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Assessing the Judicial Efficiency of District Courts in Pakistan: An Empirical Evidence Using Extended Linear Programming Technique

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ABSTRACT

Objective: The present study focuses on measuring efficiency of district courts of Punjab, Pakistan taking into consideration various measures of productivity.
Research Gap: To our knowledge, quantitatively analysis of these issues is not done so far dealing the efficiency issue of the Justice System both at higher and lower level of Judiciary in Pakistan. Therefore, this study embraces this novelty in itself by measuring the efficiency of lower courts in Punjab' judiciary system considering the judges' caseloads, administrative staff, and court expenses.
Design/Methodology/Approach: The study adopted frontier approach i.e., Data Envelopment Analysis for the calculation of efficiency estimates for 36 Districts of Punjab using the dataset of the year 2020-21.
The Main Findings: Registration (Filing) of new cases in civil courts is found to be the most restrictive exogenous factors causing delays in the case disposition.
Theoretical / Practical Implications of the Findings: The most important implication of this study is to highlight the existing bottlenecks in the courts at district level. By calculating pure, overall and scale efficiency of courts, the judicial bodies can have better understanding whether it's the issue of human and physical resources or the size of courts itself causing high rate of pendency of cases in district courts of Punjab.
Originality/Value: This study is innovative which discussed the quality of judicial services. Very few studies empirically estimate the efficiency of Pakistani courts at District level. Hence this shows a significant contribution of this study in existing literature

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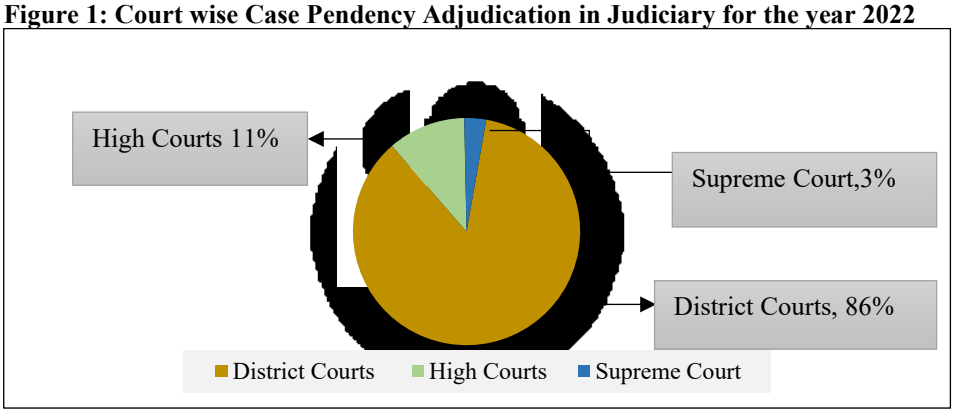
1. Introduction

The importance of a sound judicial system cannot be denied as one of the important pillars for economic prosperity and human development as quick and transparent justice prevents the uncertainties and chaos in the society thus improving living standard, citizen trust on the government which can significantly contribute towards sustainable economic development. Transparent judiciary builds the confidence and trust of investors as well as promotes efficiency of the social, economic, and political system. However, in case of developing economies, the judicial system is facing major constraints such as poor infrastructure, poor incentive systems, malpractices, lack of accountability, delays and backlogs, high costs of litigation, complex procedures, lack of judges and supporting staff vis-a-vis lack of transparency in appointments. These challenges are ultimately causing socio-economic and political unrest in the country. Without a well-

functioning judiciary system, it is difficult to induce public harmony and conflict resolution for creating an enabling environment towards sustained peace and security, enforcement of human rights, good governance, and economic development. Therefore, dispensation of judiciary should be the central objective of a nation-state as justice and rule of law is the backbone of well-developed society. This study focuses on two major issues; firstly, to undertake efficiency analysis of the Lower courts of Pakistan. Secondly, it aims to critically examine the bottlenecks specifically faced by the District Courts of Pakistan. The Lower courts have been taken as unit of analysis as these courts are facing the highest backlog and large caseloads (Judicial Statistics of Pakistan, Annual Report 2020). Due to long procedural delays, the pendency rate is mounting every year along with high rate of case institution resulting from absence of rule of law. Such delays also cause an increased cost of civil litigation that makes justice beyond the reach of common man with severe social implications. This court congestion also affects the quality of justice. According to recent survey of World's Justice Report, Pakistan's rank on Rule of Law Index 2021 is alarmingly disappointing which is 130th out of 139 countries. This index is composed of eight dimensions including criminal and civil justice. Pakistan is experiencing the lowest rank of justice, freedom, accountability, and gender disparities which reflects the failure of our political, social, and economic system not only as an individual entity but also regionally and among the bracket of lower income countries.

At present, courts in Pakistan are facing congestion of cases resulting from high pendency rates and such delays have become an alarming feature of our judiciary system.

Figure 1: Court wise Case Pendency Adjudication in Judiciary for the year 2022

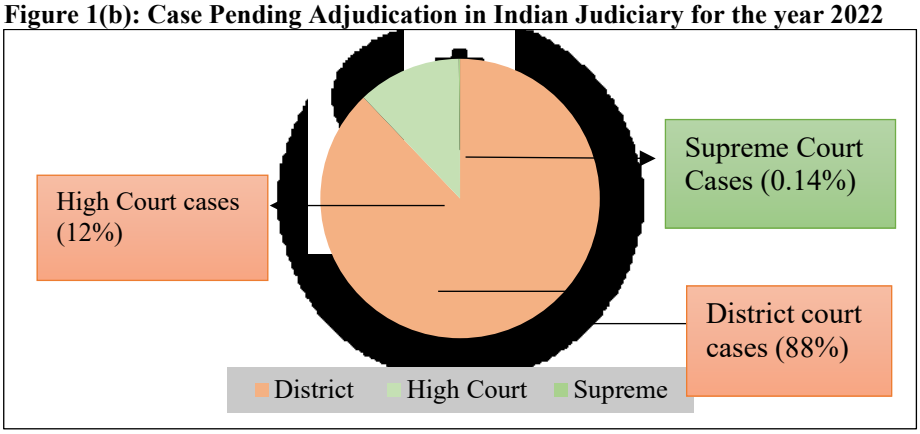


Source: Author's own extracted and calculated from the available reports

In the figure 1 an overview of Judicial System of Pakistan is provided for the year 2020. After the implementation of National Judicial Policy 2009, it is observed that number of disposed cases has increased in 2020 in comparison to previous year's performance. However, the situation has worsened for District courts in terms of caseloads, pendency rates and delays as can be observed in the figure below i.e., the largest number of delays and non-disposal of cases fall under district courts.

For understanding the issue of this huge case pendency in case of Pakistan, a similar graphical expression is provided below for another developing economy having almost same socio-cultural setup i.e., Indian courts. Fig 1 (b) is portraying the scenario till December 2022 for Indian economy where this can be observed that district courts are hugely overburdened compared to rest of the courts however in case of Supreme court, we see the backlog is meagre which is negligible. This comparison helps in understanding that developing countries are facing this issue of case pendency due to their socio-demographic design of economies where on the one side they having fastest growth of population leading to increased poverty levels which ultimately triggers the crime and corruption rates in such societies and on the other side capacity issue is another stumbling block in these economies which are making the system inefficient and ineffective for masses.

Figure 1(b): Case Pending Adjudication in Indian Judiciary for the year 2022



Source: Author's own extracted and calculated from the available reports on website

Hence to improve the efficiency of judicial system, two important factors need to be focused on as the existing literature. These are caseload per judge and time in the disposition of case.

Among many other factors, the most important reason for huge pendency in District courts is the constrained number of judges and lack of facilities provided to both lawyers and judges such as the infrastructure. Usually, it is observed that judicial staff face a poor working environment like small compact rooms, electricity shortfall and lower level of privileges and salaries. Above all, the scarcity of judges is becoming a major hindrance in providing the speedy and efficient delivery of justice in the case of district courts.

Nevertheless, there are many other factors which cause delay in justice other than judicial officers like police department, lawyers, and medical practitioners etc. who are directly or indirectly involved in case preparation and provision of supporting documents. Such elements are also negatively affecting the efficiency of judicial system in lower courts (Former Chief Justice of Sindh High Court Justice, 2017). There are many reasons for the observed high rate of delays but apparently the lack of judges' appointments and supporting staff are the key factors. Table 1 given below provides statistics on differences between the number of sanctioned judges and working judges among various levels and categories of courts.

Table 1: Comparative Statistics about Strength of Judges

Types of Courts	Sanctioned Judges	Working Judges	Difference
Supreme Court	17	16	1
High Courts	60	47	13
District Courts			
Additional District & Sessions Judges	606	492	114
Senior Civil Judges	109	103	6
Sr. Civil Judge /Judicial Magistrate /Family Judges	1613	963	650
Total Difference (District Courts)	2364	1594	770

Source: Judicial Statistics of Pakistan, Annual Report 2020

The Table given above hints the district courts face more issues in this regard. Among the different categories, it can be clearly seen that lack of appointed judges is the most important cause of delays and court congestion.

1.1. Rationale of the Study

At present, in case of developing economies both the provision of Justice and then the quality of Justice has become a main point of interest for policymakers. The major reason behind this is that due to inefficiency and ineffectiveness of these court systems, there is lack of trust and confidence of people in the public and

private policies of the Government. Pakistan is also facing the same issue and its impact is visible both in domestic and international statistics that due to the fear of insecurities and delay in justice, citizens are losing faith on the integrity of the public and private policies. Congestion in courts, cost of litigation, and delay in the disposition of cases are the major characteristics of our judiciary system. It is believed that delayed justice is denied justice, and this seems quite applicable in case of developing economies. Inefficient Justice System provokes rent-seeking activities, social and political unrest, and lawlessness among certain segments of the society due to which sometimes violent acts have become normal routines in lower income countries for pressing and challenging the writ of the State. To our knowledge, quantitatively analysis of these issues is not done so far dealing the efficiency issue of the Justice System both at higher and lower level of Judiciary in Pakistan. Moreover, the available literature is qualitatively in nature not covering specifically District Courts of Punjab both in the domain of criminal and civil cases. Therefore, this study aims at measuring the efficiency of lower courts in Punjab' judiciary system considering the judges' caseloads, administrative staff, and court expenses. Following this objective, the study targets further to explore the various dimensions /parameters which are acting as bottlenecks in the district judiciary causing delay in justice and high rate of pendency of cases.

1.2. Objective & Hypothesis of the Study

The objective of the study is to evaluate the impact of exogenous factors i.e. caseloads, institution of cases, and pendency on the efficiency/productivity in Lower Courts of district Punjab, Pakistan. The hypothesis under consideration is that exogenous factors i.e. caseloads, institution of cases, and pendency, affect the court efficiency/productivity in Lower Courts.

2. Literature Review

Table 2 is showing various studies measuring efficiency of Justice system in different regions of the World. Literature exists in case of developed economies but for developing economies empirical evidence is very thin and if it exists that is more of theoretical and analytical in nature. Therefore, this research aims to fill this gap by measuring efficiency of court system first using secondary available dataset and secondly an in-depth analysis will be made based on a survey for measuring the bottlenecks in Lower judiciary of Punjab. In the end the study aims to examine the quality of services provided by using an innovative econometric approach in the literature that has not been much applied. Few studies are available and being cited in literature review, but these are covering the developed economies. Hence this research aims to measure how much the litigants are satisfied with the court delivery system.

