

The Use of Data Analytics Techniques to Assess the Functioning of a Government's Financial Management Information System

An Application to Pakistan and Cambodia

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Abstract

Public financial management enables government to implement policy. Financial management information systems are a central element of PFM in that they facilitate government financial transactions and subject them to rigorous budgetary controls. Therefore, the adequate use of FMIS systems supports the implementation of fiscal rules and provides the basis for holding the executive accountable for implementing the budget. Yet, the integrity of expenditure transactions and effectiveness of budget controls is rarely assessed. This paper explores the meaning of adequate use of FMIS systems and points to data analytics techniques that can shed light on how the use FMIS systems affects expenditure data integrity and effectiveness of budget controls. This methodology is applied to Pakistan and Cambodia, which reveals two very different problems. In Pakistan the

analysis of the transactions profile suggests that a large share of the budget is not subjected to FMIS internal controls. In Cambodia the majority of the budget is channeled through the system, but the method exposes very large advances to commercial bank accounts that are subsequently drawn upon but outside the system. Both of these raise concerns about the effectiveness of the FMIS system. Deploying data analytics techniques can help assess whether FMIS systems serve form or function. Judging a system by its use is informative about governments' revealed preferences in expenditure management. This paper puts the spotlight on the foundation of expenditure data and advocates for a transparent, methodical and evidenced based approach to FMIS deployment and expenditure management reform.

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1. Introduction and Motivation

The way budgets are managed has direct implications on a government's ability to maintain a prudent fiscal stance and efficiently deliver services. Public financial management (PFM) is the vehicle that enables governments to implement policy. This is broadly recognized by the literature and practitioners alike [1-6] and consequently governments with the assistance of the development community have invested considerable time and resources into PFM reforms. The OECD estimates that every year oversees development assistance to PFM amounts to about US\$ 1.6 billion globally. [7]

Financial management information systems (FMIS) play a central role in PFM, as they facilitate the budget execution process. [8-10] At their core, FMIS systems enable processing of financial transactions and have embedded a set of controls that ensure the PFM act is implemented. As such, the adequate use of an FMIS should ensure budgetary and commitment control and thereby contribute to adherence to fiscal rules. The repository of financial transactions carried out in government provides the basis for financial accountability of the executive to the legislature and citizens and is thus a fundamental building block in democracy. Conversely, inadequate and opaque capture of government expenditure data introduces opportunity for fraudulent conduct and distances the executive from citizens. FMIS systems are thus central to expenditure control, transparency, and service delivery and by extension democratic processes.

Recognizing the potential benefits, many donors have invested significant resources into FMIS reforms. The World Bank alone has committed over US\$ 4,079 million through 134 operations across 74 countries since 1985. By the turn of the century, about six operations were approved annually, averaging about US\$ 33 million each. About 28 percent of all projects mapped to the World Bank Governance practice had at least one FMIS component making up about 17 percent of its overall commitment. [10]

However, the results have often been disappointing. Frequently implementation of FMIS systems has been found to be operationally difficult, prone to cost overruns and delays, and subject to change management issues,¹ [11] which eventually led to unsatisfactory progress. It was estimated that FMIS project completion times range from seven to 14 years [12], which is well beyond the stipulated five-year period for World Bank investment loans and even still an underestimation of implementation time, as it

¹ A detailed discussion on the role of change management issues in FMIS reform can be found in Hugues et al 2017.

does not account for the many back to back operations.² The financial costs associated with such projects are significant and range from US\$ 5 million for small countries to US \$100 million or more for mid to larger sized countries. The treasury system investment operations in Nigeria and the Russian Federation consumed US\$ 200 million and US\$ 650 million, respectively. [10]

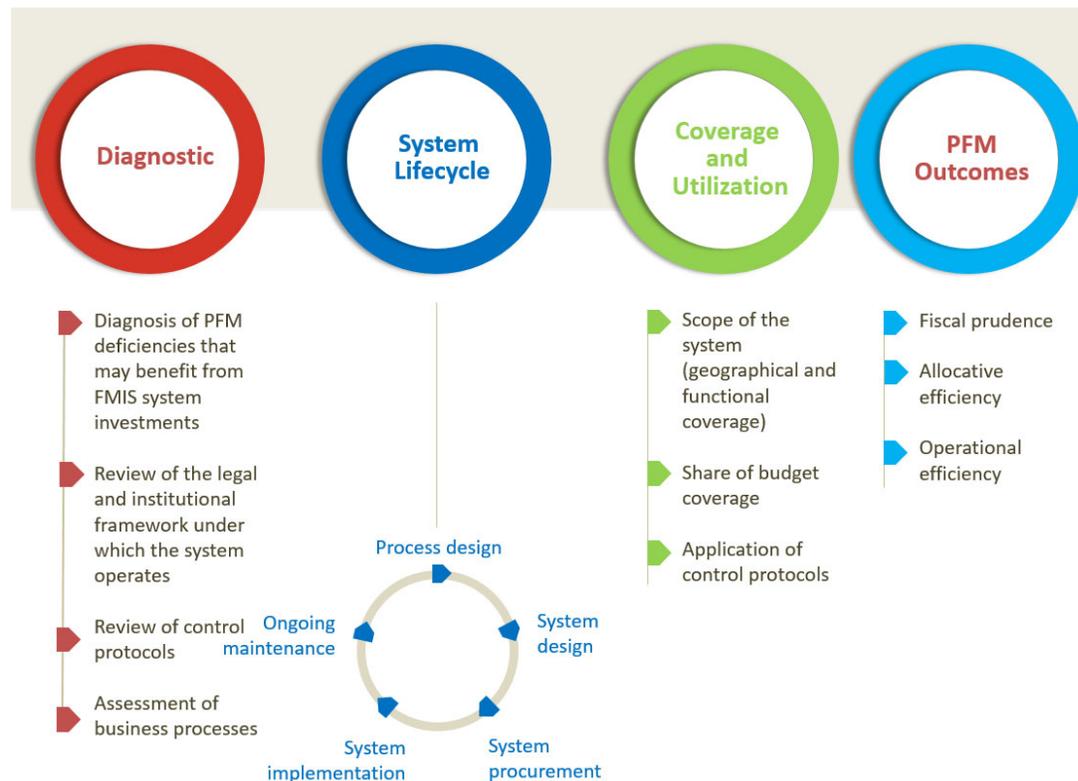
The costs and time associated with these projects suggest the need for a diagnostic to ensure deficiencies are adequately identified and reforms are well targeted to ensure the reforms contribute efficiently to the larger PFM objectives. Toward this end, the World Bank's Independent Evaluation Group (IEG) developed a diagnostic framework that guides such an assessment [13] and issued an accompanying policy research paper that outlines critical success factors and key failure points throughout the FMIS system lifecycle. [10]

1.1. The Role of Budget Coverage in FMIS Reform

A fundamental theme that emerges from the diagnostic framework [13] and the policy research paper [10] is that budget coverage and utilization are critical for FMIS reform in its contribution to PFM objectives. The authors developed a conceptual framework of FMIS reform and place coverage and utilization firmly into their theory of change. They argue that a comprehensive diagnostic, and successful design, procurement, and implementation, are all important steps in the reform process. Ultimately, however, the usefulness of the FMIS as a means to achieve PFM objectives will depend on its budget coverage and how it is actually being used. The framework is shown in figure 1 below.

² Examples of back to back operations include Cambodia, Malawi, and Zambia where the entire FMIS reform process has already taken well over a decade and is unlikely to be completed anytime soon.

Figure 1 A Conceptual Framework of FMIS Reform



Source: Hashim and Piatti-Fünfkirchen 2018 [10].

Given the role of budget coverage in FMIS reform, it is important to illustrate what budget coverage means. The aforementioned FMIS diagnostic [13] pursues this question and identifies the following areas that should be captured on an ex-ante basis:

- Whether transactions handled by the central ministry of finance, such as debt servicing, fiscal transfers, and subsidies and transfers to state-owned enterprises are routed through the system or are carried out directly by the ministry of finance communicating with the central bank;
- Whether the system is implemented only at the central level or if it has also been implemented at the provincial level and other subnational levels;
- The percentage of the recurrent budget that is processed through the FMIS and whether the system is used for detailed transaction processing or a large part of the recurrent budget is transacted through program advances issued to spending agencies which are processed outside the system;
- Whether transactions related to the capital budget are processed through the FMIS, and the extent to which this budget is transacted through project advance accounts;

- e) Whether transactions against extra-budgetary funds are processed through the FMIS;
- f) Whether transactions against internally generated funds are processed through the FMIS;
- g) The extent to which transactions related to donor funds are processed through the system.

For a set of 22 countries, the coverage of the FMIS has been estimated by trying to determine which payments and receipt transactions are routed through the FMIS and which bank accounts are covered by the FMIS. This was used by a quantitative study to assess whether FMIS systems have an effect on fiscal discipline and found a negative correlation between FMIS budget coverage and the deviation of planned to actual deficit targets, as well as a positive correlation between budget coverage and relevant PEFA scores. The authors stress that results only hold if budget coverage means budget subjected to FMIS internal budgetary controls, as expenditure controls may otherwise not be applied. [14] In Ghana and Zambia for example, wages and salaries were not managed through the FMIS and thus not subject to FMIS internal controls. The executive was therefore able to increase salaries substantially mid-year without legislative approval and adequate checks and balances. This put excessive strain on the budget and would not have been possible had these items been subjected to FMIS internal controls. [15-17]

FMIS coverage and utilization also matters for the reliability of expenditure reports. Partial budget coverage in the FMIS means that any reporting from the system will also be partial, and therefore any resulting analytical work potentially biased or misleading. [10] Transactions can also be posted to the ledger without going through the FMIS to complement, but this process does not go through the same rigor and verifying the integrity of these is more difficult. Some of these transactions may be accurate, others may not be, and other transactions may not be posted at all, as was found during an assessment of the Malawi FMIS. [10, 18] Posting transactions into the system after they have occurred only gives the illusion of comprehensiveness and control, while integrity cannot be ensured, and controls are actually not applied.

