KUWAIT's LABOR MARKET DYNAMICS DURING THE CORONAVIRUS PANDEMIC
Policy Lessons from TED's CEO Survey, Labor Force Supply and Household Survey 2020

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1. INTRODUCTION

The focused research conducted in this paper is part of a broader integrated policy-supportive research that aims to study: (1) the differentiated impact of coronavirus cum oil price collapse on the Kuwaiti economy, its labor market dynamics and viability of its business firms, especially SMEs; and (2) the policies needed to safeguard its longer-term sustainability under rapidly changing oil and energy market dynamics, automation and the penetration of business disrupting technological innovations. The present paper reviews the labor market and its profile over Kuwait's growth cycles and derives estimates of the growth rates of labor productivity in the overall economy and according to key sectors. As well, the paper applies the Ackerberg et. al (2015) econometric estimation varieties to firm-level establishment survey data in order to derive total factor productivity and its time-varying growth. Formal model findings are then blended with the Techno-Economics Division's, TED's, recent surveys in order to provide a more complete set of research findings. TED's field surveys are as follows:

1. TED's CEO survey data conducted during September-December 2020. The survey was designed by KISR's Techno-economics Division and polled about 262 business leaders of small, medium and large companies and establishments. Among other aspects, Kuwaiti CEOs were probed about their assessment of the economic toll of the coronavirus pandemic on employing Kuwaiti and Non-Kuwaiti workers and on recession severity gauged by contracted company sales. Furthermore, CEOs were asked about their expectations of the future direction and magnitude of their demand for labor in the post-coronavirus economy especially when factoring in the increased pace of automation and probable replacement of machines for human labor.

2. TED's Labor Force Survey which was also conducted in parallel during the same period September-December 2020 and gathered info and data on the labor characteristics of a purposely drawn up sample of 420 Kuwaiti and Non-Kuwaiti workers. The survey fetched data on worker's age, education, job-affiliation or profession, firm-specific experience, total labor market experience, monthly wages, working hours, incidence of last unemployment spell, and the number of times each worker experienced job mobility (number of times changed jobs) during past career.

3. TED's Household Survey which elicited the responses of some 250 Kuwait and Non-Kuwaiti households regarding household-experience of the coronavirus-recession severity summarized by household members losing employment opportunities and wage and salary cuts that any members endured as a result of the pandemic. As well,

the survey asked about impact of the coronavirus pandemic on household resources compared to levels that existed at the end of 2019. Households provided info regarding estimated changes in expenditures on a broad set of expenditure groups including food, transportation and travel, health hygiene and prevention, and remote learning etc.

Besides data analysis of the three field surveys, the research conducted herein draws on Kuwait's high frequency time series data covering total employment from PACI as well as the CSB Establishment Surveys data covering 6000 establishments annually which are used to generate productivity estimates. Specifically, TED applied a variety of methods that were recently suggested by Ackerberg-Caves and Frazer (2015) the Levisohn and Partin method (2003) and the Olley and Pakes method (996) and the Woodridge method (2009) in order derive total factor productivity in the Kuwaiti economy during period 2003-2018. Besides the manufacturing sector, productivity estimates are generated for the whole economy and key sectors. Growth rates of labor productivity and of total factor productivity are then contrasted against the growth rates of wages in the whole economy and in the key economic sectors. The findings strongly suggest the hypothesis that total factor productivity growth rates have been trending downwards. Accordingly, a major source of growth in modern economies, is in fact minute in magnitude in Kuwait's context (Adler, et.al 2017, Article IV, 2017). A closely linked finding is that wages have been growing at annual an average rate of 4.1%, which is double the corresponding growth rate of labor productivity, 2.1%.

The remainder of this paper is organized in five sections: The first reviews long term trends in Kuwait's labor market and its pattern over the growth cycles which TED had derived chronologies of using standard filtering methods and the NBER approach for identifying economic troughs and peaks. In the second section key findings of TED's Labor Force Survey conducted under coronavirus recession are presented and salient implications are discussed. The third section presents a narrative drawn up from TED's survey of Kuwaiti CEOs. The section focuses on responses provided by Kuwaiti business leaders about their assessment of the impact of coronavirus on the demand for labor according to nationality. It also addresses the assessment of CEOs regarding their expectations of future demand for Kuwaiti and Non-Kuwaiti workers and the role of automation in influencing their future labor demand. Section four provides empirical estimates of labor productivity growth as well as estimates of the time-varying growth rates of total factor productivity, TFP, in the whole economy and according to key manufacturing niches and economic sectors (ISIC-level 3 TFP not displayed in the paper

for space considerations). In the fifth and final section, the paper articulates elements of productivity-lifting and innovation-fetching strategy which the analysis strongly suggests.

1.1 Employment and Kuwait's Growth Cycle

Building on TED's seminal work in identifying growth cycles and the chronology of recession dates for Kuwait, Figure 1 superimposes on identified recession spells the growth rates of total employment, shaded blue, as well as the growth rates of real GDP2015 as published by CSB. Using standard and internationally-practiced methodology, TED generated quarterly data from CSB published annual data on real GDP base=2015. Broadly, the figure suggests that employment growth tends to slow down during recession spells. This seems the case during the great global financial crisis and recession of 2008 which adversely affected Kuwait's growth during 2008-2010 and slowed down employment growth, the blue solid line dipped appreciable especially in 2009 and 2010. Similarly, the earlier recession of the 1990-1991 which resulted from Kuwait's invasion and subsequent liberation was accompanied by a sharp dip in total employment that lasted till around mid 1990s. During the more recent recessionary spells, total employment trended downwards for instance during 2016-2017. By contrast, total employment trended upwards during buoyant years for instance during 2002-2007 and during 2012-2013. That said, there are clear departures from the general trend which suggests that labor hoarding was practiced and secondly that the consumptive demand for nannies and domestic sector purposes continued unabated.
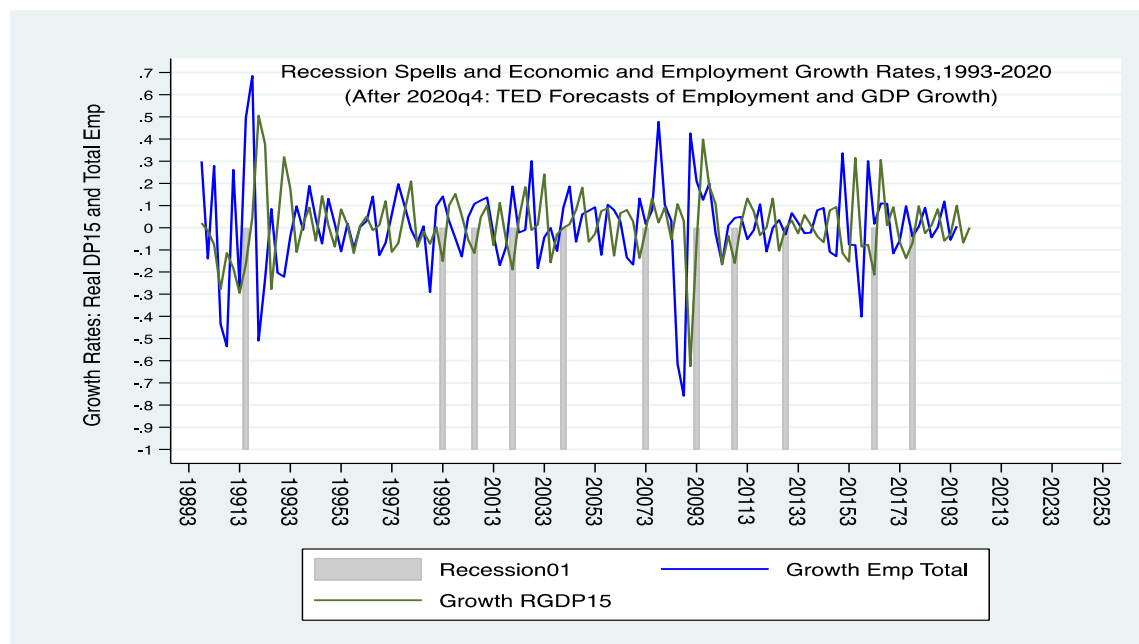