Table 2: Literature Review

Study	Analysed Judicial System	Output	Input	Econometric Techniques
Kumar & Singh (2022)	Indian Courts	Court Performance	Judges, Lawyers and Litigants	Efficiency Factor Analysis (EFA)
Achenchabe, Akaaboune (2021)	Moroccan courts	Cases resolved	judges; clerks and Court operating expenses	Data envelopment analysis (DEA)
Tabassam, Kamboyo,Manrio and Siddiqi (2021)	Pakistan (Relationship between number of judges at the level of district judiciary)	Resolved cases	Number of Judges	Survey based
Bełdowski, Dąbroś, Wojciechowski (2020)	Poland (Measuring court efficenicy of District Commercial Court)	Resolved cases	Judges, Caseloads	stochastic frontier analysis (SFA)
Ferro, Oubiña and Romero (2020)	Argentine Labor Courts		Caseload and Backlog	Data Envelopment Analysis efficiency frontier
Zafeer and Maqbool (2020)	Pakistan (delay in civil Justice)	Delay in Justice	Corruption, Frequent Transfer of Judges, Insufficient of Judges, Heavy backlog of cases, Non-punctuality of	Survey Based

			plaintiff and defendant, Lengthy and complicated procedure	
Falavigna et al. (2019)	Italian courts (Civil and Criminal Justice)	Resolved cases	judges; staff; pending cases; incoming cases	Data Envelopment Analysis
Agrell at al. (2019)	Sweden courts	Resolved cases	judges; clerks; area of the court	Data Envelopment Analysis
Ippoliti et al. (2015a), (2015b)	European Court (Civil Justice matter)	Resolved cases	judges; staff; pending cases; incoming cases;	Data Envelopment Analysis
Espasa & Esteller-Moré (2015)	Catalonia, (civil courts of first instance and family law cases)	Resolved cases	Congestion and Temporary judges and working staff	fixed-effect panel stochastic frontier model
Castro and Guccio (2015)	Italian Courts	Resolved Cases	Judges, Administrative Staff	Data Envelopment Analysis
Ippoliti (2014)	Italian First instance courts (Civil Justice)	Resolved cases	judges; pending cases and institution of cases	Data Envelopment Analysis
Ferrandino (2012)	USA Florida	Resolved cases	judges	Data Envelopment Analysis

Source: Author's Compilation

The studies mentioned above are particularly relevant to our research objective and have also made the use of non-parametric technique for the data analysis. Yeung & de Azevedo (2011) by employing DEA measured the efficiency of Brazilian courts for the time period 2006-2008 and concluded that lack of resources cannot be regarded as the major reason of inefficiency of court systems rather and highlighted the role of 'skillful managerial leaders' can improve the efficiency of poor performers. While on the other side Guzowska & Strąk (2013) conducted the similar nature of study for polish civil courts and made the use of microeconomic analysis technique for evaluating the performance of courts. The authors specifically emphasized upon the use of 'technical efficiency' and finding the instruments for measuring operational quality to improve the administration of courts keeping constant the same level of inputs. Achenchabe & Akaaboune (2021) also worked for measuring the efficiency of Morrocon courts using DEA technique but in this study the authors go beyond measuring the efficiency only and try to explore the determinants using OLS method which are affecting these efficiency estimates in both small and large courts. The study concluded that those courts are more efficient, which are more populated and have high number of cases in process. Furthermore, the efficiency estimates show increasing trend where senior judges are available in courts. The paper focused on highlighting the managerial implications of court managers in enhancing court productivity. Nissi & Rapposelli (2019) explored the Italian court performance for the year 2008 using DEA analysis. The study employed input-oriented model and calculated CRS and VRS production frontiers. The results showed that all the courts were technical highly efficient and suggested that the inefficient courts should follow the 'peers' as a symbol of 'best practices' to increase the court productivity. However, the authors also shed light on the operation dimension of model's definition as well when calculating the efficiency estimates. Other than estimating the efficiency scores for each court considering the internal inputs for the desired output many exogenous factors have also been discussed in literature which are directly acting as the impediments in enhancing the efficiency of court systems. Many times, caseloads, backlogs, institutions of cases and overall pendency of cases in each court are taken as external shocks affecting the performance of courts. Castro and Guccio (2015) also highlighted that caseloads are behaving as major obstacle in case of Italian courts with respect to their court productivity. Ippoliti & Tria (2020) found that other than caseloads, if we include case matters in the model then efficiency scores drastically change for Italian courts. Hence, it's upon the way the model is defined for the calculation of efficiency estimates. However, the study suggested in the end that these are the 'civil procedures' technologically practiced by the judges which are required to be reformed for better performance of the courts. Beside using DEA technique, a few numbers of authors have explored the court performance through conducting survey. Zafeer et.al (2020) conducted research to find the factors causing delay in civil courts with 60 respondents and highlighted that it's the huge case backlogs and negligence of judicial staff which has caused low productivity of district courts. Similarly, many authors have attempted to develop a scale for measuring the efficiency using various parameters (Kumar & Singh 2022). However somehow all

the existing research studies tried to examine the restricting causing court productivity at lower courts by using a general cohort of respondents not specifying the impact of such obstructions separately for various court users like litigants, lawyers, and judges. As mentioned earlier that mostly research work is done in developed economies and hardly any study is available empirically for developing economies and if it is, then just based on available secondary data information. Hence the current research aims to fill this gap with reference to the specific district courts of Punjab and intends to provide in a targeted way the policy recommendations which will be more practical in nature and evidence based in its implications.

Corruption regarding white collar crimes not only cause social unrest, but it has economic consequences too. Haag (1982) argued that the deterrence effect can justify the threats attending prohibitions of criminal law, however without threat being punished will be untrue. Prohibition of the law burdens those who are desirous in violating it.

Seligson (2002) and Anderson and Tverdova (2003) analyzed that people's attitudes towards political system and leaders are well depicted in their perceptions about corruption. This further acts as a determinant of investment decisions, political participation and other behaviors.

Katie, at el. (2016) concluded that severe and increased punishments may prove as improvement in deterrence and avoid repetition of white-collar crime. Lučić, et al (2016) showed that change in corruption levels may defer change in GDP for six to ten years and vice versa. The economic policy makers may use this information as an important signpost.

Blackburn et al (2017) argued that organized crime alone raises the cost of business activity and also creates an unfavorable environment for business. Gründler et al. (2019) concluded that corruption and economic growth have an inverse relation. They concluded that reversed CPI increased by one standard deviation decreases GDP by 17 percent. While, Podobnik et al. (2008) and Shao et al. (2007) evaluated there is a positive link between CPI and economic growth and less corrupt countries grow faster. Shao et al. (2007) used another corruption indicator developed by the World Bank and checked the strength of their results which proved an inverse relation of corruption and economic growth. Both the results showed the same consequences supporting proof of negative relation of corruption and economic growth.

Dutta et al (2009) showed a positive relation of conviction with crime rate. It shows that there are inherent system flaws in criminal detection and correction. The Penal system be reformed to rectify the behavioral pattern of criminals through education and technical and vocational training to bring them to mainstream. Liviu-Stelian and Razak (2017) studied the short-run impact of deterrence and analyzed that short run, deterrence of punishment affects the economy and growth positively.

Alfada (2019) estimated that when interaction between corruption and public investment expenditure is included there is strong destructive effect of corruption. The World Bank identifies that corruption acts as a barrier for socio economic development (Dreher et al. 2007).

Christos, et al (2018) concluded that for European countries except Non-European countries including Turkey, the change in corruption and per capita income move in the same direction. Geremy (2008)figured out that awareness and the enforcement of law of anti-corruption laws educate people about the corruption and its possible consequences. The use of media, especially news, proved to be an effective tool in creating awareness among the public. Moreover, Jurg and Eric (2007) analyzed that implementation of heavy fines, rigorous imprisonment and moral education may hinder offences through deterrence.

Francis (2014) stated that as soon as the Cold War was over, international organizations started to work for development and emphasized the countries to fight against corruption which will strengthen the institutions and states.

Andreas (2019) tested that in all kinds of fraud a high significant deterrent effect was exercised and in case of white collar crimes conviction appears to deter the offenders in short term. Therefore, Henning (2015) argued that while dealing with white collar crimes Judges should be aware of little deterrent impact of conviction.

Campbell-Austin Stephanie (2020) talked about the dilemma while dealing with white collar crimes and analyzed that thinks it difficult to figure out that how conviction or prison deter white collar criminals. Samina (2022) concluded that the strict punishment against white collar crimes and deterrence makes implementation of laws proper. Furthermore, Stephanie (2023) was on the view that prosecution of persons involved in white collar crimes helped to preserve the integrity of financial markets and protect the victims. The punishments including imprisonment and fines served as deterrence against white collar crime in coming years.

3. Methodology and Data Sources

The analysis is based on two parts; 1) Situational Analysis & 2) Non-Parametric Analysis.

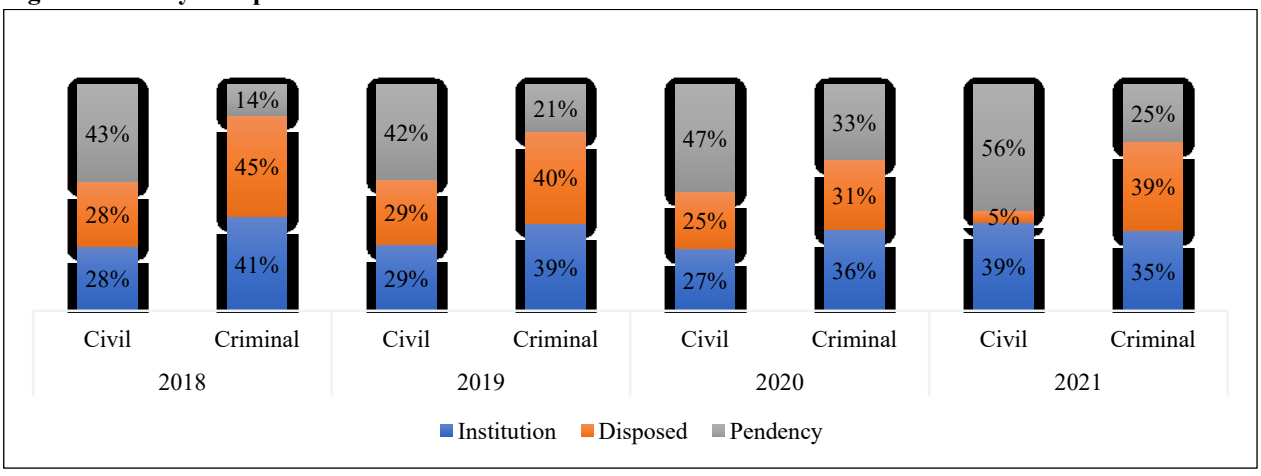
3.1. Situational Analysis

This analysis is conducted using the secondary dataset from the published reports and websites for various case types and 36 districts of Punjab initially for the year 2021. In this section two approaches have been used; 1) Graphical Analysis, 2) Efficiency Analysis using Non- Parametric Technique Data Envelopment Analysis (DAE). This estimation is made to equip the readers that how much the existence inputs are conducive to produce justice efficiently in overall Punjab. Data on two inputs i.e. Judges and Administrative staff has been taken in this regard and two output variables have been used for measuring the efficiency. Below is given in detail the structure of the proposed technique and the estimated figures.

