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Fiscal devolution and energy sector performance in Pakistan

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Abstract

Devolution reforms agenda was approved by the parliament in Pakistan through enactment of 18th Constitutional Amendment in 2010. Pakistan is a federation comprising of four provinces. The amendment aspired decentralization of fiscal powers to the provinces from federal government and considerably changed the structure of the public sector. This study examines the impact of decentralization on the performance of the energy sector through examining indicators relevant to energy systems in the country. We analyse data on key performance indicators of natural gas, oil and electricity sectors in the pre- and post-amendment periods. More specifically, the devolution reforms change the provincial shares in exploration and production of oil and natural gas that can be attributable to increased competition and governance among the provinces. The devolution adversely affected the supply of natural gas by making the gas allocation policy redundant especially limiting the gas allocation to power sector raising the fuel oil and LNG imports by the public and private power producers. It has serious fiscal consequences for energy sector that is already facing recurrent circular debt.

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Fiscal Devolution and Energy Sector Performance in Pakistan

1. Introduction

Reliable energy supply is essential for sustaining economic activity. In this context, energy security is an absolutely contemporary and perennial issue that comprises of accessibility, affordability and acceptability of different forms of energy available in adequate amounts for a diverse range of consumers. In most of the developing countries, energy supply is managed by public sector either through controlling the production and supply or regulating private energy providers. Issues related to management and governance pertaining to public utilities especially during past few decades drive the governments to introduce energy sector reforms (see for example, Joskow, 1997; Borenstein, 2002; Jamasb, 2006; Yang et al., 2007; Gasparatos and Gadda, 2009; Kruyt et al., 2009; Umbach, 2010; Aunphattanasilp, 2018). A key objective of these reforms is the provision of clean and efficient energy resources at a lower cost especially to the poor households and small enterprises who are extremely vulnerable to rising energy costs (Dorsey-Palmateer, 2020). Reforming and restructuring the publicly owned energy industries involve in particular, transferring some roles either from the public to private agencies (privatization), or from the federal or central government to the provincial or state level governments (devolution). The key objective of such a reform process is to improve the energy sector governance and overall performance and to ensure sufficient energy supply to all consumer categories in an efficient manner.

The main objective of this study is to examine the impact of devolution in energy sector of Pakistan and to offer strong analytical framework through identifying key performance indicators. To this end, the study included key dimensions of energy production, distribution and investment employed most relevant energy sector data in the pre and post devolution periods for comparing the performance of the provinces.

Various studies evaluate the international experience of the reform process and show that sustainable energy development can be ensured through increasing efficiency and taking appropriate regulatory measures (Sankar, 2004; Bhattacharyya, 2005; Dubash & Rao, 2008; Liew et al., 2012; Usman et al., 2015; Rauf et al., 2015). Developed countries reform their energy sectors in the aftermath of 1970s oil crisis through introducing competition and innovations. The core objective was to achieve efficiency in energy supply and emphasis remained on reducing the hazardous impact of energy use on the environment (Joskow, 1998; Gasparatos & Gadda, 2009). This transition essentially requires these economies to constantly cut the use of fossil fuels down and take effective measures for increasing the share of sustainable and renewable sources in energy mix (Newberry, 2004). On the contrary, the developing countries introduce reforms to cast aside investment and management burdens from the public sector in order to limit fiscal deficits and easing the energy shortages (Lin and Liu, 2000; Williams and Ghanadan, 2006; Joseph, 2010; Goldthau, 2014).

There is sufficient empirical evidence highlighting that privatization of state-owned enterprises, establishment of regulatory bodies and competition among the suppliers may improve efficiency (Joskow, 1998; Hogan, 2002; Jamasb, 2006; and, Zhang et al., 2008). Nonetheless, implementation of effective policies and legal frameworks would not ensure the success of energy reforms if the regulatory authorities lack political independence, professional expertise and financial capacity to implement regulation in favor of the public interest (Stern, 2000; Nagayama, 2009; Sambo et al.,

2012). Most of the previous studies focused on general reform process in energy sector and as per review of relevant literature, no study found the impact of devolution reforms on the energy sector performance. Our study fill this gap by explicitly analysing the data to determine the success of decentralization.

Pakistan is a typical example of developing country who initiated reforms the electric power sector in the mid-1990s to attract investment (Jamasb, 2006). However, overall energy sector in the country can precisely be characterized predominant publicly controlled even after almost three decades of the reforms. The 18th Constitutional Amendment devolved the public service provisions in Pakistan through transferring some of the rights and roles of the federal government to the provincial governments (Burki, 2010; Aslam and Yilmaz, 2011; Shah, 2012; Khayam and Ahmad, 2020; Rana, 2020). The data analysis show that there is no major change in supply-side of energy however, the devolution has changed significantly the energy distribution and consumption shares of the provinces. More than 85% of energy mix in Pakistan is comprised of crude oil, natural gas and hydroelectricity and historically, the supply of these energy commodities was controlled and regulated by the federal government that has now tilted towards more discretion of provinces.

