	0.13	1.8%	905	123	0.67
United States	52,704	514%	0.005	7.0%	806	205	0.63
Germany	43,788	440%	-0.0003	32.0%	764	95	0.55
Algeria	13,795	135%	-0.94	95.3%	1,221	1,049	0.99
Iraq	14,459	141%	-0.97	99.3%	1,234	1,190	1

Source: Author's calculations based on the Atlas of Economic Complexity data (Center for International Development at Harvard University, 2016) and World Bank (2016a). Egypt's GDP per capita is the reference.

Figure 11 conveys the same messages. It shows both countries at another country level comparison pertaining to their relative position in the product space. The figure plots opportunity value against economic complexity. Two types of countries are not rewarded for their overall level of complexity, namely: a) those that have very low levels of complexity because they have limited accumulated productive knowledge and so few products nearby, thus limiting their ability to diversify further (in technical terms, they have less average distance to their more sophisticated, unsuccessfully exported products; and b) countries with very high hoarded productive knowledge, such as Japan, the United States and Germany – the latter an extreme outlier with very little opportunity value, in fact, the least of all countries. This is so because they have already exhausted all opportunities and already occupy a large fraction of the better part of the product space. In technical terms, they have fewer, more sophisticated, unsuccessfully exported products. Most notably, Germany has the fewest products in the world – which are more sophisticated than the country's current complexity level – that it does not yet successfully export (95, see Table 2).[18] This decreases its OV markedly, which is unable to offset the country's very low average distance, which is also the smallest in the world, a reflection of the largest accumulated knowledge that exists worldwide.

18 Iraq, on the other hand, lies at the other end of the spectrum to Germany with: 1) the highest number for unsuccessfully exported products as well as the highest numbers for more sophisticated, unsuccessfully exported products and; 2) the greatest distance and average distance (0.997) to its more sophisticated, unsuccessfully exported products.

For countries in the middle section, there is a positive relation between complexity and opportunity value. Tunisia and Egypt fall above the line indicating that both are in a good position to achieve diversification, complexity and, in turn, economic growth.

4 Product space sector possibilities for Egyptian and Tunisian future exports

This section presents the identified sectors for future production based on the Product Space Methodology. It also contrasts these results with those for two more strategies. The first is on the other end of the spectrum from the Product Space Methodology, which is a strategy pushing for much more sophistication. The second is in the middle of the spectrum and places significant weight on current trade trends in manufactured products.

4.1 Product feasibility

Figures 11a (Egypt) and 11b (Tunisia) show clear trade-offs. The x-axis gives the distance of each non- or weakly-exported product from Egypt's (Tunisia's) current position in the product space (please refer to footnote 15). The more to the left, the closer the non-exported product is to Egypt's (Tunisia's) current stock of productive knowledge. The y-axis in Figures 11a and b measures the level of complexity of the product.[19] The ideal choice is to pick products at the very corner of the upper left quadrant (Hausmann et al., 2005). These are the products with the highest levels of complexity, which are located as close as possible to the country's current set of capabilities. For Egypt, at the lower end are dairy products such as eggs and cream, that is, products from live animals. Cereal, ice cream and baked products such as bread and biscuits follow – more highly processed foods. In addition, pipes and tubes of iron and steel and some more complex plastic articles (e.g. plates) were followed by medicaments and then other articles of iron or steel. Farther away, hence more sophisticated, are industrial electric furnaces. For Tunisia, the feasible products that are an upgrade in terms of complexity are waste of manmade fibre, ceramic sinks, furniture, refrigerators and freezers, base metal mountings, telephones and other appliances for thermostat-controlled valves, yet the more distant, the more complex. It is clear that Tunisia has more low-hanging fruit in electronics compared to Egypt, where the advantages are in the chemicals sector.

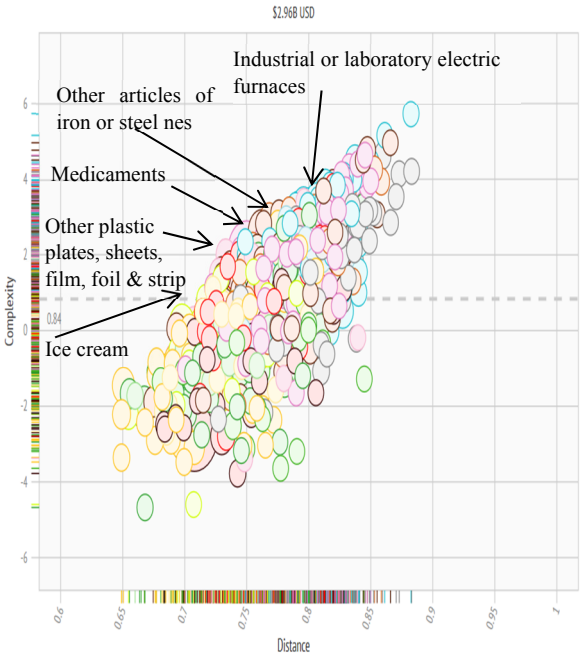
19 The PCI ranks products by the amount of capabilities or know-how necessary to manufacture them. Products such as chemicals and machinery are highly complex because they require a sophisticated level of productive knowledge and typically emerge from large organisations, where a number of highly skilled individuals interact. Whereas products such as raw materials or simple agricultural products require only a basic level of know-how and can be produced by an individual or family-run business. More specifically, the PCI ranks products by their complexity. Product complexity is determined by calculating the average diversity levels of countries that make a specific product, and the average ubiquity level of the other products that these countries make. Analogously, we define a PCI; because of the symmetry of the problem, this can be done simply by exchanging the index of countries **c** with that for products **p** in the definition in footnote 5. Hence, PCI is defined as:

$$PCI = \frac{\vec{Q} - \langle \vec{Q} \rangle}{stdev\,(\vec{Q})}\,\vec{Q} = \text{ eigenvector of } \widetilde{M}_{pp}\text{, associated with the largest eigenvalue}$$

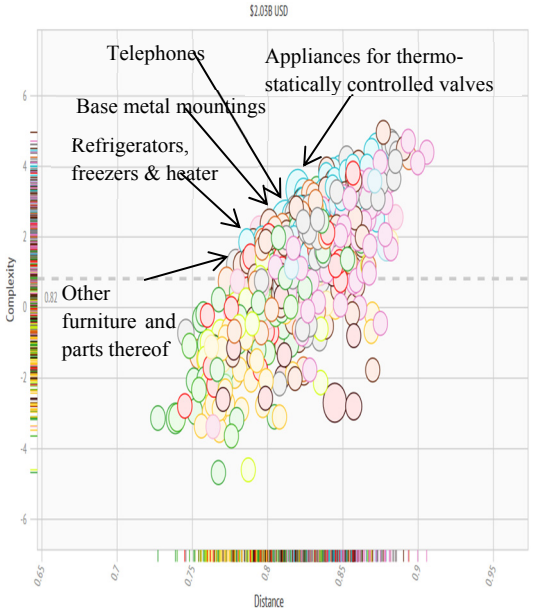
(Hausmann, Hidalgo et al., 2014).

Figure 11: Product feasibility: complexity and opportunity gain (2014)

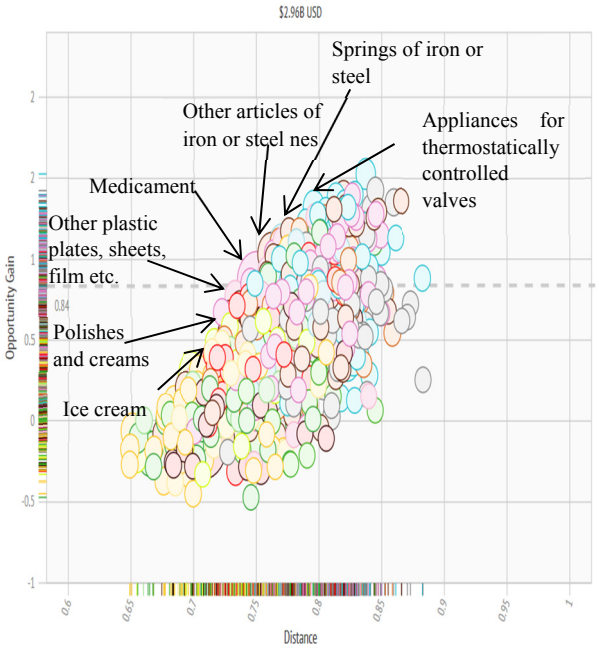
a. Egypt: Complexity versus distance



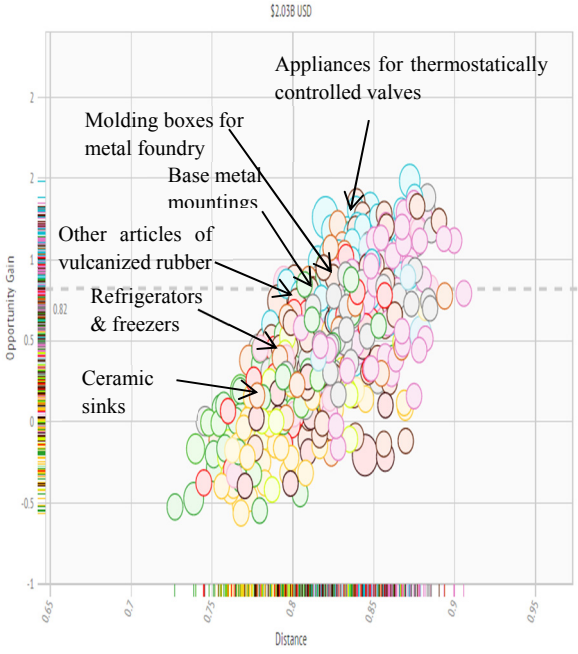
b. Tunisia: Complexity versus distance



c. Egypt: Opportunity gain versus distance



d. Tunisia: Opportunity gain versus distance



Note: The size of each node is determined by product's share in world trade

Animal and Animal Products, Vegetable Products, Foodstuffs, Mineral Products, Chemicals and Allied Industries, Plastics/Rubber, Raw Hides, Skins, Leathers, and Furs, Textiles, Footwear/ Headgear, Wood & Wood Products, Stone/Glass, Metals, Machinery/Electronics, Transportation, Miscellaneous, Services

Source: Author, adapted from the Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)

Another trade-off also exists between proximity or distance and opportunity gain (OG) (Figures 11c and d). A product can be close to the current set of a country's capabilities but adds very little value to the country's connectedness in the product space and, in turn, to its sophisticated diversification prospects for the future. If the new product is in a dense part of the product space, then producing it would create capabilities with significant value for other new and complex products, and vice versa. OG is thus at the level of the product, in contrast to OV, which is at the level of countries. Here there is also a negative relation between the OG[20] of a product and its distance.[21] Again, OG varies, for example between "low" (agricultural products such as cucumber and bread), "moderate" (ice cream) and "high" (appliances for thermostat-controlled valves. For Tunisia, in the upper left quadrant, it rises from textiles (the green dots) to ceramic sinks (metals sector) to refrigerators and then to appliances for thermostat-controlled valves (electronics). The latter are products that provide more OGs but are farther away from Tunisia's current set of productive capabilities.