3.1.1. Facts about the Judiciary system in Punjab at District Level

This section is designed to depict the Judicial performance of province Punjab considering various aspects. The purpose is to dig out the areas where the issues are lying and the responsible internal and external factors which have caused these problems in the system. The figure given below is self-explanatory in its nature that how the courts at district level in Punjab are congested in terms of civil cases compared to criminal ones. And the intensity of this imbalance can be observed from their percentage share in the overall pendency. Moreover, a drastic difference between civil and criminal cases can also be visualized from this figure in every year both in terms of case disposal and pendency. The rate of case disposal is quite low comparing to criminal cases and this is the reason the pendency of civil cases is accumulating each year.

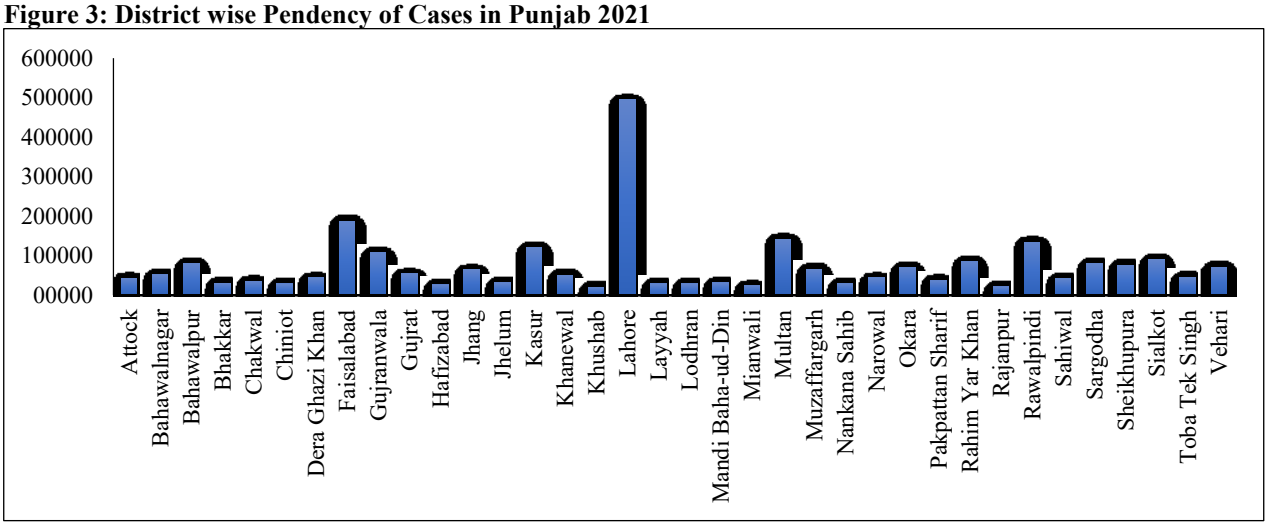
Figure 2: Yearly Comparison between Civil and Criminal Cases



Source: Author's own using dataset from High Court Lahore

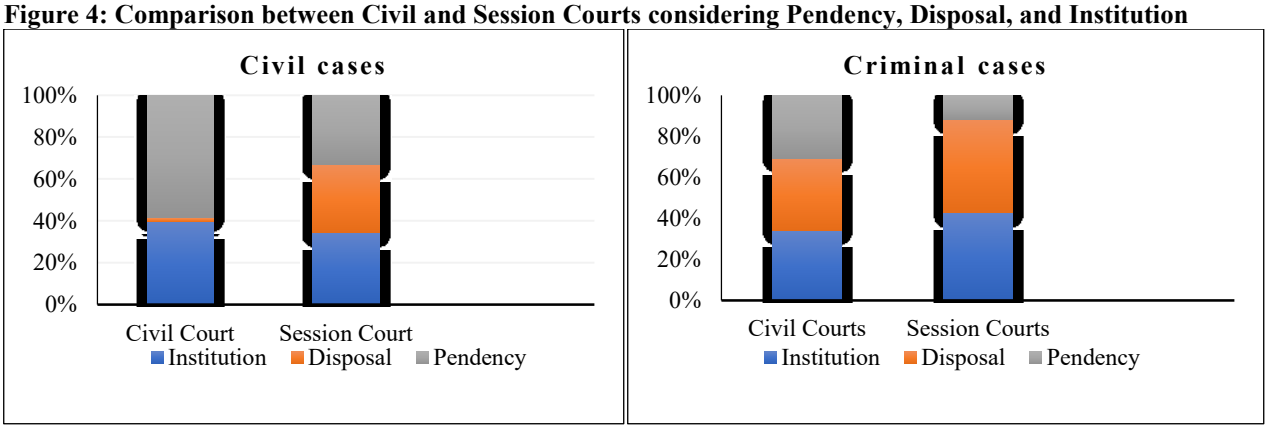
Below the given Figure 3 is further trashing this pendency problem more deeper at district wise in Punjab. The figure is truly depicting the most affected districits i.e. Lahore, Faisalabad, Multan and Rawalpindi. Keeping in view this scenario, the curent study planned to choose these over burdened cities for survey to know about the reasons of poor court performance in these areas.

Figure 3: District wise Pendency of Cases in Punjab 2021



Source: Author's own using dataset from High Court Lahore

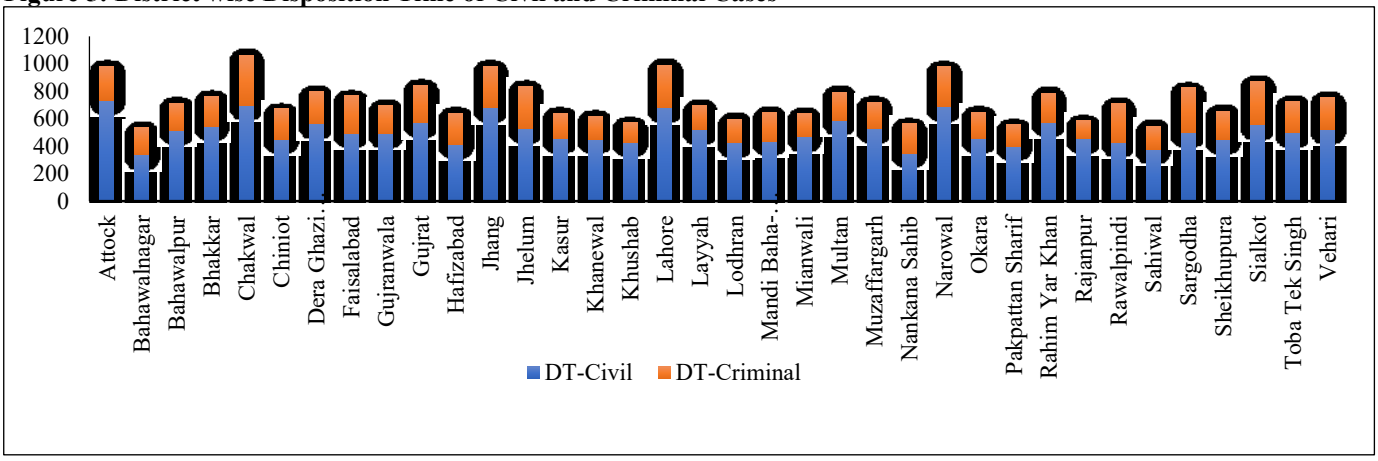
Figure 4: Comparison between Civil and Session Courts considering Pendency, Disposal, and Institution



Source: Author's own using dataset from High Court Lahore

Figure 4 gives visualization of comparison between civil and session courts for both case matters i.e. civil and criminal. From here this is quite clear that session courts are performing better in terms of productivity as compared to civil courts for both types of cases i.e. civil and criminal.

Figure 5: District wise Disposition Time of Civil and Criminal Cases

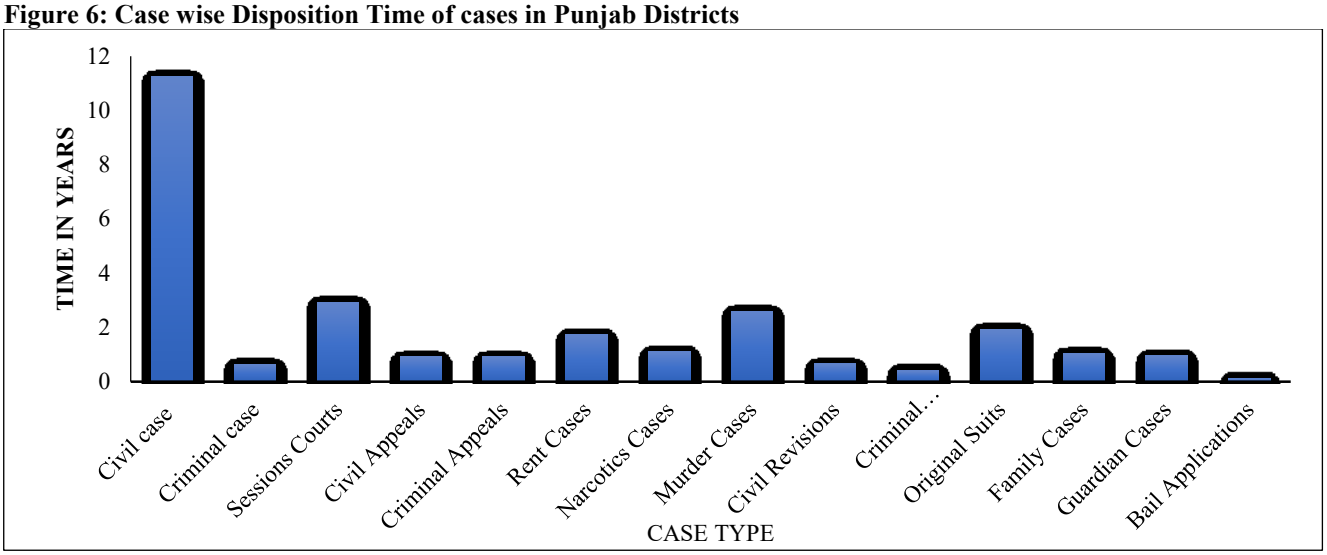


Source: Author's own using dataset from High Court Lahore

Figure 5 is highlighting a very important phenomenon i.e., the disposition time1 for the different case matters in the most congested districts of Punjab. And from this representation, it can be observed that for civil matters, the disposition time is very high while comparing this to criminal cases.

Figure 6 shows the same issue of disposition/clearance time in various case types. And we can see from here that civil cases are dramatically consuming more time comparing to other case matter. Bail applications are the most efficient case type consuming lesser time in days.