The first major step towards disintegration in electricity sector of Pakistan was the Strategic Plan 1992 that set off the enactment of National Electric Power Regulatory Authority (NEPRA) Act, 1997. It envisioned to promote fair competition in the electricity industry. Pakistan's Power sector was planned to gradually pass through a shift two decades ago from an entirely government owned vertically integrated utility to autonomous companies' band performing power purchase, generation, transmission, dispatch and distribution functions. K-Electric operating in the metropolitan Karachi was first utility that was privatized in 2005.

This analysis addresses several specific questions such as whether the 18th Amendment improved the energy sector performance in Pakistan. How does this constitutional amendment affect energy shares of the provinces and the federal government? How far does the devolution affect the energy consumption patterns and overall performance? The answers to these questions are critical for an impact assessment of the amendment and to point out weaknesses of reform design so as to ensure energy sustainability and economic development. The analysis employed province-level performance indicators for major energy sources including oil, natural gas and electricity, focussing primarily on upstream activities, energy consumption and consumer mix. The study finds that energy sector faces various unintended changes as an outcome of the decentralization for which energy sector was not fully prepared indicating that the amendment was a leap in the dark.

This is seminal study that objectively examine the impact of the constitutional amendment on the energy sector. The study dispels the prevailing delusion that the constitutional amendment has nothing to do with the energy sector by examining the impact of the amendment on different components of the energy sector performance in Pakistan. The findings suggest that the amendment contains clauses that directly affect the upstream sector and natural gas distribution. However, reforms through this amendment did not alter electricity generation and distribution. The relevant clauses of the amendment are explained in the next section followed by the data analysis and discussion. We conclude the study and highlight some implications in the end.

2. The Energy Sector and the 18th Amendment

This section of study provides an overview of the 18th Amendment and its role in modifying the energy sector. Energy markets around the world bear some resemblance with the economists' definition of a competitive market. There are a large number of buyers and sellers of energy commodity in question, which either qualify to be termed as homogeneous or can be measured and accounted for the possible product differentiation. Energy commodities, in general, are supplied by decreasing cost industries whose average costs continually fall over different scales of output. The government intervene because the marginal cost pricing rule of the competitive market will not cover the cost of supply. However, the growing role of national energy supply companies lead to efficiency loss that calls for introduction of reforms.

Energy sector reforms process started in the country more rigorously in 1990s when Ministry of Petroleum and Natural Resources promulgated the successive Petroleum policies in 1991, 1993 & 1994 focussing on the exploration and production (E&P) of oil and natural gas.[1] Alongside, the Power Policy 1998 was a drive towards liberalization of the upstream power sector and vertical and horizontal unbundling of the Water and Power Development Authority (WAPDA). The vertical unbundling of WAPDA resulted in the separation of generation, transmission and distribution functions where eight distribution companies (DISCOs) and 4 generation companies (GENCOs) were given a leeway to become autonomous through horizontal unbundling. However, these companies are still relying on the federal government and are far from being termed as financially and operationally independent. The power purchases and allocations for these DISCOs are made by Central Power Purchasing Agency (CPPA). In the downstream, natural gas is distributed through two public utilities regulated by Oil and Gas Regulatory Authority (OGRA).

Pakistan is a federation comprising of four provinces namely Punjab, Sindh, Balochistan and Khyber Pakhtunkhawa (KPK). Energy sector in the country is predominantly controlled and managed by the federal government. The devolution of powers and rights had long been demanded by political forces in the country. In 2010, the 18th constitutional amendment introduced many reforms that transformed the modality of the state functioning. Particularly, the amendment revoked the constitutional distortions introduced during the military coup in 1999. The amendment essentially altered the sharing of powers between the federal and provincial governments that tilted towards the provincial governments. In this backdrop, the Amendment is considered a landmark towards decentralisation in the country that also affected the energy sector. Most affected components of energy sector include the exploration and production at the upstream sector and natural gas distribution. This amendment transferred some functions of federal ministries to the provinces. Although, the Ministry of Energy is not devolved, the amendment has altered the overall energy sector by modifying Articles [157], [161], and [172] of the Constitution of Pakistan. The new arrangement enabled the provincial governments to have more regulatory control over the upstream sector of oil and natural gas (Arif, 2012).

The Constitution of Pakistan warrants the energy producing provinces to fulfil their own energy requirements on priority. The federal government would levy federal excise duty [Article 158; Constitution of Pakistan].[2] Article [161/1(a)] entitled the province in which a wellhead is situated

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1 Now the same ministry is called Ministry of Energy.