4.2 Product Space Methodology results

The PSM results are presented in Tables A1 and A2, which give the first 20 upmarket products for Egypt and Tunisia. These products meet each of the following criteria: a) they lie above the regression line of the PCI on distance (red dots in Figures 12a and b) to ensure greater complexity for the same distance (additionally, they have a PCI that exceeds the average ECI level of the relevant country,[22] so adding them would increase each country's current level of economic complexity); b) they lie above the regression line of OG on distance and their OG is positive (red dots in Figures 12c and d), so they are able to move the country into parts of the product space that are more connected, thereby leading to more diversification in the future; c) the respective country does not produce them with a comparative advantage, that is, products should have an RCA<1; and d) they should be no farther than the average distance to ensure proximity to the country's productive knowledge.

The results in Tables A1 and A2 in the Annex are ordered by distance. As the methodology would suggest, top products for Egypt are mostly agricultural products – the first ones are live animals, so very simple animal products (PCI=-017) – followed by simple wooden pulp products such as paper (-0.06), and then metals and minerals (e.g. salt and sulphur). Only further down do we find food processing, such as water beverages, vinegar and cereals, very basic plastics as well as more complex metal, stone and glass (classified in the mineral products group) as well as textiles and clothing. Beyond the top 20 products at the very end are high-value chemicals as well as machinery and electronics. Since Tunisia is more sophisticated, the top products are, in relative terms, slightly more complex in the chemicals area (containers

20 "Complexity outlook gain" (COG) is used to calculate the potential benefit to a country if it were to move towards a particular new product. It is calculated as the change in complexity outlook that would come about from developing that product. "Opportunity gain" quantifies the contribution of a new product in terms of opening the doors to more – and more complex – products. Formally, this is the opportunity gain given as (Hausmann, Hidalgo et al., 2014):

$$Opportunity\ Gain = COG_{cp} = \left[\sum_{p'} \frac{\emptyset_{p,p'}}{\sum_{p''} \emptyset_{p'',p'}} (1 - M_{cp'})\ \mathrm{PCI}_{p'}\right] - (1 - d_{cp})\ \mathrm{PCI}_p$$

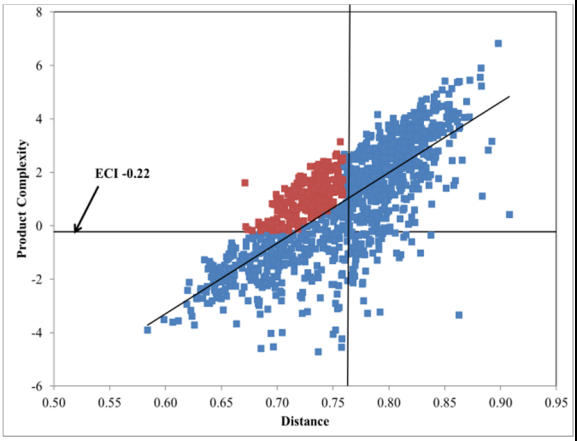
21 This confirms and represents another way of looking at the positive results between opportunity value and complexity we saw earlier in Figure 10.

22 Therefore greater than -0.22 for Egypt and 0.1 for Tunisia.

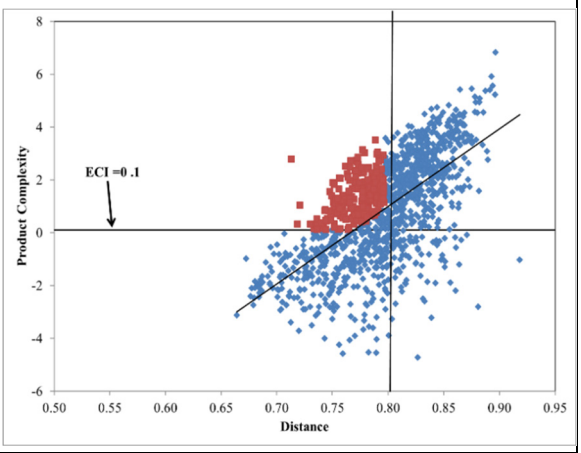
and bobbins), and there are more sophisticated wooden products (e.g. broom handles and wickerwork), some products with low levels of complexity from the highly manufactured goods area, such as furniture (PCI= 0.95), and then food processing and textiles and clothing. These results will be contrasted in the following section using a more invasive approach.

Figure 12: Distance versus product complexity and opportunity gain regressions

a. Egypt

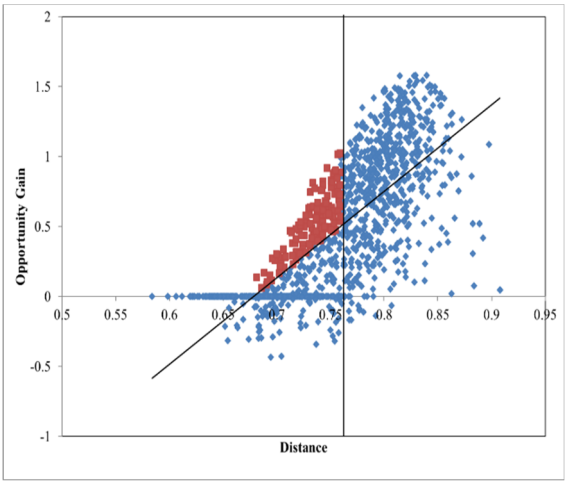


b. Tunisia

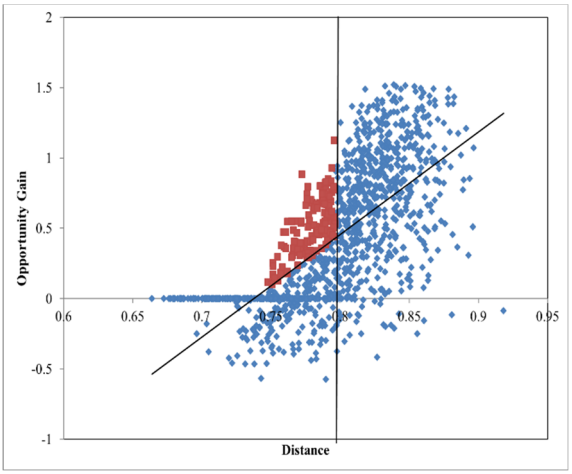


Distance versus opportunity gain

c. Egypt



d. Tunisia



Source: Author's calculation based on Atlas of Economic Complexity data (Center for International Development at Harvard University, 2016)

4.3 Strategic Bets: more active industrial policy

Inward-looking development strategies dominated much of the thinking of several newly-independent countries, such as India and the Maghreb countries, in the second half of the 20th century. In terms of industrial policy, such an orientation results in the adoption of an import substitution industrial strategy. It also means a desire to quickly move away from light industries, such as food processing and clothing, to more sophisticated, capital-intensive, heavy industries, such as machinery and iron and steel. As a result, in both Egypt and Tunisia, the surplus generated from agriculture has been used to finance industrial development into heavy industry. In the jargon of the PSM, this industrial policy orientation

is referred to as Strategic Bets. Strategic Bets is a strategy that accentuates more sophisticated sectors, which therefore provide also greater OG, despite the larger distance. These industries will push economic growth and achieve more diversification and urban job-creation (Hausmann, Hidalgo et al., 2014).[23]

In line with the Strategic Bets strategy, instead of focussing on proximity, our countries would focus on giving a greater weight to product complexity and OG and less to distance. Tables A3 and A4 show the results for products in the top 40 per cent in terms of both complexity and OG, with a distance that is as much as 80 per cent or more away from the respective country's average distance. The results are, at the very end of the spectrum, led by highly complex manufactured metals, machinery, equipment, electronics and chemicals (Tables A3 and A4). These are also the results that are repeated most often (Table 3). However, there is a drawback, especially for countries with such high (youth) unemployment rates, such as Egypt and Tunisia. These sectors are mostly less labour-intensive and require high-skilled workers. If workers are quickly moved out of labour-intensive light-manufacturing sectors – agricultural products, garments and food processing – then the workforce may be moved into unemployment or into low-productivity informal sectors. The tradeoff – better jobs versus more jobs, or jobless versus penniless growth – is quite apparent here.

Table 3: Summary results by product groups

Group	*Product Space (Egy: 97; Tun: 106 products)*		*Strategic Bets (Egy: 228; Tun: 328 products)*	
	Egypt	Tunisia	Egypt	Tunisia
Metals and manufactured articles made mostly of metal	28	36	141↑	181↑
Agricultural products	24	16	1↓	7↓
Non-consumable animal and plant products	16	14	5↓	13↓
Chemical and related products	15	18	62↑	92↑
Non-metallic mineral products	6	6	11↑	16↑
Mineral products	4	0	0	0
Textiles and apparel	3	11	5↑	13↑
Other highly manufactured and special-purpose goods	1	5	3↑	6↑

Source: Author's calculation based on Atlas of Economic Complexity data (Center for International Development at Harvard Unversity, 2016)

4.4 Forward-looking strategy: trends in international markets

There are a number of criticisms directed at the PSM, which are dealt with in some details in Section 5 below. Among these is the limited ability of trade classifications to reflect market size and trade policies (Radosevic, 2017, in Altenburg, Kleinz, & Lütkenhorst,

23 There is no contradiction here. Still, more sophisticated products are less labour-intensive compared to less sophisticated products. However, the point is that the small amounts of employment that more sophisticated products actually create will be in urban areas as opposed to rural areas.

2016). The variation introduced in this section is mainly directed at the limitation of the approach regarding market size.

