

## **Tunisia: Towards New Employment, Industry and Innovation Policies?**

### **A Synopsis of Recent Studies on Tunisia's Economic Reforms**

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### **1 De-Industrialization, Reindustrialization and Employment. Elements of a National Employment Strategy for Tunisia**

In this study the causes of Tunisia's severe employment problems are discussed. The Arab Spring movement in Tunisia started in the hinterland when mining workers went on strike because of bad working conditions and when self-employed workers demonstrated against the government because they could not survive faced with burdens from high taxation, unfair regulations and corruption. This analysis is done by investigating the processes and the management of de-industrialization and the interventions towards and the perspectives of re-industrialization in Tunisia. This is done with the view that these processes impact on the employment situation. Employment policy requests that de-industrialization is better managed and that the paths of re-industrialization are solidly planned. Four hypotheses matter in this context. These hypotheses are elaborated in the study in detail; examples and data are presented to substantiate the findings. *Hypothesis one* is that Tunisia has delayed its labour market and economic reforms as well as the constructive managing of its de-industrialization process, with severe consequences for employment, and now the country needs to change the industrial policies as a pathway towards re-industrialization. *Hypothesis two* is that Tunisia's employment problems are specifically caused by the failures to react to the process of de-industrialization, so that any attempt to re-industrialize will also fail if not new directions are chosen for industrial policies. *Hypothesis three* is that employment creation (in the face of high overall unemployment and very high unemployment of the academic and vocational graduates) requests a broad-based four paths approach of re-industrialization to be effective. *Hypothesis four* is related to the insight that a holistic framework for the implementation of a coherent employment strategy is needed so that the multiple objectives, the many institutions and the sectoral plans which are targeting employment creation will involve all relevant stakeholders. These four hypotheses touch central issues of Tunisia's economic policies. Since 2011 the

country is not only searching for a sound mix of policies but is also aiming at a political constellation to implement the chosen mix of policies.

### ***1.1 Delays of Labour Market Reforms and weaknesses of formulating a coherent National Employment Strategy***

*Concerning hypothesis one*, it is argued that the severe employment problems of the country are caused by delays in labour market and economic reforms, but also by mismanaging the deindustrialization process. The paper has two sections on these issues. In section 1 there is an analysis of the structures and the dynamics of the labour markets in Tunisia. Trends of employment and unemployment are reviewed, looking at sub-sectors, at regions, at labour contracts, and on data of informality of work. The causes of the fragmentation of labour markets are discussed. Most important are three trends which are looked at carefully: the increase of unemployment after the Arab Spring event, especially among graduates; the deterioration of working conditions; and the increasing share of fixed term and temporary employment contracts. The regional dimensions of these trends signal that unequal conditions are on the increase and prevail widely in Tunisia. In section 2 a critical assessment of the National Employment Strategy is given. While the National Employment Strategy of 2013-2017 was ambitious in correcting some of these unfavourable labour market trends and in generating more demand for labour, there are increasing doubts about the results. It seems that the conditions of the Small and Medium Enterprises (SMEs) for hiring new workers have not improved, although this was the main content of the National Employment Strategy (beside of transforming Tunisia to a knowledge economy being able to absorb the many unemployed graduates in the labour market). It is therefore argued throughout the paper that Tunisia needs a newly conceived, participatory and broad-based National Employment Strategy.

### ***1.2 Inappropriate Management of Deindustrialization in Tunisia due to Inconsistent Use of Policy Instruments***

*Concerning hypothesis two*, it is argued that the bad management of deindustrialization in Tunisia has caused many of the employment problems in the country. Foregone employment opportunities were the result of inappropriate policies to react to the trend of deindustrialization. These issues are discussed in section 3. Five major factors (and reform failures) are mentioned which have caused employment losses due to the mismanagement of deindustrialization. These five factors have impacted heavily on industrial structures and performances. First, the highly inappropriate systems of state support for investors and entrepreneurs in Tunisia need to be