2 Article 158: Priority of requirements of natural gas: "The province in which a well-head of natural gas is situated shall have precedence over other parts of Pakistan in meeting the requirements from that well-head, subject to the commitments and obligations as on the commencing day."

to take royalty on the produced volumes of natural gas. The amendment introduced a similar clause [161/1(b)] for crude oil.[3] Article [172/3] is highly instrumental in determining the resource ownership and states that the ownership vests jointly and equally between the concerned province and federal government.[4] This subsection led not only to equal sharing of revenues collected from oil and natural gas reserves located in the provinces but also that both parties would have equal representation in the Board of Directors. It implies that a province can influence the award of new exploration contracts in its jurisdiction. This amendment reiterated the existing provision to the provinces by the Power Policy 1998 to build power plants up to 20 Megawatts that was extended to 50MW in the Power Policy 2002 (MPNR, 2018). The upstream sector is regulated by the Directorate General of Petroleum Concession, which administers and regulates the oil and natural gas production and sets wellhead prices. The downstream sector of oil and natural gas is regulated by the OGRA.[5]

Primary energy in Pakistan comprise of hydrocarbons, hydroelectricity, nuclear energy and renewables wherein crude oil and natural gas contribute about 70% of supply. A glimpse of performance of the upstream sector over the time is shown in Table 1 that gives an over-arching view of the activities and achievements of upstream sector in Pakistan. The table accounts for overall contributions to appraise scale effect over time and at national level. Interestingly, the data analysis indicates that the number of attempts to get one successful well is decreasing as drilling activities grew. It signifies a rising success rate. Among the two energy sources, successful discoveries are more evident in the case of non-associated natural gas. KPK outperformed both in oil and gas exploration and production among the four provinces after the amendment. Pakistan has substantial domestic energy potentials especially in the case of coal, hydroelectricity and other renewables, but the country is considered an energy deficient country because production falls short of the demand. As a result, it has been importing crude oil and oil products since past many decades (Jamil and Shahzad, 2017).

Table 2 shows the composition of total energy supply in the time periods studied. During 2003-10, natural gas consumption increases substantially whereas the share of hydroelectricity in total energy consumption remained rather stable. Over the years, Pakistan has moved from relatively low cost to high cost electric power generation. The cost of electricity supply grew considerably due to fossil fuels dominated energy mix and heavily relying on imported oil that force the government to subsidise underprivileged economic sectors and energy consumers. Subsidy policies and tariffs offered by the government in the energy sector ensued the circular debt.

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3 [Article 161/1]: Natural Gas and Oil:

(a)"the net proceeds of the Federal duty of excise on natural gas levied at wellhead and collected by the Federal Government and of the royalty collected by the Federal Government, shall not form part of the Federal Consolidated Fund and shall be paid to the Province in which the wellhead of natural gas is situated;"

(b) "the net proceeds of the Federal duty of excise on oil levied at well-head and collected by the Federal Government and of the royalty collected by the Federal Government, shall not form part of the Federal Consolidated Fund and shall be paid to the Province in which the well-head of oil is situated;"

4 [Article 172/3]: Ownerless Property

"Subject to the existing commitments and obligations, mineral oil and natural gas within the Province or the territorial waters adjacent thereto shall vest jointly and equally in that Province and the Federal Government."

5 OGRA (Fines and Recovery) Rules, 2009; Natural Gas Theft Control Rules, 2011; Tight Gas Policy 2011; LNG Policy 2011; and Petroleum Policy 2012. Recently, Ministry of Energy introduced the Gas (Theft Control & Recovery) Ordinance 2014.

Table 1: Upstream performance indicators of Oil and Natural Gas

Indicator	2003	2010	2017
Exploratory wells	572	769	1021
Development wells	754	1032	1348
Drilling Density (Km)	1446*	1376	810
Total Discoveries:	154	233	357
Oil Discoveries	59	69	91
Natural Gas Discoveries	95	164	266
Overall Success Rate**	3.70	3.30	2.86

Note: For example, * means one well per 1446 square Kilometers. ** shows one successful well out of how many drillings.

Source: Energy Yearbook (Issues of 2003, 2010 & 2017).

Table 2: Final Energy Consumption by Source (MTOE)

Source	2003	2010	2017
Oil	10.9 (41.4)	10.8 (27.8)	17.9 (35.7)
Natural Gas	9.1 (34.6)	17.0 (43.8)	17.0 (33.9)
Electricity	4.3 (16.3)	6.1 (15.7)	7.8 (15.6)
Coal	1.7 (6.5)	4.3 (11.1)	6.1 (12.2)
LPG	0.4 (1.5)	0.6 (1.5)	1.3 (2.6)
Total	26.3	38.8	50.1

Source: Pakistan Energy Year Book: Issues of 2003, 2010 & 2017.

Note: MTOE=Million tonnes of oil equivalent. Parenthesis (.) give the percent share in total energy consumption.

This study opens up to appraise the impact of the amendment on the energy sector performance by using provincial and aggregate data, which compare the energy sector performance in the pre- and post-amendment periods. Three performance indicators are analysed covering the upstream and downstream sectors including reserves and production of oil and natural gas, and consumption of electricity and natural gas and we evaluate the performance of each indicator separately. Data on the energy sources is mainly taken from the *Pakistan Energy Yearbook* for the relevant years. Other main data sources include the *Power System Statistics* published by National Transmission and Dispatch Company and *State of the Industry Report* published by NEPRA.