Coverage and utilization of FMIS is important as it determines how well the system can support expenditure control and gives a measure of the integrity of expenditure reporting. What underpins coverage and utilization is the actual transactions database. Yet, actual government transactions data are rarely analyzed despite their obvious value proposition: (i) revealed preferences of the executive to meet expenditure targets, and (ii) a measure of confidence in the integrity of government expenditure data. This paper is the first in exploring governments' expenditure transactions more closely and

develops a methodology that helps analyze these data and identify deficiencies. The examples of Pakistan and Cambodia are used illustratively to showcase how such an analysis could be done and inform the reform process. The foundation of expenditure data comes from the transaction profile. Harvesting and analyzing this provides critical insight into the governing political economy and an opportunity for a more targeted engagement.

2. Materials and Methods

All expenditure transactions that are routed through the FMIS are reflected in the general ledger without exception. Each transaction originates from a spending unit and must be executed against the full chart of accounts, and specify the amount, payee including recipient account number, and the time of transactions. Depending on the detail of the chart of accounts, the transaction may capture source of funds, the organizational code, the purpose of the expenditure (economic classification / line item), in which jurisdiction the transaction happened and for what program or sub/program it was intended. Each line of a typical budget execution report that is produced by the FMIS would be an aggregate of multiple transactions against a particular charge code. The format that the data structure of financial transactions in an FMIS typically takes is given in table 1 below.

Table 1 Example of Data Capture by Transactions in FMIS

Transaction ID	Time Stamp (date)	Full chart of accounts segment					Amount	Payee (and account number)
		Source of Funds	Org Code	Purpose Code (Line Item)	Location Code	Prog/Sub- Prog Code		
Transaction 1								
Transaction 2								
...								
Transaction n								

Source: Authors.

These data can naturally be broken down and analyzed in many ways. For example, the analyst may be interested in which spending units are making the largest transactions and how can one ensure that these are carefully monitored. It allows an assessment for price differentials for the same goods across governments across different suppliers. Should a government wish to digitize payments it would have to work with service providers who can be identified through this database. The timing of transactions is an

important variable as it sheds light on adequate cash flow management, which has direct consequences on the government’s ability to deliver services. These are just a few examples of the types of analyses that are possible. They all have in common however that access to the individual transactions is necessary, as aggregation in the FMIS across line items, spending units or programs hides the necessary level of detail.

This study pursues a very specific purpose: it develops a methodology based on transactions data on (i) how to estimate overall FMIS budget coverage for a given country, and (ii) how to develop an expenditure transactions profile for government. Data for Pakistan and Cambodia were kindly made available from state treasuries and are used illustratively to showcase how such data can be analyzed and interpreted to provide critical information for the expenditure management reform process.

2.1. Calculating Budgetary Coverage in FMIS

Calculating FMIS budget coverage requires the summation of the value of all expenditure transactions routed through the FMIS in a given fiscal year, and subsequently dividing these by the total approved budget reported by government. This is presented in the equation below, where t represents the fiscal year and i the individual transaction.

$$\frac{\sum_{t,i}(trans_{1,1} + trans_{1,2} + trans_{2,2} + \dots + trans_{t,i})}{Total\ approved\ budget}$$

From this, table 2 can be produced, which is populated by sample figures for illustrative purposes.

Table 2 Sample Output of FMIS Budget Coverage Estimation

	2015	2016	2017
Total approved budget	590,131,124	655,701,248	771,413,233
Total volume processed through the FMIS	415,895,403	577,632,504	722,040,630
Percentage processed through the FMIS	70.5%	88.1%	94%

Source: Authors.

These figures can be calculated for general government as well as provinces and/or other subnational levels of government separately. These then give an idea of the geographic spread in coverage of the FMIS and the distribution of the usage of budgetary resources across the country, allowing the analyst to assess what percentage are spent at the center and what at other levels of government (e.g. provinces).

2.2. Developing an Expenditure Transaction Profile

The transactions profile is a measure that gauges how all government expenditure transactions are distributed by size. This was first presented in the 2018 Policy Research Paper [10], which shows that the actual pattern of financial transactions can have significant implications for budgetary control strategies and how to improve the effectiveness of the FMIS for budget management. This study follows suit in the estimation strategy, and calculates the number of transactions, percent of transactions, the cumulative share of the number of transactions, as well as the cumulative share of the amount processed through the FMIS for specific sets of transaction ranges. Table 3 provides a sample template with illustrative figures that was populated for both Pakistan and Cambodia.

Table 3 Sample Template for Developing the Transaction Profile

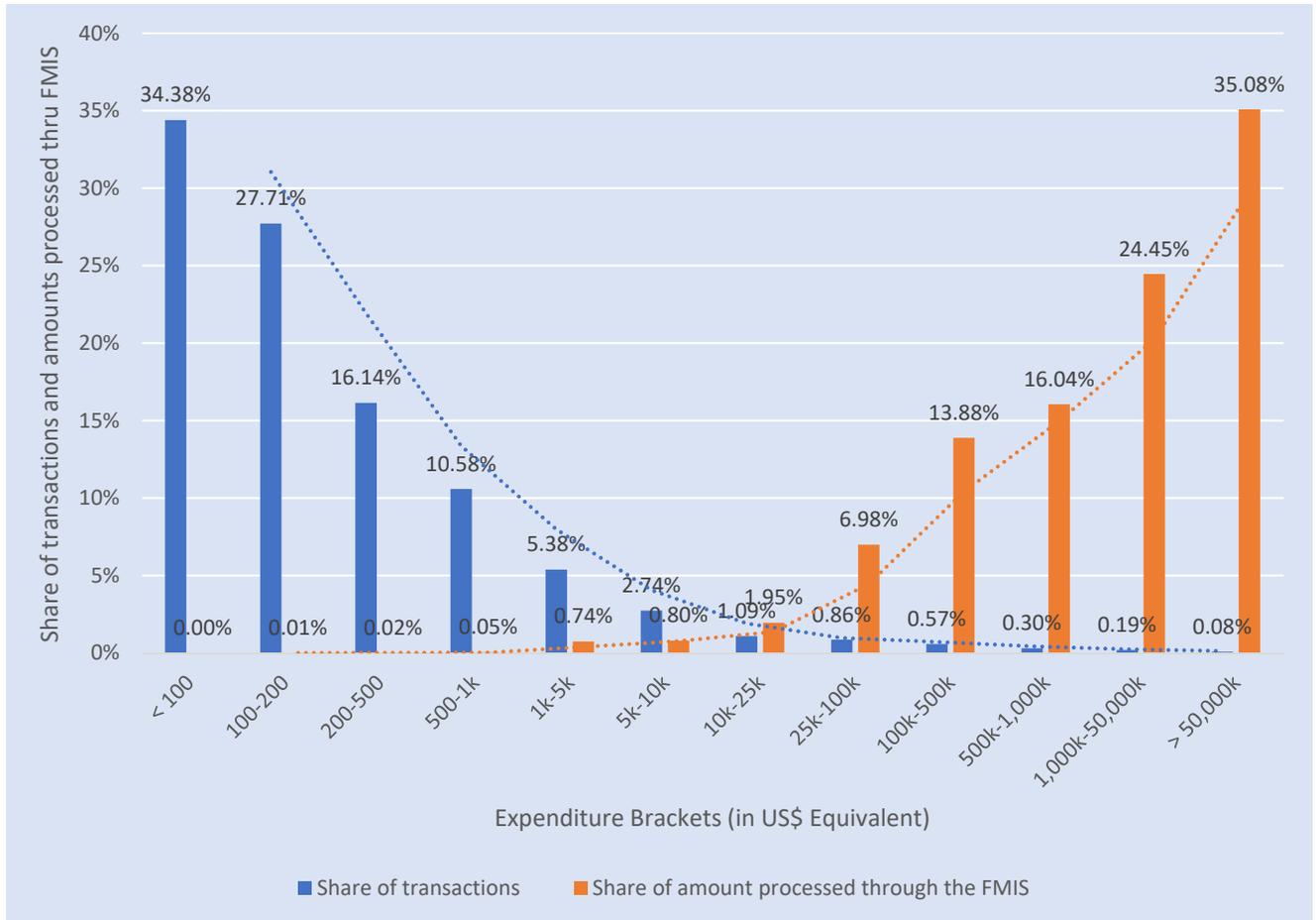
Ranges In US\$ Equivalent	Number of Transactions	Share of Transactions	Cumulative Share	Total Amount (US\$) of Transactions	Share of Amount Processed Through the FMIS	Cumulative Share of Amount Processed through FMIS
< 100	3126	34.38%	3.80%	17,748	0.00%	0.00%
100-200	2519	27.71%	9.30%	70,160	0.01%	0.01%
200-500	1467	16.14%	18.00%	150,081	0.02%	0.05%
500-1k	962	10.58%	24.50%	443,526	0.05%	0.11%
1k-5k	489	5.38%	52.30%	7,019,724	0.74%	1.08%
5k-10k	249	2.74%	63.50%	7,532,601	0.80%	2.13%
10k-25k	99	1.09%	75.30%	18,427,032	1.95%	4.68%
25k-100k	78	0.86%	88.60%	65,989,063	6.98%	13.82%
100k-500k	52	0.57%	97.00%	131,150,367	13.88%	37.52%
500k-1,000k	27	0.30%	98.50%	151,599,040	16.04%	52.98%
1,000k-50,000k	17	0.19%	100.00%	231,045,308	24.45%	100%
> 50,000k	7	0.08%	100.00%	331,450,281	35.08%	100%
Totals	9,092	100%	100%	944,894,931	100%	100%

Source: Authors.