mentioned, as they lead to unproductive rent incomes of entrepreneurs/enterprises instead of generating productive investment and sustainable employment. Second, Tunisia has not managed properly to reform the national innovation system to make it more responsive to the demands of the enterprises, especially so the small ones. Third, the mobility of qualified workers between enterprises and between sectors of economic activity is weak, and the Tunisian government failed in its policies to work on this issue although such policy moves would have been so important for overall structural transformation in the country. Fourth, the demand for qualified people (academic graduates and vocationally trained workers) is low in Tunisia because of failures to install economic incentives in the economic system for hiring more qualified persons. There is instead demand for low qualified and unqualified workers in the labour market; such labour is cheap and works without contracts but has a low level of productivity. However, also unfavourable supply factors in the education and training system play a role. Fifth, the labour market support programmes, the social security programmes and the social safety nets of the country are expensive for the government budget but do not reach important segments of the population and of the workers. Reforms in this field were delayed; such reforms could have contributed to poverty reduction and a higher mobility of workers.

### ***1.3 Four Paths of Reindustrialization matter in Tunisia and could create Sufficient Employment Opportunities***

*Concerning hypothesis three*, there is a discussion in the study on four paths of reindustrialization and on the potential implications for employment creation. It is argued that Tunisia can only solve its employment problems by broad-based and coherent reindustrialization strategies. These strategies are discussed in section 4. Employment creation in Tunisia needs pursuing a four paths approach. *First*, it is necessary to improve the value chains of all the productive sectors beside of manufacturing, namely agriculture, agroindustry, and agribusiness; industry subsectors such as construction, mining, public utilities; and services subsectors, such as infrastructure and transport, trade, professional services, tourism, etc. This is necessary for higher value addition and for employment creation; the value chain approach is favourable as it gives signals of the weak links and the inappropriate factors in the chain. *Second*, it is necessary to work in a new manner on the sub-regional imbalances of industrial employment in Tunisia. Manufacturing is highly concentrated in coastal regions without generating major spillovers and linkages to the interior regions. This has also to do with the “onshore sector” and “offshore sector” duality which is prevailing in Tunisia; because of this duality of sectors (due to different regulations and incentives) export firms in the “offshore

sector” will not outsource production activities to “onshore sector” firms but will import production inputs. *Third*, integration of Tunisian firms into global value chains is weak. Mostly based on foreign corporations, the role of Tunisian enterprises is limited. The “offshore sector” hires (quite similarly to the “onshore sector”) low qualified and unqualified workers instead of using the potential of qualified labour; this works as complex production inputs are imported. The Tunisian firms in the “offshore sector” are producing at the lower ranks of the global value chain, where only few innovations take place; there is a gap with regard of “horizontal integration” into global value chains. “Horizontal integration” would mean that there is a parallel advancement and integration of linked sectors in global value chains (such as health and hospital services, pharmacy products production and development, medical equipment production and technology development, and IT applications for the health sector). *Fourth*, there are opportunities in “green growth sectors” by supporting industries like construction, mining, organic agriculture, waste management, renewable energy and energy efficiency, eco-tourism, etc.

It is argued that during implementation these four paths of reindustrialization could utilise considerable synergy effects. More neutral regulations and incentives are needed to give the productive sectors and sub-sectors, the regions and municipalities, the global and regional value chains, and the green growth sectors and firms a more equal chance to develop and to generate employment.

#### ***1. 4 A coherent and comprehensive National Employment Strategy for Tunisia has to involve All Major Stakeholders***

*Concerning hypothesis four*, we argue that a coherent and broad-based national employment strategy must be based on all relevant stakeholders and on new concepts of employment creation, and that such a strategy needs a shortened implementation cycle. These issues are analysed in sections 5 and 6. The National Employment Strategy for 2013-2017 was a quite limited exercise, characterised by too many implementation weaknesses. Too many important actors were excluded, from ministries and public-sector authorities to private sector agents and civil society actors. New partners from the businesses’ side and from the workers’ side could play a role, as well as additional NGOs (non-governmental organisations) and CSOs (civil society organisations) to bring in the new social forces in a democratic governance system. The implementation cycle of economic reforms is extremely long in Tunisia, so that as part of a new National Employment Strategy the implementation cycle should be focussed on from the outset.