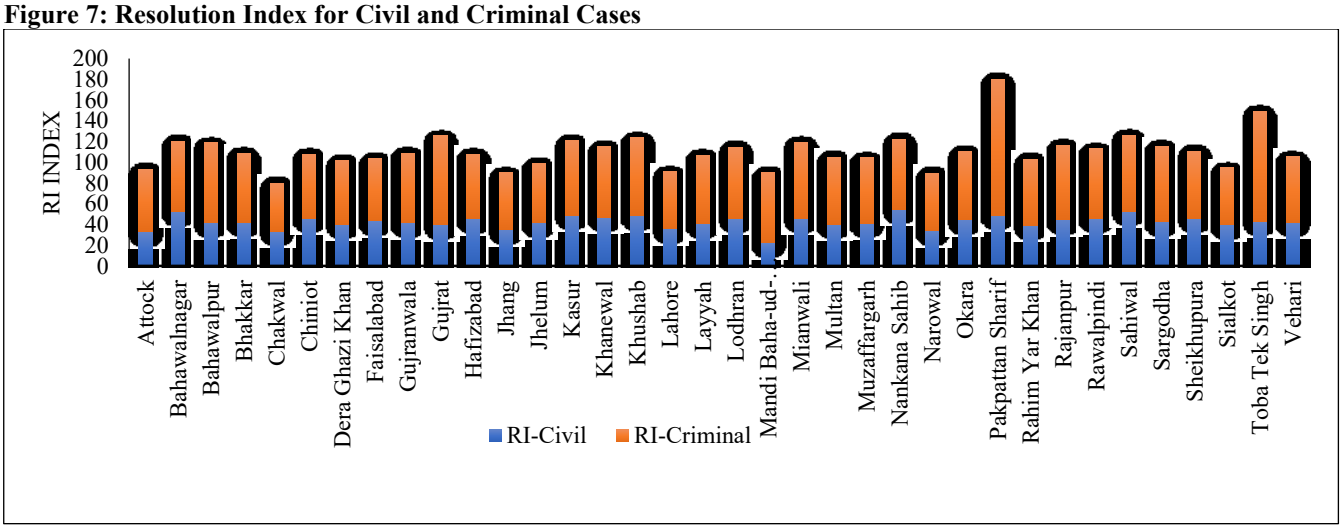
Figure 6: Case wise Disposition Time of cases in Punjab Districts



Source: Author's own using dataset from High Court Lahore

Figure 7 is the outcome after the calculation of resolution index[2] given above in the methodology section. From here it is deduced that for Lahore the problem of low judicial productivity is very acute. And the lowest resolution index is found for civil cases i.e., blue part of the bars. The orange part of the bars is greater in size than the blue one showing the inefficiency of civil courts in increasing their turnover. Hence this fosters the need to ponder into this situation for the solution of such a crucial issue we are facing presently.

Figure 7: Resolution Index for Civil and Criminal Cases

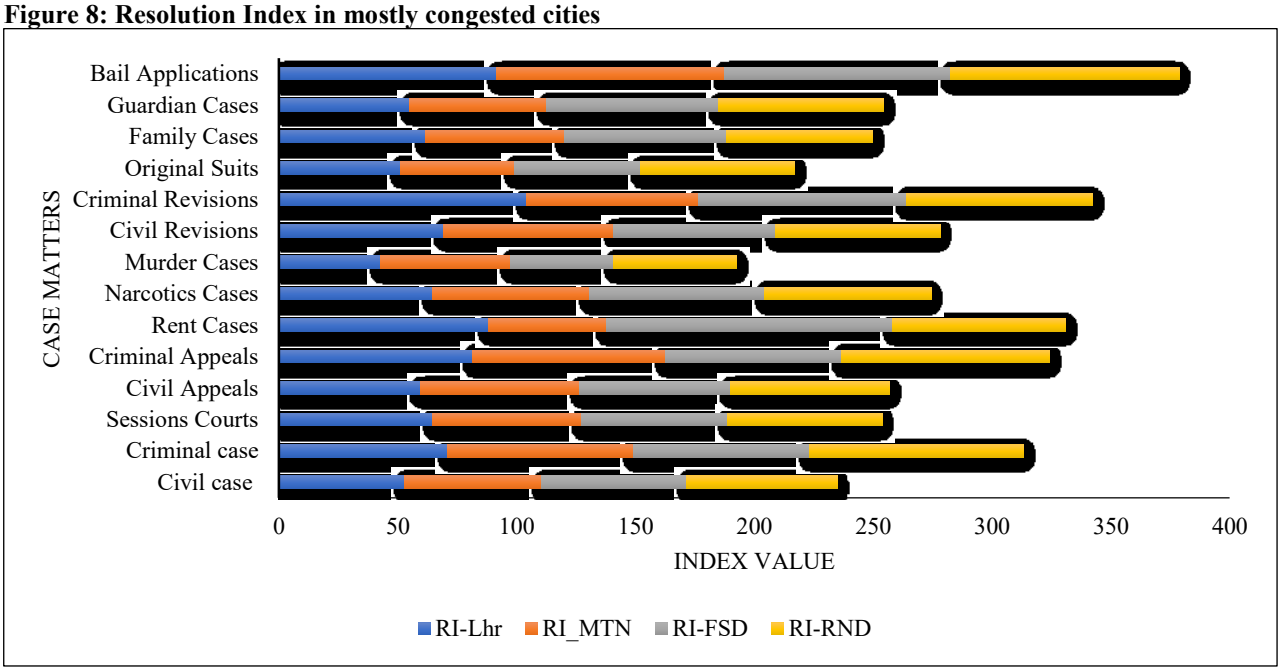


Source: Author's own using dataset from High Court Lahore

[1] This is calculated following the formula: Disposition Time= (Total Pendency/Disposal) * 365
[2] Resolution Index: Total Settled cases/Workload

Now the same analysis is attempted four most congested nations with respect to various case types and again this is quite clear that civil case is having lesser resolution incidences in all these four cities comparing to other types of cases being instituted in district courts. Courts are highly efficient in case of Bail applications, Criminal Revisions, Rent cases and criminal cases.

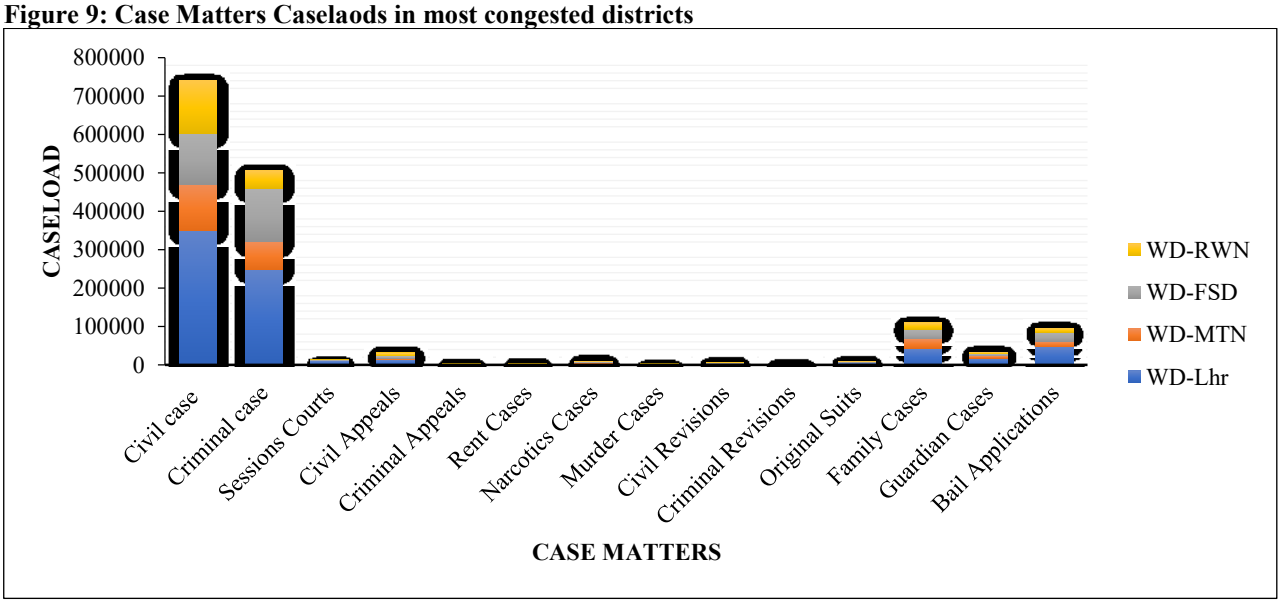
Figure 8: Resolution Index in mostly congested cities



Source: Author's own using dataset from High Court Lahore

Figure 9 shows the caseload situation with respect to case type for highly congested four districts mentioned above. And from here too, we can observe the tallest bar for civil cases following the criminal cases. In both ways, District courts in Lahore seem to have more troubling and alarming situation[3].

Figure 9: Case Matters Caselaods in most congested districts



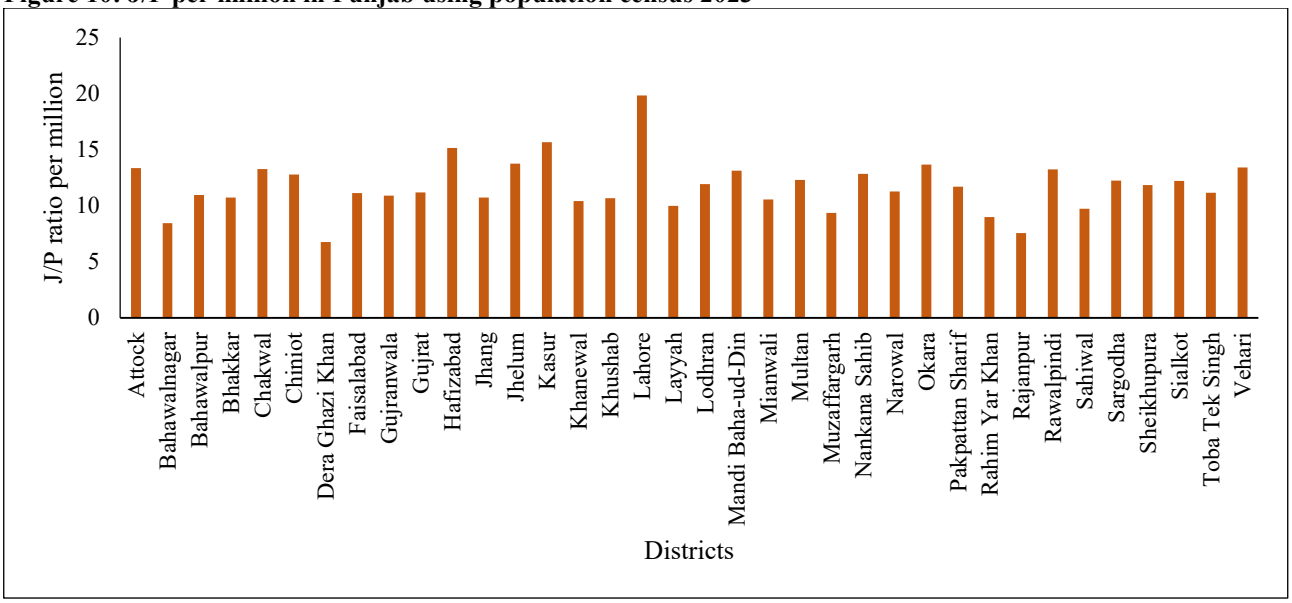
Source: Author's own using dataset from High Court Lahore

Now discussing the actual situation of case resolution both district wise and case wise , we attempted to relate this with judge to population ratio per million in each district which helped in reaching out the intensity of the issue. This ratio reports about the case burden per judge in each district and also highlights

[3] The separate graphical analysis is given in appendix for district Lahore, Multan, Faisalabad and Rawalpindi.

the shortage of judges as per requirement. Below is given the graphical presentation of this ratio using the latest census of Punjab 2023.