As shown in the hypothetical example above, a larger percentage of the transactions typically falls in the lower amount ranges. At the same time the total amounts of these transactions tend to be low. On the other hand, the numbers of transactions in the higher ranges is low but their share of the total amount processed through the system is

high. This pattern is visualized in figure 2, where expenditure brackets are plotted against the share of the number of transactions and value of transactions.

Figure 2 Typical Expenditure Transaction Profile



Source: Authors.

The transaction profile data was obtained for Pakistan and Cambodia and was plotted against this template. This has subsequently been used to determine the granularity of the transactions. The granularity of the transactions allows for an assessment of whether the system is being used for retail transaction processing or just for drawing out advances from treasury which are then processed off-line (and not through the system). Therefore, it can be used to see whether there is a wider control problem with the payment approval process in a country.

3. Diagnosing the Transaction Ecosystem: The Cases of Pakistan and Cambodia

This study draws on transactions data from Pakistan and Cambodia to investigate actual FMIS budget coverage and determine the transactions profile to help interpret how data from actual system use can guide expenditure management reform.

3.1. The Pakistan Case

Background

The process of improving fiscal and financial reporting in Pakistan was initiated in the early 1990s after observations by both the World Bank and the IMF, and a diagnostic study undertaken by the Auditor General of Pakistan (AGP), that the (then manual) accounting and reporting system did not meet adequate standards for either financial or fiscal reporting. Notably, both accounting and auditing were directed by the Auditor General of Pakistan (an anomaly from pre-1947), budget reports by the Ministry of Finance (MOF) were not fully reconciled with accounting reports by the AGPR and provincial AGs, the Chart of Accounts (COA) was not compliant with IMF Government Finance Statistics (GFS) standards for fiscal reporting, and neither financial nor fiscal reports were timely or reliable. To meet these challenges, the Pakistan Audit Department (PAD) launched the PIFRA Program in 1995 with World Bank support. Under this program two projects have been executed, PIFRA I and PIFRA II. PIFRA I was completed in 2005, and PIFRA II in 2015.

As part of the project, a major mission critical country-wide integrated system, the Financial Accountability and Budget System (FABS), has been implemented to spearhead the reforms and assist the government in the functional processes associated with financial accounting and budgeting at the federal, provincial and district levels.

FABS functionality includes:

- Budget preparation: assists in compilation of budgets, prints the budget book and associated reports, maintains a record of initial budgets, revisions, and budget releases.
- Budget execution:
 - Records commitments, receipts of goods and services;
 - Ensures expenditures are in accordance with budget appropriations, commitments and budget releases;

- Authorizes payment after checking for controls; gives payment instructions to bank; and
- Records revenues and other receipts, enables better control over fiscal deficits and arrears;
- Accounting and fiscal reporting:
 - Enables accurate and timely posting of all transactions;
 - Comprehensive reporting;
- Calculates payroll for civil servants;
- Maintains general provident fund accounts for civil servants; and
- Calculates pension payments and maintains pension accounts for government retirees.

FABS has been implemented using an internationally well-known off-the-shelf application software package, SAP, that was acquired after international competitive bidding.

FABS includes modules for:

- Budget preparation
- General ledger
- Accounts payable
- Accounts receivable
- Payroll
- Pensions
- General Provident Fund
- Cash Flow Forecasting

The functional requirements of the system were developed by an international consulting firm. Total direct costs related to systems implementation have been about US\$50 million, comparable to costs for similar projects in other countries.

The main system users are:

- Budgeting organizations across all levels of government including the federal MOF; provincial finance departments; and district finance departments
- Accounting organizations across all levels of government including the Office of the CGA; AGPR and Sub Offices; Provincial AGs; District Accounts Offices – DAO (105); Sub-district and Tehsil offices; Government of Azad Jammu and Kashmir (AJK)
- Line ministries and provincial line departments

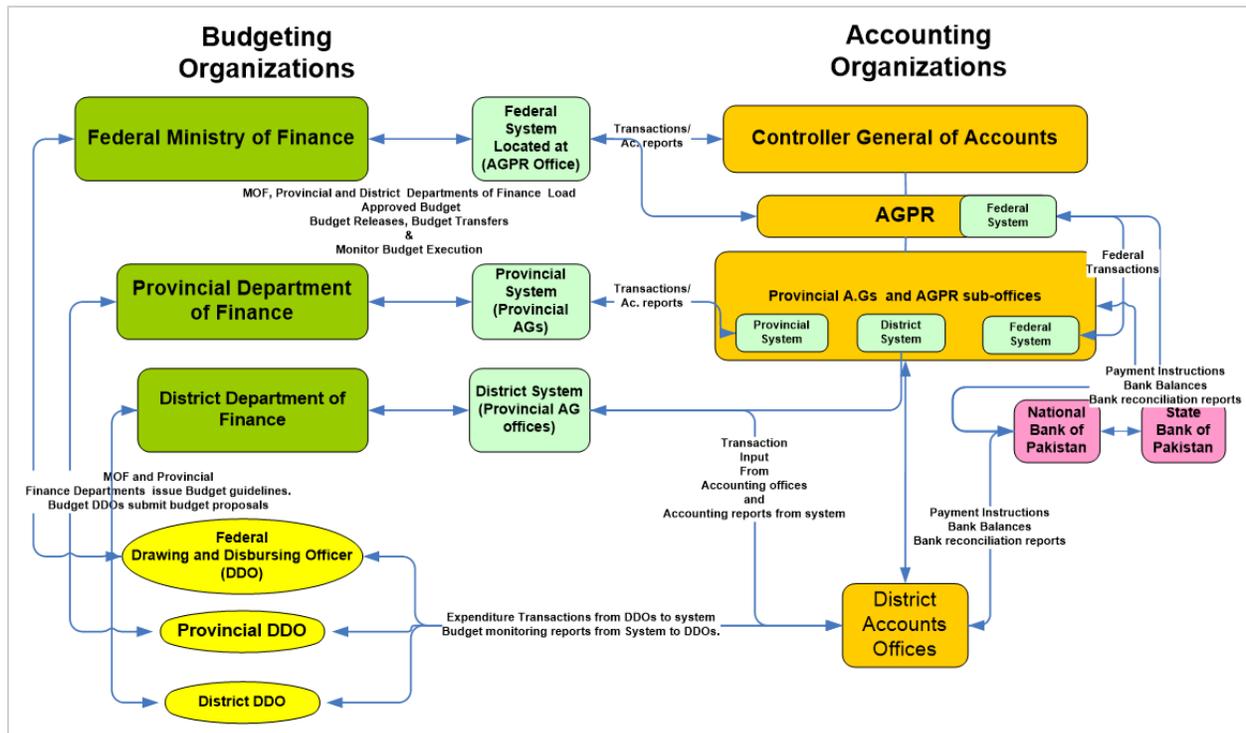
The system has been implemented in a partially distributed architecture and interfaces with the Planning Commission, the Central Board of Revenue, the State Bank, the National Bank, and the Debt Management Office.

Five separate systems have been implemented as follows:

- One for the Federal Government; Budgeting and Accounting transactions are carried out on a central server located in Islamabad.
- One each for the four Provincial governments, of Punjab, Sindh, KP and Baluchistan. Provincial Government Budgeting and Accounting transactions are carried out on servers located in each of the provincial capitals, Lahore-Punjab, Karachi-Sindh, Peshawar-KP and Quetta-Baluchistan.
- District government budgeting and accounting transactions are carried out on the respective provincial servers.

The systems architecture and the institutional interfaces with the systems are shown in figure 3 below.

Figure 3 Pakistan FABS System Deployment and Institutional Relationships



Source: Authors.

FMIS Budgetary Coverage

There is significant variation in system use of the five systems across Pakistan. At the federal government, only about 10% of the budget is routed through the system, meaning that the main business of federal government is being done outside the system. This share is significantly larger for provincial systems ranging from 43% to 69% of budget coverage. This is in part a reflection of high payroll and pension coverage at the provincial level (table 4).

Table 4 Percentage of Total expenditure, Payroll and Pensions Processed Through FABS, 2016/17

Systems	Share of Total Expenditures	Share of Salaries	Share of Pensions
Federal	9.8%	35.3%	11.0%
Punjab	43.6%	84.8%	89.9%
Sindh	72.2%	96.1%	48.9%
Khyber Pakhtunkhwa	67.5%	98.0%	58.1%
Baluchistan	68.9%	93.7%	90.5%

Source: Authors.

The conclusion of this breakdown is that at federal level only about 10% of the budget is subject to system internal ex-ante budget controls. The remaining 90%, including the majority of salary and pension payments, is handled outside the system. The system can thus not credibly affect aggregate expenditure control or expenditure targets. As the payment and reporting is only integrated for those payments transacted through FABS, the integrity of reporting can only be guaranteed for those 10%.

