UNCDF

Unlocking Public and Private
Finance for the Poor

The case for the collection and analysis of transaction-level, supply-side data on remittances

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ACKNOWLEDGEMENTS

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ABBREVIATIONS

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AML	anti-money laundering
BoP	balance of payments
GDP	gross domestic product
KYC	Know Your Customer
MTO	money transfer operator
PDF	Portable Document Files
SARB	South African Reserve Bank

GLOSSARY

Definitions as developed by UNCDF for use in this paper, unless otherwise attributed.

Aggregated data – data where volumes and values of transactions are aggregated by one or more attributes. For example, where the value of remittances is reported summarized by the country of origin or by the channel (i.e. bank or money transfer operator (MTO)). This would provide a central bank with the ability to analyse the data either by country or by channel (but not both).

Highly disaggregated data – data that is aggregated using multiple, not singular attributes. For example, if remittance values and volumes were reported summarized by country of origin, channel, currency, gender and location of residence of the sender or recipient. This would, for example, enable a central bank to see how many women, in a certain region, received what total value of remittances from the United States, through a transfer via a commercial bank.

Sex disaggregated data – data collected separately for individual men and women. Data is disaggregated by sex and not by gender because it is the biological difference (the sex) of a person that is recorded.

Transaction-level data – can be thought of as every transfer having its own individual record or entry in a database, the equivalent of a single row in an Excel document.

Supply-side data – for remittances, this consists of the data generated by the transfer of value, across international borders, through formally regulated service providers from a non-resident to a resident not made in exchange of any goods or services (transaction data), as well as supplemental data that are necessary for analysis but not generated by the transfer instruction.

Transaction data – data that could be expected to be present within the transfer instruction. This would include country of origin and destination, entity type (i.e. bank or MTO), currency of transfer, value of transfer.

Remittances – the transfer of value, across international borders, from a non-resident to a resident not made in exchange of any goods or services.

Formal remittance transfers – the transfer of value, across international borders, from a non-resident to a resident not made in exchange of any goods or services through a formally regulated remittance service provider.

Informal remittance transfers – the transfer of value, across international borders, from a non-resident to a resident not made in exchange of any goods or services through a means other than a formally regulated remittance service provider. This could include carrying undeclared cash over an

international border, transferring value using cryptocurrency or unregulated fintech products.

Demand-side data – for remittances, this is the data collection efforts for the demand side (i.e. from the point of view of the receiving or sending household or individual).

Case study – case studies will explore specific examples of real or fictional economies and how disaggregated supply-side data could be used to inform policy and product decisions in a specific market.

EXECUTIVE SUMMARY

This paper aims to provide central banks and financial regulators of countries that are net recipients of international remittances with a greater awareness of the value that transaction-level, supply-side data can offer in understanding international remittances and their potential contributions to policymaking, market development, financial inclusion and effective regulation.

Increasing understanding of remittances markets

In many low- and middle-income countries, remittances play an important economic role and account for a significant percentage of gross domestic product (GDP). While significant investments are being made in data systems to collect and analyse data on the domestic economy, the available data on remittances often amounts to a single high-level estimate. Many countries rely on data generated by systems designed primarily to either calculate balance of payment statistics or to monitor foreign currency transactions. In many cases, the relatively low average value of remittance transfers means that only highly aggregated data is captured and analysed, with remittances below a certain threshold not reported at all.

The collection and analysis of transaction-level, supply-side data helps to redress this information imbalance and increases the understanding of the remittance market for policymakers in key areas, including:

Economic role of remittances – countries that are net recipients of remittances, and rely on high-level summaries of the value of remittances for decision-making, miss important insights into the make-up and potential role of remittances in the economy. To illustrate this, imagine two economies with similar estimated total remittance values in a given year. Economy 1 receives a high number of low-value remittances, which support many low-income families, help increase resilience and smooth consumption during economic shocks. Economy 2 receives relatively few small-value remittances and a limited number of very high-value remittances, which are used by a small number of wealthy migrant workers to set up and make investments in domestic businesses. In each case, remittances play a valuable, but very different, role in the economy. Without the collection and analysis of transaction-level, supply-side data, a significant part of the economy will remain poorly understood.

Dimensions and drivers of usage and exclusion – behaviours surrounding remittances are highly nuanced. Users' choice of product and service will likely be influenced by a diverse range of factors, including sex, location of services, age and legal requirements (i.e. requirements for formal national ID). These factors are often

fundamental in determining usage of and exclusion from certain services.

Understanding these nuanced barriers to use is especially key for economies who wish to either increase the total value of remittances or those who wish to increase the use of formal services in the market. To illustrate this, imagine an economy, Economy 3, where the government wishes to increase the proportion of remittances sent via formal channels. However, the only data they have available is the high-level estimate of the total value of remittances received, which provides no real information on what the barriers to the use of formal services are.

Contrast this to Economy 4, which receives detailed, transaction-level, supply-side data and which can analyse the data based on the receiving state and the sex of the recipient. Economy 4 analyses their data and realises that in State X the value of remittances received by women are less than 10 percent of the national average. Further, this state neighbours a country that employs a very high number of day labourers and so the value of remittances could be expected to be much higher than the value reported. This might suggest that transfers are being conducted through informal channels, such as in-person cash transfers. This kind of insight can then be used to influence the remittance market to achieve the desired goal.

Increasing ability for market development

A better understanding of the remittance market can improve the ability of central banks and policymakers to influence the market in a range of ways:

Data-informed policy – central banks and other key policymakers, including financial intelligence agencies, ministries of labour, immigration and education, and

market players can benefit from the insights generated by the analysis of transaction-level, supply-side data to directly inform policy. To illustrate, imagine a bank-led remittance market where all formal remittances must flow through a regulated commercial bank. Analysis reveals that a key barrier to the use of formal remittance services in a country lies in the geographic distribution of bank branches and their concentration in urban centres. This situation forces rural residents to either make long and costly journeys to urban centres or to turn to informal services, such as hawalas, that may be more locally accessible. This insight could inform the development of policies allowing bank extension services, such as agent networks, to offer remittance cash-out services, or alternatively to open up the market by licensing non-bank remittance service providers to offer these services directly. Case studies from Kenya, Australia and South Africa illustrate the usefulness of disaggregated data to inform better policies (see Section 2). The case study from Kenya explores how data disaggregated by country of origin could be used by a range of policymakers, both within and outside the financial sector, to inform policy aimed at increasing the value of remittances. A case study from Australia explores the value that transaction-level data can bring to combatting financial crime, and how through data sharing arrangements this data can also be used by policymakers and researchers to influence the market. Further, a case study from South Africa explores how collecting and analysing transaction-level data, including attributes such as the sex and location of senders, recipient country, currency of transaction and the sending mechanism, in almost real time, can be used to inform regulation and policy. This means that even low value remittance transactions can be captured at the transaction level.

Sex disaggregated data for policy
Women, like men, can face barriers to both sending and receiving money internationally

through formal channels. However, women can experience these barriers more often, to a greater extent and in different ways. Such gender-specific barriers can include difficulty in accessing formal identification, mobile phone ownership and lower levels of financial inclusion and literacy.[1] Redressing gender-specific barriers is a pre-condition for successful transition of migrants from informal to formal digital channels. Using sex disaggregated data to understand and develop supportive policy to redress these barriers may be one of the most efficient and effective ways of combatting informality in some remittance markets.

Data-informed product development – in addition to direct policy intervention, central banks have significant potential to influence the market through the data that they make available to remittance service providers. As fintechs make remittance markets more competitive and service providers strive to provide better products, lower costs and increased access, central banks have a key role to play in making sure that service providers have the information they need to deliver on these goals. Detailed, transaction-level data allows central banks to identify barriers to usage of formal remittance products and underserved populations. By supporting service providers to understand these barriers, banks can spur increased and better targeted private sector investment in smarter product design, marketing, pricing and roll-out strategies. Insights from transaction-level data can be used to de-risk investment and encourage innovation.

However, the only way to realize these gains is for central banks to fully embrace their role in the market information ecosystem and share insights that support positive change. The case study from Mexico (see Section 2) explores how collecting data disaggregated by state, municipality or other subnational breakdowns can highlight populations underserved by formal remittance products, reveal opportunities in the market for more supportive policy and inform the development of better products and services. Nepal (see Section 2) showcases the potential value that can be derived from highly disaggregated data, where service providers are required to report data using multiple attributes, such as combining sex and location.

Sex disaggregated data for service providers

Central banks and other policymakers are in a unique position to not only influence the market through policy, but also through the data that they choose to make available. Remittance service providers, especially amongst the newer fintechs, have started to express the need for a better understanding of the gendered usage of remittance products in both sending and receiving markets. Appropriate products and services can only be developed and targeted in an environment where service providers can access adequate information to justify investment. Understanding gendered patterns of usage and adoption of services will be key for service providers to develop products that help to overcome gendered barriers and ultimately drive increased usage of formal services.