Figure 10: J/P per million in Punjab using population census 2023



Source: Author's own using dataset from High Court Lahore and Punjab Welfare Department (PWD)

From this figure this can be observed that in almost all districts the ratio is quite low. Only in case of Lahore we can see the longest bar but even then, the ratio is very disappointing i.e., 1: 19 judges. However, this research has also attempted to calculate the total number of required judges to clear the backlog within each district using a formula[4] given below.

Required Number of Judges= Time to clear the backlog / Time required per judge per year(s)

= Time to clear the backlog / 252days x 6 hours x 60 minutes[5]

Required time to clear the backlog = Total backlog of cases * Average time required per case

Following this formula, we estimated the required number of judges for clearing the backlog in a year time period, and interestingly the number rose to 611 against 258 currently appointed in Lahore with improved J/P ratio per million 1:47. Similarly while calculating for Multan, where the existing number of judges is 66 with J/P ratio 1:12, the required number of judges to clear the backlog in this district appeared to be 120 with improved J/P ratio 1:31. Likewise for Rawalpindi where the actual number of judges are 81 with 1: 13 J/P ratio but the required number to clear the backlog is 201 which will improve J/P ratio till the point 1:40.5[6] Required Number of Judges= Time to clear the backlog / Time required per judge per year(s).

= Time to clear the backlog / 252days x 6 hours x 60 minutes[7]

Required time to clear the backlog = Total backlog of cases * Average time required per case

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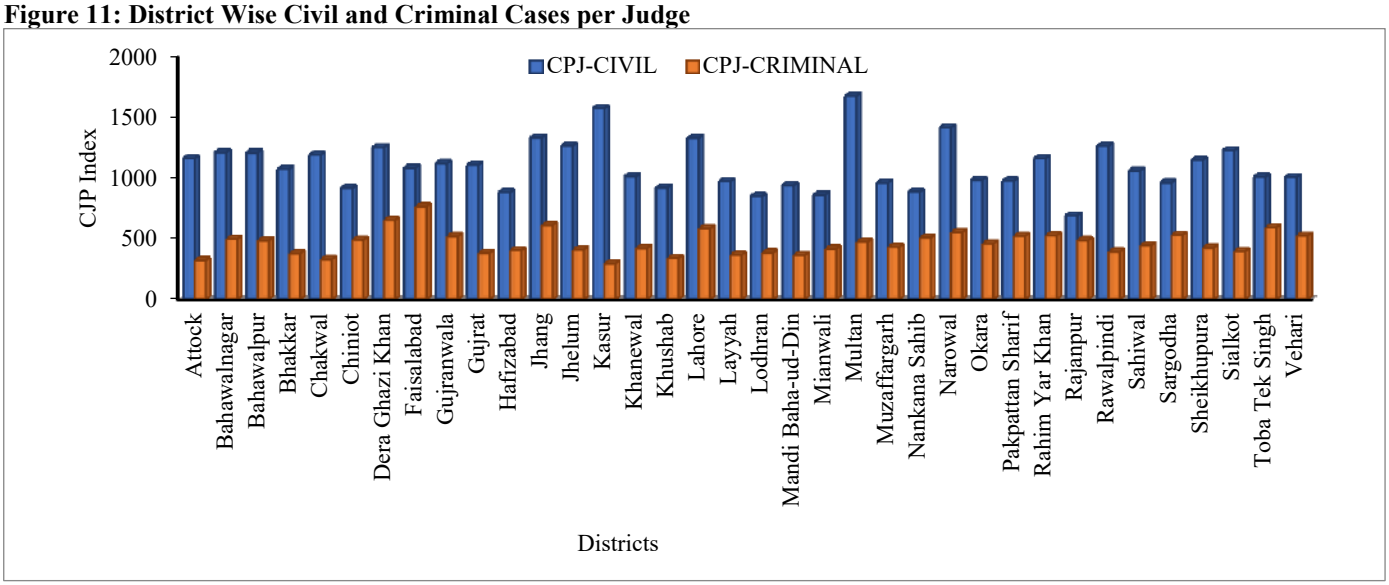
[4] This report has been used as a reference for calculation of this number: DAKSH. 2020.
[5] This is calculated using the calendar and average time per hearing. Number of hours a judge spends in court per week 32.5, which is being estimated by keeping in view the timings in court from Monday-Thursday and then different timings for Friday.
[6] The complete calculation can be shared upon the request.
[7] This is calculated using the calendar and average time per hearing. Number of hours a judge spends in court per week 32.5, which is being estimated by keeping in view the timings in court from Monday-Thursday and then different timings for Friday.

with J/P ratio 1:12, the required number of judges to clear the backlog in this district appeared to be 120 with improved J/P ratio 1:31. Likewise for Rawalpindi where the actual number of judges is 81 with 1: 13 J/P ratio but the required number to clear the backlog is 201 which will improve J/P ratio till the point.

3.1.2. Calculation of Indices Measuring Efficiency of District Courts

In this section, we have calculated various indices for measuring the efficiency of the court system which have been standard practice followed in Western economies8. The most important one out of these is Case per judge indicator (CPJ) which shows the allocation of cases per judge district wise just to detect the judge's productivity. This is calculated using the following formula i.e., Number of cases of a particular type per judge in the given period.

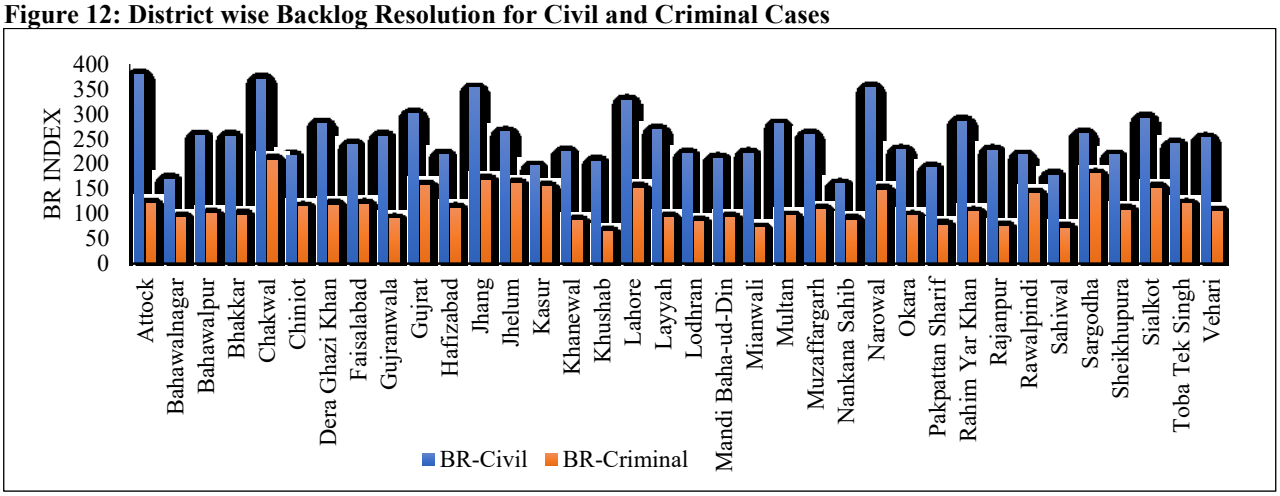
Figure 11: District Wise Civil and Criminal Cases per Judge



Source: Author's own Estimation

Here the Figure 11 shows that judges in each district have been assigned more civil cases as compared to criminal cases. This burden is highly uneven in the case of Multan, this shows the shortage of judges there that's why more burden is transferred to the existing number of judges which is resulting lower productivity. The other indicator is the backlog resolution index. This is calculated using the formula given below.

Figure 12: District wise Backlog Resolution for Civil and Criminal Cases



Source: Author's own

[8] For further information please see the website: www.coe.int/cepe

Backlog resolution (BR indicator): This indicator is used to measure the time required to settle the total backlog in particular time, calculated as the relationship between the number of cases and the clearance time. This figure highlights that clearance time for backlog of cases in high for civil cases in all districts compared to criminal cases again showing the intensity of the case pendency for civil cases at district court level. Following all these facts, we are now moving towards the use of non-parametric technique for understanding the issue in depth.

4. Non-Parametric Estimation Using Data Envelop Analysis (DEA)

4.1. Data Envelopment Analysis (DAE)

For testing the first hypothesis, which is relating judicial efficiency with court productivity, Data Envelopment Analysis (DAE) is used which is a non-parametric approach for efficiency analysis. This is a technique which has been applied for evaluating the performance of various public sector institutions like health and education sector (Mitropoulos, Talias, & Mitropoulos, 2015 and Pulina, Detotto, & Paba, 2010), police departments (Drake & Simper, 2004), educational institutional and judiciary (Peyrache & Zago, 2016; Santos & Amado, 2014) as well. Using this approach, we assign a particular score to efficiency performance by setting a benchmark. This approach helps in building a deterministic and non-parametric production function comparing performance of different decision-making units which are 'courts' here in our analysis. The study has adapted output-oriented model introduced by Farrell (1957), which assumes Variable Returns to Scale (VRS) as proposed by Banker et al., (1984). Following the approach given by Ippoliti and Falavigna (2012), the scores of technical efficiencies will be calculated for each court within the sample with the help of this formula of **Technical Efficiency** i= zi, i= 1,2,….n. Where,'n' characterizes the number of courts in the analysis and TE will be having its range between $1 \leq TEi \leq +\infty$. Technically these TEi scores are calculated using linear programming duality problem given (Farrell, 1957) as follows:

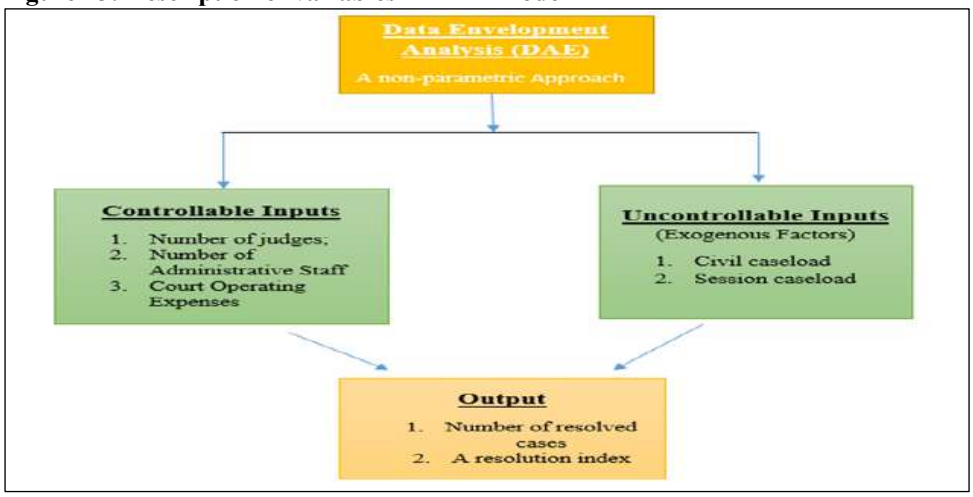
$$\textbf{Max}_{z\mu}\ \mathbf{Z_i}$$

Subject to

$$Y_i > Y\mu$$
$$Z_i X_i < X\mu$$
$$\mu \geq 0$$

Here, Yi and Xi are the input and output of each Decision-making Unit respectively. Y is the matrix of inputs and X is the matrix of outputs of the sample; μ is an n ×1 vector of weights. The same model has been updated by Banker et al. (1984) who added the flavour of Variable 'Returns to Scale' with a little modification eμ= 1which is called as convexity constraint. 'e' is the row vector which differentiates between 'Technical Efficiency' and 'Scale Efficiency" with all elements equal to one in that row. Below is given the description of variables to be used in the analysis:

Figure 13: Description of variables in DEA Model



Source: Author's own

This is the most used method in the past literature for measuring the technical/managerial efficiency of the judiciary system of any society proposed by the authors Finocchiaro & Guccio, 2015; Peyrache & Zago, 2016 in their analysis. On the other side Yeung and Azevedo (2011) have introduced an index for the measurement of efficiency both at aggregated and disaggregated level of all case matters which are dealt in different court systems. This index will help us to measure the productivity not only taking into account the 'incoming cases' only rather the workload will be measuring the total burden by adding the backlog of cases into the current year's cases. It is defined as:

$$\text{Resolution Index} = [\text{settled cases}^{t}_{i}] / [\text{Workload}^{t}_{i}]$$

Here i represents the i-th district court taken at year(s) t. on the other side, workload is measured by using the formula (Yeung & Azevedo, 2011): pending cases at the beginning of the year and institution of cases during the year, then normalized by 100. This index is innovative in its approach in a way that it does not take into account in denominator the 'incoming/newly instituted cases' which highlights only 'flow of justice' (demand for justice) ignoring the 'backlog' which affects actually the supply of justice and determines the efficiency of the judges in the dispensation of justice. Below is given the detailed structure of models which have been used in the study for testing the hypothesis:

Table: 3: Classification of Models

Variables	Model (1)	Model (2)	Model (3)	Model(4)
Inputs				
Judges	♦	♦	♦	♦
Admin Staff	♦	♦	♦	♦
Uncontrollable inputs				
Caseload Civil		♦		♦
Caseload Session			♦	♦
Outputs				
1. Settled cases & 2. Resolution index	♦	♦	♦	♦

Model 1 is the baseline model of the study where the court's efficiency is measured on a pooled data set using DEA technique. However, in next models (2, 3, 3), an addition of non-discretionary input has also been made following the one stage model given Banker and Morey (1986a). This modification of the model is made to differentiate between managerial efficiency/inefficiency due to non-discretionary caseload in various district courts.

Below is given the detailed estimates of all 36 districts showing three types of efficiency estimates i.e., pure efficiency[9], technical efficiency[10,] and scale efficiency[11] so that we could know whether it's the size of existing courts which are causing this issue of low productivity or the in efficiency of the existing resources which is not letting the demand and supply of justice equal in the province. Ranks of each district have also been calculated. OTE stands for overall technical efficiency, PTE stands for pure technical efficiency and SIE shows the Scale efficiency of each district. DEA provides efficiency scores under different orientations and assumptions of returns-to-scale (RTS). Scale efficiency is measured in two forms, increasing returns to scale (IRS) and decreasing returns to scale (DRS). Two Proxies of Judicial output have been used as discussed in methodology section.

Table 4 uses 'Disposal Rate' as the output for this estimation. IRS = increasing returns to scale, DRS=

[9] The Overall Technical Efficiency (OTE) helps in identifying inefficiencies stemming from both input/output arrangements and operational scale. Within the context of Data Envelopment Analysis (DEA), the OTE is dissected into two distinct and non-additive components: Pure Technical Efficiency (PTE) and Scale Efficiency (SE).

[10] PTE is derived by gauging the efficient frontier under the premise of variable returns-to-scale. Consequently, the PTE metric serves as an indicator of managerial efficacy.

[11] On the other hand, the SE assesses management's capacity to select the optimal resource magnitude, highlighting their proficiency in resource allocation.

Decreasing returns to scale, and the dashed boxes are showing that these districts are fully efficient in their productivity.

Table: 4: Overall Technical Efficiency, Pure Efficiency, Technical Efficiency and Scale Efficiency Scores of District Courts Punjab using Disposal Rate as Output

District	OTE	%OTIE	PTE	%PTIE	SE	%SIE	RTS	Rank
Attock	0.562	43.8	0.700	30	0.803	19.7	IRS	35
Bahawalnagar	1.000	0	1.000	0	1.000	0	-	1
Bahawalpur	0.857	14.3	0.876	12.4	0.979	2.1	DRS	11
Bhakkar	0.666	33.4	0.694	30.6	0.960	4	IRS	32
Chakwal	0.492	50.8	0.560	44	0.879	12.1	IRS	36
Chiniot	0.757	24.3	0.793	20.7	0.954	4.6	IRS	21
Dera Ghazi Khan	0.830	17	0.881	11.9	0.942	5.8	IRS	15
Faisalabad	0.915	8.5	1.000	0	0.915	8.5	DRS	5
Gujranwala	0.882	11.8	0.930	7	0.948	5.2	DRS	7
Gujrat	0.604	39.6	0.606	39.4	0.998	0.2	DRS	34
Hafizabad	0.711	28.9	0.750	25	0.948	5.2	IRS	26
Jhang	0.678	32.2	0.680	32	0.997	0.3	DRS	30
Jhelum	0.694	30.6	0.834	16.6	0.833	16.7	IRS	28
Kasur	1.000	0	1.000	0	1.000	0		1
Khanewal	0.845	15.5	0.849	15.1	0.996	0.4	DRS	13
Khushab	0.822	17.8	1.000	0	0.822	17.8	IRS	16
Lahore	0.721	27.9	1.000	0	0.721	27.9	DRS	24
Layyah	0.732	26.8	0.772	22.8	0.949	5.1	IRS	23
Lodhran	0.757	24.3	0.777	22.3	0.975	2.5	IRS	21
Mandi Baha-ud-Din	0.707	29.3	0.726	27.4	0.974	2.6	IRS	27
Mianwali	0.767	23.3	0.820	18	0.935	6.5	IRS	20
Multan	0.878	12.2	0.981	1.9	0.895	10.5	DRS	8
Muzaffargarh	0.718	28.2	0.740	26	0.970	3	DRS	25
Nankana Sahib	0.813	18.7	0.893	10.7	0.910	9	IRS	17
Narowal	0.689	31.1	0.712	28.8	0.968	3.2	IRS	29
Okara	0.847	15.3	0.850	15	0.996	0.4	DRS	12
Pakpattan Sharif	1.000	0	1.000	0	1.000	0	-	1
Rahim Yar Khan	0.812	18.8	0.836	16.4	0.972	2.8	DRS	18
Rajanpur	0.933	6.7	1.000	0	0.933	6.7	IRS	4
Rawalpindi	0.839	16.1	0.900	10	0.932	6.8	DRS	14
Sahiwal	0.895	10.5	0.911	8.9	0.983	1.7	IRS	6
Sargodha	0.667	33.3	0.673	32.7	0.992	0.8	DRS	31
Sheikhupura	0.860	14	0.863	13.7	0.997	0.3	DRS	10
Sialkot	0.653	34.7	0.660	34	0.989	1.1	DRS	33
Toba Tek Singh	0.864	13.6	0.890	11	0.971	2.9	IRS	9
Vehari	0.768		0.773		0.994		DRS	19
Average	**0.784**		**0.831**		**0.945**			

Source: Estimates calculation by Author

The results show that the districts Kasur, Pakpatan Sharif and Bahawalnagar are efficient in their court performance but as being mentioned above that while using this approach of output, we are ignoring the supply side of the justice that takes into consideration the backlog of the judges a well. Keeping in view this concern, the same Model has been applied with different output variables i.e., Resolution index. Recently authors have shown their concern for the first output variable i.e., disposal rate that it is only containing the demand side of justice however if resolution index is used as output variable, then it also adds the supply element as well into itself. And the justification for following this proxy is to that for the market to be in equilibrium, both demand and supply forces must play freely in the system. Here in this Table 5, the estimates therefore show the real picture, and we can see here that when supply side of justice is also added into the calculation, then the estimates are reduced and none of the district s observed working in increasing returns to scale. The estimates of the targeted four districts are the lowest ones among 36 districts 'estimates. And a visible change in ranks is also observed.

Table 5: Overall Technical Efficiency, Pure Efficiency, Technical Efficiency and Scale Efficiency Scores of District Courts Punjab using Resolution Index as Output

District	OTE	OTIE (%)	PTE	%PTIE	SE	%SIE	RTS	Rank
Attock	0.515	48.5	0.617	38.3	0.834	16.6	DRS	16
Bahawalnagar	0.520	48	0.759	24.1	0.685	31.5	DRS	15
Bahawalpur	0.312	68.8	0.714	28.6	0.437	56.3	DRS	26
Bhakkar	0.651	34.9	0.756	24.4	0.861	13.9	DRS	11
Chakwal	0.492	50.8	0.567	43.3	0.867	13.3	DRS	18
Chiniot	0.712	28.8	0.790	21	0.901	9.9	DRS	6
Dera Ghazi Khan	0.580	42	0.683	31.7	0.850	15	DRS	14
Faisalabad	0.140	86	0.673	32.7	0.209	79.1	DRS	35
Gujranwala	0.216	78.4	0.683	31.7	0.316	68.4	DRS	32
Gujrat	0.381	61.9	0.668	33.2	0.571	42.9	DRS	20
Hafizabad	0.697	30.3	0.795	20.5	0.877	12.3	DRS	8
Jhang	0.348	65.2	0.559	44.1	0.623	37.7	DRS	22
Jhelum	0.709	29.1	0.750	25	0.945	5.5	DRS	7
Kasur	0.314	68.6	0.708	29.2	0.443	55.7	DRS	25
Khanewal	0.430	57	0.733	26.7	0.587	41.3	DRS	19
Khushab	1.000	0	1.000	0	1.000	0	----	1
Lahore	0.051	94.9	0.565	43.5	0.090	91	DRS	36
Layyah	0.666	33.4	0.779	22.1	0.855	14.5	DRS	10
Lodhran	0.648	35.2	0.787	21.3	0.824	17.6	DRS	12
Mandi Baha-ud-Din	0.356	64.4	0.449	55.1	0.793	20.7	DRS	21
Mianwali	0.826	17.4	0.896	10.4	0.922	7.8	DRS	3
Multan	0.197	80.3	0.632	36.8	0.311	68.9	DRS	34
Muzaffargarh	0.292	70.8	0.668	33.2	0.437	56.3	DRS	29
Nankana Sahib	0.769	23.1	0.871	12.9	0.882	11.8	DRS	5
Narowal	0.512	48.8	0.592	40.8	0.865	13.5	DRS	17
Okara	0.320	68	0.702	29.8	0.456	54.4	DRS	23
Pakpattan Sharif	0.822	17.8	1.000	0	0.822	17.8	DRS	4
Rahim Yar Khan	0.267	73.3	0.651	34.9	0.411	58.9	DRS	30
Rajanpur	0.908	9.2	0.970	3	0.936	6.4	DRS	2
Rawalpindi	0.210	79	0.670	33	0.314	68.6	DRS	33
Sahiwal	0.587	41.3	0.799	20.1	0.734	26.6	DRS	13
Sargodha	0.298	70.2	0.685	31.5	0.435	56.5	DRS	28
Sheikhupura	0.320	68	0.689	31.1	0.465	53.5	DRS	23
Sialkot	0.244	75.6	0.575	42.5	0.424	57.6	DRS	31
Toba Tek Singh	0.684	31.6	0.899	10.1	0.760	24	DRS	9
Vehari	0.303	69.7	0.673	32.7	0.451	54.9	DRS	27
Average	**0.480**		**0.722**		**0.644**			

Source: Estimates calculation by Author

From these estimates, we can see that now the status of each district has changed. The colored bar shows the intensity of the problem. Red color shows inefficient districts while green is showing better performers in the field.