At the provincial level FMIS coverage is significantly larger ranging from 44% in Punjab to over 65% for other provinces. Payroll and pension expenditures constitute a large share of the budget and are well captured by the system. This supports greater overall expenditure control at this level.

Agencies whose payroll and pensions are processed outside the system should be brought in. This is true mainly for the federal level where the percentages of the payroll and pensions processed thru the system are very low. The low percentages for payroll and pensions at the federal level are due to the fact that defense does not use the FMIS. The pension figures for Sindh and Khyber Pakhtunkhwa are low because not all pension payments in Sindh and Khyber Pakhtunkhwa are done through the FMIS and still follow the legacy PPO process.

Analysis of the Pakistan Expenditure Transaction Profile

Assessing the transaction profile in more detail reveals that most non-salary transactions processed by the system are of low value and don't make up a large share of the budget. At the federal level, non-HR related transactions smaller than PKR 10,000 make up 40% of the budget and the percentage of transactions below PKR 20,000 is about 50% for the center and all provinces. However, all of these transactions together only make up between 0.4% and 1.5% of non-HR related disbursement through the system. Conversely, high value transactions (>PKR 500,000) are few across all systems but make up a large share of the budget as detailed in table 5. The entire transaction profiles for non-HR related expenditure processed through FABS for the federal government and for each of the provinces are given at Annex I.

Table 5 Analysis of Transactions Profile in Pakistan

	Share of High Value Transactions Processed Through FABS	Share of the Total Non-HR Related Disbursement	Total Number of Transactions	No of High Value Transactions > PKR 500,000
<i>Federal Government</i>	3.65%	87.31%	625,596	22,823
<i>Punjab</i>	3.85%	73.8%	861,031	33,197

<i>Sindh</i>	9.07%	89.2%	571,189	51,823
<i>Khyber Pakhtunkhwa</i>	5.8%	87.1%	339,248	19,605
<i>Balochistan</i>	3.67%	85.8%	239,708	8,797
<i>Total</i>			2,636,772	136,245

Note: High value transactions were defined as PKR >500,000.

Source: Authors:

On receipt of these figures, GOP staff have carried out a detailed analysis of what transactions are processed through the system at the center and the provinces in ex-ante mode and what is excluded. Coverage at the federal level for example is very low across the board and could be improved.

At the federal level defense and railways related expenditures are left out. Further the MOF needs to process all transactions which it currently carries out directly by communicating with the Central Bank, through the system in ex-ante mode. The items that are currently excluded are shown in table 6 below.

Table 6 Budget Items Not Routed Through the FMIS at the Federal Level

Item	Share of the Budget
Debt Servicing (Domestic and Foreign)	30.6%
Capital Budget	18.4%
Transfers and Subsidies to State Owned Enterprises	4.8%
Loans and Transfers to Province and Others	1.7%
Postal Department	0.1%
Foreign Affairs	0.4%

Source: Authors

At the provincial level there are also steps that could be taken to expand budget coverage. Here, the main reasons for the gap between total disbursement and that carried through the FMIS are that loans/transfers and debt service transactions are not routed through the FMIS and development spending is transacted through assignment accounts. Checks written by the accounting officers of these agencies are posted in the FMIS ex-post. These payments are currently done through the assignment accounts and need to be carried out directly through the FMIS instead. In Punjab the figures for loans/transfers and debt service are also higher than the other provinces. These items could be brought into the workflow of the FMIS and would significantly improve the coverage of the system and therefore its effectiveness. The budget share of categories not routed through the FMIS in provinces is given shown in table 6 below.

Table 6 Budget Share of Categories Not Routed Through FABS

	Transfers/Loans	Debt Service	Development spending
Punjab	10.8%	2.9%	38.0%
Khyber Pakhtunkhwa	2.6%	1.8%	38.1%
Sindh	7.2%	3.9%	36.8%
Baluchistan	5.3%	1.3%	51.1%

Source: Authors.

The Problem of Capturing Transactions Ex-Post

The Government of Pakistan informed while some transactions (as outlined below) may be out of the normal workflow, monthly data on them is still being captured into the SAP data-warehouse of FABS and a dashboard report produced for the Secretary Finance Division. These include

- (i) Domestic Debt figures are captured on a weekly basis from Central Directorate of National Savings (the data from saving centers across the country is entered into the central system at CDNS on weekly basis and is pulled-in into the IFMIS through an automated solution).
- (ii) External debt data is being captured into FMIS at the same time as it is updated in DMFAS, through entry into a SAP terminal made available at Economic Affairs Division (this arrangement has been implemented as an alternative to interface with DMFAS).
- (iii) Data on tax receipts from Federal Board of Revenue on a daily basis through optic-fiber linkage with database of FBR.

Daily expenditure data from SAEs like National Highway Authority is also being captured into system ex-post as cheques of NHA come to AGPR for endorsement and data is entered into the SAP system. Daily expenditure statement of Pakistan Public Works department is entered into the FMIS ex-post from its 58 formations. Similar steps are being taken to extend this process to capturing daily expenditure data ex-post from Pakistan Post.

However, while this methodology may suffice for getting adequate up to date reports, these transactions would not have been subject to FMIS based ex-ante budget control. This means that for a particularly of expenditure, e.g. debt or even for the subsidies to the State-owned enterprises and the expenditure carried out by the SAEs no FMIS based budget control is being exercised. While it is understood that this is supposed to be done by the various entities that are generating the transactions in an off-line mode, this

process leaves open the possibility that the expenditure can exceed the budget allocation. This is especially true of the debt, subsidies transactions that are carried out by the MOF itself.

In practice what happens in these cases is that the budget ceilings for these categories (or for any other categories where this control is not exercised in ex- ante mode) are exceeded and the government regularizes these expenditures by passing supplementary budgets. However, this means that the sanctity of the annual budget law as passed by the parliament goes by the way side and has de facto little meaning. Instead the MOF in effect remakes the budget during the course of budget execution. This can be avoided by routing these transactions through the FMIS and exercising ex- ante budget control on them.

3.2. The Cambodia Case

Background

Cambodia has recently completed Phase I of implementing an FMIS and embarked on Phase II of the implementation which expands the scope and functionality of the system. Phase I of the reform focused on core functional processes and modules that cater to core budget execution processes and processing of payments and receipts transactions across government before going on to other, non-core, elements. Systems deployment was restricted in the first instance to MEF departments that were involved in the budget execution process for all types of expenditures including the actual payment and subsequent reconciliation with bank accounts where government funds were housed.

For this the government has acquired the application software package, PeopleSoft; parameterized it for its requirements and installed it at a central server in the MEF. By mid-2016 the central offices of the MEF including the GDNT (Accounting Department), GDSNAF, Budget, FAD, DI, DCDM were all connected to the system through remote terminals. FMIS had also been implemented at all 25 provincial treasuries (PTs). Transactions for the districts and communes were processed at the respective PT.

At the end of Phase I, the core functionality of the FMIS related to budget execution was in place with the implementation of the Budget Allocation (BA), General Ledger (GL), Accounts Payable (AP), Accounts Receivables (AR), Purchase Order (PO), and Cash Management (CM) modules. This enables full implementation of comprehensive transaction processing including recording all phases of the transaction from Procure to Pay (P2P) and comprehensive report generation facilities. At the central level the

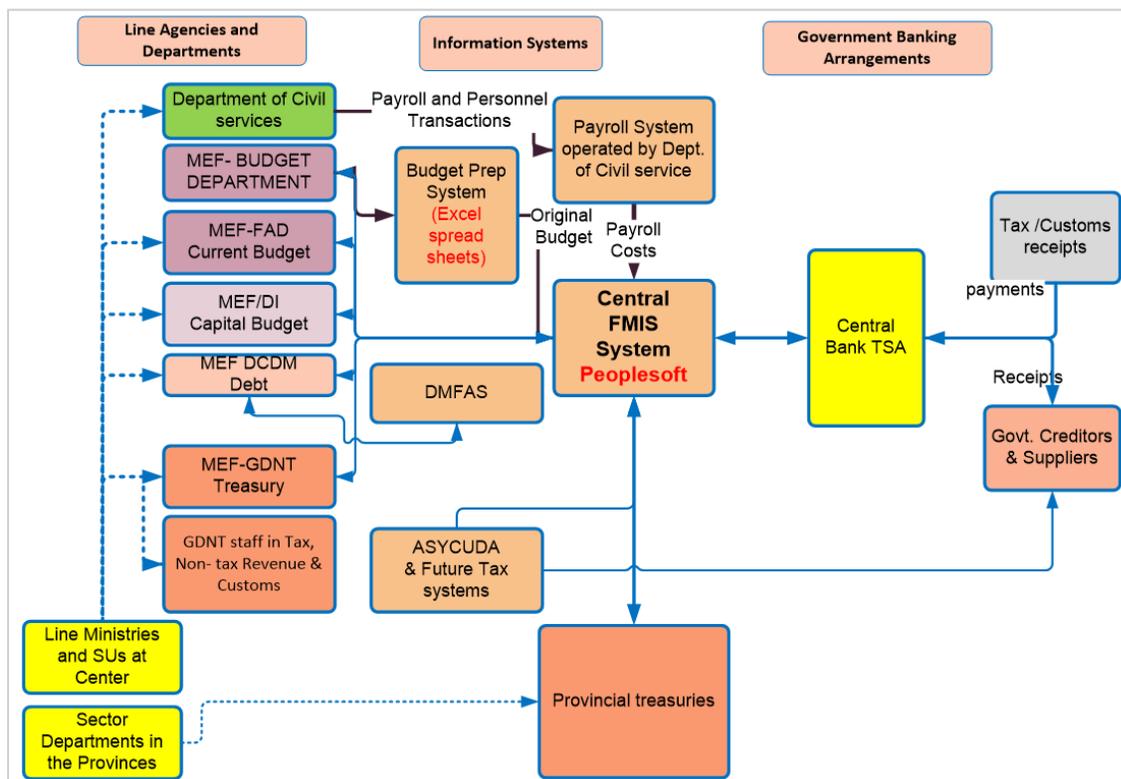
transaction processing includes all stages of the 'procure to pay' process. At the provincial level payments are made on the basis of invoices only.