The 18th Amendment alters the composition of committee at Directorate General of Petroleum Concession that awards petroleum exploration rights and now the committee has representation from all provinces. Khyber Pakhtunkhwa (KPK) constituted a provincial holding company namely Khyber Pakhtunkhwa Oil and Gas Company Limited (KPOGCL) that is working under Energy & Power Department, Government of KPK, which signed Petroleum Concession Agreements under Article 79 of the Petroleum Exploration and Production Rules 2013 with E&P companies in different exploration blocks. Sindh and KPK provinces are demanding the right to have their own regulatory bodies. In general, the amendment is seen as a step towards devolution, however it

created misconceptions and differences among the federal and provincial governments. This state of affairs created uncertainty and negatively affected the energy sectoral performance.

3. Analysis and Discussion

Natural gas is a substantial resource in the upstream sector of Pakistan constituting 38% of the primary energy supplies. The country has abundant resources of conventional as well as unconventional natural gas including, more distant methane hydrates, tight gas and shale gas (Jamil, 2012). EIA reports that Pakistan holds sizeable shale gas reserves equivalent to over 100 trillion cubic feet (Tcf).[6] That is why, the government has offered investment incentives for shale gas development. However, investors are not motivated to develop these resources primarily due to low natural gas prices in Pakistan. Conversely, Pakistan's conventional natural gas reserves have declined over the past several years and now it is importing gas. The reserves and production of oil is quite limited in the country and with only around 15% of domestically produced oil (HDIP, 2016). Sindh has been the leading province in terms of reserves and production of oil and gas. During the study period, the upstream sector in KPK accelerated enormously both in terms of exploration and production of oil and natural gas. The country has quite limited crude oil reserves that increased modestly over the period and the economy has to rely mainly on oil imports.

Table 3 shows the reserves and production for crude oil and natural gas. The most significant change in the discovery and production of crude oil is evident in KPK province where cumulative production increased from 0.2 million barrels in 2003 to 112 million barrels in 2017 and total reserves exceed to 295 million barrels from merely 20 million barrels during this period. The share of KPK in oil production outdo the production of Sindh for the first time and its annual crude oil production reached 16.4 billion barrels in 2017 from negligible amounts in the early 2000s. The upper panel of Table 3 shows that crude oil reserves of Punjab and Sindh are retiring gradually because significant additions are not seen during 2003-2017. The positive side is that despite low oil reserves relative to natural gas, the production per day has increased and the remaining reserves are rising moderately.

As far as, natural gas is concerned, Sindh and Balochistan provinces are surplus producer provinces. The additions in gas reserves of Balochistan halted significantly during the period studied due to deteriorating political and security conditions in the province. Addition in total reserves of natural gas in the Sindh province is encouraging to some extent, as the data show a more than 50% increase, however the remaining reserves exhibit a gradual decline. On the whole, the remaining natural gas reserves data is showing a rapid fall as can be seen in the lower panel of Table 3. The lessening reserves cannot support the required annual production, and the lower panel of Table 4 shows a fall in annual natural gas production in all major producing provinces. To bridge the demand supply gap, the government has been importing LNG from Qatar since 2015.

In the downstream domain, the data analysis is carried out for natural gas and electricity only because oil products are distributed through the private market with a minimal role of devolution on the allocation. Pakistan has electricity and natural gas utilities that are public sector enterprises. The analysis is based on some indicators that can provide benchmarks against which progress can be measured. The analysis shows some interesting trends in the electricity distribution system. Although controlled by the federal government, provinces may exercise some powers in electricity distribution to benefit consumers in their jurisdiction.

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6 EIA's *Technically Recoverable Shale Oil and Shale Gas Resources* report published in 2013.

Table 3: Crude Oil Reserves and Cumulative Production by Province

Province	Total Reserves			Cumulative Production			Remaining Reserves		
	2003	2010	2017	2003	2010	2017	2003	2010	2017
	Crude Oil (Million Barrels)								
KPK	20.6	119.85	295.6	0.2	20.12	112.2	20.4	99.73	183.4
Balochistan	1.35	1.38	1.7	0	0	0.2	1.35	1.38	1.5
Punjab	402.0	417.39	425.6	272.9	323.61	359.2	129.1	93.78	66.4
Sindh	353.7	436.76	474.5	215.8	315.09	393.7	137.9	121.67	92.7
Pakistan	**777.6**	**965.38**	**1197.5**	**488.8**	**658.82**	**865.3**	**288.8**	**306.56**	**344.0**
	Natural Gas ((Trillion CFt)								
KPK	0	2.702	2.025	0	0.194	0.946	0	2.508	1.079
Balochistan	16.39	19.866	19.268	9.470	11.926	14.015	6.921	7.941	5.253
Punjab	1.78	3.032	2.600	0.461	1.703	1.259	1.320	1.329	1.341
Sindh	21.96	28.364	33.106	5.202	12.55	19.986	16.761	15.814	13.120
Pakistan	**40.13**	**53.96**	**57.00**	**15.13**	**26.37**	**36.20**	**25.00**	**27.59**	**20.79**

Source: Pakistan Energy Year Book: 2003, 2010 & 2017. Note: Total reserves are total recoverable reserves by definition.