The various elements of the new employment strategy need to become reality in parallel steps so that a holistic approach is feasible just from the start. Also, a new national employment strategy needs to be balanced in terms of global partners (by collaboration also with non-EU trade and investment partners, especially those from Africa and the Near East), in terms of private sector development (via new policies and adaptation of laws on foreign investment, on privatisation of state corporations, on informal, communal, social and cooperative enterprises), in terms of sub-regional development policies (via adopting in economic policies a new paradigm of decentralisation, local mobilisation of resources and spatial development to focus on specific competitive advantages of the various regions). Also, the cooperation with regional and international organizations and with global development cooperation partners could be improved.

Based on all these findings, nothing less than an Employment Pact is proposed for Tunisia to impact on employment generation through economic reforms and multiple paths towards reindustrialisation.

## **2. Towards A Comprehensive Science, Technology and Innovation (STI) Policy in Tunisia**

### ***2.1 Identifying the Obstacles to Innovation in Tunisia and Consolidating the National Innovation System (NIS)***

It is most important to identify the obstacles to innovation in the private sector of Tunisia. On this basis it is possible to reconstruct the national innovation system (NIS). During their engagement in innovation activities, companies are affected by certain type of obstacles. Such obstacles can arise in the environment of the company or within the company, but also other sources of obstacles are possible (nine obstacles from O<sub>1</sub> - Economic Risk - to O<sub>9</sub> - Customers Responsiveness – are focussed on). Such an approach is relevant for policymakers, as a functioning national innovation system can be reconstructed from such bottom-up information about real obstacles to innovation which are confronting the companies in their daily work. However, it is necessary to relate these obstacles also to the structure of the enterprises, to their size, their R&D activity, their cooperation styles, etc. It is important to identify the barriers to innovation for formal and informal enterprises, for small and large ones, for export-oriented and for domestic-market-oriented ones. To identify the major internal and external factors that may influence or block the innovation process is a complex research work, but it is highly useful

for the policymakers in their effort to prepare for policy interventions. The focus is also on the possible complementarities between obstacles. Four couples of correlation are identified which have strategic importance: first, the economic risk ( $O_1$ ) and the high costs of innovation ( $O_2$ ); second, the lack of sources of funding ( $O_3$ ) and the high costs of innovation ( $O_2$ ); third, the lack of qualified personnel ( $O_5$ ) and the lack of information on technology ( $O_6$ ); and finally fourth, the lack of information on the market ( $O_7$ ) and the lack of information on the technology ( $O_6$ ). Innovation policy needs to react by policy changes to these four identified complementarities to support the firms in an appropriate way. The research on the obstacles and their complementarities mobilizes a systemic approach to innovation policy in Tunisia. Such an approach is highly needed as private sector-led innovations need support. As the data for the research on obstacles to innovation are based on an Innovation Survey done in the period 2002/2005 it is urgent to update the information – by using more recent Innovation Surveys and by extending the data base to all segments of the private sector (so, microenterprises and informal sector enterprises need to be covered as well). But, also the publicly owned companies need a coherent innovation strategy, for reasons of budget consolidation and because of the need to supply public services in appropriate quantities and qualities.

The findings from the empirical analysis for Tunisia and other studies on innovation in emerging economies reveal that there is a positive relationship between the perception of the obstacles and the ability of firms to achieve their innovation projects. This awareness encourages companies to develop strategies to minimize innovation barriers, through reorienting their business models, through developing internal R&D strategies, through exporting, through cooperation, through PPPs, and through building company and R&D networks. Not surprisingly, most of the difficulties which are faced by innovative firms are related to the problems of obtaining the necessary financial resources and to the risk of high costs of innovative projects. These firms are also concerned by the lack of qualified personnel and are more sensitive than others to the barriers linked to the internal resistance to innovation (because of fears about job security and personal adaptation costs). The lack of flexibility of regulations and the lack of customers responsiveness to new products or processes are strongly perceived by exporting companies (as they miss a domestic market to experience with new products). The cooperation with consulting companies (such services are still undersupplied in Tunisia) can help to reduce the intensity of the problems which are associated with the excessive costs of innovation, the lack of market information, the lack of flexibility of regulations, and the lack of customers responsiveness. But such companies have their price for their services (and so more competition in this sub-sector may be helpful). More public and private sector