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[1] Dhrodia, Azmina, "Exploring the Gender Gap in Identification: Policy insights from 10 countries", GSMA, Gender Gap - Mobile for Development, 23 February 2019 (https://www.gsma.com/mobilefordevelopment/blog/exploring-the-gender-gap-in-identification-policy-insights-from-10-countries/, accessed 10 December 2021); Hanmer, Lucia and Marina Elefante, *Achieving Universal Access to ID : Gender-based Legal Barriers Against Women and Good Practice Reforms*, World Bank, Washington DC, USA, 2019 (https://openknowledge.worldbank.org/handle/10986/32474, accessed 10 December 2021); Hasler, Andrea and Annamaria Lusardi, *The Gender Gap in Financial Literacy: A Global Perspective*, GFLEC, July 2017 (https://gflec.org/wp-content/uploads/2017/07/The-Gender-Gap-in-Financial-Literacy-A-Global-Perspective-Report.pdf, accessed 10 December 2021); OECD, "Gender gaps in financial literacy and financial education", in *The Pursuit of Gender Equality: An Uphill Battle*, OECD Publishing, Paris, 2017 (https://doi.org/10.1787/9789264281318-13-en, accessed 10 December 2021).

The relative value of data reported at different levels of aggregation

The final section of this paper (Section 3) compares the relative values of reporting data at different levels of aggregation:

- **Totally aggregated data** – the total number and value of remittances

- **Single attribute disaggregation** – data disaggregated by a single attribute, such as sending country or transfer mechanism

- **Highly disaggregated data** – data disaggregated by multiple attributes, such as the value of remittances originating in the United States that were sent by women

- **Transaction-level data** – can be thought of as every remittance transfer having its own individual record or entry in a database (the equivalent of a single row in an Excel spreadsheet). These records contain all the data attributes generated by the transfer (i.e. value and channel) as well as any supplemental data (i.e. location or sex) that is reported.

The value of different aspects of aggregated and transaction-level data – including in insight generation, quality, ease of reporting and flexibility – are discussed. We do not recommend capturing totally aggregated data in any market where remittances play a significant role in the economy. Aggregated data refers to data aggregated by a single or multiple attributes besides value. The following table illustrates these ideas:

	Aggregated data	Transaction-level data
Insight generation	- can help answer specific questions around single aspects of remittances - rarely provide insights detailed enough to inform policy, product development or investment	- allows the most detailed analysis of the data possible - allows data to be analysed by any combination of attributes such as country of origin, time, currency, location and sex
Quality	- manual processes involved in aggregation often leads to the introduction of errors in the data - aggregation makes detecting data errors difficult if not impossible	- enables the implementation of validation and quality control procedures ensuring data quality to point of submission - enables individual records to be rejected or queried whilst allowing clean data entry for analysis
Ease of reporting	- most central banks and most reporting entities are familiar and comfortable with this process - preparing and submitting aggregated data can take a significant amount of effort on the part of the reporting entity and can be a significant burden	- requires more data to be submitted - removes the requirement for the data to be processed in any way - can require central banks and reporting entities to invest in updating their systems (especially for institutions with heavily siloed or legacy systems)

	Aggregated data	Transaction-level data
Flexibility	• difficult to vary data requirements as it requires changing data reporting templates and this may require updating legal directives • limited flexibility in analysis	• extremely flexible in terms of the possible combinations of data attributes for analysis and the level of detail for the analysis • allows users to proactively explore the data to find novel insights outside of predefined use cases and requirements • allows analysis by different audiences to meet a diverse range of needs and use cases

INTRODUCTION

Background

Supply-side remittance data has the power to not only inform financial policy, but also to support broader economic development goals by informing more appropriate migration, education, foreign and broad economic policies. It can also be harnessed by central banks to support remittance service providers to develop more appropriate products and services. However, to generate these insights data must be collected at an appropriately disaggregated level and analysed on an ongoing basis.

Migrant and diaspora remittances are an important and growing source of value and foreign exchange in many developing economies. The World Bank estimates that officially recorded remittance flows to low- and middle-income countries reached US$540 billion in 2020.[2] This was greater than the value of foreign direct investment ($259 billion) and overseas development assistance ($179 billion) combined. It should also be noted that this figure only includes officially recorded remittance flows, does not include value sent through informal channels, and likely significantly underestimates the real total. Data from the World Bank shows that there are 29 countries where formal personal remittances account for more than 10 percent of the country's gross domestic product (GDP).

For such an important part of the economy, remittances are poorly understood. This is often particularly true of the countries that rely on them the most. What drives remittances, the barriers to increasing total values, drivers of increased formalization, gendered dimensions of usage, where remittances go, what they are used for, and the impact of economic shocks to both senders and recipients, are nuanced, dynamic and yet to be properly understood.

The behaviours and preferences of migrants and remittance recipients evolve and change in response to their socio-economic situations, needs, pricing, the products and services available to them and the political realities of their home countries.[3]

Remittance patterns are gendered: they can differ both between and among groups of men and women, because of their gender roles and positions. The position of a migrant

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[2]   World Bank, "Defying Predictions, Remittance Flows Remain Strong During COVID-19", May 2021 (https://www.worldbank.org/en/news/press-release/2021/05/12/defying-predictions-remittance-flows-remain-strong-during-covid-19-crisis, accessed 14 December 2021).

[3]   Nyblade, Benjamin and Angela O'Mahony, "Migrant's remittances and Home Country Elections", Studies in Comparative International Development 49, 44–66, 2014 (https://www.researchgate.net/publication/271916922_Migrants'_Remittances_and_Home_Country_Elections_Cross-National_and_Subnational_Evidence, accessed 14 December 2021).
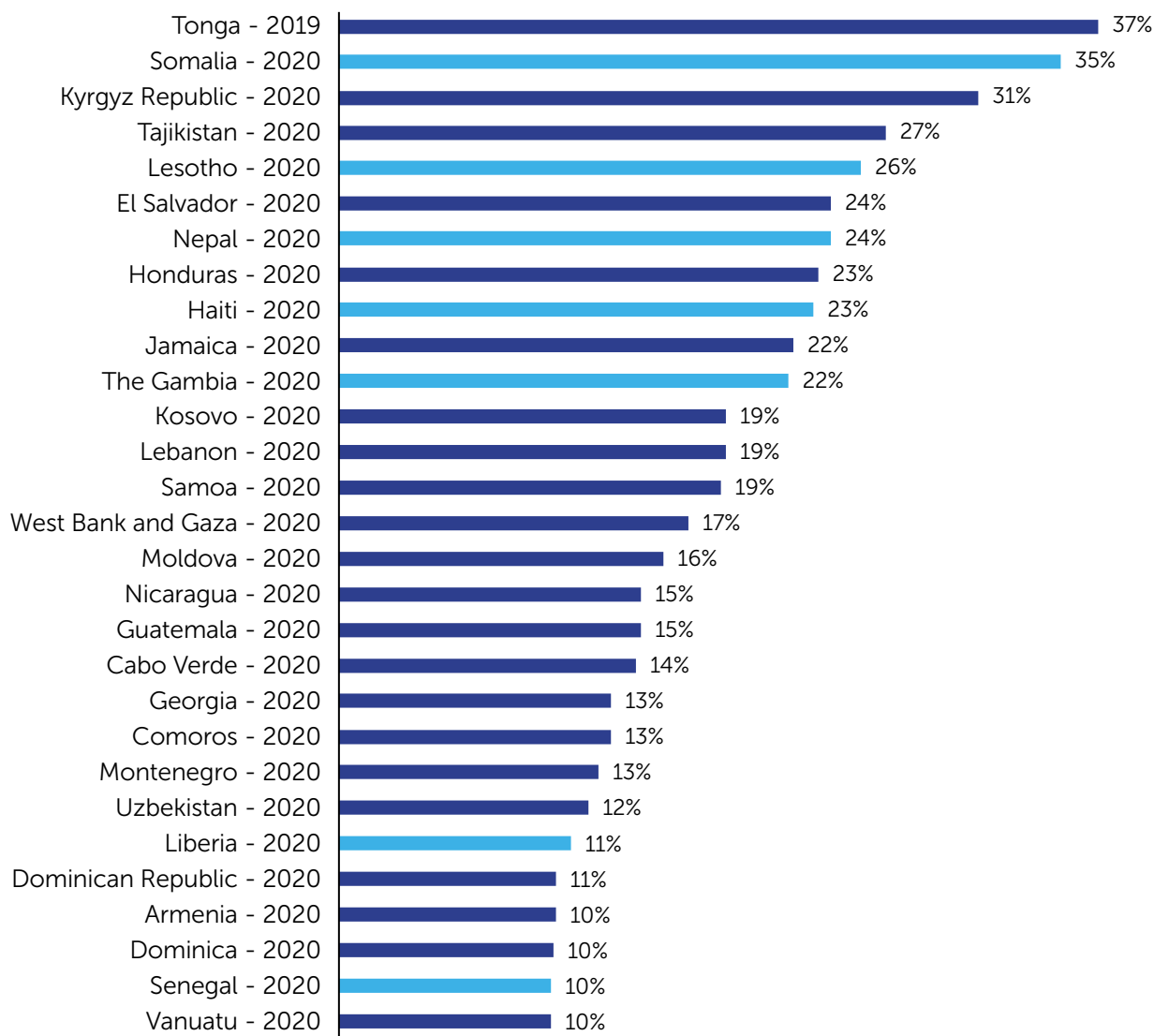
Figure 1. Personal remittances received as a % of GDP (countries over 10%).
Source: World Bank Data Bank, https://data.worldbank.org

and/or remittance recipient within their household, and the characteristics of that household, may influence their ability to leverage remittances to capture opportunities and build their resilience.