Table 4: Province-wise Annual Production of Crude Oil and Natural Gas

Province	2003	2010	2017
Crude Oil (Billion Barrels)			
KPK	0.3	6.0	16.4
Balochistan	0.02	0.0	0.0
Punjab	8.3	5.1	5.6
Sindh	14.7	12.9	10.8
Total Pakistan	23.3	24.0	32.8
Natural Gas (Billion CFt)			
KPK	3	74	144
Balochistan	348	288	326
Punjab	65	69	49
Sindh	764	1,049	953
Total Pakistan	1,180	1,482	1,472

Source: Pakistan Energy Yearbook various issues; Note: Values for all three periods are 3-Years averages.

Natural gas has the unique character of being a comparatively cheaper fuel in Pakistan and thus is the consumer's first choice. The most significant and considerable impact of the amendment is evident in the downstream sector of natural gas where devolution made the Gas Allocation and Management Policy 2013 quite feeble. After the amendment, the national priorities are undermined by the 'right of the producing province' argument.

One common observation is that the natural gas sector expanded more rapidly between 2003 and 2010. The Medium-Term Development Framework MTDF-2005-2010 envisioned to promote

natural gas consumption in the country. As a result, all the sectors plan to achieve their growth targets assuming the availability of sufficient natural gas. This is especially true in the case of compressed natural gas (CNG) to the transport sector, which grew during late 2000s so quickly that it could not be sustained. In all four provinces, the trend of extended gas connections and distribution infrastructure is quite similar (Gomes, 2013; Khan & Yasmin, 2014). Punjab and KPK provinces had the highest growth rates in both indicators that diminished in the post- amendment period due to constrained supply. Surprisingly, Sindh province being the highest producer of natural gas has the lowest growth rates of connections and distribution infrastructure. In Tables 5 and 6, we show the increasing trend in natural gas connections and infrastructure stretched throughout the provinces. If we extend the discussion to natural gas consumption as presented in Table 7, it is ironic that natural gas consumption growth rates in Sindh were the lowest among all the provinces during 2010-2017 with the exception of Punjab where a negative growth was recorded. In 2003, the share of Punjab in natural gas net consumption was 52%, equivalent to its population share that grew to 60% in 2010. Following the 18th Amendment, Punjab's consumption share declined to 55% in 2017. On the other hand, gas consumption grew by more than 48 and 41% respectively in KPK and Balochistan during 2010-2017.

The share of Balochistan in total gas consumption (excluding the natural gas allocation to the electric power sector) is merely 1.7%, while its share in total domestic production is 22%. The actual consumption is obtained by subtracting the gas allocation for the power sector from the total provincial consumption, because power generation in one province does not imply that this energy is used in that province. This meagre share of the province in gas consumption is due to low economic activity. Another noticeable finding is a relatively slower growth in gas consumption than the expansion in distribution infrastructure. It is pertinent to mention that gas consumption is constrained with production that cannot keep pace with growing demand and distribution network.

Table 5: Province-wise Natural Gas Consumers Number

Province	2003	2010	2017
KPK	257,537	454,007 (76%)	726,114 (60%)
Balochistan	129,187	203,035 (57%)	261,806 (29%)
Punjab	1,916,158	3,252,694 (70%)	4,938,466 (52%)
Sindh	1,528,761	2,044,122 (34%)	2,577,365 (26%)
Pakistan	3,831,643	5,953,858 (55%)	8,503,751 (43%)

Source: Pakistan Energy Yearbook: 2003, 2010 & 2017. Note: Percentages in the parenthesis are growth rates from the previous column.

Table 6: Province-wise Natural Gas Distribution Infrastructure (Kilometers)

Province	2003	2010	2017
KPK	5,926	12,248 (107%)	17,692 (44%)
Balochistan	4,383	6,690 (53%)	8,592 (28%)

Punjab	35,218	70,990 (102%)	101,403 (43%)
Sindh	21,816	30,061 (38%)	40,881 (36%)
Pakistan	67,343	119,989 (78%)	168,568 (40%)

Source: Pakistan Energy Yearbook: 2003, 2010 & 2017.

Table 7: Natural Gas Consumption (Million CFt)

Province	Sector	2003	2010	2017	Growth rate %	
					2003-10	2010-17
KPK	Residential	12,210	19,303	29,805	58	54
	Commercial	1,762	2,409	2,364	37	-2
	Industries	8,690	11,995	12,451	38	4
	Transport (CNG)	1,476	13,418	25,094	809	87
	Sub Total:	24,138	47,125	69,714	95	48
Balochistan	Residential	8,412	8,245	11,375	-2	38
	Commercial	446	611	901	37	47
	Industries	126	242	325	92	34
	Transport (CNG)	10	521	952	5110	83
	Sub Total:	8,994	9,619	13,553	7	41
Punjab	Residential	85,680	126,023	162,702	47	29
	Commercial	13,999	24,341	20,150	74	-17
	Industries	176,136	337,175	321,569	91	-5
	Transport (CNG)	7,693	61,090	16,483	694	-73
	Sub Total:	283,508	548,629	520,904	94	-5
Sindh	Residential	47,206	65,811	86,987	39	32
	Commercial	6,569	9,594	9,443	46	-2
	Industries	164,070	206,163	205,049	26	-1
	Transport (CNG)	2,141	23,973	24,716	1020	3
	Sub Total:	219,986	305,541	326,195	39	7
Power Generation		335,637	366,906	446,941	9	22
Grand Total:		**872,265**	**1,277,820**	**1,377,316**	**46**	**8**

Source: Pakistan Energy Yearbook (Issues 2003, 2010, and 2017).