Starting in January 2018, system roll-out has now progressed to include 10 Line Ministry Central offices and 12 Level 1 Budget Entities. The 10 Ministries include the Ministries of Education, Youth and Sports Health; Agriculture; Forestry and Fisheries; Labor and Vocational Training; Environment; and five others. Of the 12 Level 1 budget entities, six are in the MEF and the remaining six in the Ministry of Environment.

In 2019 an additional 10 ministries, 20 level 1 budget entities and the 25 Provincial Finance Departments will be connected. This will add another 460 users to the system. Configuration of the system, including user access matrices, training activities, and provision of workstations for the next tranche of the rollout, is underway. The rollout of the core FMIS modules to the remaining line ministries and Level 1 budget entities is planned to be completed in 2020.

The Information architecture of the Cambodia FMIS is shown below.

Figure 4 Cambodia Information Systems Architecture for Fiscal Management



Source: Authors.

FMIS Budgetary Coverage

Information on the total number of expenditure transactions processed through it in a given period (e.g. an FY) and the amount of budgetary resources transacted by these transactions give the extent of its use and scope of its coverage. When these figures are calculated for the center and the provinces or other subnational levels of government separately, they provide information on the percentage of budgetary resources spent at the center and the percentage at the provinces.

The total amounts processed through the FMIS represent a high percentage of the total domestically financed budget for 2017 and this shows that the coverage of the FMIS is very good on an overall basis. Donor funds are not processed through the FMIS at present.

Table 8 shows that 62.9 % of the budgetary amounts are transacted at the National level and 37.1% at the provinces. However, the total number of transactions processed at the national level is only 8.7% compared to 91% at the provinces. This suggests that this area needs to be investigated further. This has been done and the reason for this disparity are explained below by looking at the granularity of the transaction data.

Table 8 Total Amount Processed through the FMIS and Values they Represent

	Total no of transactions	Share of total no	Total amount (Riels)	Share of the total amount
National level	19,004	8.70%	12,794,095M	62.90%
Provincial treasuries	198,470	91.30%	7,530,580M	37.10%
Total	217,474	100%	20,324,676M	100%

Source: Authors.

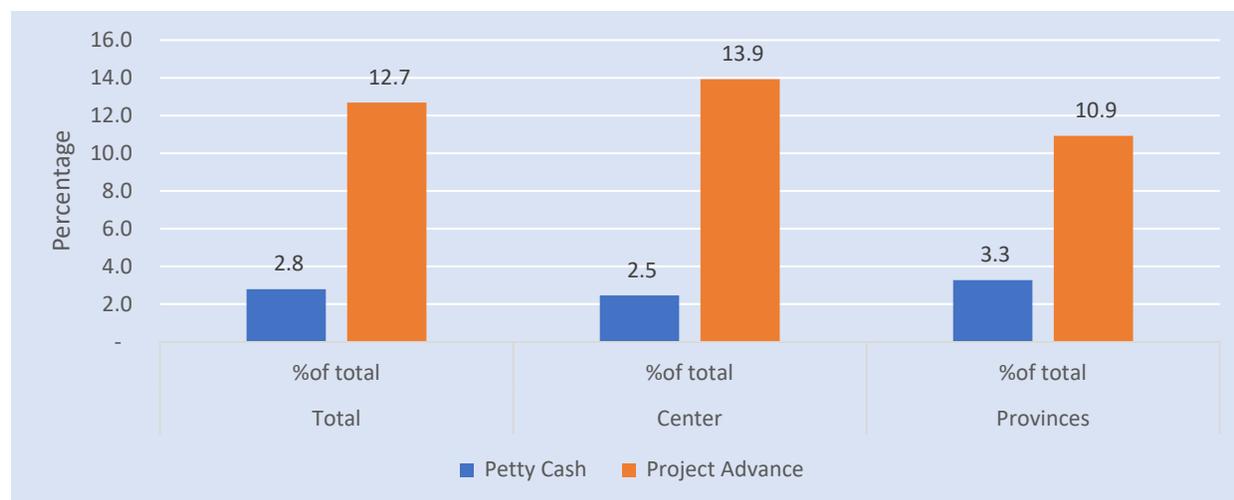
Analysis of the Cambodia Expenditure Transaction Profile

It is observed that only 15% central expenditure transactions in 2017 are below \$2,500 or 10 million Riel, while 71.6% of the Provincial transactions are below 10 m Riel or \$2500. From this appears that at the central level the system may be used mainly for drawing out advances from Treasury which are then processed off-line. This can be tested to determine the granularity of the transactions. The transaction profiles for Cambodia are given at Annex II.

The granularity of the transactions would then show whether there is a wider control problem with the payment approval process in the country. In this case the line ministries and SUs would resort to taking advances, since it takes an inordinate time to process payment requests through the Treasury.

The petty cash and project advance data for 2018 is shown in the attached figure. The total amounts are a relatively modest percentage of the total disbursements. The petty cash process, when limited to small amounts on an overall basis and a low individual transaction threshold, is generally a good way for developing countries to provide easy access to small amounts of money to SUs like schools and health clinics and has a positive impact on service delivery.

Figure 5 Advances as Percent of Total Disbursements



Source: Authors.

An analysis of the frequency distribution of project and program advances and of petty cash advances was therefore done (see Annex II for details). From it, the following is evident:

- 83% of the advances are below 100M Riels or US\$25,000;
- 25% of the Petty Cash advances at Center are above 400M riel or US\$100,000; and
- At the provinces 95% are below 100M Riel or US\$25,000.

Some petty cash transactions are quite large. Out of a total of 4,098 petty cash transactions in the first 4 months of 2018, only 100 transactions which are more than 400,000,000 Riel would constitute almost half of the total amount 199 billion i.e. 98 billion Riel. Out of these 10 transactions 27 take place at the center and 73 at the provinces. In 2017 a total of 11,775 petty cash transactions took place totaling to 506 billion Riel or about 2.55 % of the total amount disbursed. However, of these, 251 transactions were above 400 million Riel or \$ 100,000 and totaled 205 billion Riel or 40% of the total. 242 of these high value transactions took place at the center and 9 at the provinces.

The 400 million Riel used as a threshold is significant for Cambodia. Transactions above that should preferably not be routed through the petty cash process. However, some line ministries and sector departments continue to take out these large petty cash advances and distribute these to their subordinate units. To improve this situation, the advance could specify the spending units and the amounts it will be distributed to.

In addition to petty cash advances, line agencies can also apply and get program advances for line items which are not eligible for petty cash advances. Together, these two can constitute up to 50% of the non-salary part of the recurrent budget of the line agency.

Cambodia still uses petty cash for small payments and advances for investment expenditure. Usually excessive use of these instruments points to delays and complications in the regular payment process. They also imply inefficient cash management and are a risk factor for misuse of funds. Use of these payment modalities avoids the ex-ante control of payments that is part of Cambodia's expenditure control system.

The entire process of using advances for a major part of the recurrent expenditure is necessitated by the fact that on average it takes about three weeks to process an expenditure transaction through the normal payment process and agencies adopt these alternative methods to avoid these delays. However, adoption of this method implies that a major part of the recurrent budget of a line agency is spent without ex-ante control. Further, since the expenditure is allocated to a particular program, sub-program, activity, only at the time the advance is settled, the expenditure reports from FMIS do not reflect the full expenditure at these levels before the advances have been settled. Given a country's institutional capacities, the use of these instruments often cannot be totally avoided until new payment processes, or payment methods (debit/credit cards instead of petty cash) are developed.

One option to improve such a situation would be for MEF to establish a threshold size for petty cash usage. For that it would be necessary to investigate the sources of the high-value transactions and the reasons for their occurrence while developing a policy for the usage of the petty cash process. In addition, it should be ensured that these advances are settled promptly. In some countries spending units requiring access to small amounts of money have been given purchase cards with limits for the total amount that can be spent and on an individual transaction. The feasibility of introducing this or similar methods can be explored over the medium-term.

A recent IMF mission had recommended that business processes, including procurement, need to be reviewed from end to end to ensure they are efficient, timely, and that the appropriate levels of controls are in place, given risks. The processes should also be optimized to use the FMIS as was intended. The FMIS is a significant investment, and controls in FMIS are much more effective than those undertaken manually. There were also expectations that system-based controls would eliminate many of the manual controls that currently exist, but line ministries report that processing steps have increased with the FMIS, as the manual process is largely unchanged from their perspective.

4. Discussion and Conclusions

FMIS systems constitute an essential part of budget management. They help execute the budget and implement policy. The question of how FMIS systems are used is naturally an important one to pursue. It gives an indication of a government's willingness to pursue systematic expenditure control and confidence to civil society that reported expenditures reflect actual payments. FMIS investments are costly and take a long time to deploy. If used properly these investments will most likely render a high return and can act as the backbone for effective public expenditure management. If not used properly however, they are the epitome of isomorphic mimicry: giving the illusion of prudent expenditure management that gives legitimacy without providing for the underlying core functionality.