activity towards creation, transmission and dissemination of information is needed. So, the more public information and public support is made available and becomes more easily accessible, the better will this be for the financial viability of innovation projects. The small and medium enterprises (SMEs) are concerned more than the larger companies by the risks of the feasibility of innovative projects and the uncertainties associated with such projects. And, just these companies are neglected and even discriminated by the public authorities in Tunisia. As external R&D support agencies do not easily reach most of the SMEs, new ways of supporting innovations in this segment of enterprises must be found (such as cooperatives, science parks, innovation clusters, and vocational training institutions). But these traditional and new institutions must be open to the small ventures and to new forms of cooperation of the R&D institutions with SMEs. Also, other programmes (innovation workshops and innovation vouchers) can have a role in overcoming obstacles to innovation. This overlaps with new forms of assisting the SMEs in their objectives for digital transformation. The successive engagement in R&D activities increases the awareness of the SMEs of the acute problems which are related to the cost of innovative projects and to the lack of information on technology; both factors may influence the innovation process in the firms. Therefore, internal R&D needs support in various ways (by taxation, PPPs, grants, etc.). Such public interventions are however rare in Tunisia.

To put in place a coherent National Innovation System (NIS) in Tunisia being favourable to the emergence of an innovation culture, some recommendations are urgent to be implemented by the policymakers. First, it is necessary to introduce new policies and strategies to ensure an enabling environment for the transfer of information, knowledge, know-how, and technology on the market; second, it is necessary to create a better learning culture in society and to continue and intensify training within the company; and third, to abandon the top-down (hierarchical) method of leadership by directives and to replace it with a more participatory (non-hierarchical) approach to leadership that encourages collaboration and interaction of all the staff and all the stakeholders in the enterprises. These interactions between staff and stakeholders will allow it to better exploit the skills and the new knowledge acquired through a better functioning national innovation system in Tunisia.

Regarding the removal of barriers to innovation, the public authorities have a great role to play at all governance levels. Various policies can be supported to promote innovation in enterprises. On the one hand, accompaniment, monitoring and networking policies must be put in place to financially consolidate innovative companies. On the other hand, the implementation of

National Technology Centres (NTCs) and of the Competitiveness Clusters Programme (CCP) should be accelerated, although reforms and adaptations for these programmes are needed and were already proposed. Moreover, when certain obstacles to innovation are complementary (what is the case for some key obstacles being identified), it is necessary to implement policies which are essential for the functioning of a virtuous ecosystem. To ensure the functioning of the ecosystem, public authorities are required to establish a stable institutional framework, a favourable tax environment, a comprehensive system of financing, an infrastructure for scientific quality training, etc. Such an ecosystem will be favourable for the dynamics of the labour market and supportive to the construction of innovative industries with higher added value. The interactions in the triptych "research system-university system-industry system" of Tunisia need to be intensified. Through their training in universities, researchers are enabled to engage in R&D and in innovation activities of firms, leading to the filing of patents, the publication of scientific articles, the creation of new products and / or processes, the more systematic cooperation with research and development partners, etc. Such a strategy will contribute to more R&D within the firms, what is necessary for a country like Tunisia to regain global competitiveness. But, the three systems need reforms - the research system (RS) and the university system (US) are not really interacting optimally, the research system (RS) and the industry system (IS) are not strongly cooperating, and the university system (US) and the industry system (IS) are not interacting productively. So far, all depends on budget allocations to the RS and the US and on subsidies to pursue R&D in the IS in cooperation with partners in the RS and the US.

## ***2.2 Innovation Clusters in Tunisia need to be related to holistic Regional Development Policies***

It is necessary to review the cluster policies pursued in Tunisia and to overcome the institutional voids confronting Tunisian companies when they work in clusters and with enterprises in clusters. The institutional context of the clusters in Tunisia will have to be examined in more detail, as the country has an impressive institutional infrastructure but lacks major successes resulting from it. Cluster policies need to be coordinated and integrated with regional development policies; they should be developed in an institutionally sensitive way by looking carefully at the institutional context for the operations of enterprises. This is possible by drawing on various interdisciplinary, inter-temporal and inter-sectoral approaches, such as those borrowed from new versions of the regulation theory, from development concepts which are emphasizing "binding constraints to growth" at the sub-regional level, and from regional



development concepts with emphasis on “smart specialization”. Looking at institutions in such a way, by defining them as “stable patterns of social interactions”, could make them more relevant for the enterprises which should benefit from cluster policies. Institutions matter in many areas of the cluster policy (technology transfer, training, infrastructure, market development, etc.). Institutions for human resources development are important to overcome the skills mismatch in the labour market. The institutional context is relevant for the acquisition of anchor tenants in clusters; and language competences of managerial and R&D staff affect the prospects of attracting multinational corporations (MNCs) as anchor tenants. A new look at institutions is therefore recommended for the upgrading of the cluster programme.