Figure 1. Recessions and Employment-GDP Growth Patterns, Kuwait 1993q1-2020q4

2. Kuwait's Labor Supply Under the Grips of the Coronavirus-Recession

In describing main characteristics of Kuwait's current labor force during the outbreak of coronavirus, this section reviews salient labor attributes gleaned from TED's Labor Force Survey conducted between September and December 2020 and encompassed Kuwaiti and Non-Kuwaiti 420 workers. Noteworthy, the selected sample is drawnup to focus on workers that occupy jobs which may appeal to Kuwaitis; and therefore, menial and low-paying job slots held by the low-educated foreign workers are not covered. As well, worth noting is that existing official labor force surveys and population censuses including the database of PASI and CSB, while rich and informative, do not cover important labor supply aspects that interest labor market practitioners and that may have significant policy implications. In an attempt to fill-in existing info gaps, TED proceeded to design and collect data and info on dimensions that hitherto unavailable. These include:

(a) Age at first entry into labor market and firm-specific experience;

(b) Total labor market experience since date of first entry into the labor market;

(c) Incidence of unemployment throughout the person's labor engagement career and the last time an "unemployment spell" occurred;

(d) Number of times that an individual worker changed jobs during past years, that is, lifetime job mobility, which ascertains how lively and dynamic the labor market is and how new, including startups, firms create new job opportunities and finally,

(e) Past spells of unemployment and their duration and length of job time until landed a job

(f) Job stability in the face of looming automaton and economic structural breaks and perceptions of requisite training and reskilling and upskilling needs.

For space consideration, only a few of the above aspects and variables are discussed here. These are summarized in Table 1 below.

Table 1. Labor Supply Profile, Kuwaiti and Non-Kuwaiti Workers

	age	ageentry	educyrs	expjob	exptot	wage/m
N.K.	39.955	24.528	14.98	8.452	15.427	522.206
Kuwaitis	37.385	23.588	14.833	8.118	13.796	1011.615

Source: TED's 2020 Labor Force Supply Sample. Legend ageentry: age when first entered labor market; educyrs=years of schooling achieved; expjob=job-specific experience; exptot=total labor market experience and wage/m=monthly wages in KD.

TED's purposeful sample data indicate that the average age of Kuwait workers is 37.4 years which is commensurate with averages estimated by official, notably CSB and PACI data

sources. Non-Kuwaitis on the other hand are two years older, with an average age of nearly 40. Accordingly, Non-Kuwaitis are nearly three years older than Kuwaiti counterparts. Age at first-entry into the labor force is somewhat comparable at 23.59 years for Kuwaitis and 24.53 for Non-Kuwaitis. This implies that Non-Kuwaitis have been in the labor market, on average, 3.91 years longer than Kuwaiti workers in TED's sample. So, Kuwaiti workers are somewhat younger and have been in the labor market for nearly 4 years less than Non-Kuwaitis on average. Notice however, that the great majority of Kuwaitis had their first job in Kuwait, whereas most Non-Kuwaitis workers covered in TED's sample became gainfully employed for the first time in other countries, including the country of their origin.

There is an incremental wage premium that seems related to age and education of Kuwaiti workers. TED's sample also indicates that monthly wage earnings of Kuwaiti workers hovers around 1011 KD whereas the corresponding mean monthly wages commanded by Non-Kuwaiti workers falls in the vicinity of 522 KD per month. On top of incentives and related government support rationale, higher wages earned by Kuwaiti workers result from the type of position they occupy within their respective companies or place of work. That is, holders of management such as senior directors as opposed to regular professionals in the case of Non-Kuwaiti workers. Off course other plausible reasons for the wage increments and differentials have been discussed in the literature on labor economics.

3. Labor Demand Under Coronavirus and During Future-Post-Coronavirus Economy

This section discusses labor demand as reflected from the perception of Kuwaiti business leaders whose views were amassed in TED's 2020 CEOs which polled 262 business owners of large, medium, and small establishments. Addressing labor market issues, TED posited two questions:

1. How do Kuwait CEO's assess the impact of coronavirus on their demand for Kuwaiti and Non-Kuwaiti workers?
2. Secondly, how do those CEOs perceive their future demand for Kuwaiti and Non-Kuwaiti workers to be in the era of post coronavirus economy?

CEOs responded to an array of other pertinent questions, which for brevity purposes, are not taken up here. Table 2 below is a cascaded summary of the responses to the two questions. CEOs indicated either increase or decrease or else indicated "No change" of their company's demand for labor under the duress coronavirus months. In the case of demand for Kuwaiti workers, the majority of CEOs, 73%, stated that coronavirus did not cause demand changes.

Table 2 Demand for Kuwaiti Labor /during Coronavirus and in the Post-Coronavirus Times

Change in Hiring Kuwaiti Workers during:	Kuwaiti Workers							
	No Change		Increase		Decrease		Total	
	No.	%	No.	%	No.	%	No.	%
Cumulative Impact of Coronavirus on Employment from January 2020 to December 2020*	190	73%	11	4%	43	16%	262	100%
Post Coronavirus : Expected Change in Employing Workers**	106	40%	103	39%	45	17%	262	100%
Post Coronavirus: What is the Impact of Technology Penetration on emplyment?***	145	55%	54	21%	46	18%	262	100%

* No Response = 18   ** No Response = 8   *** No Response = 17

Nearly 16% of the CEOs indicated that the coronavirus pandemic caused a decrease in the demand for Kuwait labor. A minority CEOs, 4%, stated that their company's demand for Kuwaiti labor had actually increased.

Looking at the post-coronavirus future time periods, about 40% of CEOs expect that the daman for Kuwaiti workers will not change in the post coronavirus period. An equal percentage of CEOs 39% expect that their company's demand will increase in the post-coronavirus time periods whereas a minority percentage of polled CEOs, 17% anticipate, that demand for Kuwaiti workers would decline. Underlying reasons for the anticipated decline stem from cost and automation consideration, discussed below.