Table 6 now reports the descriptive statistics of these estimates using both output measures. Here we can see from these figures that how much the estimates were overestimated with the Disposal rate as the output variable. Average efficiencies are also differing significantly which authenticates the efficiency estimates with the use of Resolution index.

Table 6: Summary statistics for DEA efficiency scores (Disposal Rate)

Statistics	CCR efficiency	BCC efficiency	Scale efficiency
Average Efficiency Mean	0.784	0.83	0.94
Maximum	1	1	1
Minimum	0.492	0.56	0.72
Standard Deviation	0.12	0.124	0.06
Average Inefficiency %	21.6	17	6

interval	(0.664, 0.904)	(0.71, 0.95)	(0.88, 1)
Summary statistics for DEA efficiency scores (RI)			
Summary statistics for DEA efficiency scores (Resolution Index)			
Average Efficiency Mean	0.51	0.65	0.74
Maximum	1	1	1
Minimum	0.057	0.334	0.11
Standard Deviation	0.26	0.15	0.25
Average Inefficiency %	49%	35%	26%
interval	(0.25, 0.76)	(0.5, 0.8)	(0.49, 0.99)

Note: AOTE: Average overall technical efficiency, interval: AOTE-SD, AOTE+SD)
Source: Authors Calculation

Table 7 shows the reports the summary statistics based on efficient or inefficient district again using the measures of output. In the case of Disposal rate as output measure, the number of efficient districts is 3 while the same for resolution index is 1. Average inefficiency of districts is increased in the later case from 22% to 49 % after deflating the former estimates using supply side measure of output.

Table 7: Descriptive Statistics

Statistics	All districts	Efficient Districts	Inefficient Districts
Efficiency Estimates using Disposal as Output			
N	36	3	33
Average efficiency	0.784	1.000	0.76
SD	1	1.000	0.11
Minimum	0.492	1.000	0.492
Maximum	0.12	1.000	0.933
Average Inefficiency (%)	21.6%	0%	24%
Interval	(0.664, 0.904)	(1.000,1000)	(0.65, 0.87)
Efficiency Estimates using Resolution Index as Output			
N	36	1	35
Average efficiency	0.51	1.000	0.47
SD	1	1.000	0.22
Minimum	0.057	1.000	0.051
Maximum	0.26	1.000	0.908
Average Inefficiency (%)	49%	0%	53%
Interval	(0.25, 0.76)	(1.000,1000)	(0.25, 0.69)

Note: AOTE: Average overall technical efficiency, interval: AOTE-SD, AOTE+SD)
Source: Authors Calculation

Now in Table 8, classification of districts is made based on the inefficiency of districts. For this purpose, quartile measures are used. Below is given in detail about these measures and ranking of the districts following those thresholds.

Table 8: Classification of Inefficient Districts

Most inefficient Districts	Below Average Districts	Above Average Districts	Marginally Inefficient Districts
Lahore (35)	Bahawalpur (25)	Attock (15)	Chiniot (5)
Faisalabad (34)	Gujrat (19)	Bahawalnagar (14)	Hafizabad (7)
Multan (33)	Jhang (21)	Bhakkar (10)	Jhelum (6)
Rawalpindi (32)	Kasur (24)	Chakwal (17)	Layyah (9)
Gujranwala (31)	Khanewal (18)	Dera Ghazi Khan (13)	Mianwali (2)
Sialkot (30)	Mandi Baha-ud-Din (20)	Lodhran (11)	Nankana Sahib (4)
Muzaffargarh (28)	Okara (22)	Narowal (16)	Pakpattan Sharif (3)
Rahim Yar Khan (29)	Sheikhupura (22)	Sahiwal (12)	Rajanpur (1)
Sargodha (27)	Vehari (26)		Toba Tek Singh (8)

Note: Below Q1= 'Most Inefficient category' Districts
Between Q1- Q2= 'Below Average Category' Districts
Between Median – Q3= 'Above Average Category' Districts
Above the Q3= Marginally inefficient Districts
Q1= 0.30, Q2 (Median)= 0.43, Q3= 0.687

Ranks in parentheses (inefficiency wise, districts having 1 value (Khushab) are excluded)
Source: Author's Calculation

This Table gives us a clear picture of efficient and inefficient districts. Khushab is the most efficient DMU from the whole sample, that is why its not included while ranking is made of all districts. After Khushab, we see Rajanpur is the most marginally inefficient district. These results are very startling in nature however when finding the reason why is this so, it was observed that 'case institution' is very low in these districts compared to the most inefficient districts. One of the main reasons of such low rate of case registration may be their socio-cultural setup being the rural areas or semi urban areas of the Punjab. On the opposite side of the band, we observe that Lahore, Faisalabad and Multan are regarded as the most inefficient districts based on the available existing resources and human capital. If we look into the dataset, this can be seen clearly that these districts are highly populated and 'case institution' is too high due to this reason. All this is leading to prolonged case pendency in these courts because due to high growth rate of population, crime rate and corruption is galloping however the size of courts or the court infrastructure is the same that is why these courts have started now working under decreasing returns to scale. All this shows that the government is supposed to focus on improving the existing capacities of district courts so that clearance rate could be increased for mega cities with congested courts.

4.1.1: Extended Estimation of Base Line Model

It is assumed by common wisdom that courts deal with both the services provided to litigants and the resources used for that purpose. However, there are many non-controllables which act as bottlenecks in the system both internally and externally and are not easily possible to be changed. Therefore, the efficiency analysis is incomplete unless the impression of these factors is captured because they affect the court performance externally paralyzing the whole working mechanism of the system.

Now in this section after the estimation of efficiency estimates using two inputs i.e. judges, and Supporting Staff, now the rest of three models are estimated here. These are the models where exogenous (external) factors are considered for estimating their impact on judicial productivity other than internal inputs. Three exogenous factors have been: 1) caseloads, 2) pendency, and 3) institution. Table 9 incorporates the role of caseloads as an uncontrollable variable and comparing the results of Model 2, 3, 4 with Model 1, we can see that efficiency scores decline drastically. This shows that other than internal factors, external indicators are also having their influence on Court's efficiency.

Table 9: Summary statistics for DEA efficiency scores taking caseloads as exogenous factor (Four Models)

Models	Statistics	CCR efficiency	BCC efficiency	Scale efficiency
Model 1	Average Efficiency Mean	0.51	0.65	0.74
Model 2 Criminal as exogenous factor	Average Efficiency Mean	0.316	0.503	0.530
Model 3 Civil as exogenous factor	Average Efficiency Mean	0.272	0.483	0.448
Model 4 Criminal & Civil as exogenous factors	Average Efficiency Mean	0.339	0.505	0.557

Table 10 shows the correlation between various models using different proxies of output variable. In both cases, higher correlation is observed but we can see that in case of model, the correlation is deflated because its controlling for the supply side factor as well and this has eliminated the overly estimated figures from model. Hence this can be concluded that there is a higher degree of correlation between the two measures of efficiency. The residual correlation estimates and graphs of four models for two measures of efficiencies i.e., technical efficiency and scale efficiency is given in Appendix E.

Table 10: Spearman Rank Correlation test

Model Type with Disposal as output		
	CRS	VRS
CRS	1.000	0.8878*
VRS	0.8878*	1.00
Model Type with RI as output		
	CRS	VRS
CRS	1.000	0.7538*
VRS	0.7538*	1.000

Following the Table 10 below is given the analysis using Pendency as the exogenous factor affecting the court's performance. And from here again this is visible that efficiency estimates in Model 2,3,4 have been reduced compared to Model 1 showing that this external factor is causing inefficiency of district courts as well.

Table 11: Summary statistics for DEA efficiency scores taking Overall pendency as exogenous factor (Four Models)

Models	Statistics	CCR efficiency	BCC efficiency	Scale efficiency
Model 1	Average Efficiency Mean	0.51	0.65	0.74
Model 2 Criminal as exogenous factor	Average Efficiency Mean	0.242	0.480	0.414
Model 3 Civil as exogenous factor	Average Efficiency Mean	0.266	0.483	0.438
Model 4 Criminal & Civil as exogenous factors	Average Efficiency Mean	0.229	0.480	0.421

The residual correlation estimates and graphs of four models for two measures of efficiencies i.e. technical efficiency and scale efficiency is given in Appendix F.

In Table 12, the same process is repeated for four Models using case Institution as the exogenous factor and in the same fashion, we can see that efficiency estimates have reduced drastically comparing to original Model 1 but interesting fact is this, in case of this external factor, the efficiency estimates are being affected reduced more as compared to previous exogenous factors i.e. pendency and caseloads.

Table 12: Summary statistics for DEA efficiency scores taking Institution as exogenous factor (Four Models)

Models	Statistics	CCR efficiency	BCC efficiency	Scale efficiency
Model 1	Average Efficiency Mean	0.51	0.65	0.74
Model 2 Criminal as exogenous factor	Average Efficiency Mean	0.287	0.483	0.478
Model 3 Civil as exogenous factor	Average Efficiency Mean	**0.028**	0.525	0.028
Model 4 Criminal & Civil as exogenous factors	Average Efficiency Mean	0.319	0.480	0.554

The residual correlation estimates and graphs of four models for two measures of efficiencies i.e., technical efficiency and scale efficiency are given in Appendix G.