In this state of affair, the allocation of natural gas does not follow commercial operations. The connection and infrastructure are extended because the profitability of distribution companies namely, Sui Southern Gas Company (SSGC) and Sui Northern Gas Pipelines Company (SNGPL) do not depend on the sale of gas. Rather, the regulator applies a return on assets regulation with a prescribed rate of return of around 17% as a matter of policy. That is why, regardless of the dwindling supplies of gas, the distribution network kept on increasing throughout the last two decades. The Gas Allocation Policy 2013 prioritised the economic sectors for natural gas sharing

and set the priority for residential and commercial consumers, followed by power, industries and the fertiliser industry. The supply of CNG to the transport sector comes last in this ordering. The 18th Amendment directly affected the sector-wise consumption pattern of natural gas. Table 7 shows that exorbitant growth in the consumption of CNG during 2003-2010 that partly sustained in KPK and Balochistan only in the post amendment period. The devolution of powers has major impact on the gas allocation. The policy priorities are not implemented equably, and the surplus provinces ignore the priorities set by the federal government's gas allocation policy and meet their domestic demand first.

The Medium-Term Development Framework (MTDF 2005-10) adopted by the Government of Pakistan was the medium-term plan relying heavily on natural gas. It expanded the exploration and production of natural gas in the country and extended the distribution network for the residential and transport sectors. During the 2000s, Pakistan was perceived to have sufficient reserves and production capabilities. Hence, gas was offered generously to consumers at lower prices. Consequently, the demand outpaced the exploration and production of new reserves, thus putting the gas sector on the wane.

In a nutshell, there might be different explanations for the demand – supply gap. Firstly, national economic planning greatly relied on natural gas since the mid-2000s. Secondly, weak economic incentives for exploration and production companies to find new reserves have halted investment in the upstream sector. Furthermore, LNG import may have diverted the investment from upstream to natural gas trades and transport. Adding insult to injury, the unaccounted-for-gas due to theft and technical losses in the natural gas sector is high and this chops off hefty sums of revenues.

The impact of devolution on the performance of the electricity sector is assessed through certain parameters such as village electrification, power consumption and distribution losses. The overall performance of the electricity sector turns out to be improved as distribution losses show a declining trend and electricity consumption and number of consumers have increased during both periods. There is a widespread consensus in many developed and developing countries to move towards competitive electricity markets, so is the electricity industry in Pakistan that has changed with the passage of time. The annual growth rate of electricity connections and consumption is relatively high in the Punjab and Sindh provinces and the rate was higher in the pre-amendment period as compared to the post-amendment period. A similar trend is evident in case of electrification that gear up in the 2003-2010 as shown in Table 9, but the provinces cannot keep up with this rate thereafter. It is evident in the table that electrification progressed only in KPK after the devolution reforms.

Pakistan is a developing country where electric utility could not cater for the entire population. Therefore, 100% electrification of the economy remains a policy objective of the public electric utility. Competitive private firms generally have less incentive to extend transmission infrastructure to low usage consumers of rural areas and slum dwellers.

In particular, lack of effective planning and dearth of generation capacity, transmission and distribution losses (Table 10), non-payment of bills, and electricity theft lead to power shortages in the country. Problems like poor energy governance, incapable regulatory authorities and frequent political interferences affecting financial and investment decisions persist in the post-reform period. The problems become worse especially when the federal and provincial governments are from different political parties that distort the coherent functioning of the utility. The analysis shows that the decentralisation move in the energy sector does not pay off in the case

of all indicators. The capacity and existing governance in the provincial affairs determine the performance of different indicators. The study finds that proper monitoring of the sector's performance in order to improve the effectiveness of policies and institutions is inevitable and may improve public service delivery.

Table 8: Province-wise Annual Electricity Sold and Number of Consumers

Province	2003	2010	2017
Electricity Consumers (Million)			
KPK	2.26	2.94	3.63
Balochistan	0.33	0.49	0.59
Punjab	9.66	14.35	19.56
Sindh	2.86	3.56	4.21
Pakistan	15.11	21.34	27.99
Electricity Consumption (GWh)			
KPK	6,005	8,656	9,659
Balochistan	2,870	4,801	4,453
Punjab	32,866	46,348	60,940
Sindh	10,474	15,335	24,564
Pakistan	52,215	75,140	99,616

Source: Pakistan Energy Yearbook various issues; Note: Values for all three periods are 3-Years averages.

Table 9: Number of Villages Electrified

Province	2003	2010	2017
KPK	622	2043	2550
Balochistan	314	1608	1339
Punjab	2141	6201	2851
Sindh	615	2360	951
Total	**22,128**	**62,174**	**42,215**

Source: Pakistan Energy Yearbook: 2003, 2010 & 2017. Note: The numbers presented are 3-years averages.