In common with the PSM, the Strategic Bets strategy – also a variant of the Product Space Methodology – does not consider the effect of world trade on the future viability of these sectors. There is no doubt that developed countries have increasingly lost market share to developing countries. Thus, it is important to take international trade trends into account when identifying upmarket sectors. Taking into account the significance of every product in world trade is indicated by the size of the bubbles in Figure 6 above. Figure 13 expresses the results after weighing products by their share in world trade. For Egypt, packaged medicaments in the chemicals sector top all 97 products that meet all PSM conditions whilst taking trade into account. Accordingly, over a quarter of all active industrial policy efforts should be directed towards addressing market imperfections for that product. This is an abstract statement, but it indicates that this sector should have very high priority. This may mean that a quarter of the funds or budget directed to industrial policy efforts – from training and service development programmes to international fairs, etc., which deal at heart with market failures – should go to medicaments. With $337 billion worth of world exports, packaged medicaments represent the 7th largest most-traded product in the world (over 2 per cent of world exports). It is also quite complex (PCI = 2.43), but luckily fairly close to Egypt's average distance; Egypt already occupies 33 per cent of the pharmaceutical community's products, as represented by the darkly shaded part of the bubble for pharmaceuticals (Figure 14a). The segments that Egypt currently occupies in pharmaceuticals are in the less-complex parts and have an RCA less than 1.

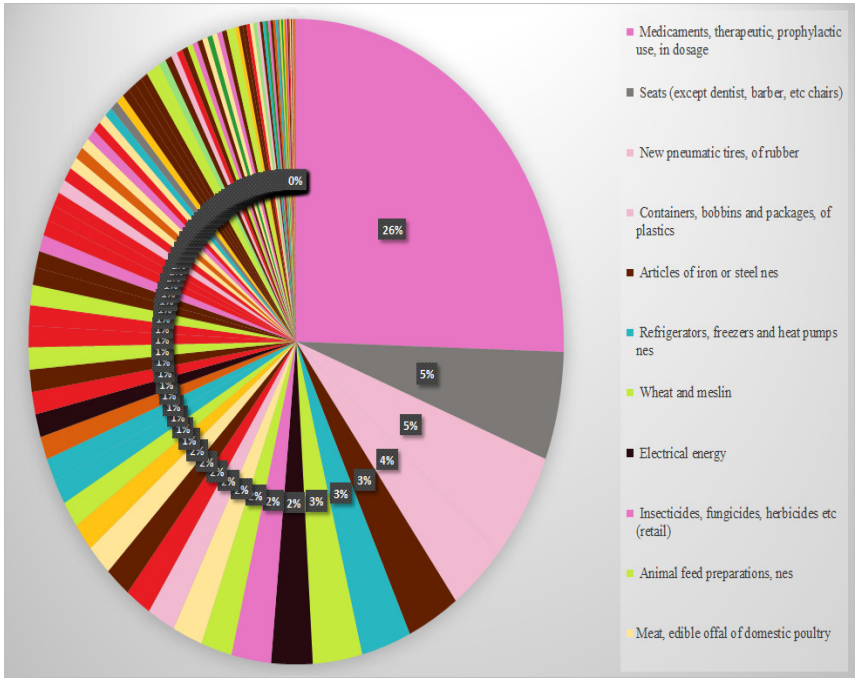
The second product group is seats (e.g. car and aeroplane seats), which is in the "other highly manufactured" sector; the third is inflated rubber tyres in the chemicals community (plastics and rubber). Despite being weakly complex (PCI=0.35), after controlling for exports, the fourth most important product group for Egypt is containers, bobbins and packages of plastics, which are also in the plastics and rubber section; the fifth is articles of iron and steel in the metals community (Table 4, for details see Tables A5 and A6). The proximity to oil and gas makes the chemicals industry an obvious candidate for Egypt. Input prices of the industry are dominated by oil and gas, and thus have been subject to a high degree of volatility. Nevertheless, with the decline in oil prices, that is likely to be permanent in the medium term; the industry may lose the advantage of cheaper inputs relative to competing countries with no oil production. The gradual elimination of the energy subsidy in Egypt may reinforce this trend.

For Tunisia, now that importance in trade has been given significant weight, it should direct 8 per cent of its efforts towards furniture in the highly manufactured and special purpose goods sectors (0.5 per cent of all world exports). The following three sectors are all in plastics and rubber in the chemicals community, with PCIs above 1, with the exception of the plastic containers, bobbins and packages, on account of their highly traded volumes (0.3 per cent of world exports). Three machinery sectors follow, with a 4 per cent weight (Figure 13). Table 4 presents the top five products across the three methodologies.

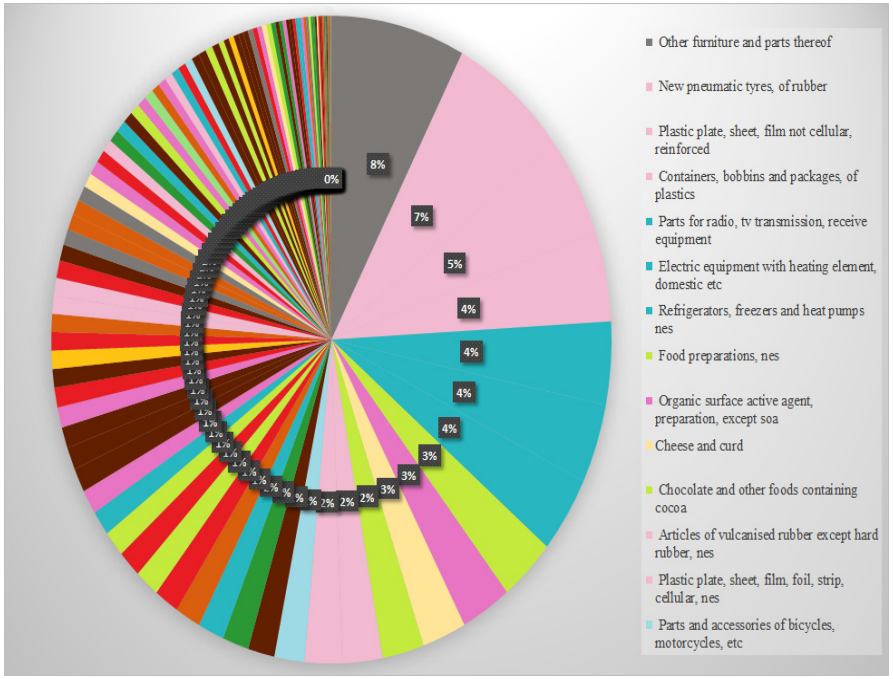
Note that most identified products show positive year-on-year growth rates during the last 5-year and 20-year periods, in the range of 2-6 per cent and 7-11 per cent, respectively, for Egypt's products, and 2-5 per cent and 5-7 per cent for Tunisia's. The only exception is parts for radio, TV transmission and receiver equipment exports, which have witnessed negative average growth rates during the last five years.

Figure 13: Upmarket products weighted by world trade, 2015

a. Egypt



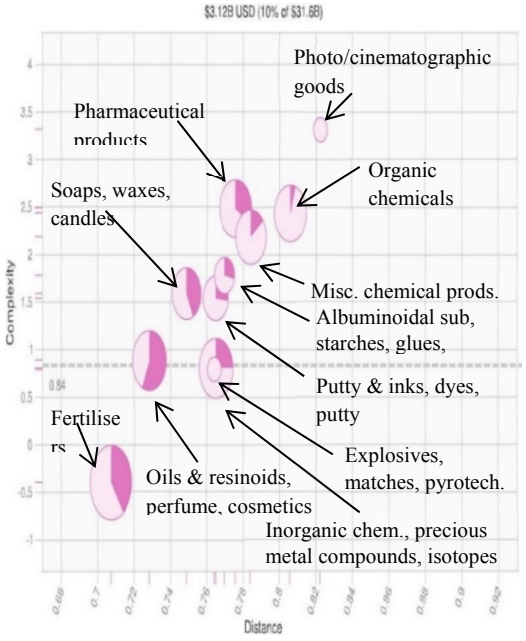
b. Tunisia



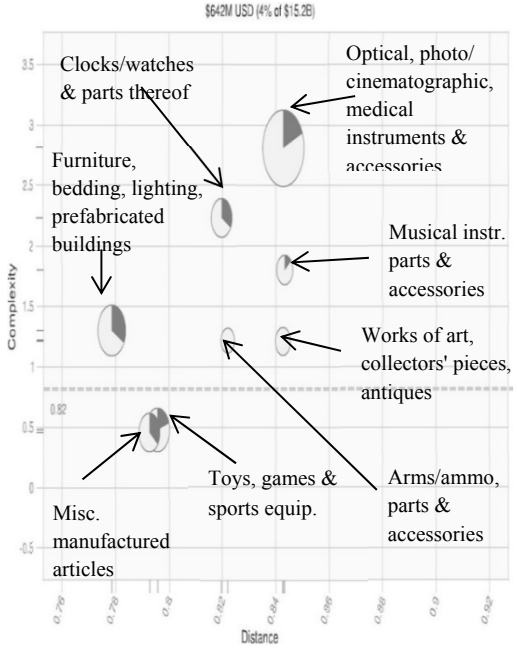
Source: Author's calculation based on Atlas of Economic Complexity data (Center for International Development at Harvard University, 2016)

Figure 14: Product complexity and opportunity gain for top country export sectors

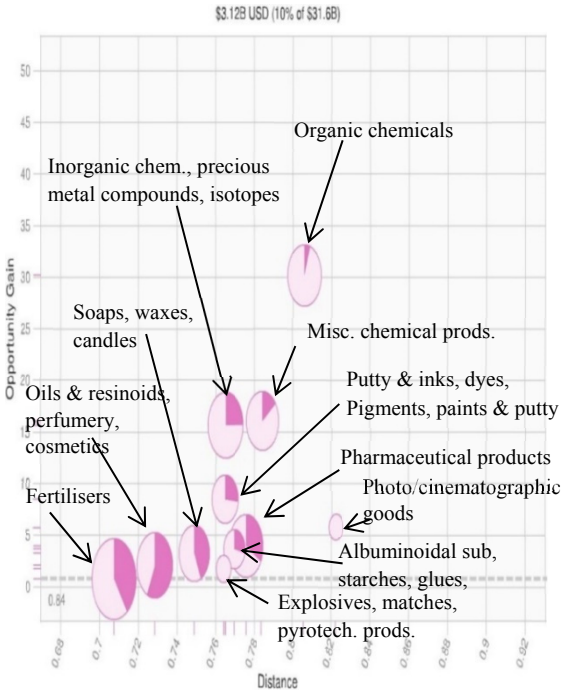
a. Egypt: Chemicals & allied industries 2014 (C)