For policymakers and service providers to understand, regulate and maximize the developmental and economic value of remittances, a flexible and responsive data solution that addresses the complex and fluid nature of remittances is needed. Understanding how to leverage the power of highly disaggregated data is vital to provide

governments and regulators the information needed to develop supportive policy and effective regulation, and to provide the private sector with the insights they need to develop and target appropriate products.

This paper is presented in three sections. The first examines examples of the analysis that is possible using transaction-level, supply-side data, the potential insights that could be generated and how these can be used by policymakers and remittance service providers. The second section explores case studies from various countries that

have gone beyond high-level aggregate data reporting. These case studies highlight the benefits of transaction-level reporting and provide insights into how systems to collect and analyse disaggregated data can be developed. The final section provides a detailed comparison of the advantages and disadvantages of collecting and analysing data at various levels of aggregation.

The current situation

In 2021, UNCDF conducted structured interviews with key representatives from the Balance of Payments (BoP) departments of 13 central banks across various regions.[4] During this exercise, we found that the use of supply-side data by central banks to inform policy and drive market change is limited. Most central banks use supply-side remittances data that is aggregated at an extremely high level: at most, disaggregated by country of origin or the means of transfer, but only rarely more detailed than this. We also found that in most cases the data was collected and analysed in a gender-blind manner. This lack of detail is not sufficient to meaningfully inform policy and leaves large gaps in the understanding of both the regulator and the market as to the drivers and condition of the remittance market. An exception to this generalization is the South African Reserve Bank, who were found to collect detailed, transaction-level data on remittances (see Section 2, South Africa case study).

Remittance data sources

"Difficulty in obtaining more accurate source data is the biggest obstacle to improving data on remittances."
International Monetary Fund[5]

Obtaining complete, accurate and timely data on remittances presents unique challenges that are not faced in the supervision and regulation of other financial services.

Firstly, the transfer of value from one country to another by way of cash or goods from a non-resident in favour of a resident can happen in a variety of ways, not all of which lend themselves to supervision. For example, a migrant worker in the United Arab Emirates could send cash to their family in Ethiopia via a bank transfer. This transfer of value creates a record within the relevant financial institutions, which can be reported to the relevant financial regulator. Equally, a Mexican migrant worker from Chihuahua employed in Texas, United States, could regularly cross the border to visit family members, bringing physical cash or consumer goods each time. This kind of value transfer creates no paper trail and is very difficult to monitor. Only value transferred through formal, regulated channels can be recorded and accurately quantified; everything else is either estimated or is not captured.

This section explores various data sources that have been used, alone or in combination, to generate insights about remittance markets:

- Demand-side surveys

- Supply-side data and different levels of reporting of supply-side data

- Aggregate data reporting

- Transaction-level reporting

Demand-side data
Demand-side data is often used to fill gaps in supply-side data and to estimate the total size

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[4]   For more insights from this exercise please see the accompanying paper, *Lessons Learned on building an International Transaction Reporting System to collect data on remittances*.
[5]   International Monetary Fund, *International Transactions in Remittances: Guide for compilers and users*, IMF, October 2019, (https://www.imf.org/external/np/sta/bop/2008/rcg/pdf/ch4.pdf, accessed 9 December 2021).

of the remittance market (not just the portion that is formally regulated). Demand-side data is typically generated through surveys carried out on a nationally representative sample of the population. These surveys are used not only to estimate the size of the total market but also to gauge the perspective of users on service levels and to categorize the different uses of remittances.

Demand-side surveys have an important role to play in many countries, especially those with a high degree of informality in the remittance market. They are however limited by:

- the cost and effort required in primary data collection

- the frequency with which they can be carried out

- the sample, which is often only nationally representative, means that variations between different areas, populations and sexes within a country are obscured

- willingness to answer sensitive questions (i.e. information on personal transfers may be underreported, because these data are often considered sensitive by respondents).

Due to these limitations, this paper will focus on the potential of supply-side data to inform government policy and private sector investment.

Supply-side data

Supply-side data for remittances consists of the data generated by the transfer of value, across international borders, through formally regulated service providers from a non-resident to a resident, not made in exchange of any goods or services.

Transfer instructions, such as Swift messages sent between banks, contain a wealth of information, including the value and currency of the transfer and the originating and destination country, and can even record the purpose of the transfer or the age or gender of the individual initiating the transfer. This data has a powerful potential to generate insights about the nature of remittance usage, insights that could be used to inform both government policy and private sector investment. Unfortunately, much of the power of this data is lost due to aggregation before it is reported to the central bank.

Data aggregation/levels of reporting

Records of remittances are reported to the relevant regulatory body either as aggregated or transaction-level data.

Aggregate data

Aggregate data is data that has been summarized, based on defined attributes. In the case of remittances, data is often summarized by a very small number of attributes, such as country or region of origin and a reporting period (a month, for example).

Many low- and middle-income countries rely on data generated by systems designed primarily to either generate BoP statistics or to monitor foreign currency transactions to collect, manage and aggregate data on remittances. While some of these systems can capture transaction-level data, in many cases, the relatively low average values of remittance transfers mean that they are only required to be reported in a highly aggregate fashion.

Table 1 shows a simplified example of a typical regulator template for the reporting of remittance data. In this example, there are very few attributes to base any analysis on – in this case, region of origin and channel – and users cannot analyse more than one attribute at a time. We may examine the data by region of origin or channel, but we cannot examine

Table 1. Example of an aggregated cross-border reporting template

Month	Value of inbound cross-border transactions (US$)			
	North America	Europe	SWIFT	Money transfer operators
January 2021	1,800,000	2,100,000	7,500,000	2,400,000
February 2021	1,600,000	2,200,000	3,100,000	700,000

if there is a difference in usage or preference for a particular channel by sending region.

Whilst aggregated data can be valuable in understanding single aspects of the remittance market, such as the source of remittances, it is highly limited in its ability to provide insights into market drivers and the barriers to access and formalization, which are crucial to the development of supportive policy and the design and deployment of appropriate remittance products and services.

Transaction-level data

Transaction-level data can be thought of as a data structure in which every transfer has its own individual record, or entry, in a database, the equivalent of a single row in a spreadsheet. This record contains all the relevant data concerning that transaction.

Table 2 shows an example structure of a transaction-level reporting template. In the interests of space only a limited number of attributes are shown. A model for a system to capture, manage and analyse transaction-

level data, along with detailed suggestions for data attributes to be reported, can be found in the accompanying paper, "A Model for the Systematic Capture, Management and Analysis of Remittance Data by Central Banks".

Transaction-level data allows data to be analysed using multiple attributes at the same time. For example, the data structure in Table 2 would allow a financial regulator to determine the relative mean (average) value of remittances flowing through banks or MTOs, as well as specific preferred financial entities. It would allow an examination of the trends in the remittance value flowing to different regions of the country, the usage of different currencies and characteristics (e.g. sex, age) of the recipients, and would provide insights into which source countries remit to which regions, using which channels.

Insights generated by the analysis of transaction-level data are vital for the development of policies, regulation, products and services that lower barriers and increase

Table 2. Example of a transaction-level reporting template

Date	Transaction value – sending currency	Transaction currency	Country of origin	Receiving institution type	Receiving institution name	Recipient location	Recipient sex
01/01/2021	10,000	US$	USA	Bank	Bank 23	Region 10	Female
01/01/2021	980	EURO	France	Money transfer operator	Bank 42	Region 5	Male

total values of incoming remittances, as well as drive remittance formalization and financial, inclusion, especially that of women and rural populations. This is particularly true of economies that rely heavily on the receipt of remittances. This paper will focus on supply-side data and the latent power it contains, which could be effectively exploited if the data were reported to central banks in a disaggregated form.

THE ROLE OF THE REGULATOR IN GUIDING THE MARKET THROUGH MARKET INTELLIGENCE

The combination of highly disaggregated data and easy-to-use data analysis tools has created an opportunity for central banks to expand their value to the financial markets they regulate. Central banks play a pivotal role in the financial system and are the major custodians and guardians of the sector's data. In many markets, regulators receive a huge amount of data from financial service providers, but very few use this data to its full potential.

As regulators move to collect more data from service providers, they also need to understand and maximize their unique role in the data economy. Regulators have access to data from all regulated service providers, which provides an overview of the market not available to any individual market actor. This data could be used by the private sector to design and deploy more appropriate products, identify and target underserved areas or populations, or be used to develop an understanding of market size and dynamics that could inform smarter investments.

Currently, where data is available it is often highly aggregated, only published with a significant delay and often in non-machine-readable formats such as Portable Document Files (PDF). These barriers prevent financial service providers from making timely, informed, data driven decisions.

Technology offers financial regulators the opportunity to not only guide the market through policy and regulation, but also to empower the private sector to make smarter decisions and to support other areas of government to enact more appropriate policies, by acting as the trusted aggregator and provider of complete, high quality, timely, disaggregated market information.

SECTION 1. USING TRANSACTION-LEVEL DATA TO IMPROVE UNDERSTANDING OF THE REMITTANCE MARKET

This section explores some examples of the insights that can be gained through the capture and analysis of transaction-level, supply-side data and some of the ways to gain maximum value from the data.