The looming penetration of automation and its probable replacement for human labor turns out to be a significant issue that Kuwaiti CEOs reflect on. This is apparent from their responses to the query about probable future impact of technology penetration on employment, third row Table 2. Whereas 55% of Kuwaiti CEOs view technology to be of neutral impact, i.e. technology will not affect their demand for Kuwaiti workers, 21% expect that their future demand for Kuwait workers will increase, presumably fostered by economic growth, replacement of Non-Kuwaitis or because they believe technology will be (Kuwaiti) labor-biased. That said, an almost equal percentage of CEOs, 18%, expect that technology will replace human labor and therefore, their future demand for Kuwaiti workers will decline.

Sifting through these responses in more scrutiny suggests that CEOs consider the role of automation within the broad context of cutting operating costs. That is, automation may not replace Kuwaiti workers per se but when the wage and benefits costs of Kuwaiti workers are

factored in, the choice between Kuwaiti-Non-Kuwait and automation may be disadvantageous from the perspective of Kuwaiti workers. This could happen if automating the production process turn out to be less costly than relying on Kuwait human labor whose costs (wages and benefits) per output unit is greater than the per unit cost of an automated production process. Said differently, rattled by the adverse effect of the unexpected pandemic shock, Kuwaiti CEOs are becoming more prudent and more cost-conscious going forward. That is, more conspicuously seen from the Kuwait CEOs response to the query: "Why does your company hire a relatively small number of Kuwaiti workers?". A significant majority, 60%, of Kuwaiti CEOs indicated that the asking (or reservation) wage of Kuwaiti workers is high resulting in labor demand contractions. On top of that, Kuwaiti workers have tend to high expectations of sizeable benefits packages which contributes to slimming the demand for Kuwait workers as illustrated in Figure 2.

	1 = Highest and 5 = Lowest					
	1	2	3	4	5	No Response
High Wages	42%	19%	14%	7%	7%	11%
High Insurance/ Social Security	18%	29%	19%	11%	13%	10%
Skill Gap	21%	19%	28%	14%	10%	7%
Employment Support Program	18%	23%	26%	12%	10%	11%
To Replace Kuwaiti for Non Kuwaiti	29%	17%	19%	8%	16%	11%

Sample Size=262
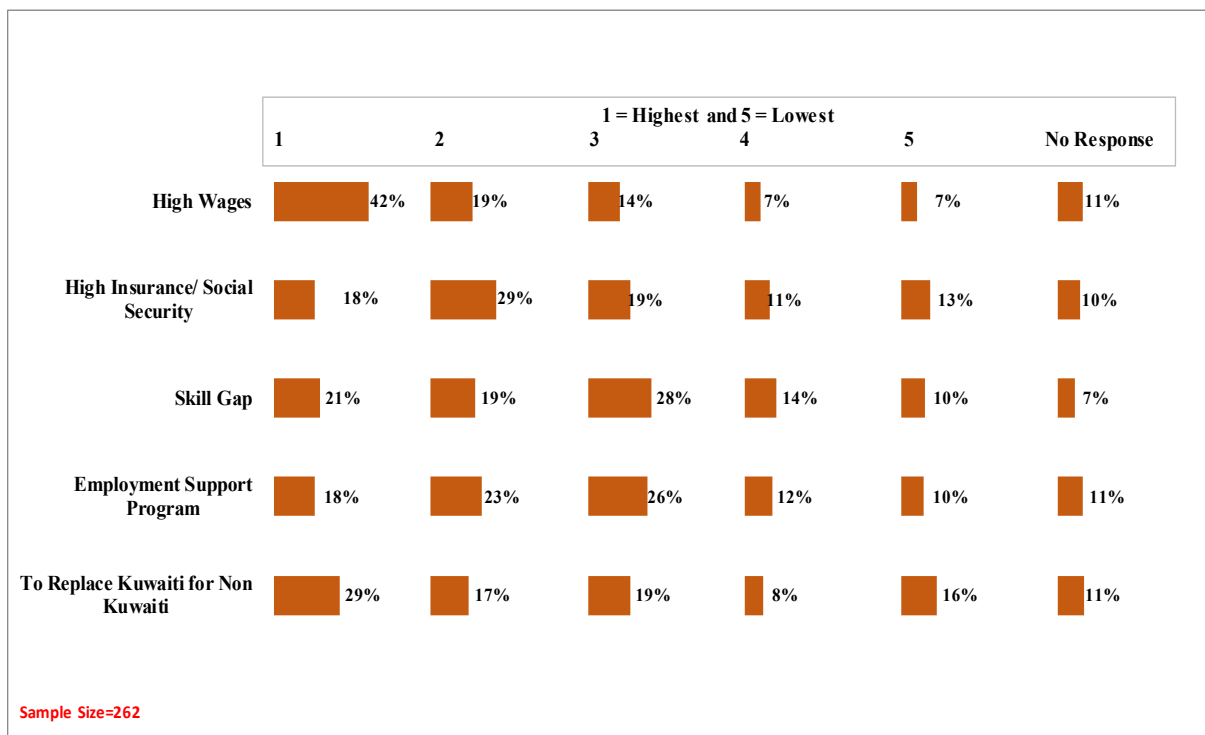
Figure 2. TED CEO Survey: What Factors Cause Your Company to Hire a Small Number of Kuwaiti Workers?

Table 3 records the assessment of Kuwaiti CEOs about the effect which the coronavirus had on the employment of Non-Kuwait workers: A large percentage, 66%, were emphatic that their company's demand for Non-Kuwait workers was scaled back by factors that range between 10-19%. Another 28% of CEOs indicated "No change" in demand for Non-Kuwait workers. A negligible few CEOs, 3%, suggested that their company demand for Non-Kuwait workers

was actually scaled upwards during the coronavirus pandemic. These might be speaking for companies engaged in delivery, healthcare, virtual communications and the like.

Table 3: How Did Coronavirus Change Your Demand for Non-Kuwaiti Labor?

Change in Hiring Non-Kuwaiti Workers during:	Non- Kuwaiti Workers							
	No Change		Increase		Decrease		Total	
	No.	%	No.	%	No.	%	No.	%
Cumulative Impact of Coronavirus on Employment from January 2020 to December 2020*	73	28%	9	3%	174	66%	262	100%
Post Coronavirus : Expected Change in Employing Workers**	49	19%	43	16%	163	62%	262	100%
Post Coronavirus: What is the Impact of Technology Penetration on emplyment?***	67	26%	19	7%	165	63%	262	100%

* No Response = 6   ** No Response = 7   *** No Response = 11

Interestingly, the majority of Kuwaiti CEOs, 62%, expect that their labor demand for Non-Kuwaiti workers would be curtailed in the post-coronavirus times, presumably reflecting uncertainty and media-health-policy challenges associated with the hiring of foreign workers. Some 19% of CEOs expect their company's demand for Non-Kuwait workers would remain unchanged with 16% anticipating demand for Non-Kuwaiti workers would actually increase.

