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Quantification of Hidden Cost/Quasi-Fiscal Activities in Electricity Sector of Pakistan

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ABSTRACT

The aim of the study is to quantify the hidden costs in the electricity sector of Pakistan and estimate which components contribute more to the hidden cost/quasi-fiscal activities (QFAs). The hidden cost is comprised of three key components: tariff differential subsidies, transmission and distribution losses, and bill collection ratio. Quantifying the hidden costs/QFAs helps policymakers understand the amount of resources that could be generated or saved within the sector. The End-product method is used to quantify QFAs through a hidden cost calculator model for the period 2009-10 to 2021-22. Based on the quantification, it is concluded that tariff differential subsidies are the major contributing component of hidden costs, followed by transmission and distribution losses. Bill arrears are the least significant contributor. The average hidden cost over a 12-year study period amounts to 2.69% of the country's GDP. The study suggests that if the electricity sector works efficiently by reducing transmission and distribution losses, collecting all bill amounts, and eliminating unnecessary subsidies, it could save an amount equivalent to 2.69% of GDP. This saved money could be utilized for investing in electricity infrastructure development. Such actions would alleviate the burden on the government's exchequer and ensure uninterrupted electricity supply, fostering economic growth and improving the standard of living in the country.

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1. Introduction

Power outage has severely hit the social life of the people in Pakistan. Power shortage causes estimated loss of around 2 percent of GDP annually (Shahbaz, 2015). The problems and challenges associated with the electricity sector in Pakistan are various and interrelated; Transmission and distribution losses, electricity theft, provision of subsidies, and low bills collection in the sector are the challenges to mention a few. Saavalainen and Ten Berge (2006) termed these problems as Quasi-Fiscal Activities (QFA) of electricity sector. It is also called hidden cost of the state-owned public utilities enterprises. Many studies have pointed out the quasi-fiscal activities of public utilities is a constraint to energy supply, but a few studies have attempted to calculate the magnitude of hidden cost in the energy sector of the regions other than Pakistan. This study will attempt to quantify hidden cost in electricity sector of Pakistan. Quantification of QFA/Hidden cost helps policy maker to know how much resources could be generated/save within the sector, and that which component contribute more in QFA of the electricity sector.

The hidden cost or the quasi-fiscal activities of state-owned public utilities is the difference of the value between actual revenue collected by public utilities at regulated prices and the revenue that it could have collected if price charged at full cost recovery rate with optimal line losses, and full bills payments (Saavalainen & Ten Berge, 2006). In simple words electricity QFA of state-owned public utilities is a constellation of issues like technical (transmission and distribution) losses, commercial losses (theft), non-payment of bills and tariffs sets below cost recovery rates. The QFA/hidden cost concept is a theme usually discussed in the policy papers of international Monetary Fund (IMF) and World Bank (Tchaidze, 2007). In most of developing countries hidden cost is high in contrast to developed countries of the world (Antmann, 2009). The technical losses of transmission and distribution are relatively high due to not deploying the state of the art technology in the electricity sector. Electricity theft (commercial losses) is a common practice in many developing countries. Saavalainen and Ten Berge (2006) showed severe technical and commercial losses of 35 %, 19 % and 18 % of GDP for Kyrgyz Republic, Moldova, and Uzbekistan economy, respectively. Many developing countries intend to save the poor people from paying high electricity prices by setting electricity tariff below cost of production (Bacon, Ley, Kojima, & Garrido, 2010). This explicit subsidy has negative repercussions on the economy. It is not only increasing burden of fiscal debt, but also crowd out productive public social spending (Coady, Parry, Sears, & Shang, 2015).

Pakistan like other developing countries faces hidden cost, amount in billions of rupees in electricity sector. Over the past few years Pakistan energy sector is trapped in circular debt – a situation in which consumer, electricity distribution companies, electricity producer and oil suppliers all owe each other and cannot pay their dues to each other. There are several reasons of the circular debt; hidden cost is the major one responsible for it. In a study Zhao (2014) reported that many elite class and government departments are defaulters of electricity bills. In certain parts of the country the distribution companies cannot collect bills due to worsen law and order situation in the regions. Non recovery of bills payment coupled with transmission and distribution losses leaves the electricity producers with no choices other than underutilization of installed generation capacity, and to hamper from investing and upgrading electricity infrastructure. The objective of the study is to quantify the quasi fiscal activities/hidden cost in electricity sector of Pakistan.