The first example explores how transaction-level data allows an analysis of the distribution of remittance values (for example, is the market dominated by high volumes and low values, low values and high volumes or something in between?) and how these insights can fundamentally impact the understanding of the remittance market. The second and third examples explore the potential value of combining transaction data, such as the value of the remittance, with supplemental data, such as data on the location and sex of users. The second example examines the potential of location-informed analysis to highlight and increase understanding around specific barriers to access to remittance services. The third example explores the importance of sex disaggregated data to a full understanding of the remittance market.

Analysing the distribution of remittance values to understand the role of remittances in the economy

Most central banks use supply-side data to collect and analyse the total value of remittance transactions and a few calculate the mean value using the number of transactions. While these indicators are important, they also hide a multitude of insights and relying on them alone can provide either no information or an erroneous or unjustified picture of the role of remittances in the economy.

One of the simplest uses of transaction-level, supply-side data is to analyse the distribution of remittance values to better understand the role of remittances in the economy. This involves analysing the make-up of the market by comparing the number of high and low value remittances.

To illustrate this, the charts in Box 1 show the distribution of remittance values for three economies.

Box 1. Comparing distribution of remittance values

All three economies have the same total value of remittances and the same mean value.

The horizontal axes indicate the remittance value, the height of the lines indicates the number of remittances that took place at that value and the yellow dotted lines are the mean value.

Economy 1: Remittance transactions cluster around the mean but have a 'normal' distribution of remittances that are above or below the average
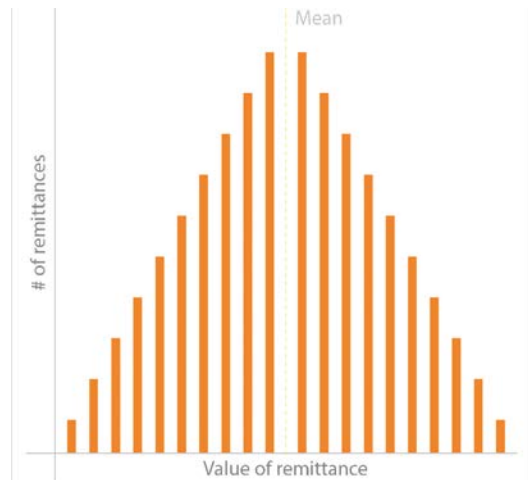
Economy 2: Remittances cluster around the mean intensively with no remittances significantly greater than or less than average
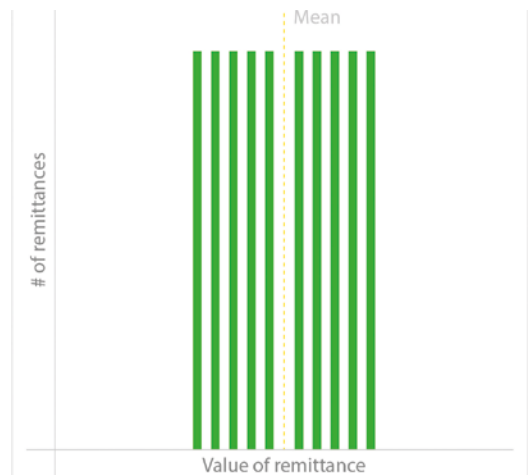
Economy 3: A high number of low value remittances and a very small number of extremely high value remittances. No transactions are close to the mean average
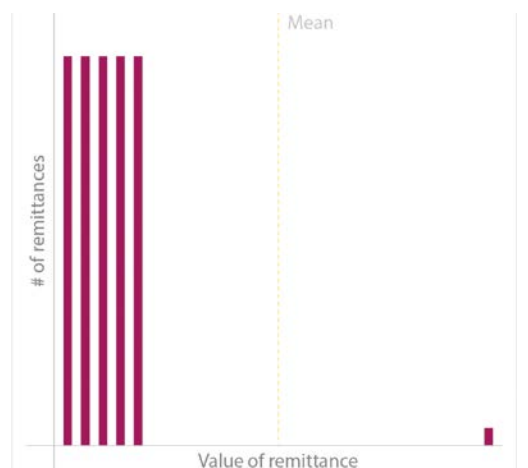
In each market, the total value and the mean value of remittances are the same. This means that to policymakers looking only at total value, each remittance market would appear identical.

Economy 1 represents a market with a 'normal' distribution, with a concentration of values around the mean and the number of transactions decreasing as they extend to the very small and very large values. This is the distribution that many people would assume to the be the case when given no other information.

This normal distribution would suggest that the services available in this market are used by a relatively diverse range of the migrant population, from those who remit relatively small amounts to those who remit much larger sums.

Economy 2 represents a market where the value of remittances is highly consistent and stays very close to the mean. This homogeneity could indicate that formal remittance services are serving a narrow audience and that the current products and services are not providing value for customers sending values that are significantly above or below the mean. This could be caused by price sensitivity, which may limit lower value remittances being sent through formal channels. It could also indicate the existence of other barriers to both high and low value remittances in the formal market, which could include price, trust, literacy and convenience.

Transaction-level data allows the analyst to dissect and explore the data in various ways, including by considering new combinations of attributes that may help to develop, explore and support different causal hypotheses. For example, analysing the distribution of value based on the sex of the recipient and sender could generate insights into the gendered nature of remittances. For example, if the data suggests that women send far fewer low-value transfers than men, this could indicate that either they are more price sensitive and prefer to incur fewer fixed costs, or that there are other significant barriers to sending lower values (such as a lower rate of smartphone ownership or a lack of access to services tailored to low value transfers). More highly disaggregated data may not always provide definitive answers, but it will invariably allow us to ask more interesting questions.

If the analysis indicated that price sensitivity was a barrier to the use of formal remittance services, a regulator in this market could choose to create new policies to directly lower the fees charged in the remittance market. Alternatively, a regulator could communicate this finding to remittance service providers and work with them to estimate the value of the unserved part of the market. This could support the development of a business case for changing pricing structures to encourage the formalization of low value transactions, or for designing new products to be more cost effective and more for lower value transactions.

Economy 3 represents a market with the same mean value of remittances as the first two markets, but a markedly different distribution. In this market, there are numerous very low value transactions, but most value actually comes from the very small number of incredibly high value transactions (shown by the very small column on the far right of the chart for Economy 3).

This situation can create a significant amount of risk for a country. If the sources of these high value remittances were no longer willing or able to transfer these funds, this could have a significant impact on the foreign currency reserves in the country. These risks need to be identified and properly understood to avoid shocks in the system.

In contrast to and comparing this, comes the case of **Economy 4**. Economy 4 receives transactional supply-side detailed data. This is then analysed and examined based on the criteria of sex and the receiving state that the remittance is coming from. In Economy 4, after data analysation, it is found that in State X the value of remittances received by women are less than 10 percent of the national average. In addition, the neighbouring country of this state employs a large number of day labourers. Thus, the value of remittances could be expected to be much higher than the value that is reported. What might be suggested from this is that transfers are additionally conducted through informal channels, which explains why the number reported is lower than what would be expected. A probable informal channel that may be utilised in such a case could be in-person cash transfers. Taking this into account and having this insight can then be used to influence the remittance market to achieve the desired goal.

Whilst these examples are highly stylized – and few countries will have such simple distributions in reality – they effectively demonstrate that analysing the distribution of remittance values can generate valuable insights into the remittance market. If central banks and policymakers in these three example markets were to rely on aggregated data and mean values to inform their view of the market, they would miss the significant differences in their markets and likely draw erroneous and possibly damaging conclusions. Capturing and analysing transaction-level data is the most effective way to identify the underlying risks and opportunities in the market, which are hidden through data aggregation.

This kind of analysis becomes even more valuable when used to compare the distributions of the value of remittances within subsets of the data. For example, if the

transaction-level data included the deposit or over-the-counter withdrawal location, these types of charts could be created for different regions within a country. This would allow an examination of subnational usage patterns and generate useful insights into the economic roles that remittances play in different parts of the country.

For example, consider a situation where data for remittances received by residents of a major city are characterized by values significantly above the national average, spread unevenly through the year with a high percentage of the deposits made to diaspora bank accounts rather than over-the-counter cash out services. This may indicate either that these funds are being sent for investment purposes, or that they are being sent by high-earning members of the diaspora to themselves or to their relatively wealthy families or households for high value consumption.

In contrast, the distribution of remittances received in a more rural region could, for example, be characterized by lower average values and a historic clustering of transfers around regular fixed dates. To turn these insights into usable intelligence, we must be able to contextualize the data. For example, if the dates of remittances cluster around the beginning of school terms, it may be assumed that there is a relationship between these transfers and the ability of families to pay school fees. Alternatively, they could cluster around the dates of planting of major agricultural crops, which may suggest that they are supporting the agricultural output of the region.

Understanding the distribution of remittance values provides insights into the drivers of remittances, as well as their uses in a country. These insights help policymakers to develop policies informed by facts. For example, the analysis example above would help policymakers to estimate the size of the

market for remittances coming from high-earning diaspora, which could inform the development of policies to encourage direct investment in the country by this group. It would also allow policymakers to understand drivers of low value remittances; household support and paying for specific goods and services, such as school fees, for example. This understanding could inform policies aimed at increasing access to financial services for these populations, or used by service providers to develop new products or services, such as a product to bundle international transfers of school fees sent through certain corridors, which could lower prices, offer better value and encourage the formalization of low value transfers.

