

# Investment Analysis on Precision Medicine Project in Saudi Arabia

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**Abstract.** In recent years, precision medicine has increased public awareness, particularly since 2020, when the COVID-19 epidemic struck almost every country in the world. Saudi Arabia is one of the affected countries, and this public health issue has affected many aspects of the country, including some key decision making in political, economic, healthcare and other major sector. Saudi Arabia is a country with the largest oil export in the world, and controlling the second largest oil reserves and the fourth largest gas reserves in the world, all these significant advantages make it occupy an important position in international relations. However, these advantages have also been a problem in the national development in the Kingdom of Saudi Arabia. For example, the revenue of the nation is too dependent on oil, resulting in uneven industrial development. With the launch of Saudi Vision 2030, the government shows its ambition in non-oil sectors and the nation also shows high interest on healthcare sector, such as precision medicine. In order to analyse the investment feasibility in precision medicine related projects in Saudi Arabia, data from different directions, such as political, economic, social and technological factors have been analysed.

**Keywords:** Precision Medicine, Saudi Arabia, Investment.

## 1. Introduction

Precision medicine, commonly referred to as "personalized medicine," is a cutting-edge strategy for adjusting illness prevention and medical care to each patient's unique traits, such as genes, lifestyles, and environments. It aims to classify individuals into different categories through differing in their response to a particular treatment or their susceptibility to a specific disease, and then target the right precautions and/or treatments to the right population at the right time [1, 2]. Therefore, it is not precise to describe precision medicine as the drugs creation or medical equipment that are unique to an individual. This would have the benefits of concentrating preventive and/or therapeutic interventions on those with efficacy, sparing expense and decreasing adverse effects for those without efficacy [2].

Precision medicine, which tailors disease prevention and treatment based on individual genetic, lifestyle and environmental differences, is not a new concept. For instance, the method of matching the blood type of transfusion patients with blood donors has been applied for more than a century. However, with the development of genetics, and the growing availability of health data, provide people an opportunity to make precise personalized care become a clinical reality. In the 21st century, the rapid growth of Next Generation Sequencing (NGS) technology presenting a chance to apply precision medicine into clinical practice. Within just two decades, the technology went from costing around US\$3 billion and taking more than a decade to sequence the first human genome in 2001, to nowadays, many genomes can be sequenced with only approximately US\$1,000 each in a single day. As a result of the capability of NGS tests in fast identifying large sections of an individual's genome, genome sequencing has now entered clinical practice, such as the diagnosis of rare disorders, which cannot be done by conventional techniques. It makes significant strides in the clinical applications of precision medicine, enabling doctors and researchers to diagnose and treat patients on an individual basis and to better understand human disease through genetic variants detected by NGS tests [1, 3].

In global, the applications of precision medicine are fast growing nowadays, which make great efforts in lives saving, genetic risk warning, health care costs reduction, and quality of life improvement. Precision medicine has now been widely applied in oncology, genetic diseases,

pharmacogenomics, non-invasive prenatal testing, genetic risk and public health, which shows its growing importance to the healthcare industry gradually, both in preventive and clinical medicine.

The advances in Precision medicine application have also shown its impacts on the macroeconomy, such as the full economic impacts and the fiscal impacts of healthy and sick population. With the aging of the global population, more and more countries have already or have the plan to extend the retirement age, in order to keep balance between labour supply and pension burden. One key factor to achieve this goal is to make sure there are enough healthy population who are still able to work after the original retire age. From a fiscal point of view, the sick and disabled population require extra financial support from the government, representing negative cash flows, while healthy population increases taxes, representing positive cash flow. In addition, poor health often leads to early retirements, which represents increased pensions. Any valuation analysis should take these cash flows into account in terms of how emerging technologies, like precision medicine, will affect cash flows [4]. In order to deeper into the precision medicine, it will be easier for understanding to separate the precision medicine into two broad types, which are Precision Medicine ‘Targeting’ (PM 1.0) and Precision Medicine ‘Breakthrough’ (PM 2.0). The first type focuses on the multidimensional (omics) information, such as genomics, transcriptomics, proteomics, epigenomics, metabolomics and other individual data can be used to target patients groups to improve safe and effective of conventional therapeutics to achieve precise diagnostics. The second category focuses on biologics rather than small molecules and leverages omics-based cell and gene therapies (like CAR-T) to genuinely give individualized care. In a medium to long term, prices will reduce due to scale economics and market competitiveness [4].