1.1. Overview Of Hidden Cost in Electricity Sector of Pakistan

The provision of affordable and adequate energy, with electricity being the most crucial form of energy, is an essential prerequisite for the economic and social development of modern societies. The importance of energy cannot be denied in improving living standards, reducing poverty, and promoting human welfare worldwide. Per capita energy consumption is a crucial indicator of socioeconomic progress, highlighting the essential role of energy in any society's development. The hidden cost of electricity in Pakistan is a major issue that contributes to the country's electricity shortage. Technical and commercial losses, non-payment of bills, subsidies, and tariffs set below cost recovery rates are some of the factors that result in hidden costs in the state-owned public utilities. In the process of electricity generation, transmission and distribution some power dissipate in electricity system. These losses occur during the process of electricity generation, transmission, and distribution, and can be divided into two categories: technical losses, which are due to energy dissipated in equipment and conductors, and non-technical losses, which include electricity theft and billing errors (Bhatti et al., 2015). The situation of high power losses in Pakistan has remained persistent over the years. During the 1990s decade, the average T&D losses were estimated at 23.6% of units generated and reached their highest point at 27.8% in 1999-2000. In the 2000s decade, the average T&D losses remained at 24.6%, with a peak of 25.8% in 2002-03. During the 2010-2020 decade, the average T&D losses were recorded at 20.1%. Along with the financial burden of subsidies, these high losses also negatively impact the reliability and quality of electricity supply. Despite various initiatives taken by the government, such as private sector participation in the power sector and the establishment of independent power producers, the efforts have been limited in reducing T&D losses and improving the overall situation (Malik, 2007).

Pakistan has a high rate of transmission and distribution losses and ranks 14th out of 131 countries in this regard. Normal T&D losses are 6-8% of generated energy, but in Pakistan, they range from 9.5 to 35.1% in different distribution centers (Discos) (Bhatti et al., 2015). These losses are significantly higher than those in other Asian countries such as South Korea, where T&D losses are only 3%, China, where losses are only 5%, and Bangladesh, where losses are only 9% (C. P. Trimble, Kojima, Perez Arroyo, & Mohammadzadeh, 2016). In addition to outdated and unreliable generation plants, the high losses in Pakistan can be attributed to weak grid infrastructure, low voltage transmission and distribution lines, and commercial factors such as default payments and electricity theft (Malik, 2007). In FY 2017-18, the distribution companies in Pakistan incurred a loss of Rs 46 billion due to T&D losses (S. Ali, 2021). The

Pakistani government offers subsidies to the country's electricity sector, with the inter-DISCO rate differential constituting the greatest component of these subsidies. This subsidy accounts for the difference between the government's uniform tariff and the price that the National Electric Power Regulatory Authority (NEPRA) determines should be charged to each individual distribution company (DISCO). The tariff that is set by NEPRA is unique for each distribution company since it takes into account a variety of criteria, including the cost of energy, capacity payments, and distribution margins. The government implements a unified tariff throughout all geographic areas, with the minimum consumer-end tariff for a specific customer category being applied to all DISCOs. This tariff applies to the government-owned electric and gas companies (DISCOs). The government provides a subsidy to the DISCOs in the amount that is equal to the difference between the uniform rate and the tariff that was decided by NEPRA.

Since the beginning of the fiscal year 2007, the government has paid more than 3 trillion rupees in subsidies to the electricity sector. Of these payments, 2.5 trillion rupees have been designated for the tariff difference subsidy. Seventy-two percent, or 187 billion rupees, of the 260.5 billion rupees in power subsidies were allocated towards inter-DISCO tariff differential in the fiscal year 2020 (SBP, 2019). The goal of the strategy implemented by the government is to shield those with incomes between zero and three hundred units from the effects of the increase in tariffs. In Pakistan, as of the month of May 2019, 86 percent of household consumers use an amount of power equal to or less than 300 units, while the remaining 14 percent used an amount of electricity equal to or greater than 300 units. This indicates that, despite the fact that there have been nominal increases, there have been no actual increases in the price of power for around 86 percent of the users who live in their own homes. In addition, in metropolitan areas, there is a cultural tradition of having two or three metres in a house in order to distribute the burden of electrical appliances among them. As a result, the amount of electricity that is utilised typically falls below 300 units. Therefore, all of the aforementioned groups are receiving the unnecessary subsidised pricing in a roundabout way. In other words, it is possible that the subsidies are not going to the consumers who are the most worthy of them (C. Trimble, Yoshida, & Saqib, 2011).