This paper develops a methodology to assess how FMIS systems are used, by analyzing the government expenditure transaction ecosystem – the foundation of all government expenditure reporting. An assessment at this level of detail can point toward deficiencies in utilization practices that could be strengthened and have a real effect on improved expenditure management in a short period of time. This is shown through the use of two case studies, Pakistan and Cambodia which have revealed completely different issues and the results of the analysis could be used to identify specific steps that need to be taken to focus further reform efforts. More generally, it appears that there is a need to take another look at the implementation of the FMIS systems and their deployment strategies.

One observation this study confirms is that few transactions tend to make up a high share of the budget. This is the case for both Pakistan and Cambodia, as well as a larger set of countries the authors have data for (see table 9). Thus, if the FMIS does not capture some of these transactions (as was the case in Pakistan), the FMIS will forgo the opportunity to control such high-risk expenditures at very low cost. Similarly, the

number of low value transactions routed through the FMIS is revealing. If, as was the case in Cambodia, these are few in number it raises the question of how these are actually executed. Large project or program advances routed through the FMIS will still give expenditure control at the aggregate level, but the FMIS does not provide for the integrity in expenditure data it otherwise would and cannot guarantee funds were actually spent according to appropriations. Pakistan and Cambodia do not appear to be isolated cases. Low budget capture was also identified as a problem in Bangladesh and Ghana, and the issue relating to advances in Somalia and Sierra Leone.

Table 9 Transactions Data for a Select Group of Countries

Country	Transaction type	Threshold	Share of Transactions	Share of the Budget
China, Central Government (2015)	High value	> US\$ 78,250	2.1%	69.0%
	Low value	< US\$ 1,564	69.0%	2.7%
Vietnam (2015)	High value	>US\$ 43,800	1.8%	75.0%
	Low value	< US\$ 2,190	78.5%	4.3%
Philippines (2017)	High value	> US\$ 10,000	7.8%	93.0%
	Low value	< US\$ 2,000	79.8%	2.2%
Afghanistan (2017)	High value	> US\$ 25,000	8.6%	86.0%
	Low value	< US\$ 1,000	55.0%	1.1%
Laos, PDR (2017)	High value	> US\$25,000	7.7%	70.0%
	Low value	< US\$ 1,000	43.4%	1.2%

Source: Authors.

In practice, if one can determine the threshold of transactions that would yield high budget coverage (e.g. 90-95%), then it would be possible to target ex-ante control to those transactions. This would ensure high coverage, and provide confidence in a government's commitment to fiscal expenditure rules.

The following provides two examples of how this information could guide an effective expenditure management reform.

- (i) **A risk based and sequenced deployment strategy.** Formulate system deployment and control strategies that focus on high value transactions. Such a strategy would enable expedited results during the implementation of FMIS systems early in the roll-out phase. Once the principle of this selective control is agreed the following steps could be pursued:
- Ensure that all transactions generated at the central MOF such as fiscal transfers, subsidies, and debt service payments, are routed through the central FMIS system;

- Ensure that all receipts are recorded in the system;
- Ensure that all payroll, and civil service pension payments calculated by a central system are routed through the central system (these would likely constitute some 30-40% of the total budget); and
- Ensure all payments from line ministries or spending units above the transaction threshold are routed through the central system.

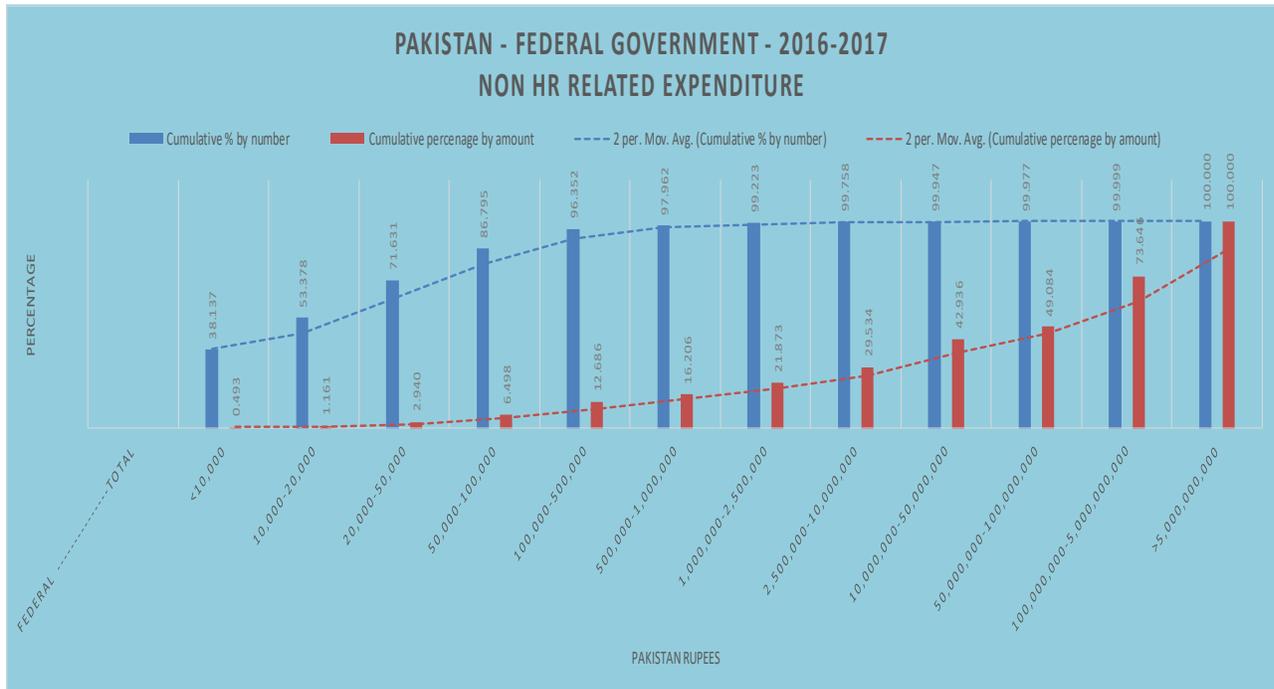
Such a deployment strategy would take less time and take a fraction of the cost of a traditional deployment strategy that aims at comprehensive coverage. This focused risk-based strategy could be the first phase of a more comprehensive FMIS reform engagement with tangible results early in the process. It would also be useful for audit departments in developing a risk-based audit methodology. Donors could support such a phased implementation process and secure financing of the second phase conditional successful completion of the first.

(ii) **Develop a differentiated risk-based control strategy.** Here a purposeful decision is made to subject low value transactions to less stringent ex- ante control than high value transactions. This would enable easier access to small amounts of money that spending units need for their day to day operational needs. Such a strategy could be most useful for service delivery sectors with rapidly changing needs such as health or education. Such a strategy would preempt a situation where health clinics or schools struggle to access small amounts of funds in a timely manner because of excessively rigid controls. The calculation of the expenditure transaction profile for a country would enable a method to propose a low value threshold for such operations and also to assess the total "exposure or risk" of processing these transactions on an ex-post control basis. Various methods could be used to facilitate the access to small amounts of money to SUs and the processing of low value transactions. For example:

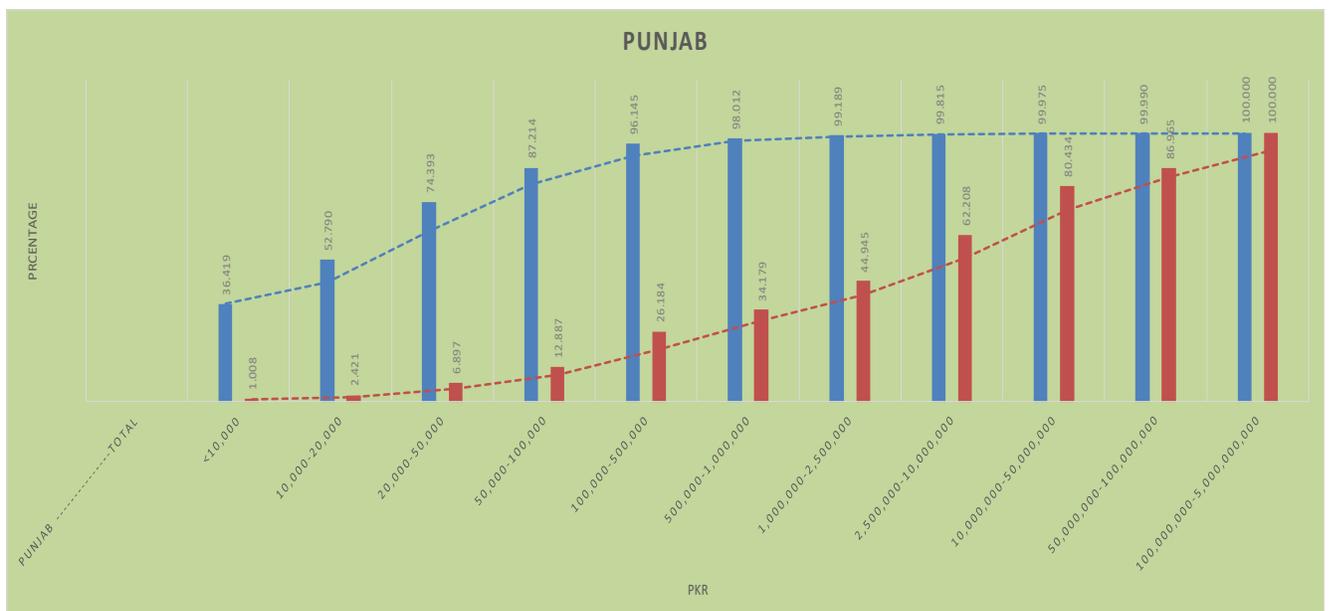
- Issue of purchase cards with limits on the total amount and the size of individual transactions, to selected staff and managers of these units. This would be the preferred modality as it would not compromise the integrity of the transaction if interfaced appropriately with the FMIS;
- Leveraging the banking system whereby small amounts of money can be transacted through designated banks which are reimbursed ex-post. This would be a modification of the classical imprest account process.