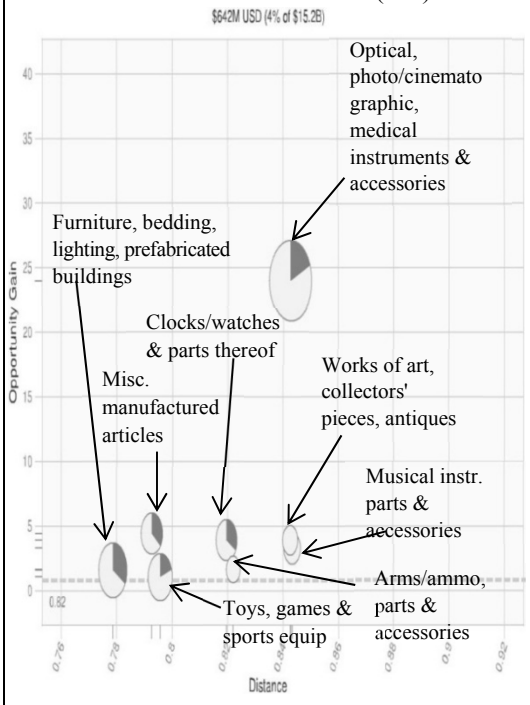
b. Tunisia: Miscellaneous 2014 (C)



c. Egypt: Chemicals & allied industries 2014 (OG)



d. Tunisia: Miscellaneous 2014 (OG)



Source: Author, adapted from the Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)

Table 4: Top five upmarket export products by methodology

	Egypt				*Tunisia*		
	Product Space Methodology	*Strategic Bets*	*Forward-looking*		*Product Space Methodology*	*Strategic Bets*	*Forward-looking*
1	**Birds eggs, in shell, fresh, preserved or cooked (5%, 8%)**	**Hand saws and blades for saws of all kinds (3%, 5%)**	**Medicaments, therapeutic, prophylactic use, in dosage (2%, 11%)**	1	**Containers, bobbins & packages, of plastics (4%, 7%)**	**Parts & accessories for motor vehicles (4%, 7%)**	**Other furniture and parts thereof (5%, 7%)**
	Dairy products, eggs, honey, edible animal product	Tools, implements, cutlery, etc., of base metal	Pharmaceutical products		Plastics & articles thereof	Vehicles other than railway, tramway	Furniture, lighting, signs, prefabricated buildings
	Live animals; animal products	Base metal & articles of base metal	Products of the chemicals or allied industries		Plastics & articles thereof; rubber & articles thereof	Vehicles, aircraft, vessels & associated transport equipment	Miscellaneous manufactured articles
	Agricultural Products	Metals & manufactured articles (made mostly of metal)	Chemical & related products		Chemical & related products	Metals & manufactured articles (made mostly of metal)	Other highly manufactured & special-purpose goods
2	**Tube, pipe of iron or steel, except seamless > 406.4m (2%, 7%)**	**Moulds for metals (except ingot), plastic, rubber, etc. (7%, 5%)**	**Seats (except dentist, barber, etc., chairs) (6%, 8%)**	2	**Tools, broom handles, bodies, etc., of wood (8%, 4%)**	**Air conditioning equipment, machinery (4%, 8%)**	**New pneumatic tyres, of rubber (3%, 7%)**
	Articles of iron or steel	Nuclear reactors, boilers, machinery, etc.	Furniture, lighting, signs, prefabricated buildings		Wood & articles of wood, wood charcoal	Nuclear reactors, boilers, machinery, etc.	Rubber & articles thereof
	Base metal & articles of base metal	Machinery & mechanical appliances; electrical equipment (parts thereof; sound recorders & reproducers, television image & sound recorders & reproducers, & parts & accessories of such articles)	Miscellaneous manufactured articles		Wood & articles of wood (wood charcoal; cork & articles of cork; manufactures of straw, of esparto or of other plaiting materials; basketware & wickerwork)	Machinery & mechanical appliances; electrical equipment (parts thereof; sound recorders & reproducers, television image & sound recorders & reproducers, & parts & accessories of such articles)	Plastics & rubber
	Metals & manufactured articles (made mostly of metal)	Metals & manufactured articles (made mostly of metal)	Other highly manufactured & special-purpose goods		Non-consumable animal & plant products	Metals & manufactured articles (made mostly of metal)	Chemical & related products
3	**Paper, board containers, packing items, box files (4%, 6%)**	**Newsprint (-6%, -3%)**	**New pneumatic tyres, of rubber (3%, 7%)**	3	**Other furniture & parts thereof (5%, 7%)**	**Medicaments, therapeutic, prophylactic use, in dosage (2%, 11%)**	**Plastic plate, sheet, film not cellular, reinforced (2%, 7%,)**
	Paper & paperboard, articles of pulp, paper & board	Paper & paperboard, articles of pulp, paper and board	Rubber & articles thereof		Furniture, lighting, signs, prefabricated buildings	Pharmaceutical products	Plastics & articles thereof
	Pulp of wood or other; waste & scrap of paper, paper & paperboard & articles	Pulp of wood or other; waste & scrap of paper, paper & paperboard & articles	Plastics & articles thereof; rubber & articles thereof		Miscellaneous manufactured articles	Products of the chemicals or allied industries	Plastics & rubber
	Non-consumable animal & plant products	Non-consumable animal and plant products	Chemical & related products		Other highly manufactured & special-purpose goods	Chemical & related products	Chemical & related products

	Egypt				*Tunisia*		
	Product Space Methodology	*Strategic Bets*	*Forward-looking*		*Product Space Methodology*	*Strategic Bets*	*Forward-looking*
4	**Quicklime, slaked, hydraulic lime for construction, etc. (5%, 8%)**	**Metals, clad with platinum, semi-manufactured (74%, 39%)**	**Containers, bobbins & packages, of plastics (4%, 7%)**	4	**Jams, jellies, marmalades, fruit, nut pastes, purees (6%, 7%)**	**Electrical signalling & traffic control equipment (3%, 7%)**	**Containers, bobbins & packages, of plastics (4%, 7%)**
	Salt, sulphur, earth, stone, plaster, lime & cement	Pearls, precious stones, metals, coins, etc.	Plastics & articles thereof		Vegetable, fruit, nut, etc., food preparations	Electrical, electronic equipment	Plastics & articles thereof
	Mineral products	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal & articles thereof; imitation jewelry; coin	Plastics & articles thereof; rubber & articles thereof		Prepared foodstuffs; beverages, spirits & vinegar; tobacco & manufactured tobacco substitutes	Machinery & mechanical appliances; electrical equipment (parts thereof; sound recorders & reproducers, television image & sound recorders & reproducers, & parts & accessories of such articles)	Plastics & articles thereof; rubber & articles thereof
	Mineral products	Metals & manufactured articles (made mostly of metal)	Chemical & related products		Agricultural products	Metals & manufactured articles (made mostly of metal)	Chemical & related products
5	**Unsweetened beverage waters, ice & snow (6%, 6%)**	**Polyamides in primary forms (1%, 8%)**	**Articles of iron or steel nes (4%, 8%)**	5	**Waste, noils, garnetted stock of manmade fibres (-3%, 1%)**	**Nonwovens textiles except felt (4%, 7%)**	**Parts for radios, TV transmission, receiver equipment (-6%, 5%)**
	Beverages, spirits & vinegar	Plastics & articles thereof	Articles of iron or steel		manmade staple fibres	Wadding, felt, nonwovens, yarns, twine, cordage, etc.	Electrical, electronic equipment
	Prepared foodstuffs; beverages, spirits & vinegar; tobacco & manufactured tobacco substitutes	Plastics & articles thereof; rubber & articles thereof	Base metal & articles of base metal		Textiles & textile articles	Textiles & textile articles	Machinery & mechanical appliances; electrical equipment (parts thereof; sound recorders & reproducers, television image & sound recorders & reproducers, & parts & accessories of such articles)
	Agricultural products	Chemical & related products	Metals & manufactured articles (made mostly of metal)		Textiles & apparel	Textiles & apparel	Metals & manufactured articles (made mostly of metal)

Source: Author's calculations based on Atlas of Economic Complexity data (Center for International Development at Harvard University, 2016). Note: growth rates in brackets are average year-on-year growth rate for last 5 years first, then for last 20 years second. Abbreviations: see notes in Tables A4 and A6.

5 Discussion: shortcomings of the Product Space Methodology

This section predominantly deals with the limitations of the PSM: It presents them, defends some and suggests simple solutions where possible.

There have been some criticisms of the PSM (see Altenburg et al., 2016). The following section presents a number of essential shortcomings. First, although the PSM methodology instructs policy-makers where to go, it remains silent about how to get there (Altenburg et al., 2016). This is because it assumes that only inherent technical capabilities matter, in other words, supply conditions alone determine a country's current and future exports, and countries will automatically head towards their future sectors. This excludes positive support from government to complement – or sometimes constrain – these favourable supply conditions. But government involvement indeed has implications on the results. For example, the decades-long energy subsidy in both countries has had an effect on the current structure of the product space and, consequently, biases future results towards more energy-intensive sectors (e.g. metals).

A typical extension of the approach is to explicitly request policy-makers' support for the proposed sectoral focus identified by the methodology, especially when market failures are present. The fewer market failures, the more pro-market – rather than pro-business – the policy should be in order to improve the business environment, namely by carrying out institutional reforms and reducing business-government transaction costs without creating cronies (Diwan & Haidar, 2016). In more recent papers of Hausmann et al., industrial policy plays an integral role in achieving the sectoral jumps. In fact, Hausmann, Matovu et al. (2014) specify four major principles of a more interventionist industrial policy: 1) *legitimacy*: It should be shown that support is in the public interest, resulting in net benefits; as such, it should be directed at increasing productivity, not compensating for weak productivity; 2) *focus on public inputs and spillovers*: Support should provide public inputs to maximise spillovers, not provide private subsidies; 3) *co-financing of the private sector to screen the viability of potential interventions* (e.g. government could guarantee the first x years of rent for privately built industrial zones to remove some of the risks associated with the investment) and; 4) *transparency and accountability*: to limit rent-seeking, increase legitimacy and signal integrity (e.g. by setting ex ante success criteria publicly, weakly performing initiatives can be identified early and either corrected or terminated). Additionally, where government intervention is more crucial, what is needed is to put in place a robust, transparent and structured process of social dialogue and stakeholder consultation in policy design, implementation and learning – a dialogue that includes the government, civil society, industry and academics (Altenburg et al., 2016; Altenburg & Lütkenhorst, 2015; El-Haddad, 2016; Loewe, 2013; Vidican et al., 2013).