Theft of electricity refers to the illegal use of electricity, which typically involves going around the metre or tampering with it in order to underreport the amount of power being consumed. It is a significant problem in many power systems because it can result in huge financial losses due to the vast amount of electricity that is distributed (Smith, 2004). These losses can be attributed to the fact that it is possible for it to cause considerable financial losses. There is no way to completely protect an electric power system from being stolen from. The quantity of electricity that is stolen from various systems ranges from one to two percent of the total amount. On the other hand, the vast amount of electricity that is distributed results in a significant financial loss (Smith, 2004). The amount of stolen electricity can be estimated, but it cannot be precisely quantified. An exhaustive investigation of the power system provides the most precise estimate of the amount of theft that has occurred. Analysis of transmission and distribution losses, also known as T&D losses, is the conventional approach to evaluating the theft of electrical power. According to Smith (2004), the method compares the quantity of electricity that is meterable and sold to the amount of electricity that is created, minus the amount of electricity that is used by the system and free electricity.

In 2018, Pakistan electricity theft in the system is 3.9 percent and it cost Rs 196 billion in electricity theft and line losses (Planning Commission, 2018). According to NEPRA report in 2020, the country is facing a massive electricity theft problem, with an estimated loss of of Rs. 111.6 billion in 2019 alone. (NEPRA 2020). In 1998 the government of Pakistan took steps to combat electricity theft by enlisting the support of the army to recover outstanding dues owed to the WAPDA and curb power theft. During the raids the army uncovered over 100,000 incidents of electricity theft and collected fines and penalties worth Rs. 2.4 billion. Surprisingly, the investigation revealed that even some government and WAPDA officials were involved in power theft. In 2000, it was reported that only 52% of Karachi Electric Supply Corporation's 1.67 million customers were paying their bills. In developed countries, the collection ratio for bills is significantly high, with nearly 100 percent of the billed amounts being paid by the consumers. However, in developing countries like Pakistan, the collection ratio is comparatively low. In 2010, the collection ratio stood at 91 percent, but it further declined to 86 percent by 2012. It is worth noting that Pakistan has never achieved a 100 percent bills collection ratio. A study revealed that even government departments and the army have not been consistent in paying their electricity bills, leading to substantial financial losses incurred by the Distribution Companies (Discos) amounting to billions of rupees. According to Faraz (2018), in Pakistan, there are over 5.3 million electricity connections without payment. These connections belong to either willful defaulters or individuals unable to pay. As of June 30, 2018, the total outstanding balance of these defaulters amounted to Rs 404.8 billion.

After the introduction, the literature review of previous studies will be discussed. This will be followed by the data and methodology in part 3. The data analysis will be presented in part 4. The conclusion will be discussed in part 5, while recommendations will be provided in part 6.

2. Literature Review

The phenomenon of Quasi-fiscal Deficit (QFD) has been extensively studied in the financial sector, however, there are fewer studies on the subject in the non-financial sector. The IMF and World Bank often address the concept of QFD in their policy papers (Tchaidze, 2007). In developing countries, the financial sector is the main source of these hidden costs, while state-owned enterprises (SOEs) are the primary generators of QFDs in former Soviet Union (FSU) countries, where public services were heavily subsidized and payment collection was lax leading to high consumer consumption. Several studies have aimed to quantify the QFDs in various countries Petri, Taube, and Tsyvinski (2002), used an end-product approach to estimate the energy sector QFD in Ukraine, and a financial balance approach for Azerbaijan. The study found the energy sector QFD in Ukraine was 6.5% of GDP, with mispricing and arrears being the major contributing factors. Meanwhile, in Azerbaijan, the energy sector QFD was 26.7% of GDP, and it was estimated that the revenue of Azerbaijan could be increased by 27% of GDP if subsidies and bill arrears were abolished. Similarly, Saavalainen and Ten Berge (2006) studied the QFD in the electricity and gas sector in eight CIS countries. The end-product approach was used to quantify the QFD, and the study found that the QFD in the electricity sector varied across the eight CIS countries, with Tajikistan and Uzbekistan having the highest QFD at 21.4% and 15.9% of GDP, respectively, and Armenia having the lowest at 1.1% of GDP. The study also concluded that IMF-supported funds and conditions for reducing QFDs were not successful.