Annex I – Pakistan Transactions Profile

Transactions Profile for Pakistan at the Federal Government (FY 2016/17- Amount Ranges in Pakistan Rupees).



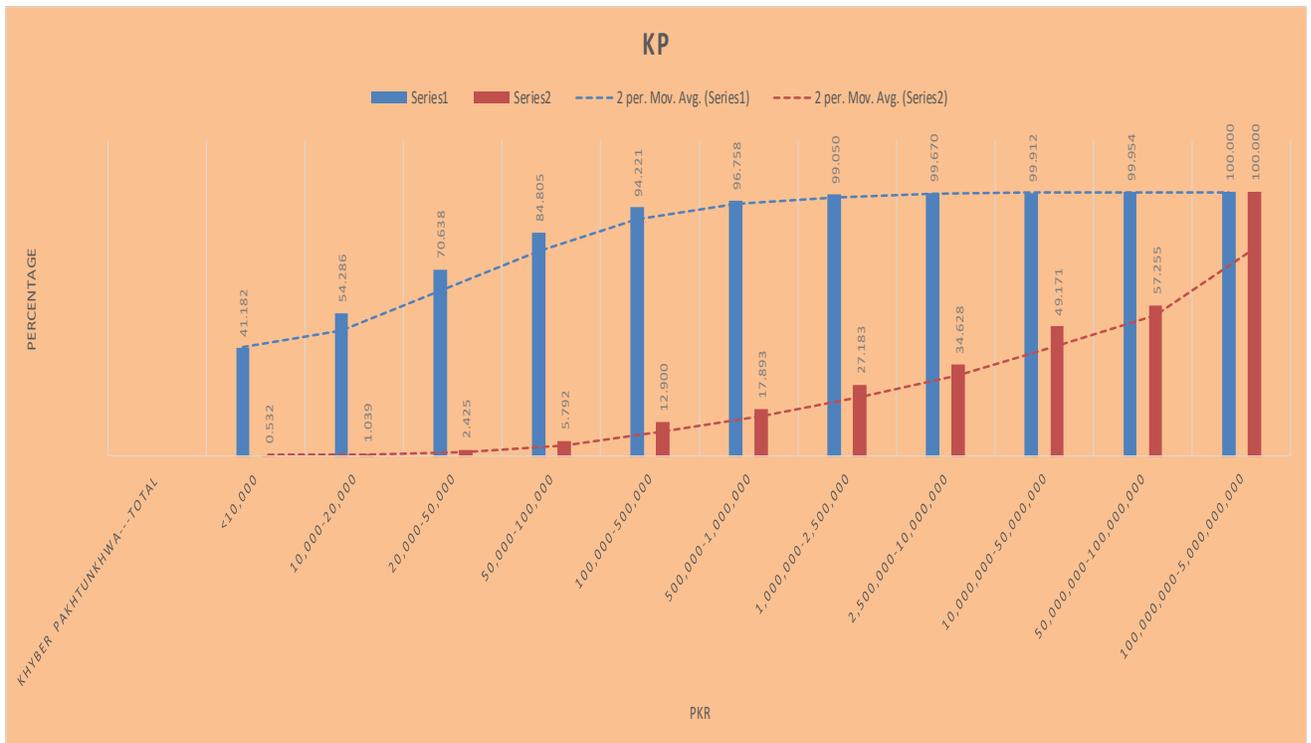
Transactions Profile for the Pakistan Province of Punjab (FY 2016/17- Amount Ranges in Pakistan Rupees).



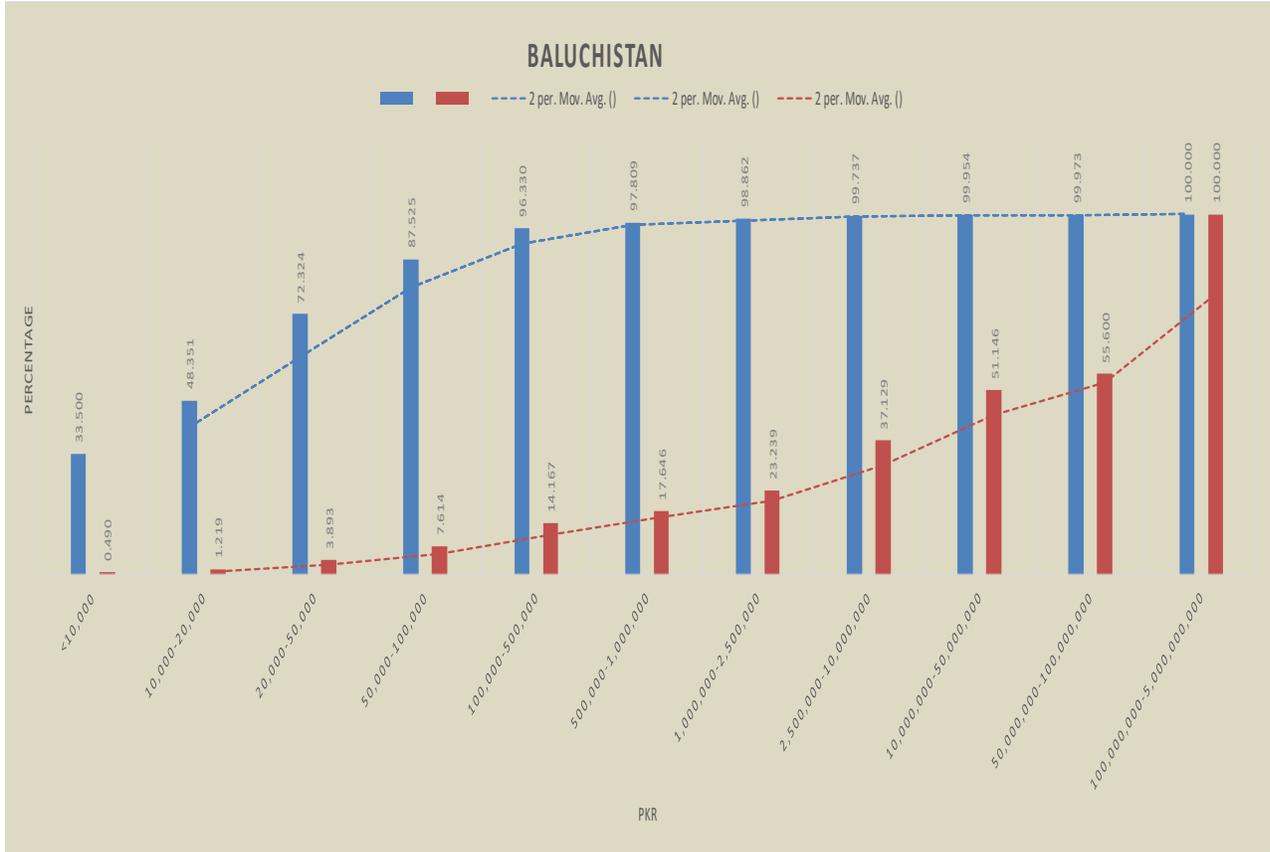
Transactions Profile for the Pakistan Province of Sindh (FY 2016/17- Amount Ranges in Pakistan Rupees).



Transactions Profile for the Pakistan Province of Khyber Pakhtunkhwa (FY 2016/17- Amount Ranges in Pakistan Rupees).

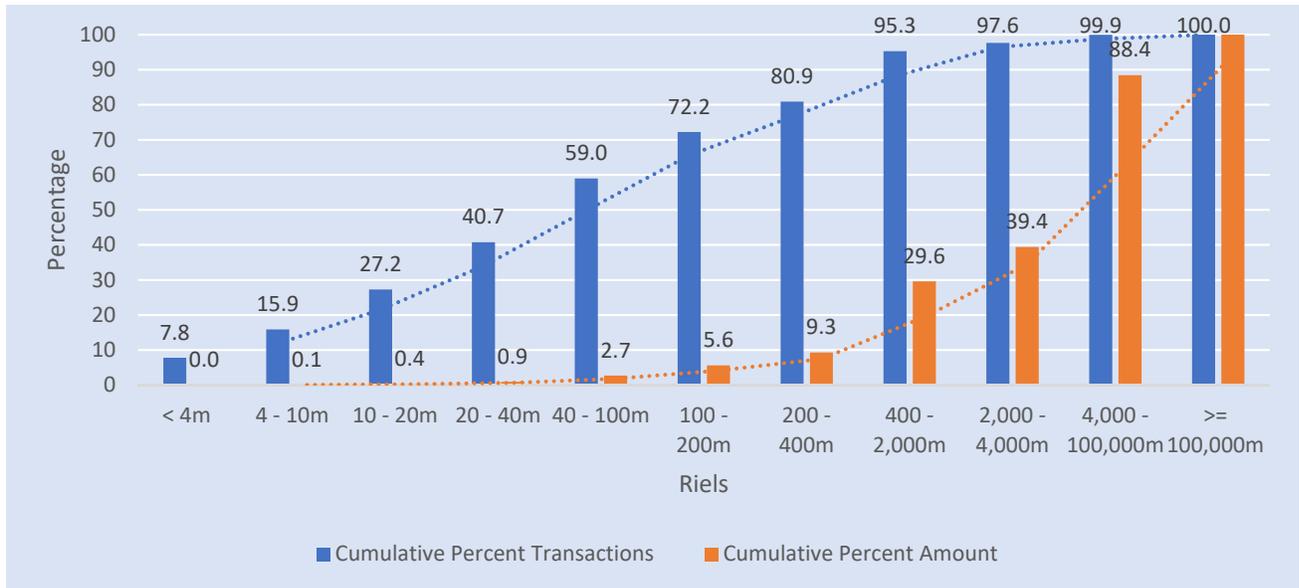


Transactions Profile for the Pakistan Province of Baluchistan (FY 2016/17- Amount Ranges in Pakistan Rupees).