## 2. Global developments of precision medicine

With a compound annual growth rate (CAGR) of 11.5% from 2022 to 2030, the market for precision medicine, which was valued at USD 66 billion in 2021, is anticipated to increase to USD 176 billion by 2030. The largest market is in North America, while the fastest-growing market from 2022 to 2030 is expected to be in Asia Pacific (Data Source: Precedence Research).

The U.S. Food and Drug Administration (FDA) has authorised numerous applications of precision medicine in clinical therapies, and this field's advancements have already produced some significant new findings. For example, the test for oestrogen receptor (ER) positivity in breast cancer, the radioisotope-based receptor-binding assays for ER were described at first time in 1973, while replaced by immunohistochemical assays later. The first ER test was approved by FDA in 1981, and the latest approval was in 2013 [5]. With the development of genome sequencing technology, trastuzumab is indicated for adjuvant breast cancer treatment of human epidermal growth factor receptor 2 (HER2) overexpressing node positive, or node negative with ER/progesterone receptor (PR) negative or one high risk feature of breast cancer [1]. From a co-development perspective, the development of tests for HER2 to accompany trastuzumab is widely recognized as the first example of a companion diagnostic [5]. Nowadays, molecular testing will be provided as a routine care to the patients with a variety of cancers, which enables physicians to choose the most appropriate treatments for patients to improve chances of survival and decrease exposure to side effects [1].

In Europe, a 27-country network cofounder by the European Commission, has built a comprehensive, manually curated and expert reviewed knowledge-based specific for rare diseases (RDs), which is called Orphanet. Orphanet resource is also recognized by the International Rare Diseases Research Consortium (IRDIRC) and the Elixir Core Data Resources. The catalogues related to rare diseases shown in Orphanet database including malformation syndromes, encompassing diseases, biological and morphological anomalies, and some clinical situations particularly considered as ‘rare in Europe’. This database can improve patients with RDs in diagnosis, care and treatment. The structure of catalogue follows the classification in medical domain with corresponding annotation, such as medical classification, inheritance, genes, age of onset, and research resources [5].

In Saudi Arabia, the government, research institutions, and hospitals are working together to advance the Saudi Genome Program (SGP) in 2018, which plans to build a gene bank particularly for Saudi Arabians. The King Abdulaziz City for Science and Technology's (KACST) implementation of the Saudi Genome Program is evidence of the government's focus on the nation's healthcare system. The goals of this initiative are to establish the physical and legal framework necessary for the development of customised medicine while minimising and preventing genetic illnesses through the use of effective screening and detection tools. This significant medical advance focused on the genes that caused the genetic disorders detection in the Kingdom. So far, the program has sequenced 61,177 samples, involved 604 researchers who are database users, and identified of 7,500 variants of which 3,000 are novel variants causing 1,230 rare genetic disorders. While genetic test is only one of the applications of precision medicine. Social and government awareness in precision medicine is raising higher during the recent decade, especially after the COVID-19 pandemic, its use in detection and treatment helped human beings successfully fight against the virus quicker and more precise than ever. Saudi Arabia, due to its unique political and economic environment, lifestyle and cultural habits, will be a country with huge potential market for precision medical investment market.

### **3. Market analysis on investment prospects in Saudi Arabia**

#### **3.1. Political factor**

In 2016, Saudi Vision 2030 was launched by His Royal Highness the Crown Prince Mohammed bin Salman. This vision is mainly based on three pillars. The first one is the geographic location with important strategic significance. The Kingdom Saudi Arabia (KSA) is located at the centre of the Arab and Islamic worlds, which enables to build its leading role in this world. The second one is the determination to be a worldwide investment powerhouse. With the strong investment power of KSA, it is expected to harness to create a sustainable economy and diversify the revenues. The third pillar is to build its role as an integral driver in international trade and continents connection among Europe, Asia and Africa. According to the ambitions of the KSA, a safe, sustainable and rapidly developing economic investment environment can be expected in the next 10 years [6].

The Saudi Vision 2030 is formed by three themes, which are a vibrant society, a thriving economy and an ambitious nation. One main direction of the economic sector is investing for the long-term, one important mission is to privatize the government services, which contributes less than 40% of GDP currently. It is strongly believed by the government that private sector will play an important role in contributing KSA GDP in the future, through creating new investment opportunities, encouraging innovation and competition, facilitating investment, removing all the obstacles preventing it from improving status. The healthcare is also mentioned in economic sector that the government will continuously improve and reform the local regulations, provide opportunities for investors and the private sector to acquire and delivery health care services, which are currently offered by the public sector. The government will mainly focus on building the capability to regulate and monitor during and after this transition. And investment will be encouraged to increase the contribution of private sector in healthcare as well.