Next, the PSM completely ignores the demand side. However, gaining access to a particular value chain is not straightforward and relies heavily on power asymmetries that also affect prospects for future upgrading (Fortunato, Razo, & Vrolijk, 2015). Such obstacles originating from the structure of the value chain are disregarded in the product space analysis. If they are taken into account, then captive value chains should be avoided. Instead, sectors in modular chains that provide opportunities for both penetration and upgrading should be selected (see Altenburg et al., 2016; Altenburg, 2006; Gereffi, Humphrey, & Sturgeon, 2005; McCormick & Schmitz, 2001; Schmitz & Knorringa, 1999). Hence, the relevant question is how are value chains identified in this analysis (pharmaceuticals,

plastics and rubber, furniture, seats and electric and electronic equipment)? Moreover, what does the global market structure look like? Are the industries competitive or oligopolistic? Are they prone to barriers to entry? For example, pharmaceuticals are divided into traditional and generic drug companies and are mostly supplier-driven global value chains, since they are a high-tech sector that relies heavily on technology and R&D. This industry is the second largest industry worldwide, after tobacco, and is exposed to barriers to entry and collusion risks (Antonelli & Mariniello, 2014). Indeed, the largest price-fixing and cartel scandals, such as that of Valeant drug company in 2015, and the 10-year scandal of the Swiss pharmaceutical company Hoffmann-La Roche, are vivid examples of how vicious and predatory this sector is. Thus, there should be detailed investigations of the identified sectors to provide further guidance on the chosen products and sectors.

The third shortcoming is the limited ability of trade classifications to reflect the actual production structure or to capture the skills embedded in exported products (Radosevic, 2017, in Altenburg et al., 2016). A piece of exported garment, such as a high-end shirt, could be sewn in the country but designed, woven or spun, printed and dyed elsewhere. The ideal construction of the product space should use value added rather than final output. In defence of the PSM, these data are far less accurate and much harder to obtain than trade data, limiting the feasibility of this approach. Moreover, PSM identifies upmarket sectors by taking product sophistication into account, which implicitly reveals the skill level embedded in the final product.

The fourth weakness pertains to the static nature of the approach. PSM looks at just one point in time, one year, and bases its product selection on that. In principle, one can repeat the analysis every year, but this would still not introduce the required dynamism to the approach. Take Germany as an example. Because of its superior technological abilities among countries worldwide, it is likely to expand the space or the frontier in the future to include a larger number of more sophisticated products that did not exist in the product space of the previous years. The current version of the methodology is unable to predict these potential future changes. This is the reason why the methodology assigns Germany, counterintuitively, such a small opportunity value. A dynamic methodology will not produce that error. More generally, the approach is unable to anticipate future changes in framework conditions.

There are alternatives to dealing with the methodology's shortcomings. One would be to combine its results with other approaches, such as the technology foresight approach, which identifies upgrading sectors under more realistic assumptions of uncertainty about future economic and technological trends. The approach combines data analysis and quantitative prediction techniques with expert knowledge and foresight, major stakeholder input and societal dialogue (United Nations Industrial Development Organization, 2005; Altenburg et al., 2016). Another alternative would be to weigh the PSM sectoral results using an index that incorporates additional aspects, including world trade (as in this paper), ecological sustainability, food security, expected shifts in technology and other factors policy-makers may be interested in or have raised concerns about. Though, of course, this would introduce complications to an approach for which simplicity is its main attraction.

6 Conclusion

Growth and employment come from export diversification and structural transformation towards the production of increasingly more sophisticated, higher-value products. These products create high-quality employment with higher wages. Egypt and Tunisia have achieved limited levels of diversification and structural transformation. They produce only slightly complex products. This structure is unable to move the two countries onto an inclusive, high-growth path buttressed by healthy growth of the private sector as the source of quality jobs.

This paper has identified leading export sectors for Egypt and Tunisia based on the Product Space Methodology of Hausmann et al. The approach emphasises technical spillovers in production and exports, identifying unexploited opportunities for each country.

Using a variant of the PSM that takes into account global trade patterns and the trade-off between the quantity and quality of jobs created suggests that – in order to exploit its potential – Egypt should focus on medicaments in the pharmaceutical sector, which are part of the chemicals product community. Of course, statistically, the chemicals industry and pharmaceuticals are proximate, but there are huge variations within both of them in terms of R&D intensity, for example. So the opportunity may be in pharmaceutical packaging or the formulation of pharmaceutical "commodities" or generics – not in developing *new* pharmaceuticals.

They should also focus on products in the category "other highly manufactured goods", such as seats (car, aeroplane, swivel, etc.) and also on "other products" in plastics and rubber in the chemicals community, such as rubber tyres and plastic containers. The last of the top five products are iron and steel articles in the metals community. The chemicals industry is an obvious candidate for Egypt, given Egypt's position in the product space and its proximity to oil and gas, the marked size and growth in the trade of chemicals, and the sector's connectedness in the space.

Tunisia should emphasise furniture in the "highly manufactured and special purpose goods" sector and products in the chemicals industry. The latter are those products with greater complexity in comparison to the identified products in Egypt's chemicals sector. Given Tunisia's greater accumulated knowledge and its relatively advanced position in the space compared to Egypt, the country should also support some electronics sectors. Electronics constitute the second-largest community in world trade and is well-connected in the product space.

The next step for research is to look at value chains identified in the analysis: pharmaceuticals, plastics and rubber, furniture, seats, and electric and electronic equipment. What does the global market structure of these products look like? Are the industries competitive or oligopolistic? Are there substantial barriers to entry? The pharmaceutical industry, for example, ranked second globally in terms of barriers to entry and the risk of collusion. The largest price-fixing and cartel scandals are usually in this sector. More generally, all market failures pertaining to the target sectors should be detected. A detailed investigation of the identified sectors is required to further confirm the suitability of the sectors and determine the strength and nature of the required industrial policy.

Active industrial policies in these two countries have been marred by a history of cronyism and political capture. Nevertheless, they remain indispensable on account of various market failures. As a result, to the extent possible, industrial policy should be pro-market rather than pro-business so that it improves the business environment without creating cronies. In implementing a more interventionist industrial policy, it is necessary to adhere to the four principles of good industrial policy-making of Hausmann, Matovu et al. (2014) and put in place a robust, transparent and structured process of social dialogue and stakeholder consultation in policy design, implementation and learning. This dialogue should include government, civil society, industry, trade unions and intellectuals. In that way, the new strategy will have broad ownership, which is a first step towards the inclusive growth these countries need achieve to ensure stability.

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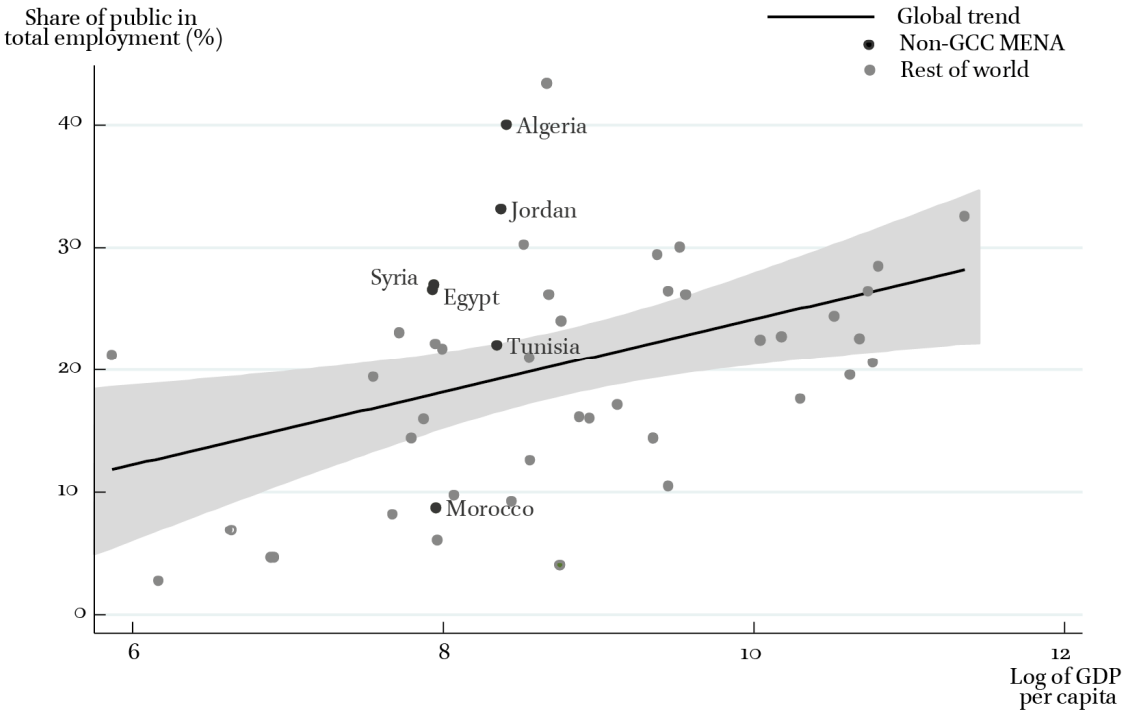
Annex

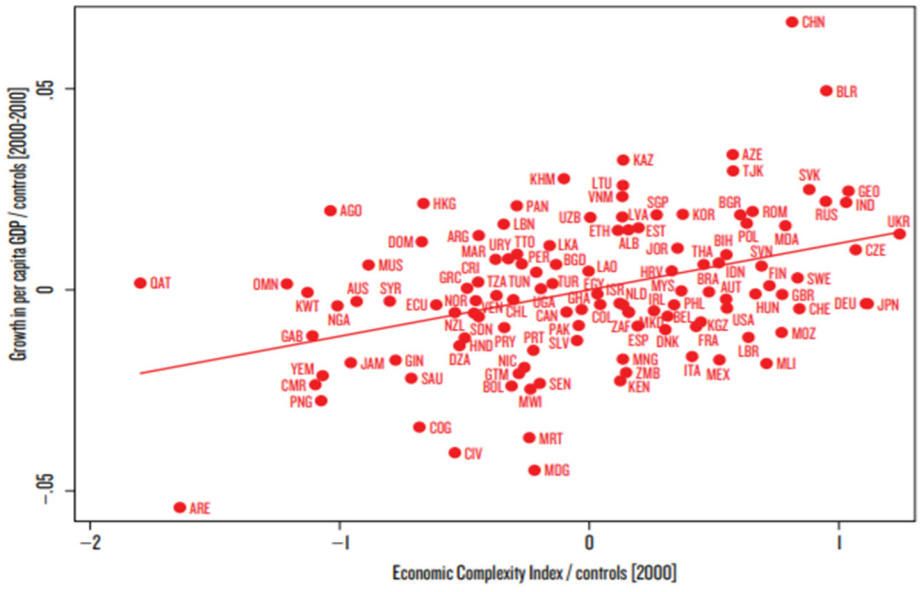
Figure A1: Public employment shares in international comparison



Note: GCC countries are left out of this graph, as the large-scale presence of foreign workers in the private sector makes a direct comparison of private and public employment problematic. We know, however, that in all cases Bahrain, more than half of citizens are employed by the respective governments (Hertog 2017).