Those persons being responsible for the improvement of the Tunisian cluster policy can learn from experiences with clusters in European or Mediterranean countries which share some similarities with Tunisia in terms of their level of competitiveness, economic integration or proximity to the European Union (EU). Especially, the experiences of countries such as Croatia, Greece or Turkey (the latter with its particularly ambitious techno-park programme) could offer some interesting insights for the Tunisian cluster policy. A reform of institutions is needed when looking at the performance of the clusters in Tunisia. What may be the direction of such institutional reform? Objectives of reform policy are of integrating cluster schemes into more comprehensive and systemic place-based regional policies. The smart specialization concept offers a method for developing such a kind of comprehensive and systemic regional policy by linking specialized economic activities with underlying capabilities and competences emanating from a region’s knowledge base and with a set of future-oriented industry policies and development visions. Existing cluster structures can act as central pillars in developing and implementing such strategies. But this will work only if adaptation and tailoring of the cluster structures along the region’s capabilities guides the regional specialization. Some coastal and urban regions in Tunisia with a stronger focus on R&D and innovation will understand smart specialization quite differently from peripheral regions with a lower focus on R&D and innovation. Some regions will go ahead with innovation-led strategies towards high-technology product and services branches, while others will focus more on efficiency-enhancing measures, market access, and on agricultural and agri-food value chains. Regions with tourist destinations might focus on new offers in tourism and on linkages between tourism and other sectors or industries. So, the type of smart specialization may differ widely between regions, but government has to address these differences through a neutral support policy to avoid new forms of discrimination. This is not easy, and so far in the history of working with clusters as

an instrument of regional policy Tunisia was not that successful in its regional development and cluster upgrading policies. But various important policy recommendations follow from the deep analyses of the performance of clusters in Tunisia.

Key policy implications for Tunisian policymakers and international donors follow:

- Developing a new policy mix for supporting Tunisian regions and their innovation ecosystems through an integrated vision of regional policy, by going beyond but integrating existing PDC (Pôles De Compétitivité), CITs (Complexes Industrielle et Technologique) and CNs (Cluster Networks).
- International donors could assist the proposed reorientation of Tunisia's regional policy by introducing the concept of smart specialization to Tunisian policymakers at the national and regional level; the development of smart specialization strategies could be applied in a limited number of pilot regions. This needs to be done in the context of the established Tunisian institutions; the creation of new institutions is not advisable, as too many are existing already.
- Tunisian regions should take part in international peer-review processes for smart specialization programmes. OECD and EU fora for benchmarking among regions might invite Tunisian regions to take part in their peer-learning mechanisms. Specifically, the EU could invite Tunisia to use benchmarking tools and processes (including, for instance, workshops and seminars) of its Smart Specialization Platform which are already open to some non-EU regions in the EU's neighbourhood.
- Twinning initiatives between EU regions and Tunisian ones with similar or complementary regional specializations might facilitate mutual learning from experience, might give Tunisian regional decision-makers guidance in developing their own smart specialization programmes, and eventually might lead to joint initiatives to prioritize and promote promising trajectories based on the regions' knowledge bases.
- Tunisian regions should develop their own approaches towards smart specialization with their own experience and expertise. While learning from experiences made by other regions in other countries might give Tunisian decision-makers some guidance, copying solutions from abroad is not advisable. It is advisable to facilitate the development of solutions which are adapted to the Tunisian context of smart specialization strategies.
- Technical assistance to regional agents, such as Local Governments, Pôles De Compétitivité or CITs, on how to contribute to more systemic and bottom-up regional development processes in line with the smart specialization approach, and on how to organize the participatory entrepreneurial discovery process in an open and effective manner, could be offered on a

bilateral basis (e.g. through partnerships with EU regions which had already successfully designed and implemented smart specialization programmes).