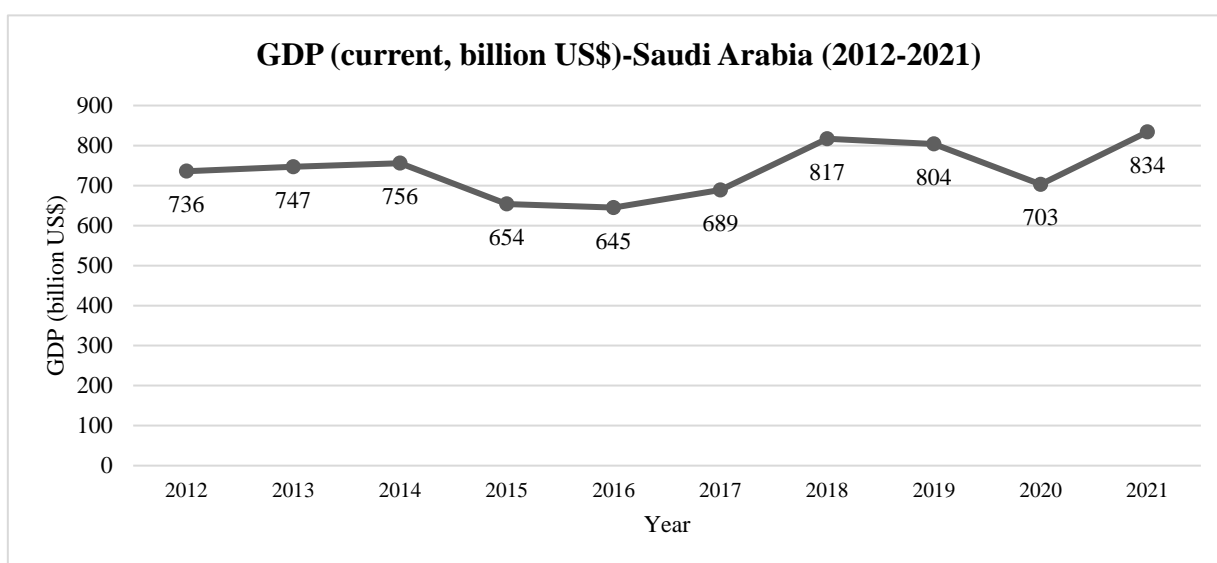
The Saudi Genome Program, launched by His Royal Highness, Crown Prince Mohammed bin Salman bin Abdulaziz, is also one of the frontier national initiatives within Vision 2030. Its goals include creating a Saudi genetic database, lowering the prevalence of genetic diseases in the country, enabling scientists and researchers to take advantage of a database of genetic information, analysing genetic variants, and developing diagnostic and preventative tools to lower the incidence [6].