Leveraging location data to under-stand access barriers to formal remittances

If the location and distribution of formal financial services do not reflect the needs of the population, this can be a significant barrier to the uptake of formal remittances. Ethiopia is a good example of this: while the country receives a significant amount of its foreign currency from remittances, a high proportion arrives through informal channels and is therefore unrecorded.

Ethiopia currently has a bank-led formal remittance market, where all formal remittances must pass through a bank, even where a third-party MTO is used. The bank-led model poses a significant constraint to the use of formal remittances, as the bank network is highly concentrated: a 2017 UN

Habitat[6] study found that 33 percent of the bank branches in the country were in Addis Ababa, where approximately 3 percent of the population reside. This concentration of bank branches in Addis Ababa likely acts as a significant barrier to the use of formal remittance services. The large investment required to build brick and mortar branches prohibits private sector investment outside of major urban centres.

An analysis comparing the distribution of bank branches[7] in Ethiopia (see Figure 2) to the population distribution[8] suggests that less than 25 percent of the population live within 10 km of a bank branch. While this estimate may be a slight underestimate – as it is possible that not all bank branch locations were recorded – it indicates the significant barriers that the vast majority of the population face to access formal remittance services.

This simple spatial analysis, shown in Figure 2, is instructive by itself and could be used to help government and regulators to develop policy and regulations to increase access to formal services. These could include policies to encourage the expansion of the existing formal network, or regulations allowing international remittances to be cashed out through a network of bank agents distributed more evenly throughout the country. The analysis could also provide an empirical basis for a discussion around allowing non-bank actors into the market to improve access.

While this analysis is useful for measuring access and coverage, when location data is combined with transaction-level data it becomes exponentially more powerful.

[6] United Nations Human Settlements Programme, The State of Addis Ababa 2017, UN Habitat, Nairobi, Kenya, 2017 (https://unhabitat.org/the-state-of-addis-ababa-2017-the-addis-ababa-we-want, accessed 10 December 2021).

[7] Bank locations extracted from OpenStreetMap (https://www.openstreetmap.org/) contributors. Data accessed May 2021.

[8] Population data downloaded from WordPop.org, accessed May 2021 (Bondarenko, Maksym, et al., "Census/projection-disaggregated gridded population datasets, adjusted to match the corresponding UNPD 2020 estimates, for 51 countries across sub-Saharan Africa using building footprints", WorldPop, University of Southampton, UK, 2020. doi:10.5258/SOTON/WP00683).
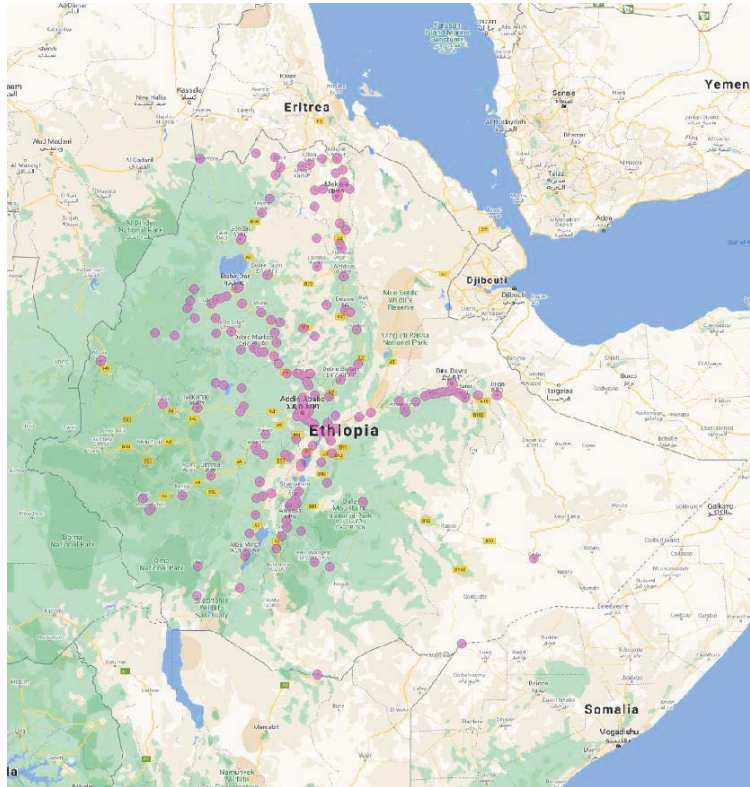
Figure 2. Map highlighting areas of Ethiopia within 10 km of a bank branch.
Source: OpenStreetMap contributors and author's analysis, May 2021.

Combining location and transactional data and visualizing the relationships between them allows for several deeper insights. Firstly, the size of the market in different areas can be disaggregated at the subnational level. This information can help to inform policies designed to support increased access; for example, allowing banks to offer extension services through agents or opening the market to non-bank service providers, such as MTOs and mobile money providers. Private sector service providers can also use this data to gauge the size of the market and justify the investment required to develop appropriate products and services and invest in the relevant infrastructure.

Understanding differences in men and women's remittance behaviours and needs through sex disaggregated data

A recent paper by UN Women highlights how "very little is known about how much women send in remittances compared to men. The limited documentation that is available suggests that globally, women transfer about half of all remittances."[9] Considering the economic importance of remittances and the ever-growing research showing that patterns of behaviour around remittances are highly gendered, a full picture of the remittance landscape cannot be achieved without the collection and analysis of sex disaggregated data.

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[9]   UN Women, "Migrant Women & Remittances: Exploring the data from selected countries", UN Women, 2021 (https://www.unwomen.org/en/digital-library/publications/2020/06/policy-brief-migrant-women-and-remittances-exploring-the-data-from-selected-countries, accessed 10 December 2021).

Sex disaggregated data for service providers

Central banks and financial regulators are in a unique position to not only influence the market through policy, but also through the data that they choose to make available. Remittance service providers, especially amongst the newer fintechs, have started to express the need for a better understanding of the gendered usage of remittance products in both sending and receiving markets.

> *"A deep understanding of the culture and position of women within the market must influence the product offered within that market."*
> Alix Murphy, Vice President Global Expansion at WorldRemit.[10]

Appropriate products and services can only be developed and targeted in an environment where service providers can access adequate information to justify investment. Central banks are uniquely well-placed to provide this service, as they have access to a market-level view of the remittance landscape. Understanding gendered patterns of usage and adoption of services will be key for service providers to develop products that help to overcome gendered barriers and ultimately drive increased usage of formal services.

Sex disaggregated data for policy

Redressing informality – the sending and receiving of international remittances outside of the formally regulated services – is a priority for many economies that receive significant international remittances. Women have been found to send money through informal channels at a higher rate than men.[11] Due to gender inequalities, financial exclusion and discrimination, in some countries women lack access to financial services in general.

Without access to safe, affordable and convenient remittances services, it is unsurprising that many migrants, particularly women, choose to bypass formal channels and instead use the unregulated networks that are ubiquitous in many countries. Often, this reliance on informal channels jeopardizes the well-being of migrants and their families and limits their resilience when faced with shocks including natural disasters, income disruptions, death or illness, violence and harassment or crop failure.

Women, like men, can face barriers to both sending and receiving money internationally through formal channels. However, because of their gender, women can experience these barriers more often, to a greater extent and in different ways. Such gender-specific barriers can include difficulty in accessing formal identification, phone ownership and lower levels of financial literacy.[12]

Redressing gender-specific barriers is a precondition for successful transition of migrants from informal to formal digital channels. Using sex disaggregated data to understand and develop supportive policy to redress these barriers may be one of the most efficient and

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[10] Mavadiya, Madhvi, "Online Remittances Closing the Gender Gap", Forbes, 7 March 2020,(https://www.forbes.com/sites/madhvimavadiya/2020/03/07/online-remittances-closing-the-gender-gap/, accessed 10 December 2021).

[11] "Migrant Women & Remittances: Exploring the data from selected countries"

[12] Dhrodia, Azmina, "Exploring the Gender Gap in Identification: Policy insights from 10 countries", GSMA, Gender Gap - Mobile for Development, 23 February 2019 (https://www.gsma.com/mobilefordevelopment/blog/exploring-the-gender-gap-in-identification-policy-insights-from-10-countries/, accessed 10 December 2021); Hanmer, Lucia and Marina Elefante, Achieving Universal Access to ID : Gender-based Legal Barriers Against Women and Good Practice Reforms, World Bank, Washington DC, USA, 2019 (https://openknowledge.worldbank.org/handle/10986/32474, accessed 10 December 2021); Hasler, Andrea and Annamaria Lusardi, The Gender Gap in Financial Literacy: A Global Perspective, GFLEC, July 2017 (https://gflec.org/wp-content/uploads/2017/07/The-Gender-Gap-in-Financial-Literacy-A-Global-Perspective-Report.pdf, accessed 10 December 2021); OECD, "Gender gaps in financial literacy and financial education", in The Pursuit of Gender Equality: An Uphill Battle, OECD Publishing, Paris, 2017 (https://doi.org/10.1787/9789264281318-13-en,

USING SEX DISAGGREGATED DATA TO ADDRESS GENDER SPECIFIC BARRIERS

ID and Know Your Customer

Access to some form of nationally recognized identification is often mandatory when transferring money internationally, to comply with Know Your Customer (KYC) and Anti-Money Laundering (AML) regulations. However, because of legal and non-legal barriers, access to ID can be much more difficult for women than men. An analysis of the 2017 Findex study found that in low-income countries, 45 percent of women did not have a national ID, compared with 30 percent of men.