Automation and technology penetration do not seem to alter the profile which Kuwaiti CEOs anticipate would prevail regarding future demand for Non-Kuwaiti workers: 63% anticipate future demand would contract, relative to 26% who foresee demand to remain unchanged with a mere 7% expecting demand to actually increase.

A similar conclusion is drawn up from responses to TED's sample of Kuwaiti and Non-Kuwaiti Households. Let's clarify that the term "sector" in the first column of Table 4, connotes the sector of employment: Government sector, Private sector or Joint sector where job-loss might have occurred; Kuwaiti and Non-Kuwaiti households were accordingly asked to indicate whether any (one or more) of their family members endured job loss due to the coronavirus outbreak. About 36 Kuwaiti households out of 130 Kuwaiti households in the sample indicated their members endured some form of job-loss; that is the incidence of job loss under coronavirus was 28% in the case of Kuwaiti households. Accordingly, 72% of Kuwaiti households did not endure job loss. Therefore, the coronavirus pandemic inflicted serious welfare loss and severe hardships on nearly 30% of Kuwaiti households.

The corresponding incidence rate of job loss in the case of Non-Kuwaiti households was I78% (that is 94 Non-Kuwaiti households out of 120 Non-Kuwaiti households in the sample). Therefore, and as expected the incidence of job-loss due to the coronavirus was much prevalent among Non-Kuwaiti households. Only 22% of Non-Kuwaiti households escaped the duress of members losing gainful employment. Most job loss occurred in the private sector, 64% in the case of Kuwaiti households and 79% for Non-Kuwaitis, Table 4. This finding must be caveated however as Non-Kuwaiti households are "unrelated individuals" who share a common entrance to the building they live in and tend to cook and eat together. Said differently, they are not relatives through blood or marriage kinships.

Table 4. Households Whose Members Experienced Job loss during Coronavirus Pandemic

Did the Corona Pandemic Cause any Family Member to be Unemployed?	Answering "No"				Answering "Yes"				Total Responses	
	Kuwaiti		Non- Kuwaiti		Kuwaiti		Non-Kuwaiti			
	#	%	#	%	#	%	#	%	#	%
Government sector	59	63%	7	27%	11	31%	18	19%	95	38%
Private sector	30	32%	18	69%	23	64%	74	79%	145	58%
Joint sector	5	5%	1	4%	2	6%	2	2%	10	4%
Grand Total	94	100%	26	100%	36	100%	94	100%	250	100%

Note: # indicates the number of responding households. The answer "Yes" indicates members did experience job loss whereas the answer "No" indicates no job loss occurred. Sector=sector where job loss occurred
Source: TED Household Survey Sept-Dec 2020

In the post-coronavirus times, as automation occurs and as AI and ML begin to penetrate Kuwait's job market, CEOs were asked to rank the types of training their company workforce needs in order to catch up and not be left behind. CEOs responded to the question about the training programs they consider needed in order to enhance the productivity of Kuwaiti workers and their responses are illustrated in (Figure 3). The majority (the sum of 60% who declare ICT is highest plus 19% who declare ICT to be second highest yield 79%) indicate that ICT is the most important training program that Kuwaiti workers needed in order to enhance their future productivity. Another 64% believe that "training on online working and communications" would fill an important training need and 58% believe upskills and productivity enhancing programs are important followed by training programs on artificial intelligence and machine learning with 54% and 50% for creative and talent program and finally 37% for training on using and dealing with robots.
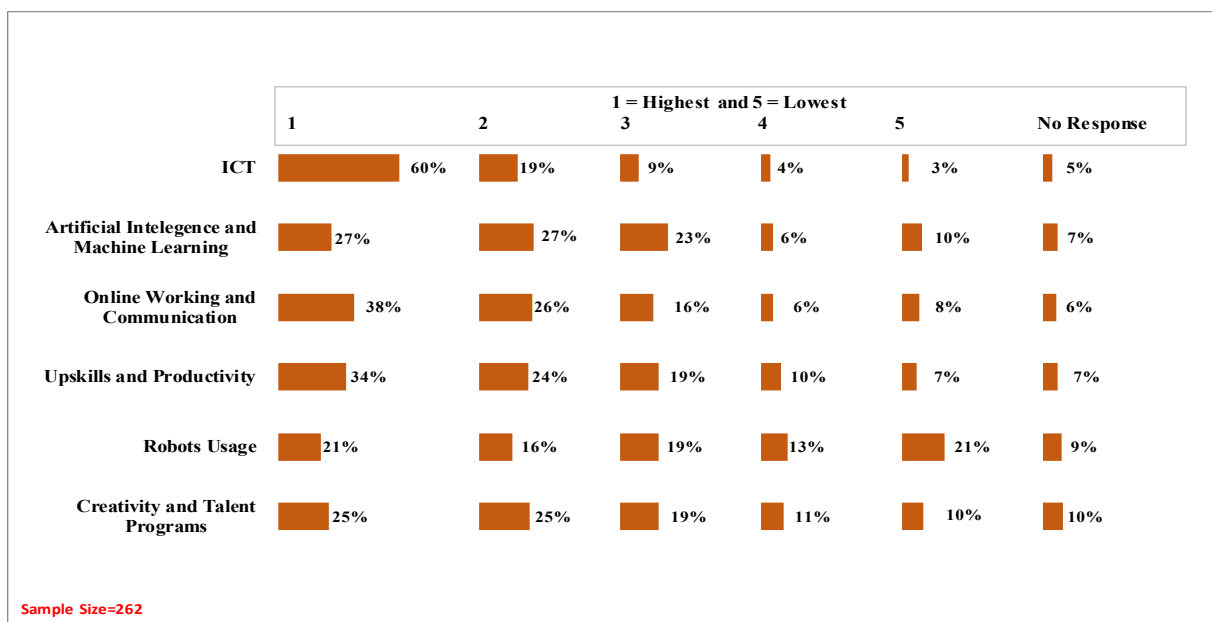
	1 = Highest and 5 = Lowest					
	1	2	3	4	5	No Response
ICT	60%	19%	9%	4%	3%	5%
Artificial Intelegence and Machine Learning	27%	27%	23%	6%	10%	7%
Online Working and Communication	38%	26%	16%	6%	8%	6%
Upskills and Productivity	34%	24%	19%	10%	7%	7%
Robots Usage	21%	16%	19%	13%	21%	9%
Creativity and Talent Programs	25%	25%	19%	11%	10%	10%

Sample Size=262

Figure 3. TED CEO Survey: What are the Training Programs Needed to Enhance Productivity of Kuwaiti Workers?

4. Labor Productivity and Its Time-varying Growth Rates

Utilizing the firm-level data on value added and workers as well as PACI data on employment and CSB figures on total and sector specific real GDP, TED derived estimates of labor productivity and its growth rates for the overall economy and by key sectors.