#### **3.2. Economic factor**

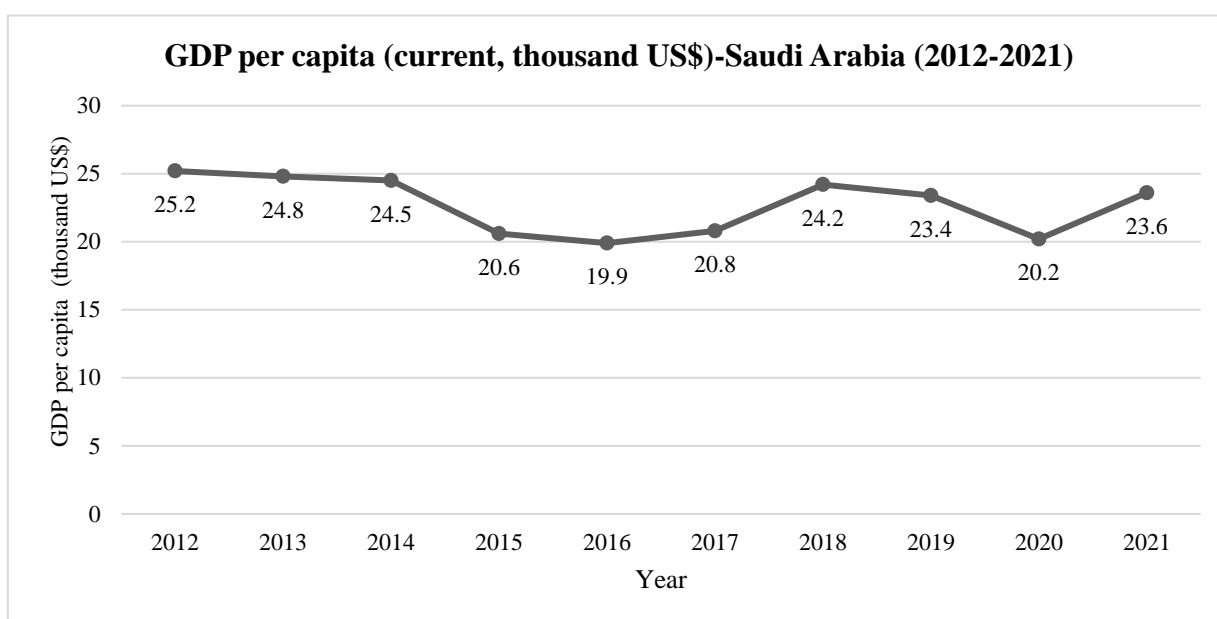
##### **3.2.1 Fiscal policy**

According to the World Bank, the GDP of Saudi Arabia kept growing for the most of the last ten years (see Figure 1). Although the data dropped due to the COVID-19 epidemic in 2020, it recovered

immediately in 2021 and reached an all-time high of nearly a decade. The annual growth rate reached 3.2% in 2021. The performance of non-oil activities showed a real growth of 6.1% which reached the highest growth in non-oil sector since 2013. At the same year, the oil activities grew by 0.2% due to the result of the economic recovery from the negative influences caused by COVID-19 pandemic. The similar condition in GDP per capita (see Figure 2), in 2020, the data decreased from US\$23.4 thousand to US\$20.2 thousand (growth rate: -5.6%), but conversely grew to US\$23.6 thousand with the growth rate 1.7% in 2021. (Data Source: The General Authority for Statistics and the World Bank) Real Gross Fixed Capital Formation Index growth actual performance of 10.1% as the Government continuously put efforts in the structural reforms to diversify the economy as described in the Saudi Vision 2030. And the Saudi Government will keep following the instructions given by the Saudi Vision 2030 in business environment improvement and opening new horizons for both domestic and foreign investors. In addition, enhancement in the role of private sector to transfer it to the main driver for economic growth has also been mentioned in the Saudi Vision 2030 [7].



**Figure 1.** GDP of Saudi Arabia during the period of 2012 to 2021 (data source: World Bank).  
(Photo credit: Original)



**Figure 2.** GDP per capita of Saudi Arabia during the period 2012-2021 (data source: World Bank).  
(Photo credit: Original)

One main fiscal performance is the total actual revenues, which was recorded around SAR 965 billion in 2021, exceeding the approved budget by 13.7%, which benefited by the increased revenues in both oil and non-oil sectors. Compared to 2020, non-oil revenues increased from SAR 369 billion to SAR 403 billion (growth rate: 9%), however its share of total revenue has decreased compared to last year (from 47.2% to 41.8%). That may be because the rise in oil prices results in a greater increase rate in oil revenues, which indicated the recovery in the worldwide demand and the developments in oil markets.

The second fiscal performance is the total actual expenditures, which was recorded approximately SAR 1,039 billion, accounted for 33.2% of the total actual GDP. According to the Ministry of Finance (MOF), in 2021, there was an increase in the actual expenditure on the Health and Social Development Sector by around 12.9%. An increased spending on Health and Social Development Sector driven by the expenditure related to the COVID-19 Pandemic, such as expanding the age range for vaccines to younger ages and providing free additional doses of the 3rd booster vaccines, etc [7].

According to the actual performance in H1 of 2022, the revenues and expenditures recorded around SAR 648 billion and SAR 513 billion separately, with the surplus at the end of H1 of 2022 reached about SAR 135 billion (in Table 1). According to the actual revenues in H1, the oil revenues accounted for 67% of the total revenues, with an increase of 12 percent compared to the H1 of 2021, which means the share of the non-oil sector fell by 12 percentage at the same period, from 45% to 33% [7].

### 3.2.2 Shifting demographics

According to a 2016 demographic census, the population of Saudi Arabia rose from 27 million in 2010 to 32 million in 2016, with an average annual rise rate of 2.54%. The number of Saudis increased to 20 million, accounted for 63.2% of the total population in 2016 comparing with 19 million, represent 56.34% in 2010. The male/female distribution in total population was 57%/43% in 2016 [8].