Table 10: Electricity Transmission & Distribution Losses (GWh)

Items	2003	2010	2017
Generation Capacity (MWs)	17,974	22,263	30,881
Total Supply	71,016	99,143	120,692
Consumption	54,397	78,383	99,744
Distribution (T&D) Losses	16,619	20,760	20,948
Percent T&D Losses of Net Supply	23%	21%	17%

Source: Electricity Marketing Data (Various issues)

4. Conclusion and Policy Implications

This study identifies the impact of the 18th constitutional amendment on Pakistan's energy sector. This amendment is regarded a drive towards decentralisation in Pakistan. The government

generally downplays the impact of this amendment on the energy sector, although this study unveiled the impact of the constitutional amendment and identifies missing links in the energy allocation and distribution policies and prevailing rules that influence the sector. Our approach was to analyse data on relevant indicators in the pre- and post-amendment periods covering three political regimes from 2003 to 2017 and we proceed with the premise that decentralization improves the delivery of publicly provided goods and overall sectoral performance. To wit, the study attempts to evaluate the impact of economic decentralisation on the structure and overall functioning of energy sector in Pakistan.

The data analysis reveals that although the devolution reforms created competition among the provinces in the upstream sector that indirectly improves the overall performance of surplus producing provinces especially KPK however, an adverse impact is evident on the allocation and distribution of energy resources that halt the smooth market functioning of energy commodity. For instance, Article [158] authorizes the producer provinces to fulfil their own energy needs prior to selling to the other provinces. This article motivates a parochial attitude that does not conform to the federal government's Natural Gas Allocation Policy 2005 that was further amended slightly in 2013. It caused anxiety among the provinces which encouraged endeavours to acquire energy independence that may not be optimal.

Reforming the energy sector through disintegration and privatisation of utilities and other measures to improve internal governance is quite arduous and it necessitates political consensus among the federal and provincial governments. It is important to fix this issue because huge financial sums are involved. Moreover, depriving the locals of the producing provinces from the natural resource on the grounds of governance issues such as, pilferage and non-payment will create apprehension and political turmoil. The most suitable solution is to create competition among provinces to attract investment in the upstream sector and improve the governance at the downstream sector to make energy distribution financially feasible fir the public utilities.

In the case of exploration and production of energy resources, KPK province performed well in the post-devolution period both in terms of upstream activities and in energy distribution and consumption. On the flipside, Balochistan, having the second largest share in gas reserves and production failed to improve its energy consumption profile while its reserves and production shares are also declining. The Pakistani economy has had a growing dependence on natural gas for many decades and the country has set up a massive transmission and distribution network. Recently, conventional natural gas reserves are depleting and if major discoveries are not made, dependence on gas imports would escalate. LNG imports have started and gas import through pipelines is planned such as the TAPI and IP projects, but may have disastrous impacts on the balance of payment account especially when theft of electricity and natural gas is rising (Jamil, 2013).

The natural gas prices did not give the right signals, that is, relatively low consumer prices motivate excessive consumption. On the other hand, regulated wellhead prices on the lower side may dis-incentivise E&P companies reducing investments in the E&P business. The alternative route may be to offer policy incentives to develop the shale gas resources that are abundantly available in the country. Policy that can attract investment in the and renewable electricity such as, solar and wind can be highly beneficial especially when off-grid distribution arrangements can be formed and managed by the concerned community. Pakistan has significant hydro power capacity that can be reaped by way of investing in these technologies. It is more plausible because of associated

environmental benefits. The provinces are free to have and develop their own power generation but the key factor relating to the decision for tariff and revenue collection still rests with the federal government. The ability of provinces to generate electricity is limited because they lack financial resources, and provincial governments are restrained by inability to provide sovereign guarantees for international funding and the absence of a national coordination plan is also a drawback. A lot of emphasis should be on factors such as regulating and reforming energy supply and identifying policy incentives that ensure sustainability.

References

Arif, M. (2012) "18th Constitutional Amendment: Implications for Energy Sector" *Institute of Policy Studies (IPS),* Islamabad.

Aslam, G., and S. Yilmaz (2011) "Impact Of Decentralization Reforms In Pakistan On Service Delivery - An Empirical Study" *Public Administration Development* **31**, 159-171.

Aunphattanasilp, C. (2018) "From decentralization to re-nationalization: Energy policy networks and energy agenda setting in Thailand (1987–2017)" *Energy Policy* **120**, 593-599.

Bhattacharyya, S. (2005) "The Electricity Act 2003: will it transform the Indian power sector?" *Utilities Policy* **13**, 260-272.

Borenstein, S. (2002) "The trouble with electricity markets: understanding California's restructuring disaster" *The Journal of Economic Perspectives* **16**, 191-211.

Burki, S. J. (2010) "Provincial Rights and Responsibilities" *The Lahore Journal of Economics* **15**, 1-14.