Table 5. Labor Productivity Growth According to Economic Sector

year	sector desc					
	Constr.	Fin.	Mfg	Non-Fin.	Trade	Total
2004	-1.525	-3.311	1.650	1.721	4.441	2.328
2005	4.523	36.967	3.961	0.612	-0.392	2.240
2006	1.446	-10.713	1.616	1.511	1.177	1.029
2007	4.555	30.100	4.690	2.025	5.814	5.298
2008	0.304	-18.893	3.218	-3.212	-2.670	-2.070
2009	0.085	-33.691	0.300	-0.049	-2.822	-2.435
2010	2.414	-11.243	4.571	2.581	6.048	3.711
2011	5.352	11.077	4.904	1.721	6.262	4.869
2012	3.437	-4.026	3.569	4.286	1.061	2.466
2013	5.936	17.195	7.534	4.234	6.156	6.244
2014	2.013	2.013	4.283	0.411	3.357	2.539
2015	1.828	5.955	3.915	0.283	2.350	2.137
2016	1.424	-8.551	1.594	-0.446	0.665	0.336
2017	7.163	0.767	-0.712	0.481	1.010	1.247
2018	0.349	-9.849	0.049	-0.377	5.701	1.816
Average	2.613	-1.183	2.991	1.049	2.537	2.104

Source: Derived from the Establishment Surveys 2003-2018

Labor productivity was positive year-on-year resulting in an average growth rate of nearly 2.1% for the whole economy from all sectors during 2003-2018. Manufacturing realized highest overall growth rates while non-financial services achieved the lowest rates. It is worth noting that the financial sector tended to enjoy robust growth rates during years of high economic

10

growth, 2005, 2007, 2011, and 2013 but was hard hit during the global financial crisis 2008, 2009 and 2010 and during periods of low or collapsed oil prices as happened mid-2014 and afterword's. Outside these volatile years, the financial sector tend to portray a similar profile of low labor productivity growth rates.

We also generated estimates of labor productivity and its growth rates for key sectors using national accounts data on real value added together with sector specific employment. The findings are illustrated graphically below, Figure 5 and Figure 6.
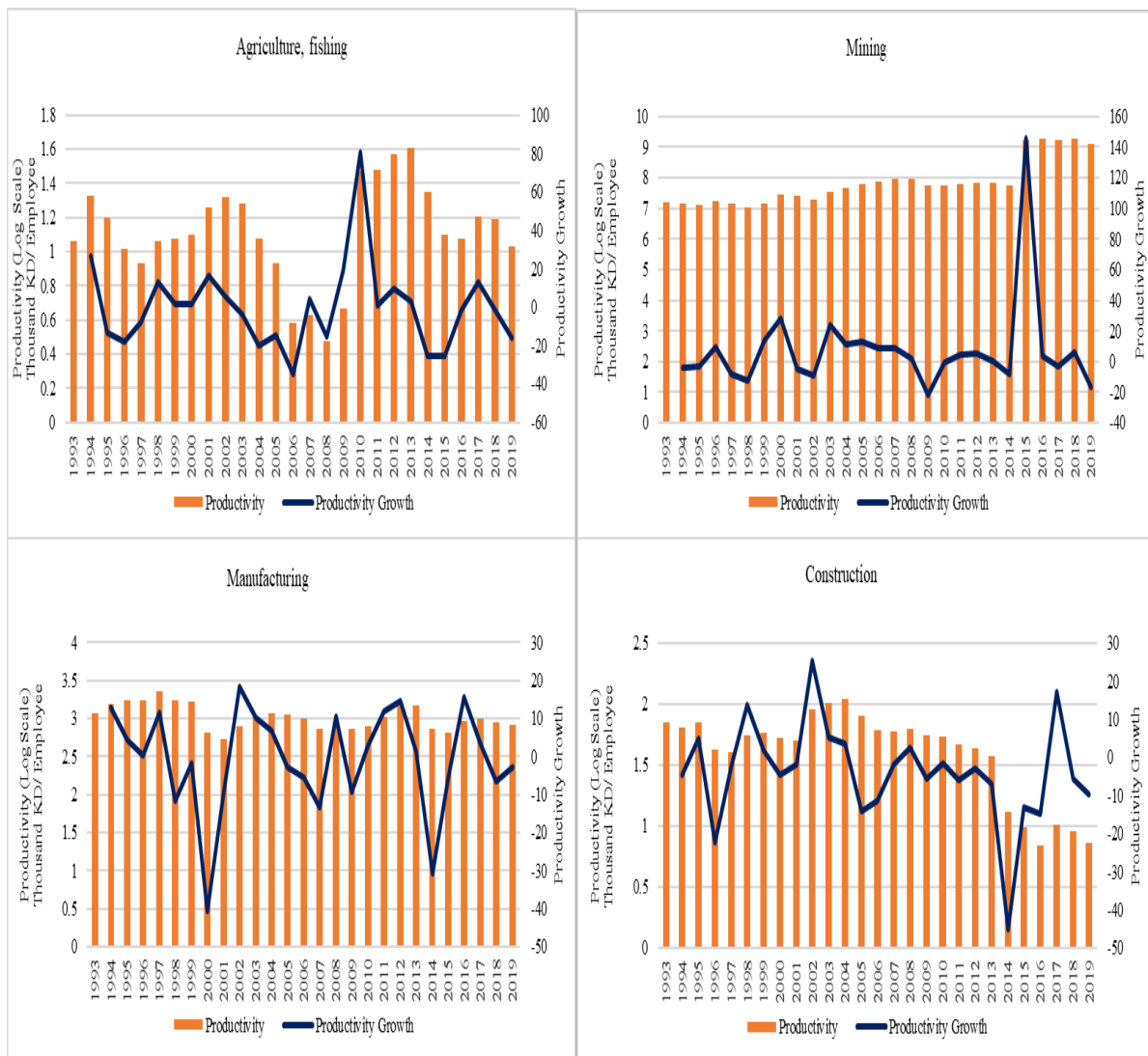