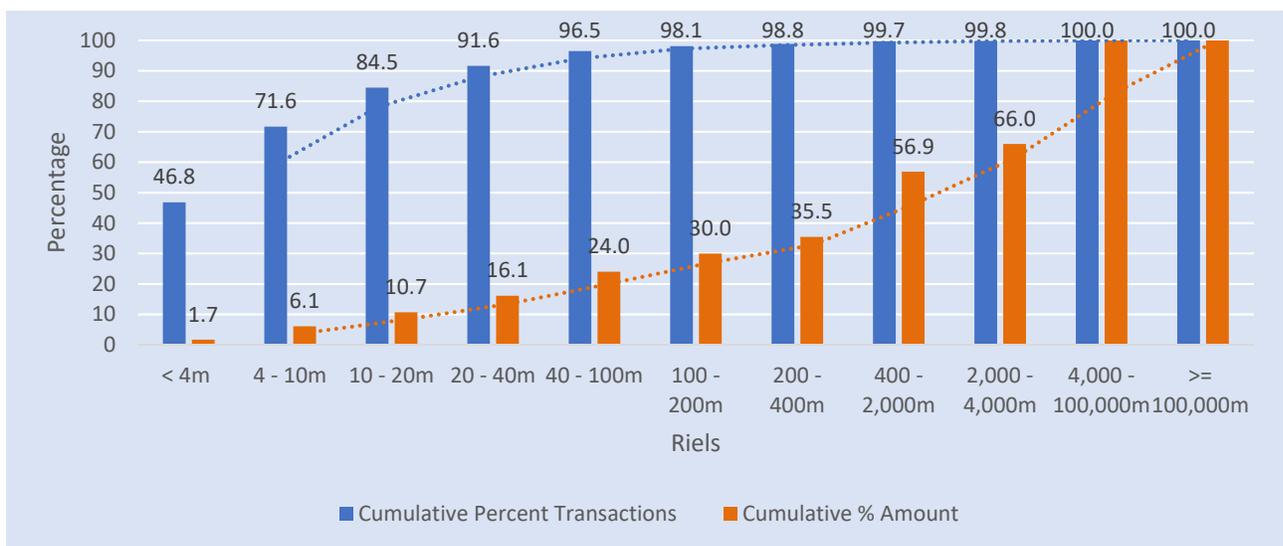


Annex II – Cambodia Transactions Profile

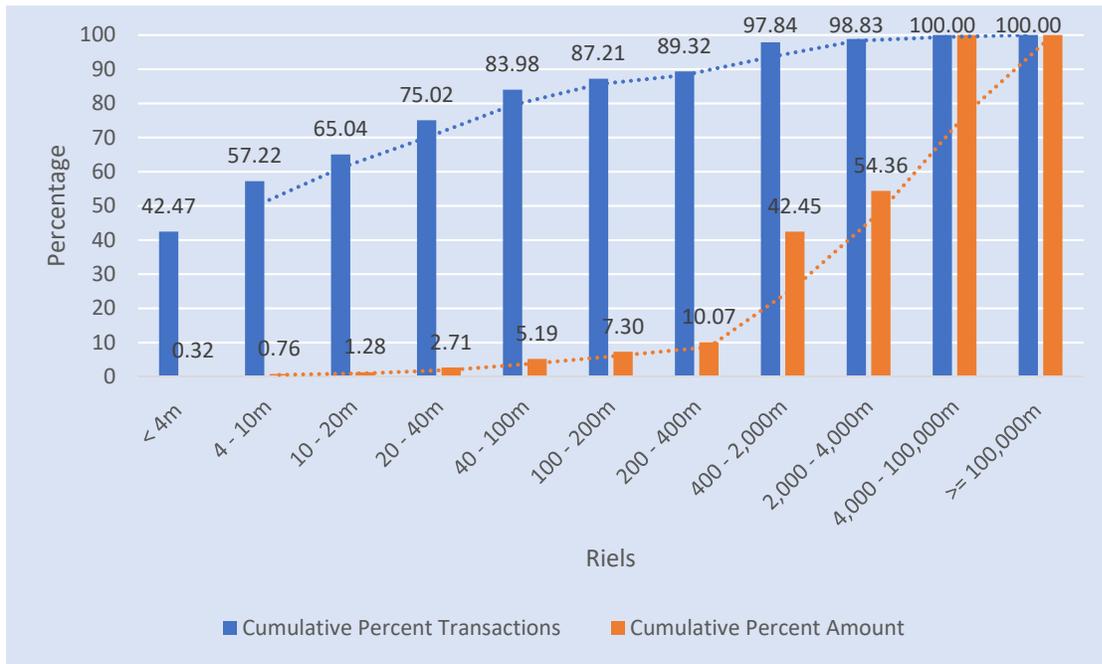
Cambodia Expenditure Transactions Profile, Central Government, 2017 - Amounts Ranges in Riels.



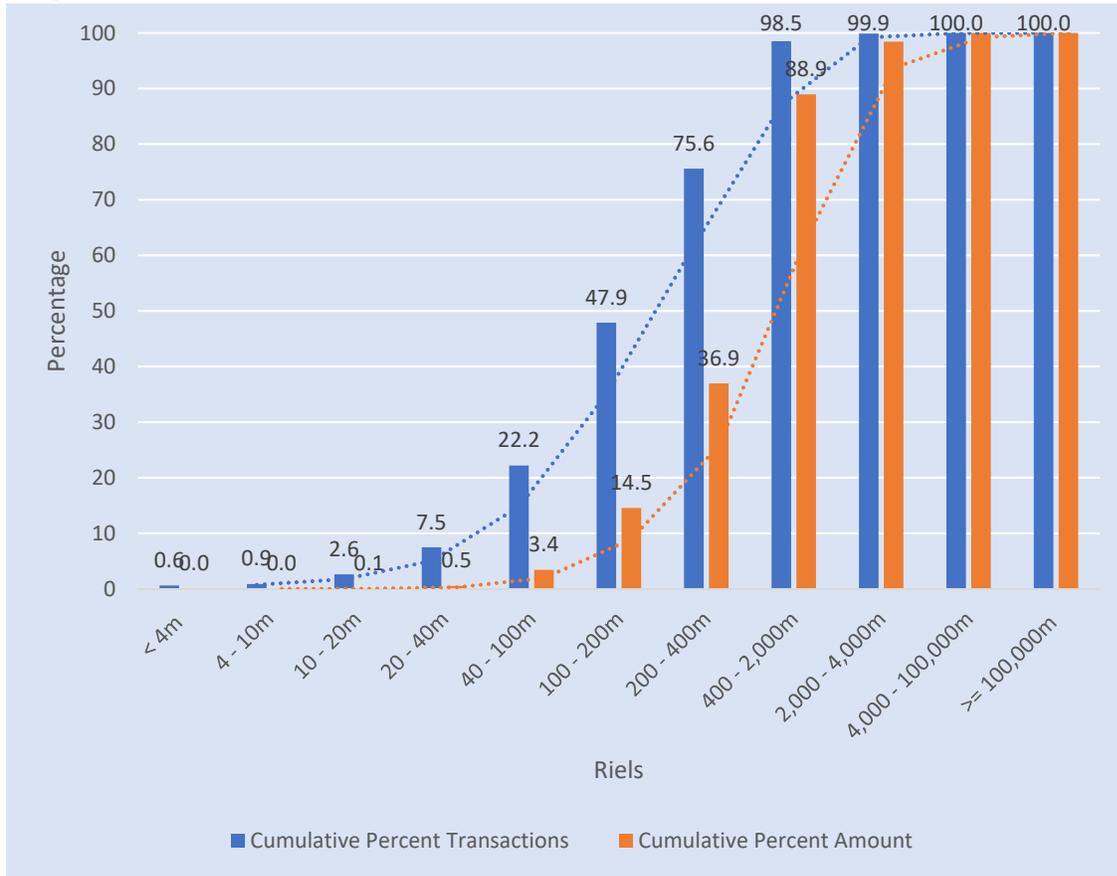
Cambodia Expenditure Transaction Profile, Provincial Treasuries, 2017- Amount Ranges in Riels.



Cambodia Expenditure Transaction Profile, Advances, 2017- Amount Ranges in Riels.



Cambodia Expenditure Transactions Profile, Central Government Petty Cash Advances, 2017 Amount Ranges in Riels.



Cambodia Expenditure Transaction Profile, Provincial Government Petty Cash Advances, 2017- Amount Ranges in Riels.



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