Hidden cost can be comprised of many factors, but in energy sector Tariff Differentail Subsidies, transmission and distribution losses, and arrears are the major components of it. Ebinger (2006) used a hidden cost calculator model to determine the magnitude of QFDs in Europe and Central Asian countries (ECA). The study found that hidden costs in the ECA region were 4.4% of GDP. Tariff Differential Subsidies (TDS) accounted for 67% of total hidden costs, while transmission and distribution losses and bill arrears accounted for 22% and 11% of total hidden costs, respectively. Smith (2004) Conducted a study, "Electricity Theft: A Comparative Analysis," in which he evaluated the prevalence of electricity theft in 102 countries between 1980 and 2000. Smith discovered that T&DL were higher in nations with weak civil rights, democratic institutions, and accountability, as well as in those experiencing political instability, violence, corruption, ineffective government, and excessive regulation.

The literature on QFDs did not solely focus on quantification; it also sought to evaluate methodologies and link various elements of these methods. Tchaidze (2007), attempted to evaluate the two methodologies for quantifying QFDs and their components, and to link the end-product method and the financial balance method. The study incorporated implicit and explicit subsidies and a firm's financial borrowing capacity in estimating QFDs, however, it acknowledged some difficulties such as determining the full cost recovery price and cross-subsidization. The study also discussed QFDs in the case of several enterprises with mutual payment arrears.

Husnain F. Ahmad, (2023) attempted to analyze the impact of infrastructure upgrades in Karachi, Pakistan. The transformation involved replacing bare distribution wires with aerial bundled cables (ABCs) to deter electricity theft through unauthorized connections. The study found that the transition to ABCs significantly reduced electricity theft, increased electricity bill payments, and also resulted in a reduction in CO2 emissions."

Freinkman, Gyulumyan, and Kyurumyan (2003) set out to provide a complete analysis of quasi-fiscal deficits and subsidies, as well as the impact that these factors had on Armenia's fiscal performance during the latter half of the 1990s, in their paper titled "Quasi-Fiscal

Activities, Hidden Government Subsidies, and Fiscal Adjustment in Armenia." The authors use a flows-of-funds paradigm to investigate the dynamics of payables and receivables across important institutional actors during the years 1997 to 2001. The key finding of this research paper highlights that a significant factor contributing to fiscal adjustment in Armenia during the studied period was the reduction in quasi-fiscal deficits. Furthermore, the study reveals that the household sector emerged as the primary beneficiary of net quasi-fiscal subsidies, receiving approximately 70% of the total. Over the years 1996 to 1999, the population consistently received more than 2% of GDP in quasi-fiscal subsidies, although this amount declined to approximately 1% of GDP in 2001.

Camos Daurella, Estache, and Hamid (2017), quantified QFD through the end-product method for 14 countries in the Middle East and North Africa region (MENA). The average QFD of the 14 countries was 4.4% of GDP, with underpricing being the major contributing factor (3.2% of GDP). Bill collection losses contributed an average of 0.6%, while transmission and distribution losses and overstaffing shared an average of 0.4% and 0.2% of GDP, respectively. The quantification of QFD helps policy makers understand how much resources could be generated or saved within the sector and which components contribute the most to QFD. C. P. Trimble et al. (2016), paper examines the financial viability of electricity sectors in 39 African nations using a similar method to the Africa Infrastructure Country Diagnostic. Two scenarios are used to calculate the quasi-fiscal deficit. In the first scenario, only 2 countries are financially viable, and deficits average 1.5% of GDP, exceeding 5% in some. The second scenario shows an increase in the number of countries with a deficit below zero, suggesting that tariff increases may not be necessary. The focus should be on reducing network and collection losses, which are a larger hidden cost, rather than underpricing.

The paper "Quasi-Fiscal Activities and Investments in Energy Sector (Case of Georgia)" by Shalikashvili (2016) analyzes the causes and effects of quasi-fiscal activities (QFAs) in Georgia's electricity and gas sectors. The study finds that the gas sector has the largest proportion of QFAs, caused by a significant difference between actual and market prices. The increase in QFAs after 2012 is attributed to tariff reductions in both sectors, which reduce company revenue and hinder investment. The paper suggests that a combination of energy price increases and improved payment enforcement could reduce QFAs. In the case of Georgia, the main factor contributing to QFAs is determined to be mispricing of output, and the author suggests aligning actual and market prices to decrease QFAs.