- To facilitate evidence-based policymaking during the participative entrepreneurial discovery process for prioritization and action planning on the regional level, scientific regional analysis will be necessary to uncover specializations and capabilities which are available in a region's knowledge base and economy. Assisting this task could be the subject of further support by international donors and might be directed towards building local research capabilities in Tunisia.

- At the national level, Tunisian regional policy could follow a new orientation of place-based regional development policies which are based on a bottom-up entrepreneurial discovery process. For example, similar the EU's approach in regional policy, the Tunisian national government could require each governorate to submit a smart specialization programme which is based on a vision for the region and a thorough regional analysis of economic activities, competences and capabilities.

- The proposed policy shift will need to be consistent with the new investment code and the incentives which are defined there. Reviewing the broader legal framework for regional development, investment promotion, innovation, environmental protection, agriculture and agro-industries development, industrial development, and tourism development might contribute to ensuring consistency between top-down policies and bottom-up strategies (such as smart specialization programmes).

- The policy shift towards a regional policy mix with a more pronounced bottom-up orientation should focus on the institutional analysis of regional economies. It is highly recommended to accompany the design of new policies with research on the institutional conditions and implications of policy changes. A mapping of the functions, stakeholders, actors and operations of all the regional institutions is requested.

An integrated approach to a regional development policy would mean that a reorientation of Tunisian regional policy is followed and goes beyond isolated projects (such as PDC/Pôles De Compétitivité and CITs/Complexes Industrielle et Technologique). An integrated scheme would add a strong bottom-up element to the top-down orientation which is apparent in the design of Tunisian cluster policy so far. A policy shift could eventually lead to a more comprehensive, integrated and systemic approach to regional policy. Cluster policies and smart specialization strategies add to the toolbox of instruments for regional development policies and increase the flexibility of innovation policies at the level of regions.

### ***2.3 Innovations in the Health Sector of Tunisia will contribute to a Knowledge-Based Economy (KBE)***

The healthcare sector of Tunisia is of great strategic importance for the development of the country. The sector contributes to Goal 3 (Ensure healthy lives and promote well-being for all at all ages) of the Sustainable Development Goals (SDGs). It is a sector adding to the high technology potential of the country, as health infrastructure, health support systems and medical practices interact in an increasingly sophisticated healthcare value chain. This value chain includes also important pharmaceutical firms and enterprises producing medical technology products, health-related services, and health-related ICT solutions, but also integrate R&D centres, laboratories, certification institutions, general and specialized hospitals, recreation and rehabilitation centres. All these enterprises and institutions apply knowledge which is generated in various disciplines at tertiary education and vocational training institutions. There is a high demand from the healthcare sector for experts and staff and as well a huge demand for modern equipment and for IT solutions. The healthcare sector is also a promising export sector as health care services, drugs, ICT solutions, and medical equipment are exported. The health care sector is a vital part of the Knowledge-Based Economy (KBE), and it accounts as an important element of the Knowledge-Based Industry (KBI) in Tunisia. Mapping the features of the Healthcare Ecosystem is therefore important for developing a strategy towards the modernization of the services sector, but also for the reindustrialization of the country. By this mapping one can give a better appreciation of the favourable intersections that have benefitted the health sector growth and the performance of the sector, especially those intersections that have led to conducive conditions for the emergence of a Science, Technology and Innovation (STI)-Oriented Healthcare Knowledge-Based Industry (KBI).

Public policy can intervene by developing concepts, plans and strategies, by applying a large toolbox of instruments along the stated objectives on a broad scale, by providing data and information about the whole sector, and by crossing the public policy instruments with the KBI dimensions in the Tunisian context. Seven important public policy instruments are in use in Tunisia; some of them need a further strengthening to lead to a change of the system. First, it is necessary to strengthen the role of public health policy in the formulation phase and in the implementation phase. Second, the funding mechanisms for the healthcare sector are not adequate so that a stronger public role is requested in three major areas: subsidizing the system of healthcare services and of medical reimbursement; improving the taxation and insurance

systems at the national level; and funding more research so that the health system can be improved in major qualitative and quantitative directions. Third, medical standards need better regulatory control and more effective third-party control of hospitals and clinics. Fourth, public-private partnerships (PPPs) are increasingly important to finance hospitals and other health services providers in the country. Obviously, this area of public policy interventions is neglected very much, despite of some new regulatory effort by drafting laws on PPPs. Fifth, labour standards need improvement, especially for certification, upgrading of working conditions, and creating adequate benefits for professionals in the healthcare system. Sixth, operational standards for healthcare services and ethical rules for medical practices need more recognition in the system. Seventh, international cooperation and standardization is increasingly important and need to be followed through agreements in international and regional organizations. In all these seven areas where public policy interventions matter there is need for more action, although the worst case is the serious gap in regard of PPPs.