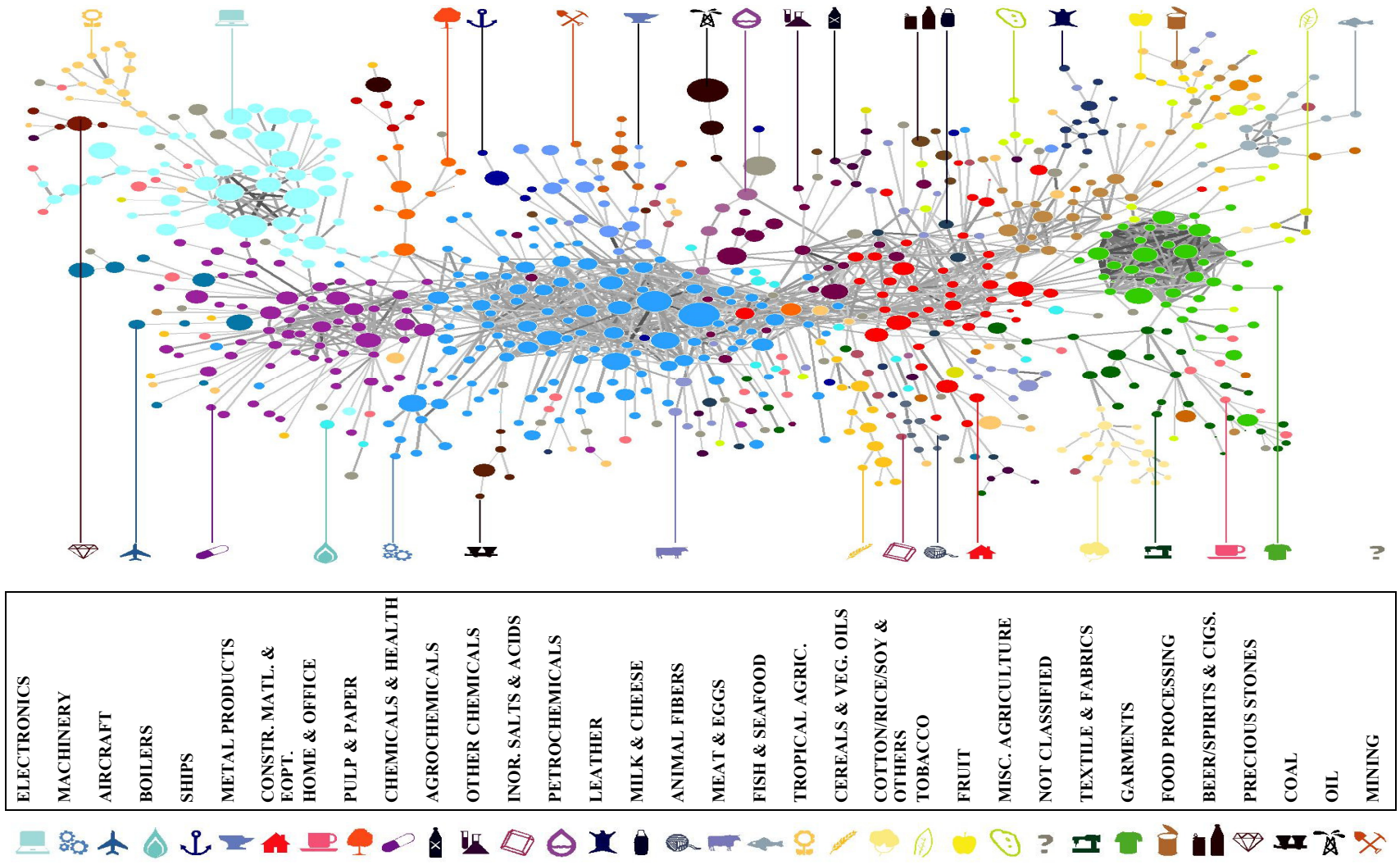
Source: Hertog (2017, Figure 5.1, p. 91)

Figure A2: Complexity and GDP growth in international comparison



Source: Hausmann, Ricardo, César A. Hidalgo, Sebastián Bustos, Michele Coscia, Alexander Simoes, and Muhammed A. Yildirim., The Atlas of Economic Complexity, (2014, Figure 3.3, p. 29). By permission of The MIT Press.

Figure A3: The global product space and Leamer clusters (2006-2008)



Source: Hausmann, Ricardo, César A.Hidalgo, Sebastián Bustos, Michele Coscia, Alexander Simoes, and Muhammed A. Yildirim., The Atlas of Economic Complexity (2014, Figure 5.1, p. 52). By permission of The MIT Press.

Table A1: Product space top 20 potential upmarket export sectors for Egypt, 2015

HS	Product	Chapter	Section	Group	RCA	PCI	Opp-gain	Distance	Exports (US$ mil)	Imports (US$ mil)	World exports (US$ mil)
4	Birds eggs, in shell, fresh, preserved or cooked	Dairy products, eggs, honey, edible animal product nes	Live animals; animal products	Agr. Pr.	0.0	-0.17	0.27	0.7	0	0	4,144
73	Tube, pipe of iron or steel, except seamless > 406.4m	Articles of iron or steel	Base metal & articles of base metal	Metals & Manuf.	0.3	0.18	0.26	0.7	9	231	20,621
48	Paper, board containers, packing items, box files	Paper & paperboard, articles of pulp, paper & board	Pulp of wood or other; waste & scrap of paper, paper & paperboard & articles	Non Cons An. & Plnt Pr.	0.8	-0.06	0.29	0.7	28	115	20,792
25	Quicklime, slaked, hydraulic lime for construction, etc.	Salt, sulphur, earth, stone, plaster, lime & cement	Min. products	Min. Pr.	0.0	0.09	0.24	0.7	0	0	997
22	Unsweetened beverage waters, ice & snow	Beverages, spirits & vinegar	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.2	-0.08	0.28	0.7	1	2	3,599
19	Cereal food (roasted, swelled), cooked grain not maize	Cereal, flour, starch, milk preparations & products	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	1.0	0.51	0.47	0.7	9	5	5,683
21	Ice cream & other edible ice	Miscellaneous edible preparations	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.4	0.53	0.46	0.7	2	2	3,248
39	Containers, bobbins & packages, of plastics	Plastics & articles thereof	Plastics & Rubber	Chemical & R. P.	0.6	0.35	0.38	0.7	47	115	46,552
22	Waters, non-alcoholic sweetened or flavoured beverage	Beverages, spirits & vinegar	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.5	0.44	0.38	0.7	14	15	17,474
41	Raw hides & skins of bovine, equine animals	Raw hides & skins (other than furskins) & leather	Raw hides & skins, leather articles, saddlery & harness, trvl goods, handbags	Non Cons An. & Plnt Pr.	0.0	0.21	0.41	0.7	0	4	5,572
1	Live bovine animals	Live animals	Live animals; animal products	Agr. Pr.	0.0	0.13	0.26	0.7	0	116	8,166
4	Buttermilk, cream, yoghurt, etc.	Dairy products, eggs, honey, edible animal product nes	Live animals; animal products	Agr. Pr.	0.1	1.16	0.48	0.7	1	1	4,034
11	Worked cereal grains except flour, groat, meal, pellet	Milling products, malt, starches, inulin, wheat gluten	Vegetable products	Agr. Pr.	0.9	0.10	0.32	0.7	2	1	1,314
27	Petroleum coke, bitumen & other oil industry residues	Mineral fuels, oils, distillation products, etc.	Min. products	Min. Pr.	0.3	-0.12	0.32	0.7	6	108	15,279
72	Angles, shapes & sections of iron or non-alloy steel	Iron & steel	Base metal & articles of base metal	Metals & Manuf.	0.1	0.67	0.51	0.7	3	95	11,644
48	Paper or paperboard labels including printed labels	Paper & paperboard, articles of pulp, paper & board	Pulp of wood or other; waste & scrap of paper, paper & paperboard & articles	Non Cons An. & Plnt Pr.	0.0	0.72	0.47	0.7	0	13	4,675
68	Articles of plaster	Stone, plaster, cement, asbestos, mica, etc., articles	Stone, plaster, cement, asbestos, ceramic pr., glass	Non - Metallic Min. Pr.	0.4	0.83	0.53	0.7	1	15	1,901
73	Reservoirs, tanks, vats, etc., iron/steel cap >300l	Articles of iron or steel	Base metal & articles of base metal	Metals & Manuf.	0.4	0.88	0.51	0.7	2	30	3,762
63	Worn clothing & other worn articles	Other made textile articles, sets, worn clothing, etc.	Textiles & textile articles	T&A	0.1	0.16	0.44	0.7	0	12	4,047
27	Electrical energy	Mineral fuels, oils, distillation products, etc.	Min. products	Min. Pr.	0.9	0.20	0.37	0.7	50	0	32,949

Note: Top 20 of 97 products suggested by the PSM sorted by distance. All 97 products available from author upon request.
Source: Author's calculations based on the Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)

Table A2: Product space top 20 potential upmarket export sectors for Tunisia, 2015