In case of Pakistan, the proper quantification of quasi fiscal activities in electricity has not been conducted, but different studies have calculated the individual components of quasi fiscal activities. The research that was carried out by Faisal Mahmood Mirza in 2015 and titled "Long Run Determinants of Electricity Theft in Pakistan: An Empirical Analysis," The authors employ an ARDL approach to examine the long-run relationship between electricity theft and the target variables. The results of the study suggest that there is a negative relationship between per capita income and electricity theft, as well as a positive relationship with electricity price and the number of consumers. The data for the study were collected annually from 1970 until 2010. Similarly, Babar, Jamil, and Haq (2022) identified a positive association between corruption and electricity theft and a negative, but statistically insignificant relationship between the chance of discovery and electricity theft in the Islamabad Electric Supply Company (IESCO) in Pakistan. This research was conducted in the country of Pakistan.

The research conducted by Awan, Samad, and Faraz (2019) and titled "Electricity Subsidies and Welfare Analysis: The Perspective of Pakistan" investigates the effect that direct subsidies to the energy industry have on the wellbeing of households in Pakistan. Both a Computable General Equilibrium (CGE) model and a Social Accounting Matrix (SAM) were utilised in the authors' research. The results showed that reducing TDS leads to higher investment levels and a positive impact on the economy, including higher real GDP and private consumption, and lower government spending. The study also found that TDS is an untargeted subsidy, with the urban rich being the largest beneficiaries. In the study "Electric Power Transmission and Distribution Losses Overview and Minimization in Pakistan" by Bhatti et al. (2015), it was discovered that various factors cause T&D losses during electrical transmission. This leads to an inefficient system with high losses and poor power quality in Pakistan. To upgrade the system and reduce losses, new technologies such as advanced metering, HVDC, and gas-insulated substations should be implemented, as seen in successful countries like China and the US. This can contribute to national development.

S. S. Ali and Badar (2010), in their paper "Circular Debt in the Pakistani Energy Sector", examined the circular debt issue in Pakistan's energy sector. The profile of the sector is presented, and the reasons behind the emergence of circular debt are discussed, including insufficient consumer tariffs, fiscal constraints preventing the government from compensating PEPCO, and difficulties in collecting dues from consumers. To address this issue, the paper suggests the need for adjustments in tariffs and explicit recognition of power subsidies in the budget by the government. The paper "Effectiveness of Regulatory Structure in the Power Sector of Pakistan" by Malik (2007) aims to evaluate the regulatory environment in the electricity sector of Pakistan. The author finds that weak administrative governance in NEPRA, the regulatory body responsible for the power sector, results in ineffective operation and a lack of autonomy. Furthermore, NEPRA is lacking in professional expertise, hindering its ability to supervise the power sector and establish fair pricing policies.

This study will quantify all the major components of the quasi fiscal activities in electricity sector of Pakistan, and its relative importance in total hidden cost.

3. Data and Methodology

This study attempts to quantify the hidden costs of the electricity sector in Pakistan utilizing time series data from 2009-10 to 2021-22. The components of hidden costs and their respective data sources are briefly discussed as follows:

3.1. Variables and Data Sources

3.1.1. Tariff Differential Subsidy (TDS)

TDS represents the discrepancy between the cost of supplying electricity and the government-regulated tariff. In Pakistan, NEPRA is responsible for determining the electricity tariff for each Distribution Company (Disco). However, the government notifies a uniform and reduced tariff for all Discos. The difference between these tariff rates constitutes the Tariff Differential Subsidy, which is funded by the Government of Pakistan. This specific consumption range (200-300 units)was chosen due to two primary reasons: firstly, the majority domestic consumers approximately 86%, use electricity up to 300 units, and remaining 14 % uses more than 300 units of electricity C. Trimble et al. (2011) and secondly, it represents a medium consumption slab.

The comprehensive data on electricity tariff costs was compiled from various editions of the Power System Statistics published by the National Transmission and Dispatch Company Limited (NTDCL), while the subsidized tariff for the 200-300 units consumption slab was extracted from various issues of the Economic Survey of Pakistan.

3.1.2. Transmission and Distribution Losses (T&D Losses)

T&D losses refer to the units of electricity dissipated during the transformation of electricity from the point of generation to the end consumers. Data pertaining to T&D losses was sourced from various editions of the Power System Statistics published by the National Transmission and Dispatch Company (NTDC).

3.1.3. Bills Recovery Ratio

The Bills Recovery Ratio signifies the percentage of the total billed amount that is successfully collected by the discos. Data regarding the Bills Recovery Ratio was collected from various editions of the Power System Statistics, published by NTDC.