It is thought that most recipients of remittances are women[i] and if they cannot access formal services, such as MTOs or bank accounts, due to lack of a national ID, they are likely to direct the remittance sender to use alternative, informal channels, such as hawalas, to overcome this barrier. Collecting and analysing sex disaggregated supply-side data can help policymakers to understand if such gender-specific barriers to ID and KYC requirements exist. The insights from this data could, for example, be used to develop policy to support and promote the adoption of a risk based and gender smart KYC ,which does not require formal ID for the use of mobile money-based international transfers.

Financial and digital literacy

Data from UNICEF[ii] in 2019 shows that the average adult literacy rate amongst women in the least developed countries was 56 percent. Literacy can be a huge barrier to the adoption of formal financial services, including accessing a bank account or even filling in the forms used by most MTOs.

"Consumer poverty and illiteracy impacts business model innovation. Ethiopia's persistent high rate of poverty and illiteracy, especially in rural areas, causes severe constraints in the formal remittance sector. It reinforces the use of informal mechanisms as those are generally perceived to be more affordable and do not require filling out of forms. The illiteracy limits the expansion potential of mobile money services in the absence of in-depth consumer education initiatives" CENFRI Stakeholder Interviews, 2017.[iii]

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[i]   International Organization for Migration, "Gender, Migration and Remittances", IOM (https://www.iom.int/sites/g/files/tmzbdl486/files/about-iom/Gender-migration-remittances-infosheet.pdf, accessed 10 December 2021).

[ii]   United Nations Children's Fund, "Education – literacy data", UNICEF, November 2019 (https://data.unicef.org/resources/dataset/education-literacy-data/, accessed 10 December 2021).

[iii] Centre for Financial Regulation & Inclusion, *Remittances in Ethiopia*, CENFRI, November 2018 (https://cenfri.org/wp-content/uploads/2018/11/Barriers-study-volume-4-Remittances-in-Ethiopia_November-2018.pdf, accessed 10 December 2021).

Globally, women have lower rates of financial literacy than men. This is represented by lower levels of knowledge and lower confidence.[iv] It is vital that this imbalance is addressed in regard to all financial services, but a special case could be made for prioritizing a gendered approach to education around remittances. Ensuring that women are not only generally financially and digitally literate, but are made a special focus of on-going campaigns providing information on new channels, options and pricing structures, could be key to providing the incentives needed to shift to formal channels as remittance markets evolve.

Fee structures

A recent paper by UN Women examining the results of 11 national household surveys found that women, "pay more in transfer fees".[v] This is also borne out by service providers such as Elena Novokreshchenova, VP International at Remitly, who recently said , "Female migrants tend to send smaller amounts, but a larger proportion of their earnings. That means that they suffer disproportionately from high remittance fees"[vi] This has both policy and product implications and directly impacts the value of total remittances that households receive.

Digital divide

According to the GSMA,[vii] in low- and middle-income countries, 82 percent of women now own a mobile phone. While this is a significant achievement, it still represents a gender gap of 8 percent, leaving over **390 million women** without a mobile phone. There are also significant differences in the gender gap for mobile phone ownership between regions. Two regions stand out in particular: **sub-Saharan Africa, with a gender gap of 13 percent**, and **South Asia, with a gap of 23 percent**. With the increasing importance of digital services, including mobile money, in the remittances landscape, this digital divide could be acting as a significant barrier to women's use of formal services. Policies and support to the private sector to increase access to low-cost handsets could positively impact the formalization of remittance services in countries where international mobile money transfers are regulated.

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iv   OECD, *Women and Financial Education: Evidence, policy responses and guidance*, OECD, 16 October 2013 (https://www.oecd.org/daf/fin/financial-education/women-and-financial-education-2013.htm, accessed 10 December 2021).

v   "Migrant Women & Remittances: Exploring the data from selected countries"

vi   "Online Remittances Closing the Gender Gap"

vii   GSMA, The Mobile Gender Gap Report 2020, GSMA 2020, (https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2020/05/GSMA-The-Mobile-Gender-Gap-Report-2020.pdf, accessed 10 December 2021).

effective ways of combatting informality in some remittance markets.

Sex disaggregated data for understanding international remittances in development

The impact of remittances on development is still open for debate and further analysis, but most experts agree that remittance flows, in the form of direct transfers to households, raise household incomes and have the potential to contribute to overall poverty reduction. Remittances may also contribute to women's empowerment and changing gender dynamics, depending on whether women themselves migrate or stay behind. Studies have also shown that the effects of remittances differ based on the gender of the person administering the funds.

More research is needed to understand the gendered impacts of who uses and benefits from remittances, for what purpose, in what way and why. Currently, capturing how remittances are used, and why, based on supply-side data can present significant challenges due to a lack of global standards (where data is captured, it is usually captured as free text, which requires significant effort to standardize and codify).

More and better sex-disaggregated supply-side data on remittances may provide an opportunity to use data as a proxy indicator of the purpose of the transfer. For example, if research in the form of a gender inclusive and representative household survey found significant correlations between the purpose to which remittance funds were put and indicators such as the amount of transfer and the sex and location of the recipient, then the transaction-level, supply-side data could be used as a proxy indicator of the likely high-level purpose of the remittance. This would allow the data to be used to model the likely regional and local developmental impacts.

THE IMPORTANCE OF INTERNATIONAL DATA SHARING AGREEMENTS FOR GENDERED UNDERSTANDING OF REMITTANCES

The behaviour and needs of senders and receivers of remittances are strongly interlinked. it is crucial that the gendered differences in behaviours and needs are understood. However, central banks usually only have the authority to collect data from service providers who provide the deposit or cash out services, for inbound transfers. This makes it extremely difficult for a central bank to compel service providers in sending countries to collect and provide data on the sex of the sender with the transaction data.

This highlights the importance of data sharing between sender and recipient economies. For recipient countries to access data on the sex of the sender, it will likely be necessary for them to obtain this data from the corresponding central bank in the sending country.

SECTION 2. CASE STUDIES

The following case studies highlight a group of countries that, to some extent, have moved beyond high-level aggregate reporting of supply-side data. Each case study describes a unique insight, either into the potential value of disaggregated data or on how this data can be effectively collected or analysed.

In Mexico and Kenya, case studies highlight the insights that can be generated when service providers disaggregate data using single attributes, such as the receiving state or the country of origin. Nepal showcases the potential value that can be derived from highly disaggregated data, where service providers are required to report data using multiple attributes, such as combining sex and location.

A case study from Australia explores the value that transaction-level data can bring to combatting financial crime and how this can be leveraged through data sharing agreements to provide insights for policymaking and market development. Finally, we look at the South African Reserve Bank, which collects and analyses transaction-level, supply-side data in almost real time to inform regulation and policy.

Mexico – Leveraging subnational reporting of remittance receipts

Reporting and understanding remittances at a subnational level is vital to understand the underlying relationship between remittances, local economies and household well-being. Mexico's financial regulator, Banco de México, is one of the few financial regulators that collects and publishes data on the receipt of remittances on a subnational basis. State and even municipality level data on the value of remittances can be downloaded in a variety of formats from their website banxico.org.mx.[13] To demonstrate the value of this publicly available data, we downloaded it and created a simple dashboard to facilitate its analysis.

Figure 3 shows the absolute value of received remittances by state. This allows us to generate several insights very quickly. Firstly, the value is highly concentrated in a small number of states. The value of remittances received by the top state, Jalisco, is more than 40 times the value received by the lowest-ranked state, Campeche, and more than the value received by the bottom 11 states combined.

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[13] Banco de México also collects and analyses data on the country of origin and, for the United States, of the State of origin.
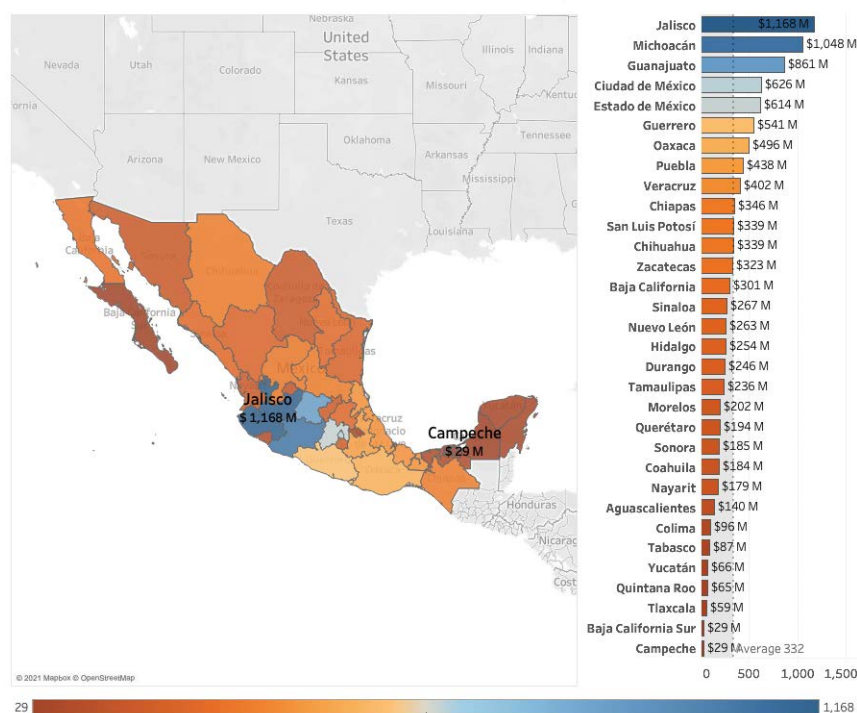
Figure 3. Total value of worker's remittances (US$ millions) for Q1, 2021.
Source: banxico.org.mx. Dashboard created by the author.