Due to the significant population ageing, Saudi Arabia is going through a period of significant demographic transition. The population ageing in Saudi Arabia study and statistics indicate that there has been a considerable change in age structure, primarily due to the reduction in fertility rates and the rise in life expectancy. By the end of 2050, there will be over 10 million Saudi Arabians who will make up 25% of the country's overall population, or more than 6 million people. Compared to the data of the same age group (60 years or more) in 2010 and 2020, which were 4.4% (1.1 million) and 6.9% (2.1 million) separately, indicating that there will be a quick change in the population demographics in the next several decades. In addition, the number of populations in age group 80 will also grow up, which is expected to reach 4% of the total population 1.6 million by the end of 2050 in Saudi Arabia [7].

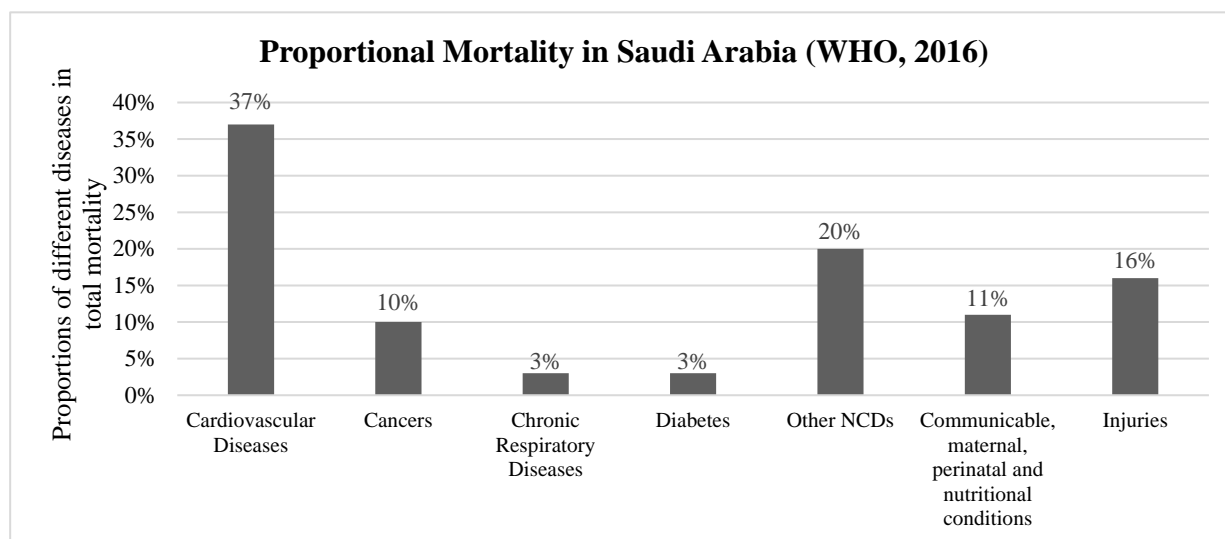
**Table 1.** Comparison between actual revenues in H1 of FY 2021 and FY 2022 (Data source: MOF).

Revenues (SAR Million)	H1 (2021)	H1 (2022)	Change
Oil Revenues (SAR Million)	248,726	434,063	75%
Non-oil Revenues (SAR Million)	204,141	214,260	5%
Total	452,867	648,324	43%

What's more, the population in elderly group is becoming healthier and healthier in the recent decades due to the development in medicine, improvement in living environment, etc. There is a terminology to describe this phenomenon in demographic terms which is called the "compression of morbidity". James Fries and Aimee Swartz coined this professional term to explain the shortening of the temporal horizon between the age of death and the onset of chronic illness or disability. [9]. The "compression of morbidity" has two basic causes: first, life expectancy has increased; second, diseases tend to have shorter half-lives and typically strike elderly people in their later years [7].

Saudi Arabia is a country with high incidence of Non-communicable Diseases (NCDs), mainly including cardiovascular diseases, cancers, diabetes, etc, and most of them are chronic diseases.

NCDs bring huge burdens in both economy and public health. In general, the prevalence of chronic disease reached 16.4% among all the Kingdom population, including both non-Saudis and Saudi population. The data shows that there is just a slight difference between Saudi males and Saudi females, 19.4% and 20% respectively. According to WHO (2016), NCDs are estimated to account for 73% of all deaths in Saudi Arabia. Among them, cardiovascular diseases accounted for the largest proportion (37%), followed by cancers (10%), diabetes (3%), chronic respiratory disease (3%) and other NCDs (20%), as shown in Figure 3. With the surge of aging population, the prevalence of NCDs will rise as well and further increase expenditure in public health sector.