3.1.4. Gross Domestic Product (GDP)

GDP represents the market value of all final goods and services produced within a country during the current year. GDP data was obtained from the State Bank of Pakistan.

3.1.5. Total Electricity Consumption

Total electricity consumption denotes the cumulative units of electricity consumed by all consumer groups under both the Water and Power Development Authority (WAPDA) and Karachi

Electric (KE). Data pertaining to this variable was also sourced from the Power System Statistics published by NTDC.

3.2. Model of the Study

This study will employ the hidden cost calculator model, as previously utilized by Ebinger (2006) for calculation of Hidden costs in the energy and water sectors in the Europe and Central Asia Region, to quantify QFA through end product approach.
The Hidden Cost Calculator Model

Hidden Cost = Tariff Differential Subsidies + Transmission and distribution Losses + Bills Collection Ratio

$$HC = TDS + Lm + Rct$$

$$HC = TQC\,(P - P1) + TQC\,(P)\,\frac{(Lm - Ln)}{(1 - Lm)} + TQC\,(P1)(1 - Rc) \quad (1$$

Where
HC = Hidden Cost in billions Rs.
TQC = Total Quantity Consumed by all groups of consumers, (GWH)
P =Cost Recovery Price Level determined by NEPRA (Rs/KWH).
P1 =Subsidized Price Level for slab 200 – 300 units notified by govt (Rs/KWH).
Lm =Financial Losses (it includes theft, Meter tempering, using out dated system of T&D Line) in percentage.
Ln =Technical Losses (unavoidable losses with state-of-the-art efficient technology) in percentage.
1– Rc)=Bills Payment Collection Ratio (It takes value between 0 and 1).

4. Data Analysis

Table 1 depicts the components of hidden cost. The first column shows the years from 2009-10 to 2021-22. The second column quantifies Tariff Differential Subsidies (TDS), the third column shows quantification of transmission and distribution losses (TDL), and the fourth column quantifies bill collection ratio (BCR). The sum of the second, third, and fourth columns is shown as the hidden cost in the fifth column.

From the table 1, it can be seen that the TDS is continuously increasing over time, while the TDL and BCR have some fluctuations over time. The table 1 also shows that TDS accounted for the highest share in the early years, with an average relative share of 481.30 billion rupees, followed by TDL with an average of 185.64 billion rupees, and BCR with an average of 122.54 billion rupees. This suggests that tariff differential subsidies were a significant contributor to the overall hidden cost. Hidden cost is at maximum in year 2021-22 amounting Rs 1971.90 billion, in which TDS contribution is Rs. 1385.87 billion, TDL is Rs. 291.77 billion and bill arrears share is Rs. 294.26 billion.

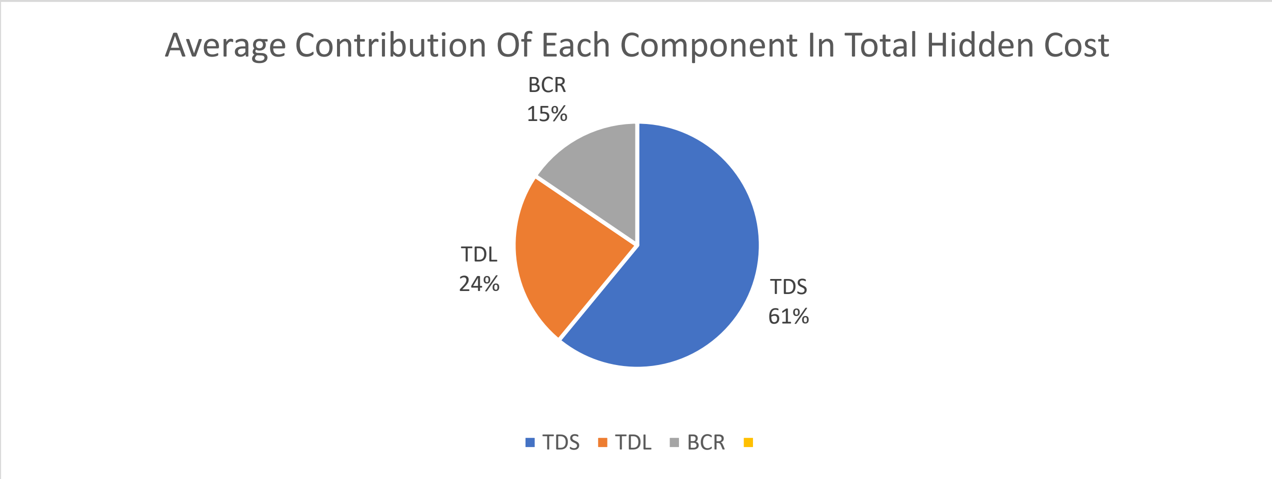
Table 1: Calculation of Hidden cost Billion Rupees