Figure 3 also shows that two of the northern states, Sonora and Coahuila, which share a border with the United States, report values significantly below the national state average of $332 million. Given the proximity to the country's chief source of remittances – the United States – it could reasonably be expected that these states would report above average remittance transfers. The fact that they do not could indicate either that the migrant labour resource in these areas is under-exploited, or that the proximity of the United States allows for greater informal flow of remittances in the form of cash or goods being carried across the border.

The subnational breakdown of the data not only allows us to both gain a deeper understanding of the distribution of absolute value and to combine the data with other subnational datasets to provide context for the analysis. The simplest of these analyses is to combine the value of remittances with the state's population figures to calculate the average value of remittances per state resident. This analysis is shown in Figure 4. Combining these datasets creates a significantly different picture of the distribution of remittance values and allows us to control for the sample size of the population.

This analysis shows that the value per state resident is much more similar between states than the simple total value. On a per resident basis, the state with the highest value, Michoacán, is only 7.8 times higher than the

lowest state, compared with the difference in total value where the remittance value received by the top-ranked state is 40 times that of the lowest. Populous states such as Estado de Mexico, which received the fifth highest share of remittances in terms of absolute value, nevertheless fall significantly below the average per resident value of $88. However, it is important to note that, while the subnational remittance data gives an idea of prosperity accruing to a particular subregion, it does not mean every resident of the subregion benefits, but only those to whom remittances accrue.

This ability to combine remittance data with other real-world indicators, including migration, education and economic data, is crucial to exploring the drivers of remittances and to implementing a supportive policy environment, not only in the financial sector but also in the wider governmental and economic space. Collection and analysis of subnational data is also the best way to link remittances to households and recipients and provides an anchor for analysing the impact of remittances on both household and business resilience in the face of economic shocks.
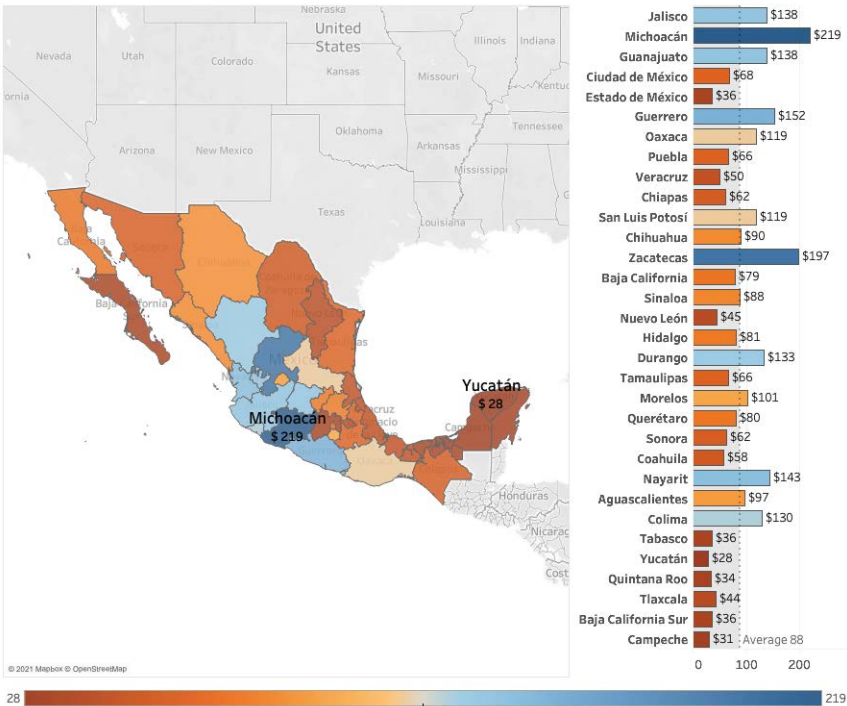

Figure 4. Value of worker's remittances per state resident (US$), Q1 2021.
Source: banxico.org.mx. Dashboard created by the author.

Kenya – Understanding market drivers and informing non-financial policy

According to the AfDB African Economic Outlook 2021,[14] Kenya was the only country in sub-Saharan Africa where the value of remittances received increased between 2019 and 2020 (see Figure 5). While other countries saw the value of their remittances drop by more than 20 percent,[15] Kenya saw an increase in the value of formal remittances of more than 10 percent.[16] The fall in value for most countries is not surprising, given the worldwide economic downturn caused by the COVID-19 pandemic and the measures implemented to combat it; but the Kenyan increase is surprising. Further analysis shows

the increased value of disaggregated data on remittances for both financial and non-financial policymakers.

In early 2021, the Central Bank of Kenya began to release public remittance data disaggregated by country of origin for the first time (see Figures 6 and 7). This data revealed that the United States was not only the dominant source of remittances, but that it was the major source of the increase in 2020 and 2021. In contrast, remittances from Europe had fallen by 19 percent during 2020.

During 2020, the contribution of remittances to the Kenyan economy was greater than the value of two of the country's major exports, tea and coffee, combined.
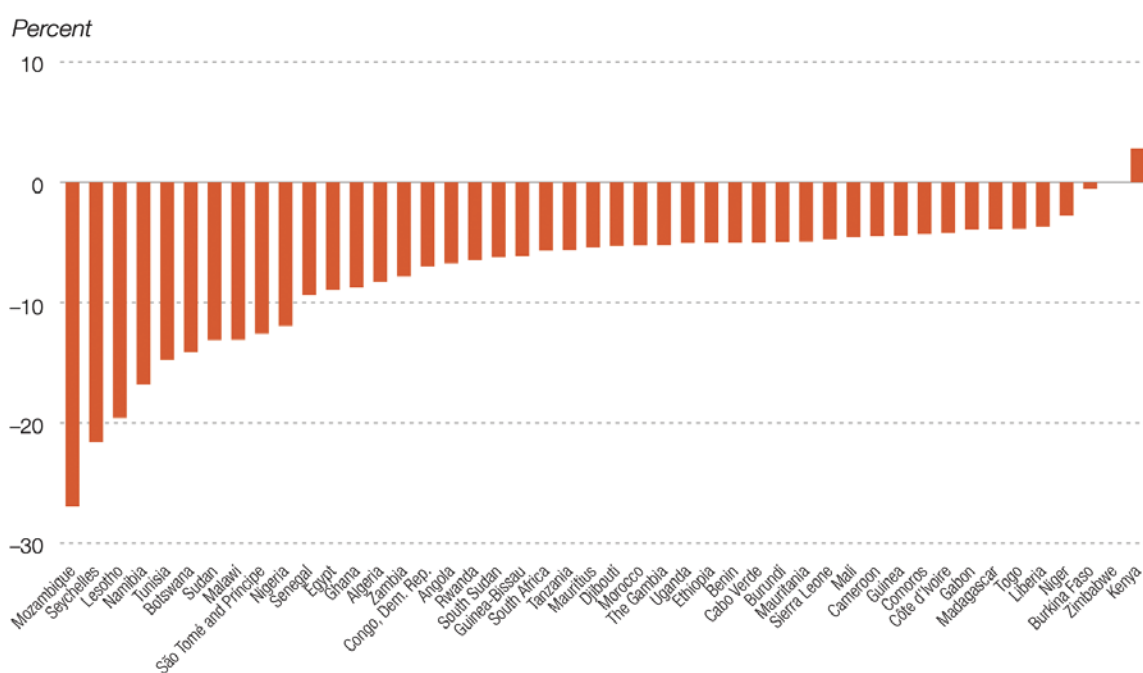

Figure 5. Remittance inflows declined in almost all African countries between 2019 and 2020.
Source: African Development Bank, World Bank, and IMF Balance of Payments Statistics database.

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[14] African Development Bank, African Economic Outlook 2021, African Development Bank, 2021 (https://www.afdb.org/sites/default/files/documents/publications/afdb21-01_aeo_main_english_complete_0223.pdf#pdfjs.action=download, accessed 10 December 2021).

[15] Estimated values from African Development Bank, World Bank and IMF Balance of Payments Statistics database.

[16] Central Bank of Kenya, "Diaspora Remittances" (https://www.centralbank.go.ke/diaspora-remittances/, accessed 10 December 2021).