**Figure 3.** Proportional mortality in Saudi Arabia published by WHO in 2016.  
(Photo credit: Original)

An upsurge in population aging will not only affect public health, but also bring enormous impact on both macroeconomic and fiscal consequences in Saudi Arabia. Firstly, in Saudi economy, the dependency ratio is expected to increase from 46% in 2015 to 52% in 2020. Secondly, as the elderly population grows and fertility rates fall, more people are expected to apply for pension benefits while fewer people are expected to be employed. As a result, current employees will have to pay higher premiums in the future to cover the increased pension costs and increase pension fund savings. One alternative is to raise the retirement age from 60 to 62 years old, as has been suggested by Shura Council, in order to minimise the cost of pensions and enhance the labour supply with experienced and competent people. Moreover, the Saudi stock market and other assets held by them will suffer from the current trend of saving less and spending more for an older population (less investment will result in a decline in the prices). However, it is anticipated that the senior population in Saudi Arabia will save more and work longer if the demographic phenomena known as "compression of morbidity" occurs in the country's economy. Simultaneously, the elderly rate will increase from 5.4% (1.6 million) to 25% (10 million) during 2015 and 2050, the public expenses on health are also expected to rise during that period. While the increase in health care costs will be largely offset by a decrease in education expenditure as the young dependency ratio falls from 41% to 24% during the same time period.

The economy in Saudi Arabia may experience slower growth starting in 2035, according to data from the United Nations, as a result of high rise in the population of those 60 and older. Because a high rate of saving and a large labour supply are necessary for a high pace of economic growth. People who are 60 or older typically produce less labour, save less money, work fewer hours owing to retirement or illness, and consume more. Saudi Arabia may consistently have an economy with a high rate of growth if the "compression of morbidity" is satisfied and the senior population is permitted to work longer [10].

As mentioned above, saving and labour supply are key factors when evaluating the economic growth. Quantifying the economic effects of an ageing population over 60 is crucial. In Saudi Arabia,

this is done by using the labour force participation rate (LFPR), which measures the ratio of the labour force to the population aged 15 and older. Table 2 (Data Source: SAMA Working Paper, 2015) illustrates that the total LFPR is predicted to decline from 53% to 48% during 2010 and 2050. Before 2030, the total LFPR will only change by 1% in the past two decades, which because the proportion of elderly population will still be low during that period. After 2030, the total LFPR will drop by 3.3% in the next decade, due to the sharp rise in the proportion of elderly people. According to the data shown in Table 1, the proportion of aging population will be levelling off between 2040 to 2050, with only 0.1% change in the total LFPR. Therefore, the escalation in the proportion of age group (60 years old or more) will have a negative impact on Saudi Arabic economy reflected by the decreased rate of labour force participation.

**Table 2.** Labour force participation rate in 2010, 2030, 2040 and 2050.

	2010	2030	2040	2050
Labour force participation rate (LFPR)	53%	52%	48.7%	48.6%

A different ratio, the labour force to total population ratio (LFTP), has economists' attention in addition to the LFPR. As Table 3 (Data Source: SAMA Working Paper, 2015) shown, the LFTP will keep increasing between 2010 and 2030 (increase from 37% to 42%), and then it will have a fluctuation from 2030 to 2050 (decrease from 42% to 38% during 2030 and 2040, then increase to 40% in 2050), which could be attributed to a synergistic effect of fertility and ageing. The explanation for the increase between 2010 and 2030 is that the proportion of aging population will not rise that much and at the same time, there will be a future drop in fertility. It is anticipated that an increase in the share of elderly population and a decrease in youth dependency will balance one another out. Thus, the total LFTP rate will still increase during 2010 and 2030. The LFTP will decrease by 4% between 2030 and 2040, which probably caused by the sharp increase in the proportion of aging population during the decade. When the proportion of elderly people become stable after 2040, the LFTP will only change slightly in the next decade, which matches to the prediction given by the LFPR.

**Table 3.** Labour force to total population in 2010, 2030, 2040 and 2050.

	2010	2030	2040	2050
Labour force to total population (LFTP)	37%	42%	38%	40%

It is preferable to divide economic growth into two components, growth in LETP and growth in GDP per worker, to make it easier to comprehend the impact of LFTP on economic growth (W). GDP per worker would then be equal to  $\frac{GDP}{W}$ . The following formulas will be created by dividing the denominator and numerator by the total population figure (P):

$$\frac{GDP}{W} = \frac{\frac{GDP}{P}}{\frac{W}{P}} = \frac{GDP}{LFTP} \tag{1}$$

Taking the log to calculated approximate grow rates of GDP per capita:

$$\ln\left(\frac{GDP}{W}\right) = \ln\left(\frac{GDP}{P}\right) - \ln(LFTP) \tag{2}$$