Fiscal Year	TDS	TDL	BCL	Hidden cost
2009-10	260.31	114.87	57.71	432.89
2010-11	317.22	137.12	75.87	530.21
2011-12	385.53	144.85	120.38	650.76
2012 -13	416.69	155.04	55.65	627.38
2013-14	642.49	186.92	120.83	950.24
2014-15	639.35	208.93	156.83	1005.11
2015-16	195.01	187.26	91.91	474.17
2016-17	350.60	186.12	118.31	655.03
2017-18	414.93	224.55	208.84	848.31
2018-19	452.30	196.70	171.65	820.65
2019-20	949.69	235.62	229.29	1414.61
2020-21	751.51	249.65	63.18	1064.33
2021-22	185.87	291.77	294.26	1917.90
Average	481.30	185.64	122.54	

Source: Authors own calculation

The overall trend shows an increase in total hidden costs, with fluctuations in certain years. If we look at the relative share of each component in the total hidden cost, as shown in the pie diagram, it is clear that Tariff Differential Subsidies (TDS) contribute the most, with an average of around 60.98% of the total hidden cost. Transmission and Distribution Losses (TDL) make up around 23.52% of the total hidden cost on average, and Bill Collection Ratio (BCR) makes up around 15.50% of the total hidden cost on average. The TDS and TDL are the major contributors to the total hidden cost, while the BCR is the least contributor.

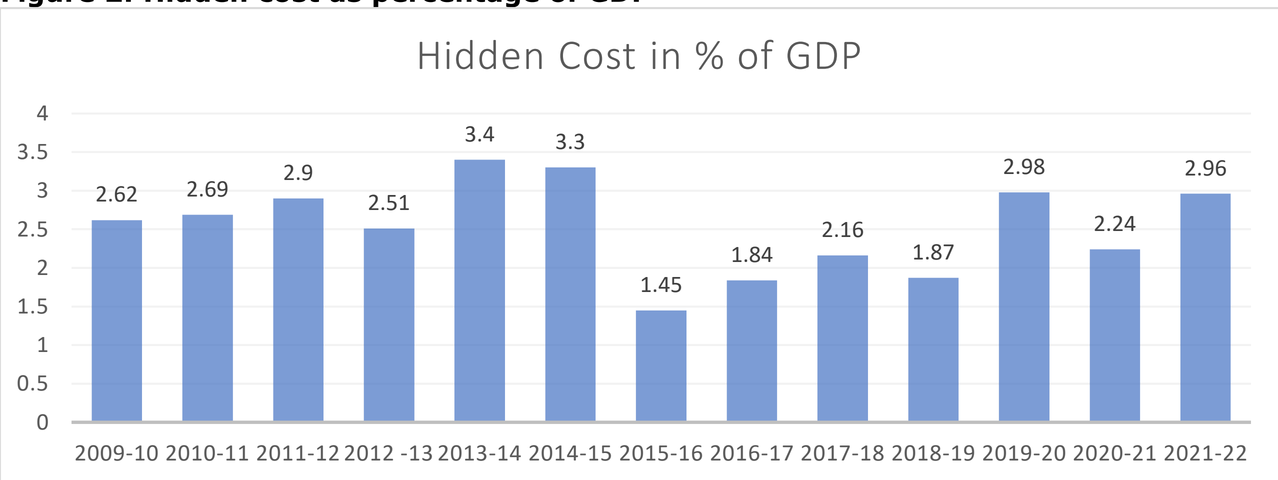
Figure 1



Source: Author's Estimation

Fig. 2 illustrate the hidden cost as a percentage of GDP, it averaged at 2.69% over the study period. This percentage represents the average proportion of the hidden cost relative to the Gross Domestic Product (GDP) during the study period. However, it is worth noting that there were fluctuations from year to year, ranging from as low as 1.45 % in 2015-16 to as high as 3.40 % in 2013-14. In the fiscal year 2015-16 subsidized price is significantly high 12.09 Rs/unit and difference with cost recovery price level (14.27 Rs/unit) is minimum in the study period, leaving per unit subsidy as lowest as Rs 2.18. Similarly, bills collection ratio is higher 92% in the same fiscal year. Consequently total hidden cost in percentage of GDP is minimum in 2015-16. In fiscal year 2013-14 per unit subsidy is the highest (8 Rs/unit), due to this high subsidy level hidden cost in percentage of GDP is highest during the study period.