HS	Product	Chapter	Section	Group	RCA	PCI	Opp-gain	Distance	Exports (US$ mil)	Imports (US$ mil)	World exports (US$ mil)
39	Containers, bobbins & packages, of plastics	Plastics & articles thereof	Plastics & rubber	Chemical & R. P.	0.44	0.35	0.25	0.75	18	90	46,552
44	Tools, broom handles, bodies, etc., of wood	Wood & articles of wood, wood charcoal	Wood, cork, manuf. of straw, esparto, othr plaiting mater., basketware & wickerwork	Non Cons An. & Plnt Pr.	0.07	0.22	0.23	0.75	0	0	363
94	Other furniture & parts thereof	Furniture, lighting, signs, prefabricated buildings	Miscellaneous manufactured articles	O Highly Manf.& Spcl-purpose Goods	0.23	0.95	0.30	0.75	17	38	80,339
20	Jams, jellies, marmalades, fruit, nut pastes, purees	Vegetable, fruit, nut, etc., food preparations	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.18	0.15	0.13	0.75	0	6	2,755
55	Waste, noils, garnetted stock of manmade fibres	manmade staple fibres	Textiles & textile articles	T&A	0.55	0.63	0.38	0.76	0	0	217
39	Plastic articles for use in construction nes	Plastics & articles thereof	Plastics & rubber	Chemical & R. P.	0.43	1.41	0.48	0.76	4	10	9,184
94	Prefabricated buildings	Furniture, lighting, signs, prefabricated buildings	Miscellaneous manufactured articles	O Highly Manf.& Spcl-purpose Goods	0.68	1.04	0.37	0.76	5	13	7,868
76	Aluminium casks, drums, boxes, etc., capacity <300l	Aluminium & articles thereof	Base metal & articles of base metal	Metals & Manuf.	0.32	1.28	0.48	0.76	1	17	4,649
48	Paper or paperboard labels including printed labels	Paper & paperboard, articles of pulp, paper & board	Pulp of wood or other; waste & scrap of paper, paper & paperboard & articles	Non Cons An. & Plnt Pr.	0.35	0.72	0.36	0.76	1	16	4,675
76	Aluminium structures, parts nes, for construction	Aluminium & articles thereof	Base metal & articles of base metal	Metals & Manuf.	0.28	1.43	0.55	0.76	3	8	10,937
41	Raw hides & skins of bovine, equine animals	Raw hides & skins (other than furskins) & leather	Raw hides & skins, leather articles, saddlery & harness, trvl goods, handbags	Non Cons An. & Plnt Pr.	0.51	0.21	0.30	0.76	3	1	5,572
76	Aluminium bars, rods & profiles	Aluminium & articles thereof	Base metal & articles of base metal	Metals & Manuf.	0.70	1.40	0.55	0.76	10	32	15,935
16	Sausages, similar products of meat, meat offal & blood	Meat, fish & seafood food preparations nes	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.06	1.46	0.55	0.77	0	0	4,265
44	Builders joinery & carpentry, of wood	Wood & articles of wood, wood charcoal	Wood, cork, manuf. of straw, esparto, othr plaiting mater., basketware & wickerwork	Non Cons An. & Plnt Pr.	0.05	1.14	0.31	0.77	1	6	14,088
21	Ice cream & other edible ice	Miscellaneous edible preparations	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.24	0.53	0.36	0.77	1	5	3,248
34	Organic surface active agent, preparation, except soap	Soaps, lubricants, waxes, candles, modelling pastes	Products of the chemicals or allied industries	Chemical & R. P.	0.60	0.93	0.49	0.77	17	57	30,174
71	Gold, silversmith wares of or clad with precious meta	Pearls, precious stones, metals, coins, etc.	Pearls, stones, metals, imitation jewl.	Metals & Manuf.	0.18	0.96	0.41	0.77	0	0	757
47	Waste or scrap of paper or paperboard	Pulp of wood, fibrous cellulosic material, waste, etc.	Pulp of wood or other; waste & scrap of paper, paper & paperboard & articles	Non Cons An. & Plnt Pr.	0.11	0.60	0.40	0.77	1	4	9,443
73	Iron or steel cloth, grill, fencing & expanded meta	Articles of iron or steel	Base metal & articles of base metal	Metals & Manuf.	0.06	0.99	0.47	0.77	0	6	4,199
4	Milk & cream, neither concentrated nor sweetened	Dairy products, eggs, honey, edible animal product nes	Live animals; animal products	Agr. Pr.	0.18	0.59	0.33	0.77	1	0	7,392

Notes: Top 20 of 106 products suggested by the PSM sorted by distance. All 106 products available from author upon request.
Source: Author's calculations based on the Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)

Table A3: Top 20 Strategic Bets products (in top 40% of PCI & OG, distance >=0.8), Egypt 2015, ordered by distance

HS	Product	Chapter	Section	Group	RCA	PCI	Opp-gain	Distance	Exports (US$ mil)	Imports (US$ mil)	World exports (US$ mil)
82	Hand saws & blades for saws of all kinds	Tools, implements, cutlery, etc., of base metal	Base metal & articles of base metal	Metals & Manuf.	0.00	2.58	1.09	0.80	0	14	3,493
84	Moulds for metals (except ingot), plastic, rubber, etc.	Nuclear reactors, boilers, machinery, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.11	3.04	1.22	0.80	3	87	17,150
48	Newsprint	Paper & paperboard, articles of pulp, paper & board	Pulp of wood or other; waste & scrap of paper, paper & paperboard & articles	Non Cons An. & Plnt Pr.	0.00	2.54	0.83	0.80	0	48	5,758
71	Metals, clad with platinum, semi-manufactured	Pearls, precious stones, metals, coins, etc.	Pearls, stones, metals, imitation jewl.	Metals & Manuf.	0.00	2.02	0.85	0.80	0	0	47
39	Polyamides in primary forms	Plastics & articles thereof	Plastics & Rubber	Chemical & R. P.	0.01	3.77	1.48	0.80	0	17	12,979
38	Reaction initiators, accelerators & catalysts, nes	Miscellaneous chemical products	Products of the chemicals or allied industries	Chemical & R. P.	0.02	2.63	1.26	0.80	1	19	16,317
84	Gaskets & similar joints of metal sheet	Nuclear reactors, boilers, machinery, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.10	3.61	1.47	0.80	1	35	3,845
84	Machine-tool for working stone, ceramics, cold glass	Nuclear reactors, boilers, machinery, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.00	2.93	1.14	0.80	0	29	2,330
84	Converters, ladles, ingot moulds, etc., for metallurgy	Nuclear reactors, boilers, machinery, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.00	2.78	1.15	0.80	0	8	2,971
38	Chemicals industry products nes	Miscellaneous chemical products	Products of the chemicals or allied industries	Chemical & R. P.	0.18	3.35	1.31	0.80	13	246	44,528
85	Sound recordings other than photographic equipment	Electrical, electronic equipment	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.00	3.59	1.37	0.80	0	9	14,928
73	Pipe fittings, of iron or steel	Articles of iron or steel	Base metal & articles of base metal	Metals & Manuf.	0.44	3.32	1.34	0.80	13	189	17,802
69	Refractory ceramic articles except for construction	Ceramic products	Stone, plaster, cement, asbestos, ceramic pr., glass	Non - Metallic Min. Pr.	0.90	3.08	1.27	0.80	3	9	1,750
90	Hydrometers, thermometers, barometers, etc.	Optical, photo, technical, medical, etc., apparatus	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments & apparatus; clocks & watches; musical instruments; parts & accessories thereof	Metals & Manuf.	0.01	2.99	1.24	0.80	0	13	5,057
35	Dextrins, other modified starches, starch glues	Albuminoids, modified starches, glues, enzymes	Products of the chemicals or allied industries	Chemical & R. P.	0.02	2.06	1.09	0.80	0	13	3,189

Table A3: Top 20 Strategic Bets products (in top 40% of PCI & OG, distance >=0.8), Egypt 2015, ordered by distance

HS	Product	Chapter	Section	Group	RCA	PCI	Opp-gain	Distance	Exports (US$ mil)	Imports (US$ mil)	World exports (US$ mil)
87	Bodies (including cabs), for motor vehicles	Vehicles other than railway, tramway	Vehicles, aircraft, vessels & associated transport equipment	Metals & Manuf.	0.08	2.56	0.92	0.80	1	30	7,510
85	Electric transformers, static converters & rectifier	Electrical, electronic equipment	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.06	2.69	1.01	0.80	7	302	82,513
76	Aluminium containers for compressed or liquefied gas	Aluminium & articles thereof	Base metal & articles of base metal	Metals & Manuf.	0.00	2.53	1.04	0.80	0	1	515
84	Ball or roller bearings	Nuclear reactors, boilers, machinery, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.00	3.32	1.31	0.80	0	56	29,299
84	Machinery, non-domestic, involving heating or cooling	Nuclear reactors, boilers, machinery, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.05	3.59	1.35	0.80	3	170	36,733

Source: Author's calculations based on the Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)

Table A4: Top 20 Strategic Bets products (in top 40% of PCI & OG, distance >=0.8), Tunisia 2015, ordered by distance

HS	Product	Chapter	Section	Group	RCA	PCI	Opp-gain	Distance	Exports (US$ mil)	Imports (US$ mil)	World exports (US$ mil)
87	Parts & accessories for motor vehicles	Vehicles other than railway, tramway	Vehicles, aircraft, vessels & associated transport equipment	Metals & Manuf.	0.99	3.43	1.25	0.80	315	256	38,930
84	Air conditioning equipment, machinery	Nuclear reactors, boilers, machinery, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.40	2.54	0.76	0.80	14	55	5,191
30	Medicaments, therapeutic, prophylactic use, in dosage	Pharmaceutical products	Products of the chemicals or allied industries	Chemical & R. P.	0.12	2.43	0.90	0.80	37	275	1,059
85	Electrical signalling & traffic control equipment	Electrical, electronic equipment	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.03	2.60	0.91	0.80	0	2	1,316
56	Nonwovens textiles except felt	Wadding, felt, nonwovens, yarns, twine, cordage, etc.	Textiles & textile articles	T&A	0.16	2.24	0.91	0.80	2	46	5,174
84	Lifting, handling, loading machinery nes	Nuclear reactors, boilers, machinery, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.16	3.00	1.05	0.80	4	27	3,433
40	Rubber plate, sheet, strip, rod, etc., except hard	Rubber & articles thereof	Plastics & Rubber	Chemical & R. P.	0.03	2.81	1.04	0.80	0	6	7,361
94	Medical, dental, surgical, veterinary furniture, part	Furniture, lighting, signs, prefabricated buildings	Miscellaneous manufactured articles	O Highly Manf. & Spcl-purpose Goods	0.95	2.65	1.02	0.80	3	7	62,229
85	Electrical resistors & rheostats except for heating	Electrical, electronic equipment	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.26	2.46	0.85	0.80	2	50	1,962
84	Machinery nes, to clean, iron, impregnate textiles	Nuclear reactors, boilers, machinery, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.06	2.53	0.97	0.80	0	16	16,317
83	Base metal fittings nes for furniture, doors, cars, etc.	Miscellaneous articles of base metal	Base metal & articles of base metal	Metals & Manuf.	0.26	2.75	0.95	0.80	7	39	3,875
84	Hydraulic turbines, water wheels, regulators thereof	Nuclear reactors, boilers, machinery, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.00	2.31	0.92	0.81	0	0	1,871
65	Headgear, not felt, plaited, knit or crochet	Headgear & parts thereof	Footwear, headgear, umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding crops & parts thereof; prepared feathers & articles made therewith; artificial flowers; articles of human hair	T&A	0.62	2.39	0.85	0.81	2	2	1,397
51	Yarn of combed wool, not retail	Wool, animal hair, horsehair yarn & fabric thereof	Textiles & textile articles	T&A	0.06	2.06	0.86	0.81	0	6	22,073
48	Paper & paper articles nes	Paper & paperboard, articles of pulp, paper & board	Pulp of wood or other; waste & scrap of paper, paper & paperboard & articles	Non Cons An. & Plnt Pr.	0.44	1.82	0.83	0.81	5	17	218