Dorsey-Palmateer, R. (2020) "Outsized impacts of residential energy and utility costs on household financial distress" *Economics Bulletin* **40**, 3061-3070.

Dubash, N. K., and D. N. Rao (2008) "Regulatory practice and politics: lessons from independent regulation in Indian electricity" *Utilities Policy* **16**, 321-331.

Gasparatos, A., and T. Gadda (2009) "Environmental support, energy security and economic growth in Japan" *Energy Policy* **37**, 4038-4048.

Goldthau, A. (2014) "Rethinking the governance of energy infrastructure: Scale, decentralization and polycentrism" *Energy Research & Social Science* **1**, 134-140.

Gomes, Ieda. *Natural Gas in Pakistan and Bangladesh–current issues and trends*. Oxford Institute for Energy Studies, 2013.

HDIP, 2016. *Energy Yearbook 2015-16*. Hydrocarbon Development Institute of Pakistan, Ministry of Energy, Government of Pakistan, Islamabad.

Hogan, W.W., (2002)"Electricity market restructuring: Reforms of reforms" *Journal of Regulatory Economics* **21**, 103-132.

Jamasb, T. (2006) "Between the state and market: Electricity sector reform in developing countries" *Utilities Policy* **14**, 14-30.

Jamil, F. (2012) "Impact of different public E&P policies on natural gas reserves and production in Pakistan" *Resources Policy* **37**, 368-374.

Jamil, F. (2013) "On the electricity shortage, price and electricity theft nexus" *Energy Policy* **54**, 267-272.

Jamil, F., and A.M. Shahzad (2017) “Decomposition Analysis of Energy Consumption Growth in Pakistan during 1990-2013” *NUST Journal of Social Sciences and Humanities* **3**, 152-177.

Joseph, K. L. (2010) "The politics of power: electricity reform in India" *Energy Policy* **38**, 503-511.

Joskow. P., (1997) "Restructuring, competition and regulatory reform in the US electricity sector" *The Journal of Economic Perspective* **11**, 119-138.

Joskow, P., (1998) "Electricity sectors in transition" *The Energy Journal* **19**, 25-52.

Khan, M. I., and T. Yasmin (2014) "Development of natural gas as a vehicular fuel in Pakistan: issues and prospects" *Journal of Natural Gas Science and Engineering* **17**, 99-109.

Khayam, M. U., and I. Ahmad (2020) "Decentralization of Environment in Pakistan: Issues in Governance."*Policy Perspectives* **17**, 101-116.

Kruyt, B., Vuuren, V., Vries, H., and H. Groenengerg (2009) "Indicators for energy security" *Energy Policy* **37**, 2166-2181.

Liew, V. K., Nathan, T. M., and W. K. Wong (2012) "Are sectoral outputs in Pakistan led by energy consumption?" *Economics Bulletin* **32**, 2326-2331.

Lin, J.Y., and Z. Liu, (2000) "Fiscal decentralization and economic growth in China" *Economic Development and Cultural Change* **49**, 1-21.

MPNR, (2018) Miistry of Petroleum & Natural Resources, Government of Pakistan. http://www.mowp.gov.pk/policiesDetails.aspx

Nagayama, H. (2009) "Electric power sector reform liberalization models and electric power prices in developing countries: An empirical analysis using international panel data" *Energy Economics* **31**, 463-472.

Newberry, D. (2004) "Regulation and competition policy: longer-term boundaries" *Utilities Policy* **12**, 93-95.

Rana, M. A. (2020) "Decentralization Experience in Pakistan: The 18th Constitutional Amendment" *Asian Journal of Management Cases* **17**, 61-84.

Rauf, O., Wang, S., Yuan, P., and J. Tan, (2015) "An overview of energy status and development in Pakistan" *Renewable and Sustainable Energy Reviews* **48**, 892-931.

Sankar, T. L. (2004) "Electricity Act 2003: dark shadows over a bright vision" *Economic and Political Weekly* **39***,* 839-844.

Shah, A. (2012) "The 18th constitutional amendment: glue or solvent for nation building and citizenship in Pakistan?" *The Lahore Journal of Economics* **17**, 387–424.

Stern, J. (2000) "Electricity and telecommunications regulatory institutions in small and developing countries" *Utilities Policy **9***, 131-157.

Umbach, F. (2010) "Global energy security and the implications for the EU" *Energy Policy* **38**, 1229-1240.

Usman, Z. G., Abbasoglu, S., Ersoy, N. T., and M. Fahrioglu, (2015) "Transforming the Nigerian power sector for sustainable development" *Energy Policy,* **87**, 429-437.

Williams, J. H., and R. Ghanadan, (2006) "Electricity reform in developing and transition countries: A reappraisal" *Energy* **31**, 815-844.

Yang, Y., Chen, Y., and Z. Liu, (2007) "Energy Constraints and China's Economic Development" *Journal of Economic Policy Reform* **10**, 343-354.

Zhang, Y. F., Parker, D., and C. Kirkpatrick, (2008) "Electricity sector reform in developing countries: an econometric assessment of the effects of privatization, competition and regulation" *Journal of Regulatory Economics* **33**, 159-178.