Figure 2: Hidden cost as percentage of GDP



Source: Author's Estimation

In summary, the hidden cost comprises three primary components: tariff differential subsidies (TDS), transmission and distribution losses (TDL), and outstanding bill arrears. TDS emerges as the predominant contributor to the total hidden cost, while TDL and bill arrears also make substantial contributions. The hidden cost as a percentage of GDP reached its highest point (3.4%) in fiscal year 2013-14 when the government of Pakistan significantly reduced electricity tariffs for domestic consumers. On the contrary, the hidden cost was at its lowest (1.4%) in fiscal year 2015-16, a period when subsidized tariffs for domestic consumers were at their peak.

Providing more subsidies to electricity consumers, tolerating bill arrears, and failing to meet targets for reducing transmission and distribution losses can lead to an increase in hidden costs, potentially having detrimental effects on the overall economy.

5. Conclusion

The objective of the study was to quantify quasi fiscal activities associated with Pakistan's electricity sector between 2009-10 and 2021-22. The study evaluated three factors contributing to these hidden costs: tariff differential subsidies, losses in transmission and distribution, and unpaid bills. Throughout the study period, the hidden cost amounted to Rs. 1971.90 billion was the highest in 2021-22. Among the contributing factors, tariff differential subsidies made the largest impact, accounting for Rs. 1385.87 billion. This substantial subsidy amount was mainly due to a high per-unit subsidy of 11.12 Rs/unit provided to domestic users. It is important to note that electricity subsidies in Pakistan tend to be regressive, disproportionately benefiting wealthy individuals who do not necessarily need the assistance, rather than those who are deserving but financially disadvantaged (Awan et al., 2019). Additionally, around 86 percent of electricity consumption in Pakistan is subsidized, as mentioned by (C. Trimble et al., 2011).

During the study period, it was found that the costs due to transmission and distribution losses and unpaid electricity bills were increasing. This means that the situation was not improving over time. Outdated meters, faulty transmission and distribution lines, and electricity theft are the main reasons behind these losses in the electricity sector. In Pakistan, the average losses in transmission and distribution are higher than the global average and even higher than in other developing countries (C. P. Trimble et al., 2016). Simply increasing the capacity to generate electricity without investing in the infrastructure for its transmission and distribution will not solve the problem. Theft of electricity is directly connected to problems in governance, including a lack of transparency, political instability, inefficient government, and corruption. It is essential to employ administrative strategies such as routine inspection and monitoring, in addition to technical solutions such as tamper-proof metres, in order to cut down on the amount of electricity that is stolen. According to Smith (2004), in some instances it may also be required to restructure the ownership of power systems as well as the regulation of those systems. It is worth noting that the electricity bill collection ratio has never reached 100 percent in Pakistan, and even government departments have outstanding electricity dues.

The presence of significant hidden costs in utilities weakens their financial position, hindering their ability to invest in essential infrastructure and necessary repairs. As a result, some plants and machinery are inefficiently over utilized, while others are forced to close down. While subsidies, theft, and non-payment of bills may temporarily benefit individuals, they can have negative long-term impacts. Over time, people may experience problems such as inadequate and subpar electricity supply, leading to a deterioration in their quality of life. To assist low-income individuals, the implementation of direct cash transfers can help alleviate the burden of high prices (Smith, 2004).

5.1. Recommendations

Based on the analysis and conclusions drawn from the given data, the following policy recommendations can be made to address the hidden cost and its components:

- Tariff differential subsidies may be abolished altogether. Policymakers should concentrate on directing subsidies to reach the right people while keeping the economic burden low.
- In order to reduce transmission and distribution (T&D) losses, significant investments in capital are necessary to replace unreliable low-voltage transmission and distribution lines. Adoption of advanced technologies such as advanced metering, high-voltage direct current (HVDC) systems, gas-insulated substations and reducing length of transmission lines can reduce the losses.
- To prevent electricity theft, government need to take strong action against people who steal electricity and give them harsh punishments. Using modern meters can also help stop them from tampering with the meters and stealing electricity.
- The provincial governments should actively participate in the decision-making process of distribution companies (DISCOs) and prioritize the goal of maximizing revenue recovery and minimizing electricity theft at the DISCO level.

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