Table A4: Top 20 Strategic Bets products (in top 40% of PCI & OG, distance >=0.8), Tunisia 2015, ordered by distance

HS	Product	Chapter	Section	Group	RCA	PCI	Opp-gain	Distance	Exports (US$ mil)	Imports (US$ mil)	World exports (US$ mil)
84	Engines & motors, nes	Nuclear reactors, boilers, machinery, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.11	2.87	1.12	0.81	2	4	2,346
72	Flat-rolled iron/steel, <600mm, clad, plated or coated	Iron & steel	Base metal & articles of base metal	Metals & Manuf.	0.03	2.49	1.02	0.81	0	6	7,211
87	Motor vehicles for transport of persons (except buses)	Vehicles other than railway, tramway	Vehicles, aircraft, vessels & associated transport equipment	Metals & Manuf.	0.01	2.61	0.94	0.81	6	700	1,041
04	Whey, natural milk products nes	Dairy products, eggs, honey, edible animal product nes	Live animals; animal products	Agr. Pr.	0.01	1.79	0.74	0.81	0	6	2,808
76	Aluminium foil of a thickness < 0.2mm	Aluminium & articles thereof	Base metal & articles of base metal	Metals & Manuf.	0.21	2.89	1.13	0.81	2	18	830

Source: Author's calculations based on the Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)

Groups:

Metals & Manuf. = Metals & Manufactured Articles Made Mostly of Metal; Chemical & R. P. = Chemical & Related Products

Agr. Pr. = Agricultural Products; Non Cons An. & Plnt Pr. = Non-consumable Animal & Plant Products

Min. Pr. = Mineral Products; Textiles & Apparel = T&A

O Highly Manf. & Spcl-purpose Goods = Other Highly Manufactured & Special-purpose Goods

Table A5: Top 20 potential upmarket export sectors for Egypt weighted by world exports, 2015

HS	Product	Section	Group	RCA	PCI	Opp-gain	Export Value (mil US$)	World exports (mil US$)
30	Medicaments, therapeutic, prophylactic use, in dosage	Products of the chemicals or allied industries	Chemical & R. P.	0.3	2.43	1.02	176	337,488
94	Seats (except dentist, barber, etc., chairs)	Miscellaneous manufactured articles	O Highly Manf. & Spcl-purpose Goods	0.2	1.05	0.49	22	71,664
40	New pneumatic tyres, of rubber	Plastics & rubber	Chemical & R. P.	0.9	1.20	0.52	104	71,343
39	Containers, bobbins & packages, of plastics	Plastics & rubber	Chemical & R. P.	0.6	0.35	0.38	47	46,552
73	Articles of iron or steel nes	Base metal & articles of base metal	Metals & Manuf.	1.0	2.53	1.02	66	42,160
84	Refrigerators, freezers & heat pumps nes	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.4	2.27	0.89	25	39,802
10	Wheat & meslin	Vegetable products	Agr. Pr.	0.0	0.69	0.40	1	39,433
27	Electrical energy	Min. Pr.	Min. Pr.	0.9	0.20	0.37	50	32,949
38	Insecticides, fungicides, herbicides, etc. (retail)	Products of the chemicals or allied industries	Chemical & R. P.	0.3	1.43	0.72	16	31,663
23	Animal feed preparations, nes	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.1	0.57	0.53	3	24,691
2	Meat, edible offal of domestic poultry	Live animals; animal products	Agr. Pr.	0.0	1.37	0.64	1	24,038
39	Plastic plate, sheet, film, foil, strip, cellular, ne	Plastics & rubber	Chemical & R. P.	0.2	1.93	0.81	8	22,433
48	Paper, board containers, packing items, box files, etc.	Prprd foods., bevr., sprts, tobacco & subs	Non Cons An. & Plnt Pr.	0.8	-0.06	0.29	28	20,792
73	Tube, pipe of iron or steel, except seamless > 406.4m	Base metal & articles of base metal	Metals & Manuf.	0.3	0.18	0.26	9	20,621
2	Meat of bovine animals, fresh or chilled	Live animals; animal products	Agr. Pr.	0.0	0.50	0.44	1	20,571
19	Malt extract, flour, dairy preparations, low cocoa	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.1	0.86	0.51	4	18,464
22	Waters, non-alcoholic sweetened or flavoured beverage	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.5	0.44	0.38	14	17,474
85	Parts for electric motors & generators	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.0	1.84	0.77	1	15,992
84	Machinery to sort, screen, wash, etc. Min. Pr.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.1	1.52	0.78	3	15,747
71	Waste or scrap of precious metal	Pearls, stones, metals, imitation jewl.	Metals & Manuf.	0.8	0.33	0.36	19	15,291

Source: Author's calculations based on the Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)

Table A6: Top 20 potential upmarket export sectors for Tunisia weighted by world exports, 2015

HS	Product	Section	Group	RCA	PCI	Opp-gain	Export Value (mil US$)	World exports (mil US$)
94	Other furniture and parts thereof	Miscellaneous manufactured articles	O Highly Manf. & Spcl-purpose Goods	0.23	0.95	0.30	17	80,339
40	New pneumatic tyres, of rubber	Plastics & rubber	Chemical & R. P.	0.22	1.20	0.41	15	71,343
39	Plastic plate, sheet, film not cellular, reinforced	Plastics & rubber	Chemical & R. P.	0.86	1.81	0.68	40	52,353
39	Containers, bobbins and packages, of plastics	Plastics & rubber	Chemical & R. P.	0.44	0.35	0.25	18	46,552
85	Parts for radios, TV transmission, receiver equipment	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.47	1.19	0.56	17	43,039
85	Electric equipment with heating element, domestic, etc.	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.57	2.28	0.80	22	41,322
84	Refrigerators, freezers and heat pumps nes	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.12	2.27	0.80	4	39,802
21	Food preparations, nes	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.47	0.91	0.38	14	33,198
34	Organic surface active agent, preparation, except soap	Products of the chemicals or allied industries	Chemical & R. P.	0.60	0.93	0.49	17	30,174
4	Cheese and curd	Live animals; animal products	Agr. Pr.	0.41	0.71	0.40	10	26,344
18	Chocolate and other foods containing cocoa	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.36	1.20	0.48	8	25,042
40	Articles of vulcanised rubber except hard rubber, nes	Plastics & rubber	Chemical & R. P.	0.35	2.26	0.89	8	23,990
39	Plastic plate, sheet, film, foil, strip, cellular, ne	Plastics & rubber	Chemical & R. P.	0.56	1.93	0.70	11	22,433
87	Parts and accessories of bicycles, motorcycles, etc.	Vehicles, aircraft, vessels and associated transport equipment	Metals & Manuf.	0.42	1.30	0.55	6	18,021
76	Aluminium bars, rods and profiles	Base metal and articles of base metal	Metals & Manuf.	0.70	1.40	0.55	10	15,935
54	Synthetic filament yarn (not sewing thread) not retail	Textiles and textile articles	T&A	0.05	1.61	0.54	1	15,834
84	Machinery to sort, screen, wash, etc., mineral products	Machinery, mechanical appliance, electrical equip. & accessories	Metals & Manuf.	0.30	1.52	0.67	4	15,747
71	Waste or scrap of precious metal	Pearls, stones, metals, imitation jewl.	Metals & Manuf.	0.38	0.33	0.24	5	15,291
49	Printed reading books, brochures, leaflets, etc.	Pulp of wood or other; waste & scrap of paper, paper & paperboard & articles	Non Cons An. & Plnt Pr.	0.18	1.43	0.68	2	14,827
16	Prepared or preserved meat, meat offal and blood, nes	Prprd foods., bevr., sprts, tobacco & subs	Agr. Pr.	0.01	1.22	0.49	0	14,673

Source: Author's calculations based on the Atlas of Economic Complexity (Center for International Development at Harvard University, 2016)

Groups:

Metals & Manuf. = metals and manufactured articles made mostly of metal; Chemical & R. P. = chemical and related products

Agr. Pr. = agricultural products; Non Cons An. & Plnt Pr. = non-consumable animal and plant products

Min. Pr. = mineral products; T&A = textiles and apparel

O Highly Manf. & Spcl-Purpose Goods = other highly manufactured and special-purpose goods

Sections:

Machinery, mechanical appliance, electrical equip. & accessories = machinery, mechanical appliance, electrical equipment & accessories; Plastics & rubber = plastics and articles thereof; rubber and articles thereof

Prprd foods., bevr., sprts, tobacco & subs = Prepared foodstuffs; beverages, spirits and vinegar; tobacco and manufactured tobacco substitutes

Pulp of wood or other; waste & scrap of paper, paper & paperboard & articles = Pulp of wood or of other fibrous cellulosic material; waste and scrap of paper or paperboard; paper and paperboard and articles thereof

Stone, plaster, cement, asbestos, ceramic pr., glass = Articles of stone, plaster, cement, asbestos, mica or similar materials; ceramic products; glass and glassware

Pearls, stones, metals, imitation jewl. = Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewelry; coin

Wood, cork, manuf. of straw, esparto, othr plaiting mater., basketware & wickerwork = Wood and articles of wood; wood charcoal; cork and articles of cork; manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork

Raw hides & skins, leather articles, saddler & harness, trvl goods, handbgs = Raw hides and skins, leather, furskins and articles thereof; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)

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