Figure 5. Labor productivity in agriculture, mining, manufacturing and construction.
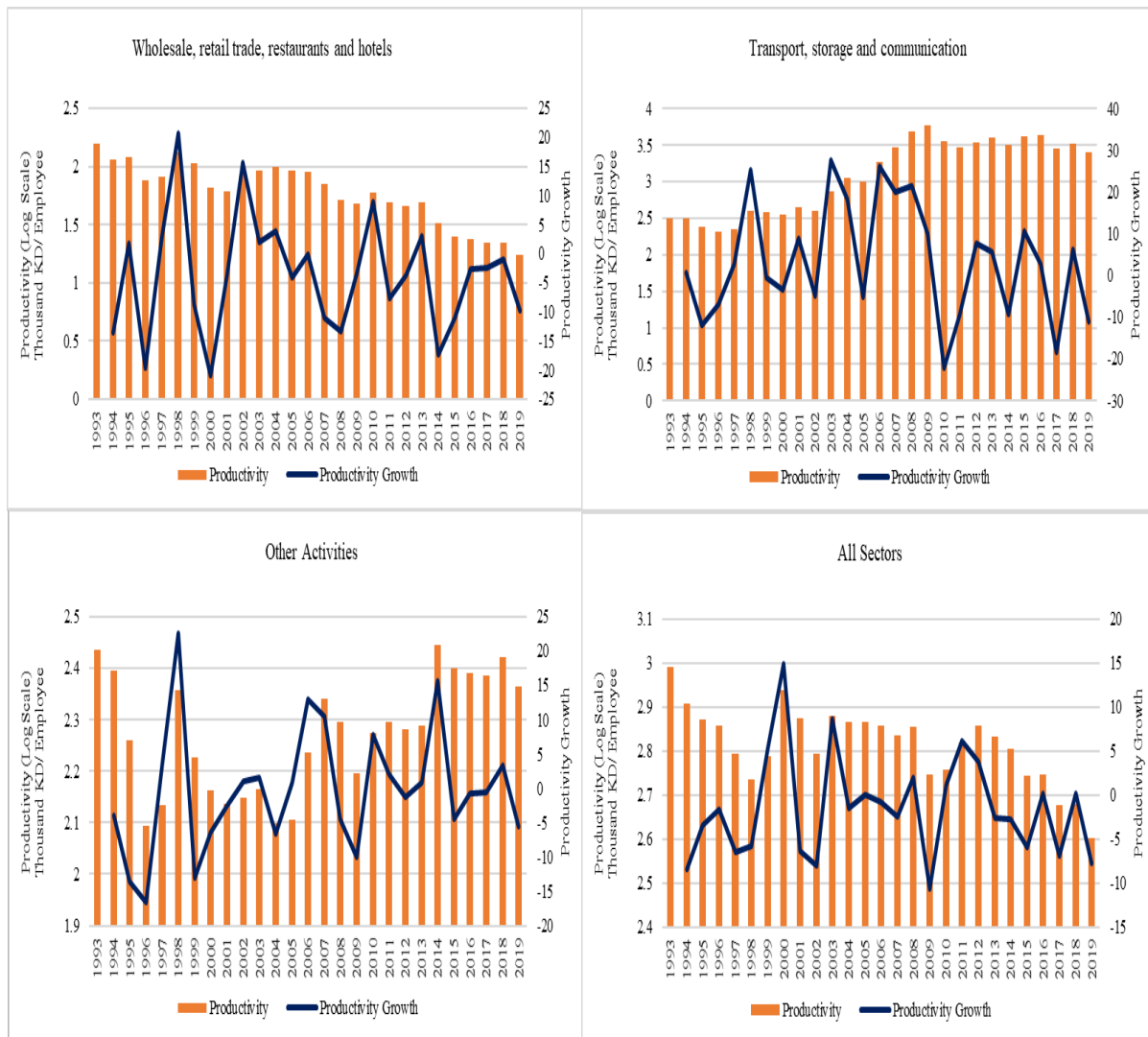
Figure 6. Labor productivity in wholesale trade and hotels, transport, storage and communication, other activities and all sectors

4.1 The Race Between Labor Productivity and Average Wages

Over the period 2003-2018, the annual growth rates of wages were, on average, more than double the corresponding growth rates of labor productivity. For instance, while the economy-wide wages grew on average at 4.1% during 2003-2018, the corresponding economy-wide labor productivity grew at only one-half that rate, or at 2.1%. This represents a net loss or substantial subsidy to workers. Workers and their firms must ensure that their productivity must grow at rates equivalent to those of wage growth rates. This points to a major structural problem in Kuwait's labor market. It emanates mostly from the wage setting in the public sector which not only pays annual wage increments that are higher than the CPI, but also resorts to permitting wages of Kuwaiti workers to leapfrog as happened during the days of the Arab uprising of 2012.

Derived empirical evidence strongly supports the hypothesis that average wages in Kuwait

have been increasing at rates that are more than double the corresponding rate of increase in labor productivity. This finding is worrying from the perspective of both the country's economic growth and its fiscal integrity and robustness. Economic theory suggests that the rewards to labor effort ought to be commensurate with the productivity that the effort yields (Wakeford, J. 2003). If paid wages are higher than actual labor productivity, then less will be available for use as reinvestment for promoting dynamic growth which would adversely affect employment growth and may induce unemployment in subsequent periods as explored early on by some macroeconomists (Blanchard and Oswald, 1994; Blanchard and Katz, 1999).

On the other hand, since the great majority of Kuwaitis are employed by the government that expends fabulous and scarce resources on the health and welfare and education and training of Kuwaitis (including the provision of free education and the payment of 200KD stipend per month to each Kuwaiti student attending post-secondary educational institutions).

Table 6. Growth Rates of Wages and Labor Productivity, 2003-2018

Year	Av. Wages	Labor Prod.
2003	.	.
2004	5.474	2.328
2005	2.78	2.24
2006	4.165	1.029
2007	5.7	5.298
2008	1.919	-2.07
2009	1.664	-2.435
2010	3.995	3.711
2011	4.901	4.869
2012	7.101	2.466
2013	8.213	6.244
2014	6.562	2.539
2015	2.722	2.137
2016	3.335	0.336
2017	1.293	1.247
2018	3.09	1.816
Average	4.18	2.10

Source: TED's estimates based on CSB Establishment Survey Data

If the government on top of that pays wages levels that are higher than productivity and if the growth of wages over time is higher than labor productivity growth, then the government is not getting its money's worth by paying Kuwaitis to become employed in its ranks and file. Some may argue that these conditions were somewhat permissible during times of accumulated surpluses and state building, overlooking this basic fact about the productivity-wage relationship during duress times and over the recovery and post-corona cycle time spells would be undeniably counter-to the dynamic economic growth, social welfare, and the sequential,

inter-temporal, wages and profits over time.

4.3 Total Factor Productivity and Its Growth Rates

TED applied a variety of recent methods suggested by Ackerberg-Caves-Frazer and similar other methodological varieties in order to estimate the economy-wide production function based on firm-level data. There is however simultaneity between productivity shocks and input use that are observable to the firm managers but not observable to the econometrician. In order to surmount the potential bias and improve the robustness of the estimates, a number of corrective methods have been proposed in the literature. TED applied a suite of these proposed methods to firm-level data from the CSB establishment surveys covering the period 2003 to 2018. For space considerations our estimates of the parameters of the production function according to these methods are deferred to the appendix. In this section, the focus is on the predicted total factor productivity estimates and their time-varying growth rates. Specifically, applying the Ackerberg variety approach, we derive the following total factor productivity growth rates for the whole economy and for key sectors as follows.