Knowledge-Based Industry (KBI) dimensions are developed consequently in Tunisia around four axes, and much more can be done to support development and consolidation of these four axes of the healthcare sector with the already available and with some newly emerging public policy instruments. These four axes are: first, the healthcare governance and institutional structures; second, the healthcare education system and professional bodies; third, the healthcare communication and information system; and fourth, the healthcare R&D and innovation system. Based on that classification, and after a qualitative scoring which stems from field observations, confirmed by exchanges with different stakeholders, the impact assessment alignment level for each of the seven policy instruments with the four dimensions of the KBI pillars is presented. Even though it is only a qualitative scoring and needs in the future a quantitative scoring frame, it highlights the strengths and the weaknesses of the various dimensions of the Tunisian Healthcare System. It is shown which policy instruments could be used to improve the status of the Healthcare Sector as a KBI. Actions at the levels of Healthcare Governance, Education, ICT and R&D are proposed. Also, the stakeholders are mentioned who need to act in a specific time frame. In regard of Healthcare Governance, the neglect of PPPs is a serious problem. In Healthcare Education, the gap with regard of PPPs is also serious, and improvements are possible and needed in labour regulations and with safety standards and ethics rules. In terms of Healthcare ICT there are observed weaknesses in all seven public policy areas, despite of the advances of the ICT sector in Tunisia. The same is true for Healthcare R&D. Obviously, these gaps related to KBI dimensions ICT and R&D are a severe problem for

developing the health sector as a KBI. Because of these deficiencies the healthcare sector cannot fully exploit the opportunities and advantages which were observed for Tunisia. A more thorough investigation for policy instruments and for KBI dimensions is however needed to get a full picture of the situation.

Three main strategic orientations are relevant to foster the emergence of a more competitive knowledge-based industry (KBI) in the healthcare sector that brings more well-being to the population through high-quality health services and generates more jobs for skilled staff and young graduates in Tunisia. The first strategic track concerns the acceleration of scientific and technological integration in the health sector value chains. This involves that regulatory constraints are applied on the acquisition of tools and computer systems by the public and private health sector institutions to ensure an interconnection of information systems for more efficient data management and a better service to be delivered to the patients. The second strategic track concerns the support to technology transfer and to the generation of digital start-ups in the E-Health field. This option requires a better collaboration between universities, research centres, and practitioners. It cannot be achieved without the role of the financial sector, which must allocate funds for the seed capital required by innovative projects. Finally, the third track concerns standardization and accreditation in the medical and para-medical fields. Tunisia would benefit from having a centre of excellence for the production and transcription of standards in the Healthcare Sector when it is regarded as a KBI.

Exploring these options will set the stage for a global and competitive healthcare sector in Tunisia based on knowledge and technology. This strategy is converging with the ambition of Tunisia to become an STI Hub for the African Continent. Although the potentials are there, many weaknesses need to be removed - at the level of the sector, at the level of the economy, and at the level of politics and policies. A prospering healthcare sector also requests that the overall business climate of Tunisia is favourable for entrepreneurial action and that the STI policies of Tunisia are adapted to the best practices. So, while the Healthcare Sector of Tunisia moves ahead and becomes a KBI, sustainable successes ultimately depend on the national competitiveness conditions. There is increasing trade potential for this Tunisian sector in Europa, in the North Africa region, and in the wider Africa region.

### 3. Sources of and Bibliographic Information on Publications

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### 4. Further Information on the Tunisia Project

[http://www.karl-wohlmuth.de/sti\\_policies\\_tunisia/](http://www.karl-wohlmuth.de/sti_policies_tunisia/)

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