The growth rate can be calculated as follows:

$$g = \ln\left(\frac{GDP_{t+1}/W_{t+1}}{GDP_t/W_t}\right) + \ln\left(\frac{LFTP_{t+1}}{LFTP_t}\right) \tag{3}$$

The actual GDP per capita between 1970 and 2010 has been determined, with the assumption that the same trend will be followed between 2010 and 2050, in order to apply the previous equation to

the real economy. The estimates show that between 1970 and 2010, the average economic growth rate per person was 1.24%. And according to the predictions, from 2010 to 2050, it will expand by an average of 1.74% per year. The prospective economic benefits of the higher LFTP in terms of real economic growth per capita are relatively positive.

When assessing the impact of precision medicine at the full economic level, both GDP and non-GDP related impacts need to be considered. A healthy population contributes positively to the national economy through consumption and unpaid labour. Precision medicine, such like any innovation, is supposed to be considered a growth driver with associated value for the national economy [4].

### 3.3. Social factor

#### 3.3.1 Education levels

The Organization for Economic Cooperation and Development (OECD) reports that at the same educational level, the net enrolment rate reached 96.1%, while the gross enrolment ratio entered the elementary schools at about 103%. Saudi Arabia achieved 109.9% gross enrolment and 83.1% net enrolment for secondary education (International Standards: Intermediate and Secondary Stages). Saudi Arabia's gross and net enrolment in higher education (The University Stages) was 90.1% and 46.4%, respectively [8].

Table 4 (Data source: OECD) demonstrates that Saudi Arabia had gross and net enrolment rates of 106.3 percent and 90 percent, respectively, at all levels of public education. The gross enrolment rate for Saudi males is greater than that for Saudi females (102.4% and 116.6% respectively) at both the primary and secondary levels (103.6% and 117% respectively). In contrast, Saudi Arabia's female population at the university level has a greater gross and net enrolment ratio (97.5% and 51.6%, respectively) than Saudi men (83.1% and 41.6%, respectively). This may be due to the fact that male students immediately enter the workforce after completing their secondary education whereas female students prefer to continue their studies in colleges [8].

**Table 4.** The gross enrolment rate and net enrolment rate in different public education stages.

Different stages in public education	Gross Enrolment Rate	Net Enrolment Rate	Gross Enrolment Rate			Net Enrolment Rate		
			All	Male	Female	All	Male	Female
Primary Education	103%	96.1%	106.3%	103.6%	102.4%	90%	-	-
Secondary Education	109.9%	83.1%		117%	116.6%		-	-
University Education	90.1%	46.4%		83.1%	97.5%		41.6%	51.6%

The Saudi Arabian illiteracy rate has two basic characteristics. One is age disparity, which is calculated as 7% of Saudis being illiterate, with the percentage rising as the age group passes from younger to older. In age group 10-14, there is only 0.7% of the population are illiterate, while it increases to 52.7% in age group older than 65 years old. That mainly because the younger generation have better opportunities to access education system than older generation. The age distribution of illiteracy for various genders does not deviate much from the distribution of the population as a whole. Geographic difference is another trait. Riyadh (4.7%) and Aseer (12%) have the lowest and highest rates of overall male and female illiteracy among Saudis [8].

#### 3.3.2 Cultural custom

Consanguineous marriage is popular in many countries, especially among Muslims. In Saudi Arabia, although the education rate is increasing fast, the prevalence of consanguineous marriages seems have no obvious reduce among generations [11]. Among top four countries of consanguineous

marriage, Saudi Arabia has the highest rate, which is 42.1% to 66.7%. An increase incidence of genetic diseases will result from high consanguineous marriages. Raising public awareness of genetic testing is important on both the government (hospital) side and the individual side to reduce the burden of genetic disorders. Improved population awareness and application of genetic testing will have a significant impact on their medical decisions [12].

### **3.4. Technology**

#### **3.4.1 Biomedical technology**

In the Kingdom of Saudi Arabia, there are two critical elements developing fast to support bio-related industries: biotechnology and medicine, which doubled in size during the last decade. The development of conventional products in medical field, such as vaccines, stem cell therapy, recombinant insulin, monoclonal antibodies, antibiotic, bioengineered tissues, etc., is largely relied on the innovative development in biotechnology tools. Localized innovation and development of medical technology tools will decrease the rate of conventional medical imports, which currently accounts for around 65% of the Saudi expenditure. In the future, the government will put more efforts on localizing manufacturing tools of medical products, like RNA interference technologies, human genome project, gene therapy, bio nanotechnology and induced pluripotent stem cells. At the same time, manufacturing innovative solution in medical field will also benefit on reducing national expenditure on medical imports, and further create more high-wage job opportunities, boost local economic development. The research and development of modern biotechnology and medicine will bring a cleaner environment, higher life quality and great tremendous opportunities to the Kingdom of Saudi Arabia.