Table 7. Total Factor Productivity for the Whole Economy and For Key Sectors

year	Constr.	Fin.	Mfg	Non-Fin.	Trade	Total
2004	-5.684	-4.762	1.781	1.548	5.201	2.099
2005	1.070	34.328	4.975	-2.746	0.688	1.512
2006	-0.304	-8.555	0.802	3.634	1.785	1.523
2007	5.212	25.331	5.843	-0.608	5.024	4.362
2008	-1.811	-15.850	2.040	2.909	-3.636	-1.131
2009	0.660	-35.924	0.892	-1.105	-0.604	-1.720
2010	1.427	-13.662	3.995	3.354	5.468	3.391
2011	4.509	8.517	1.241	4.454	6.347	4.748
2012	4.361	-4.240	3.415	4.927	-0.293	2.195
2013	11.616	4.112	13.009	12.656	16.209	14.053
2014	2.628	-9.579	4.876	-3.441	3.447	1.714
2015	0.624	3.629	4.270	0.609	2.752	2.240
2016	-2.107	-12.579	-6.609	-5.944	-4.459	-5.220
2017	7.102	-1.584	-0.196	-0.337	1.007	1.034
2018	-1.218	-13.765	0.919	0.663	6.481	2.276
Total	**1.864**	**-4.626**	**2.727**	**1.412**	**3.012**	**2.172**

Source: TED's estimates based on Ackerberg, et.al. method.

TFP varies across sectors and in each sector tends to decline over time. Another anomaly is in terms of the productivity-wage relationships over time. At the sector-level, TFP grows at rates that are markedly smaller than those of growth of sector wages, Table 8.

Table 8. Growth rate of average wages over time and according to key economic sectors

year	Constr.	Fin.	Mfg	Non-Fin.	Trade	Total
2004	4.037	7.878	7.676	7.556	3.458	5.474
2005	5.371	4.299	3.731	1.445	2.365	2.780
2006	4.316	15.819	1.778	5.433	3.541	4.165
2007	5.578	19.819	4.330	5.185	5.477	5.700
2008	-0.020	9.262	2.315	1.481	1.799	1.919
2009	-1.791	-0.330	2.792	3.567	1.092	1.664
2010	0.561	2.565	4.381	6.420	3.341	3.995
2011	5.360	-8.018	9.036	6.241	3.168	4.901
2012	6.418	1.910	3.784	6.475	9.888	7.101
2013	3.862	12.728	6.607	7.232	10.495	8.213
2014	8.088	3.460	8.859	7.150	4.927	6.562
2015	4.077	1.770	3.459	2.385	2.284	2.722
2016	-0.261	3.380	4.331	2.630	4.398	3.335
2017	0.891	-0.884	2.483	0.574	1.589	1.293
2018	2.326	0.035	2.553	2.629	4.233	3.090
Total	**3.232**	**4.363**	**4.512**	**4.417**	**4.126**	**4.177**

Source: TED's estimates based on data of the establishment surveys 2003-2018.

To summarize, TED's empirical estimates indicate unequivocally that the growth of TFP in Kuwait has been quite modest pointing to the need for articulating and implementing carefully designed and pertinent policy programs, along with fostering R&D and fostering innovative tech business startups along with labor upskilling and training programs. Such a well guided productivity and innovation policy strategy and programs are critically needed for breaking away from the low TFP trap. Such programs should also promote competition in both the labor and product markets and encourage the lead to the adoption and diffusion of innovations by medium and smaller firms; that is, ensure widespread diffusion of innovations (OECD, 2015). This becomes all the more relevant and merited given that recent KFAS-funded KISR-research has demonstrated that Kuwait's business sector reveals significant measures of concentration gauged by such indicators as investments, value added, sales and revenues (KISR Jabsheh, F. Al-Qudsi, S. and Hajiiee, 2018).

5. Policy Takeaways: Kuwait Needs Higher Productivity and More Innovation

Productivity is extremely important for the long-term sustainability and prosperity of the economy and its citizens. As Paul Krugman noted in 1994: "productivity isn't everything, but in the long run it is almost everything". In the modern day and age Kuwaiti workers as the economy encounters major existential difficulties, policy makers must create widespread awareness of productivity and set in motion programs and policies that aim to harvest ever higher productivity levels over time. To that end, all economic agents, workers, business owners, students, households' members, must become privy to working "smarter" and working "harder". With the unabated infusion of modern innovative technologies, agents must take advantage of the flux of innovations and use them for the sake of promoting higher

productivity. Kuwait needs more productive student, more productive workers, and more productive business owners. That is, citizens and foreign workers, as well as owners of business firms from all walks of life must be convinced that Kuwait's future economic growth will largely depend on productivity leapfrogging. Policy reform is urgent and must concentrate on realizing the maximum possible productivity of each individual and of each firm. Drawing on other evidence from many countries, Kuwait and its citizens stand to gain tremendously by reforms that make it easier for productive individuals to be given the opportunities and offered the rewards to produce their absolute max output and that productive firms to attract the resources required to underpin their growth (OECD, 2015).

Kuwait needs to encourage higher productivity and foster more innovation. Regrettably, Kuwait currently achieved low and with time downward trending ranks on the Global Innovation Index, GII, Figure 7, a reminder that the current incentive structure needs major tweaks and modifications. As the Global Innovation Index, GII 2019, notes countries and companies seeking to improve their innovation performance and leapfrog ought to "ensure that innovation is embedded as a key priority in the country's path of national development and progress, possibly formulated in a clear innovation policy, ensure that each possible innovation policy taskforce interacts and includes stakeholders in public and private sectors, deans and scholars from universities and research institutions and relevant innovation clusters" (GII, 2020 p.14).
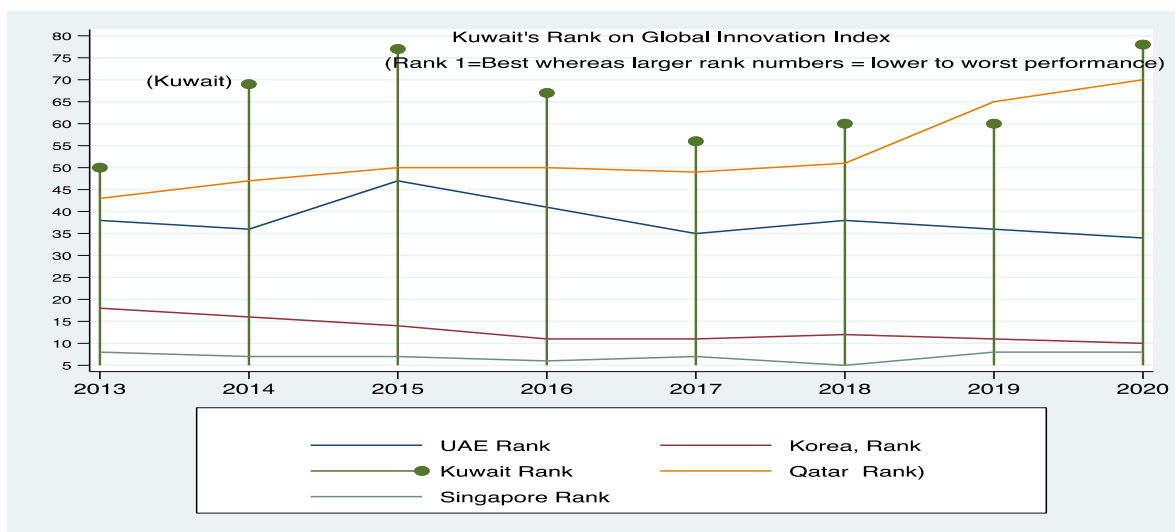

Figure 7. Kuwait's rank on the global innovation index, GII.