5. Conclusions and Policy Recommendations

The efficiency and effectiveness of judicial systems is one of the main points of interest in public sector administration, due to the beneficial effects of an efficient judicial system on the economic system. This study is particularly covering Punjab province for the efficiency analysis of the courts which is having

largest number of districts and huge case pendency of civil cases as per the recorded official figures. Linear optimization method usually known as Data Envelopment Analysis (DEA) and a non-parametric frontier is used to measure the efficiency of 36 District courts of Punjab for the period 2020-21 and to distinguish between pure, technical and scale (in)efficiency and (in)efficiency due to the non-discretionary caseloads both in civil and criminal matters. By employing two output measures, 1) Disposal rate, and 2) Resolution index, the efficiency estimates are calculated however results with the later output measure are closer to the real situation of the district judicial system as this is incorporating both the demand and supply aspect of settlement of cases. According to the approach of resolution index, the most inefficient district is Lahore and the most efficient includes Khushaab. However, this is due to the reason that the institutional arrangements are very much perfect therefore the clearance rate is high. The (in)efficiency depends on socio economic demographic as well which are somehow unable to quantify. For example, in Khushab and Rajanpur districts, case filing in courts is not the usual practice of people for the demand for justice, rather they have their own 'jirga system' where they prefer to resolve their matters through arbitration. Hence if the case institution is lesser then backlog log will not be there ultimately leading to decline in pendency. And this is the reason when our DEA model is replicated after adding 'institution' as the exogenous factor to see its impact on court performance, we have observed that the average efficiency declined from 0.51 to 0.028 (Table 16). Therefore, if Lahore is regarded as the most inefficient district productivity wise then this may be due to the size of the city, its population dynamics and income disparities which is causing increased rate of crime and corruption leading to more case filing and adding into backlogs. Hence this calls for increasing the capacities of existing courts in mega cities for catering to the demand for justice in the best possible way on the one hand while on the other side, this demands for better role of Law enforcement agencies to control the malpractices in the society.

For measuring the capacity of courts, scale efficiency is calculated, and it shows that all the district courts are operating in decreasing returns to scale which means that court size is too large to take full advantage of economies of scale and operates at supra-optimum scale size. All this demonstrates that courts are overly congested and therefore dispensation of justice is slow. The findings of the study showed that both the 'institution of cases' and 'pendency' in civil matters have played an intense regressive role as external factors in triggering the inefficiency of courts at district level compared to caseloads overall (Ippoliti 2014) in case of lower courts in Pakistan. For both of these exogenous factors, the overall scale efficiency in both the civil and criminal matters is reduced showing the over utilization of resources without increase in court output. In other words, this clearly exhibits the inability of existing resources in our judicial system on the one side i.e., judges and administrative staff to clear the backlog. Therefore, policy makers should work towards enhancing the court resources in terms of their number and manpower to reduce the existing burden and cases backlog. Moreover, creation of mobile courts and the awareness about the judicial process among public will aid to enhance productivity

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There is no conflict between authors to produce this research and every author(s) took effort to contribute his part.

Disclaimer

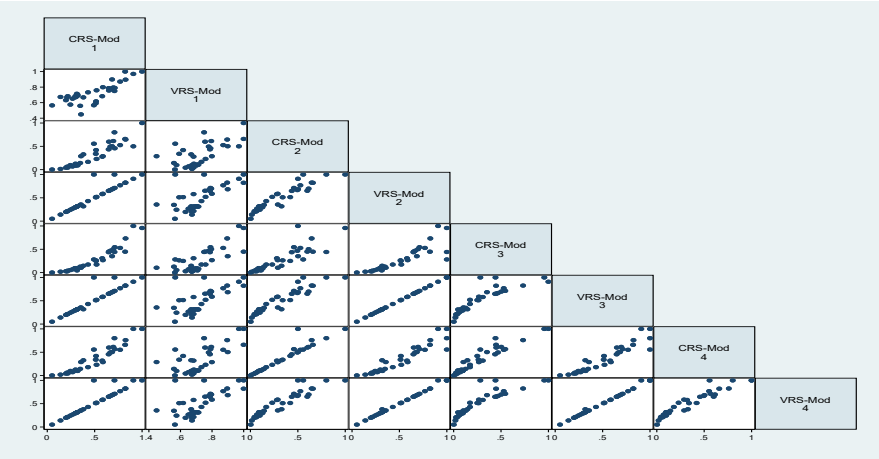
The views and opinions expressed in this paper are those of the author alone and do not necessarily reflect the views of any institution.

Appendix E

Models	CRS_1	VRS_1	CRS_2	VRS_2	CRS_3	VRS_3	CRS_4	VRS_4
CRS_1	1.0000							
VRS_1	0.7538*	1.0000						
CRS_2	0.9365*	0.6038*	1.0000					
VRS_2	0.9573*	0.6504*	0.9505*	1.0000				
CRS_3	0.9723*	0.6862*	0.9219*	0.9417*	1.0000			
VRS_3	0.9573*	0.6504*	0.9505*	1.000*	0.9417*	1.0000		
CRS_4	0.9566*	0.6262*	0.9838*	0.9575*	0.9517*	0.9575*	1.0000	
VRS_4	0.9628*	0.6563*	0.9559*	0.9970*	0.9490*	0.9970*	0.9670*	1.0000

* Shows significance at 5% level.

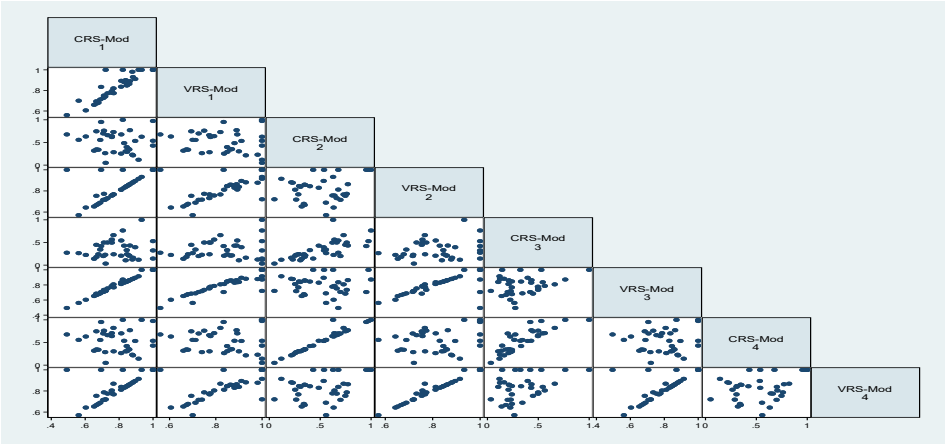
Scatter plot between estimated models with RI as output w.r.t Caseloads in civil and criminal cases.



Source: Author's own based on estimation

Models	CRS_1	VRS_1	CRS_2	VRS_2	CRS_3	VRS_3	CRS_4	VRS_4
CRS_1	1.0000							
VRS_1	0.8878*	1.0000						
CRS_2	---------	--------	1.0000					
VRS_2	0.7284*	0.7176*	---------	1.0000				
CRS_3	---------	---------	0.7785*	---------	1.0000			
VRS_3	0.9887*	0.9053*	---------	0.7535*	---------	1.0000		
CRS_4	---------	---------	0.9723*	---------	0.8449*	--------	1.0000	
VRS_4	0.7232*	0.7165*	----------	0.9773*	---------	0.7571*	---------	1.0000

Scatter plot between estimated models with Disposal rate as output w.r.t Caseloads in civil and criminal cases

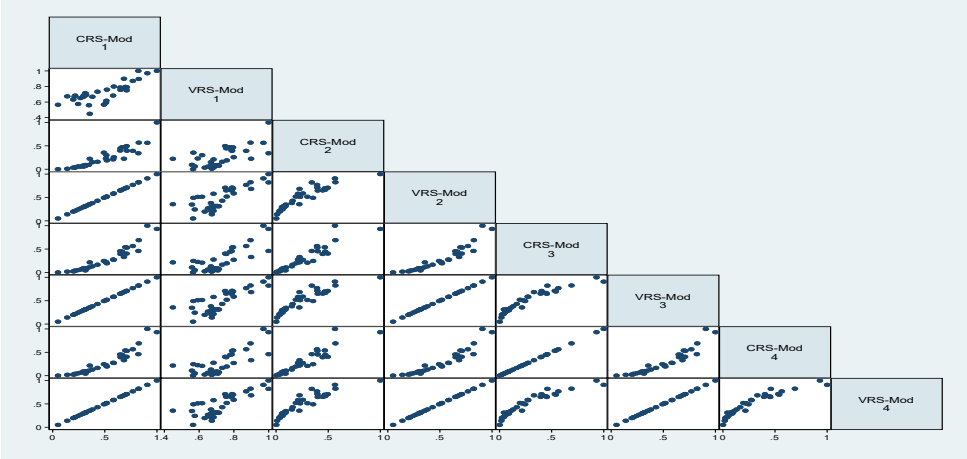


Source: Author's own based on estimation

Appendix F

Models	CRS_1	VRS_1	CRS_2	VRS_2	CRS_3	VRS_3	CRS_4	VRS_4
CRS_1	1.0000							
VRS_1	0.7538*	1.0000						
CRS_2	0.9530*	0.6261*	1.0000					
VRS_2	1.0000*	0.7538*	0.9530*	1.0000				
CRS_3	0.9754*	0.6895*	0.9557*	0.9754*	1.0000			
VRS_3	1.0000*	0.7538*	0.9530*	0.1000*	0.9754*	1.0000		
CRS_4	0.9754*	0.6895*	0.9557*	0.9754*	1.0000*	0.9754*	1.0000	
VRS_4	1.0000*	0.7538*	0.9530*	1.0000*	0.9754*	1.0000*	0.9754*	1.0000

Scatter plot between estimated models with Resolution index as output w.r.t Overall pendency as exogenous factor (Four Models)

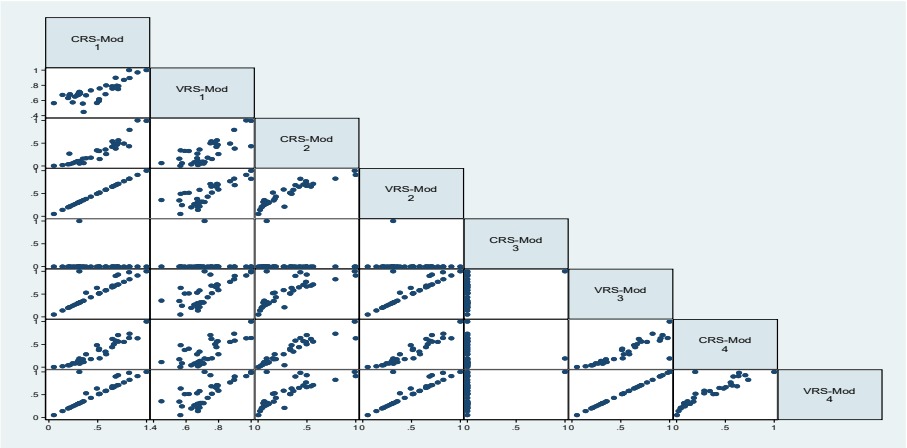


Source: Author's own based on estimation

APPENDIX G

Models	CRS_1	VRS_1	CRS_2	VRS_2	CRS_3	VRS_3	CRS_4	VRS_4
CRS_1	1.0000							
VRS_1	0.7538*	1.0000						
CRS_2	0.9142*	0.6650*	1.0000					
VRS_2	1.0000*	0.7538*	0.9142*	1.0000				
CRS_3	----------	----------	---------	---------	1.0000			
VRS_3	0.9047*	0.7267*	0.8239*	0.9047*	---------	1.0000		
CRS_4	0.9577*	0.6775*	0.9284*	0.9577*	---------	0.9292*	1.0000	
VRS_4	0.9047*	0.7267*	0.8239*	0.9047*	---------	1.0000*	0.9292*	1.0000

Scatter plot between estimated models with Resolution index as output w.r.t Institution as exogenous factor (Four Models)



Source: Author's own based on estimation