#### **3.4.2 Financial technology**

The Financial Sector Development Program (FSDP) introduced in 2017, is another one of the frontier national initiatives under Vision 2030. Its goal is to create a strong and diverse financial sector that would promote economic growth, revenue diversification, saving and investment stimulus. The FSDP added the FinTech Strategy to its transformation strategy. The FinTech is a technology to boost the innovation in financial services and create new business models, process, products and applications, which will bring great impact on financial services. On the purpose of positioning Saudi Arabia as one the leading countries in FinTech sector, the strategy plans to raise the number of companies in the field of FinTech operating to 525 by 2030. This achievement will bring about 18,000 jobs in the field of FinTech, and increase its GDP contribution to SAR 13 billion, and volume of venture capital investments to SAR 12 billion.

## **4. Conclusion**

The Kingdom's ambition under Vision 2030 is to open the country to the world, and make Saudi Arabia as one of the leading countries in the world competition. The government's determination to reform the economics structure, such as increasing the share of non-oil sector and private sector in total revenue, will create a huge amount of new opportunities in precision medicine. Although, according to the data in 2021, the economic structure is still relying on oil sector (58.2%), the performance of non-oil sector shows highly potential in growth with increased revenues from SAR 369 billion to SAR 403 billion (growth rate: 9%). According to the Saudi Vision 2030, a lot of financial and medical projects have been or plan to be launched in the next decade. Future expansion of the market in precision medicine is anticipated owing to the increase in the geriatric population and the increase in the healthcare burden of non-communicable diseases, such as diabetes, cancer, cardiovascular diseases, which all require precision medicine. The LFTP shows positive data during the overall period of 2010 to 2050, but during the 2030 to 2040, both LFTP and LFPR shows negative data. In order to solve this problem, the process of building capabilities of precision medicine in both public and private sectors to extend retirement age for labours, decrease or postpone pension

expenditure, maintain steady economic growth will be accelerated in the next decade to fulfil the Kingdom's ambition under Vision 2030. In addition, to achieve this goal, the importance of private sector in precision medicine will play an even more important role in the nation. The precision medicine industry is a rising industry in Saudi Arabia without doubt, and the investment advice for precision medicine projects with mature strategic plan is positive. For example, short-term for sales of reagents, medical devices or medical service, mid-term for International Clinical Laboratories to localize the service, and long-term for precision medical centre (including medical check-up centre, health management centre, gym, health supermarket, central kitchen and so on) to build a downstream industrial chain and form a closed commercial loop. To be noted, precision medicine is high tech industry, covering basic medicine, preventive medicine and clinical medicine, which enables to provide medical solution for an individual's whole life cycle.

Major progress and rapid development have been made in both scientific advances and therapeutic breakthroughs, but the progress of precision medicine is still quite slow. The key obstacle may not be scientific but rather economic, which could be the explanation. Due to the special cultural characteristics of Saudi Arabia, the customs here are still relatively conservative. Although the government is promoting openness, the process will be even slower due to more cultural barriers than other regions. Therefore, precision medicine related projects have the characteristic of high investment with high return in Saudi Arabia, which requires sufficient cash flow for a long period.

From the national level, alternative options based on nation specific systems, such as new models of funding or business required. For example, many healthcare systems in Europe have started to combine the public and private healthcare providers to make the fees available to be co-paid by both public and private insurances. Under emerging precision medicine, new models of funding need to be analysed with regards to pay for cell and gene therapies, which seem to need a large amount of upfront expenditure and obviously cannot be afforded by the current healthcare systems. According to conservative estimate of WHO, system waste accounts to approximately 20% to 40% of total care expenditure, if it can be reduced, funds will be released to use in curative treatments. One solution to facilitate the efficiency of healthcare value chain is to carry out pricing based on indications and outcomes. In order to better develop precision medicine, there is still a lot of space for improvement in healthcare system of Saudi Arabia.

In general, the Kingdom of Saudi Arabia provides both the dominant and oversea investors a stable, growing and opening economic environment, and the government is trying to raise the importance and increase the share of the private sectors in its overall GDP. The economic implementation works perfectly with the Saudi Vision 2030, a growing market of precision medicine is positively expected for the following decade.

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