The GII index strongly supports the view that policy and stakeholders ought to be cognizant that there are important time lags between instituting, and implementing innovation policy and

the impact. Particularly, the developmental impact of innovation policy tends to be time consuming and requires ample financing and the inclusion of likely innovative parties". Innovation policy does not bear instant fruits but rather leads to small but steady developmental results especially that besides innovation, other forces and factors influence the developmental and progress trajectory of innovation-adopting countries.

The primary conclusion of the research TED conducted thus far is that the best human resource policy action for Kuwait is to ramp up competition, innovation, labor productivity and total factor productivity. This policy action entails major revamping of existing labor market skills and chores through widespread and carefully designed and implemented upskilling programs in order to enhance future productivity in the age of automation, and concomitantly, fully replace the seniority-based pay system with a dynamic system that is fully and vigorously based on productivity and creativity merits. In other words, the vigorous new system rewards innovative business leaders and fosters tech business startups and recognizes and rewards highly productive workers. It is firmly and robustly pillared on the principles of competition and level-playing filed together with reciprocity between merits, efforts, innovation, and rewards and upwards advancement.

APPENDIX A
PRODUCTION FUNCTIOON AND TFP ESTIMATION RESULTS

Table 9. Estimating the parameters of the production function using the method suggested by Ackerberg-Caves Frazer, Kuwait Manufacturing Sector

....
Ackerberg-Caves-Frazer Method to Estimate Production Functions
(Non-linear homoskedastic GMM estimates for value added)
Number of obs. = 15601

lnvaen	Coef.	Std.Err.	z	P>z	[95%Conf.	Interval]
lncapiten	0.113	0.017	6.580	0.000	0.079	0.147
lnfixasseten	0.022	0.010	2.290	0.022	0.003	0.041
lnindnonind	0.129	0.022	5.780	0.000	0.085	0.173
lnpersonen	0.746	0.070	10.610	0.000	0.608	0.884

Note: lnvaen=Log Value Added; lncapiten=log capital; Lnfixasseten=log fixed assets; lnondnoind=log of industrial and non-industrial raw materials and lnpersonen=log scale number of workers.
Wald test of constant returns to scale: Chi2 = 0.08 (p = 0.7754)
Sargan-Hansen J-statistic: 0.000 (p = .)
Exactly identified model (no overidentifying restrictions)

Table 10. Estimating the parameters of the production function using the method suggested by Ackerberg-Caves Frazer, Kuwait: All Sectors

(Non-linear homoscedastic GMM estimates for value added)
Number of obs. = 79959

lnvaen	Coef.	Std.Err.	z	P>z	[95%Conf.	Interval]
lncapiten	0.221	0.018	12.440	0.000	0.186	0.256
lnfixasseten	0.038	0.006	5.830	0.000	0.025	0.050
lnpersonen	0.799	0.055	14.630	0.000	0.692	0.906
totownen	0.079	0.047	1.700	0.090	-0.012	0.171

Note: lnvaen=Log Value Added; lncapiten=log capital; Lnfixasseten=log fixed assets; totoown=owner and lnpersonen=log scale number of workers.
Wald test of constant returns to scale: Chi2 = 15.68 (p = 0.0001)
Sargan-Hansen J-statistic: 10.753 (p = .)
Exactly identified model (no overidentifying restrictions)

When compared to OLS estimated of the C-D production function, the Ackerberg method varieties are apparently more robust, free of the simultaneity issue between productivity shocks and factors demand. This is revealed by estimating the function using OLS with robust standard errors

Table 11. Standard OLS Estimation of Firm-level Production Function (PF)

lnvaen	Coef.	St. Err.	t-value	p-value	[95% Conf.	Interval]	Sig
lncapiten	0.311	0.003	113.56	0.000	0.305	0.316	***
lnfixasseten	0.068	0.002	37.04	0.000	0.064	0.072	***
lnpersonen	0.672	0.003	200.03	0.000	0.665	0.679	***
totownen	-0.008	0.001	-15.45	0.000	-0.010	-0.007	***
Constant	5.428	0.023	236.43	0.000	5.383	5.473	***

Mean dependent var.	12.369	SD dependent var.		1.497
R-squared	0.816	Number of obs.		91029.000
F-test	62121.261	Prob > F		0.000
Akaike crit. (AIC)	177773.051	Bayesian crit. (BIC)		177820.146

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

TED also estimated firm-level total factor productivity using three other methods to correct for error induced by the simultaneity between the unobservable productivity shocks and input use. The findings are shown below:

Table 12. The Olley and Pakes Method for Estimating TFP, Manufacturing

op productivity estimator				Cobb-Douglas PF		
pendent variable: value added				Number of obs = 16965		
Group variable (id): id				Number of groups = 1192		
Time variable (t): year						
Obs per group: min = 1						
avg = 14.2						
max = 16						

lnvaen	Coef.	Std.Err.	z	P>z	[95% Conf	Interval]
lnpersonen	0.738	0.009	83.53	0	0.721	0.755
totown	-0.087	0.023	-3.73	0	-0.132	-0.041
lncapiten	0.125	0.002	53.62	0	0.12	0.129
lnfixasseten	0.047	0.002	23.44	0	0.043	0.051

Wald test on Constant returns to scale: Chi2 = 46.82
p = (0.00)

Table 13. The Levinsohn and Pertin Method for Estimating TFP

	lp productivity estimator			Cobb-Douglas PF		
Dependent variable: value added				Number of obs = 16965		
Group variable (id): id				Number of groups = 1192		
Time variable (t): year						
Obs per group: min = 1						
avg = 14.2						
max = 16						

lnvaen	Coef.	Std.Err.	z	P>z	[95% Conf	Interval]
lnpersonen	0.738	0.009	83.53	0	0.721	0.755
totown	-0.087	0.023	-3.73	0	-0.132	-0.041
lncapiten	0.125	0.002	53.62	0	0.12	0.129
lnfixasseten	0.047	0.002	23.44	0	0.043	0.051

Wald test on Constant returns to scale: Chi2 = 46.82

p = (0.00)

Table 14. The Woodridge Method for Estimating TFP

	wrdg productivity estimator			translog PF		
Dependent variable: value added				Number of obs = 15576		
Group variable (id): id				Number of groups = 1192		
Time variable (t): year						
Obs per group: min = 1						
avg = 14.2						
max = 16						

lnvaen	Coef.	Std.Err.	z	P>z	[95% Conf	Interval]
lnpersonen	0.729	0.005	143.19	0	0.719	0.739
totown	-0.117	0.015	-7.73	0	-0.147	-0.088
lncapiten	0.133	0.007	18.27	0	0.119	0.147
lnfixasseten	0.044	0.004	10.39	0	0.035	0.052

Wald test on Constant returns to scale: Chi2 = 153.64

p = (0.00)

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