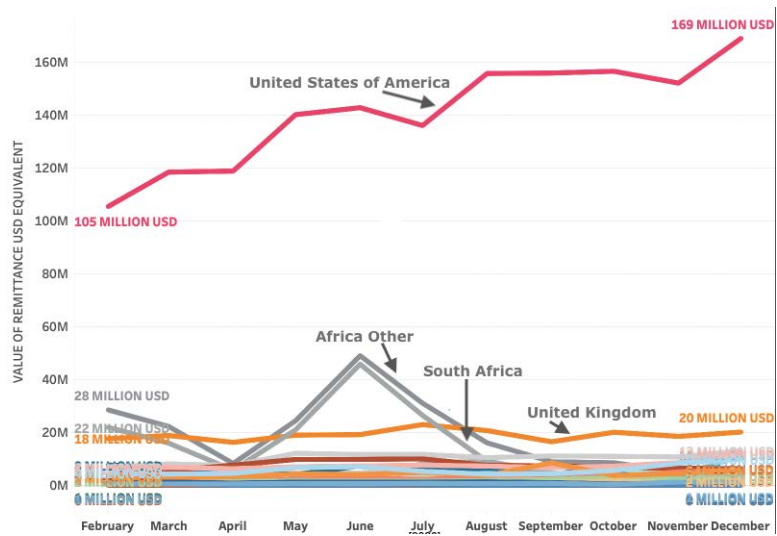**Figure 6.** Value of remittances received in Kenya during 2020. Source: Central Bank of Kenya, accessed via www.covid19econdatakenya.com.[17]
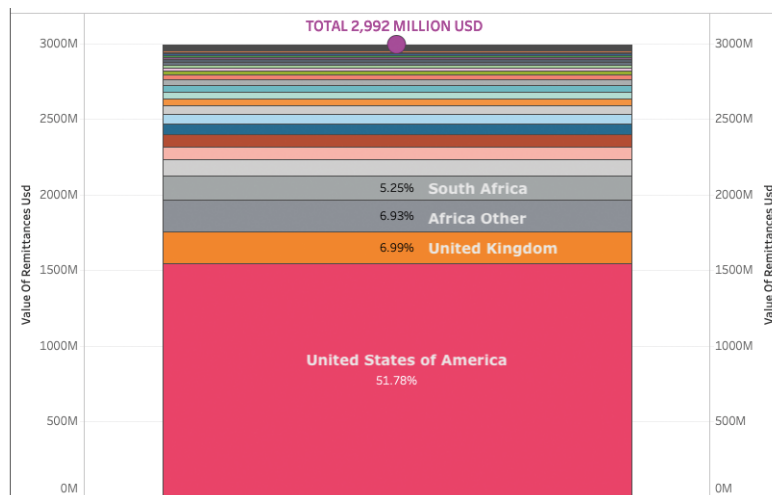

Figure 7. Value and % of remittances to Kenya by originating country, 2020. Source: Central Bank of Kenya, accessed via www.covid19econdatakenya.com.[18]

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[17] FSD Kenya, "Covid-19 EconData Kenya" (www.covid19econdatakenya.com, accessed 10 December 2021).
[18] Ibid.™

This detailed analysis of the supply-side data allowed hypotheses to be formed, which could then be validated through comparison with findings from demand-side surveys. Research conducted by the Migration Policy Institute[19] on the composition of the Kenyan diaspora in the United States revealed that Kenyans living and working in the country are highly employed (93 percent of those in the labour force were employed), 62 percent are either professionals or work in managerial positions, 27 percent of the workforce are working as registered nurses or nursing aides. This highly skilled, professional diaspora proved a huge and quantifiable benefit to the Kenya's economic resilience. The $300 million additional funds received by Kenya in 2020 during the COVID-19 crisis could therefore be argued to represent the dividend of the domestic investment in basic education and professional training.

This analysis demonstrates the potential value of capturing and publishing more disaggregated data to inform non-financial policy. It also effectively demonstrates that access to more disaggregated data not only generates insights – it also generates better questions.

Figure 7 shows a significant increase in the value of remittances from South Africa and 'Africa Other' from May to July 2020. Understanding the drivers of this spike would likely require much of the detailed transaction-level data we will discuss in the next case study.

Nepal – Highly disaggregated data

Highly disaggregated data refers to data that is aggregated using multiple, not singular attributes. For example, if remittance values and volumes were summarized by all the following:

- country of origin / destination

- channel (i.e. bank transfer, MTO)

- currency

- gender

- location of residence of the sender or recipient

Data reported with all these variables would, for example, enable a central bank to see how many women, in a certain region, received what total value of remittances from the United States, through a transfer via a commercial bank. Whilst not providing all the potential benefits of transaction-level reporting, reporting highly disaggregated data does have some distinct benefits, including:

- being familiar to reporting entities

- generating a much smaller volume of data, lowering requirements for investment in increased data storage capacity

- allowing for the adaptation of existing data reporting systems instead of requiring investment in new technology to allow for transaction-level reporting

Usually, data on remittances is reported based on individual, rather than combinations, of attributes. In Ethiopia, for example, reporting entities report the value of remittances by means of transfer (i.e. through a bank transfer

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19   Migration Policy Institute, "The Kenyan Diaspora in the United States", June 2015 (https://www.migrationpolicy. org/sites/default/files/publications/RAD-KenyaII.pdf, accessed 10 December 2021).

or MTO) and value by country of origin. They do not, however, combine these to report the value **and** means of transfer for each country.

Means of transfer	Value
Bank transfer	10,000,000
Money transfer operator	7,500,000

or

Country of origin	Value
United States of America	10,000,000
United Arab Emirates	7,500,000

but not

Country of origin	Value by bank transfer	Value by mto
United States of America	6,000,000	4,000,000
United Arab Emirates	5,000,000	2,500,000

Our research did not uncover any central bank that currently collects highly disaggregated data on remittances. However, Nepal provides an interesting model with data for financial inclusion. In 2015, Nepal was hit by an earthquake that led to significant loss of life and economic damage. As part of its effort to rebuild the economy, the Nepal Rastra Bank recognized a need for more granular data on access to financial services in the country.

Nepal Rastra Bank implemented a new reporting framework that required reporting entities to report all indicators around access to financial services, disaggregated by a range of attributes including type of service, location and gender. The reporting templates required all attributes to be reported in the same table to allow for analysis based on combinations of attributes. This allowed Nepal Rastra Bank to look at the gender divide in access and usage, from the national level down to the smallest administrative area. This could be further subdivided by the type of financial service being analysed. These insights directly informed government policy and the establishment of financial inclusion targets and provided the insights necessary to prioritize certain areas and geographies for investment by the private sector.

While highly disaggregated data reporting requires central banks to restructure databases and provide more data storage capacity, it does not necessarily entail the development of entirely new systems, which can be a distinct advantage for central banks without the budget to develop a transaction-level reporting system. The main cost is borne by the reporting entities, in the form of the human or systematic resources required to populate the complex, multifaceted data reporting templates required for reporting highly disaggregated data.

Australia – Data sharing and leveraging transaction-level remittance data to improve financial intelligence

It is not only central banks that collect and require insights from supply-side data on cross-border transactions. In Australia, the financial intelligence agency, AUSTRAC, collects transaction-level data for every cross-border transfer of money or property from over 16,000 reporting entities,[20] for the specific purpose of fighting financial crime pursuant to their Anti-Money Laundering and Counter-Terrorism Financing Act 2006.

AUSTRAC does not employ a reporting threshold and all regulated institutions, including banks and MTOs, report transactions of all values at the transaction level. While other countries, including New Zealand and Canada, require similar reporting from regulated institutions, these institutions only require data to be reported on transactions over $10,000, meaning that the vast majority of remittances will not be captured.

The AUSTRAC system uses three reporting tools:

International funds transfer instruction reports – these reports must be submitted by any institution which engages in the transfer of monetary or property value into or out of Australia. Every transaction must be reported individually (i.e. at transaction level) and must be reported within 10 days of completion. Reporting entities must provide details of value and the names of the sending and receiving parties. Other details of individuals or of the transfer can be demanded by AUSTRAC in order to further investigate the transaction, where necessary.

In the financial year 2020-21 AUSTRAC received 176 million international funds transfer instruction reports.

Threshold transaction reports – this report is similar in nature to the international funds transfer instruction report, but has an expanded set of requirements, including reporting details of the individuals involved in the transaction, details of the recipient and the source of the funds where the transaction is carried out by a proxy.

In the financial year 2020–2021, AUSTRAC received 2.1 million threshold transfer reports.

Cross-border movement reports – these reports capture data on individuals physically carrying currency, or other bearer negotiable instruments, with a value of more than AUD $10,000 on their person, or when an individual sends or receives cash of this value using a courier, via the post.

AUSTRAC uses this data to monitor and detect financial crime, including money laundering and terrorist financing. In 2020–2021, AUSTRAC contributed to the Serious Financial Crime Taskforce in recouping over AUD 144 million, raising over AUD 120 million in tax liabilities. A further AUD 1.3 billion penalty was imposed on a single company for failure to report their transactions.

Whilst generating remittance-focused policy and investment insights for government and remittance service providers is not the focus of this system, it is clear that the AUSTRAC monitoring system supplies the infrastructure to support such insight generation. The purpose of the AUSTRAC system is to produce actionable intelligence for law enforcement, revenue protection and

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[20] AUSTRAC, *Annual Report 2020/21*, (https://www.austrac.gov.au/sites/default/files/2021-10/AUSTRAC_AnnualReport_2020-21_web.pdf, accessed 10 December 2021).

national security agencies; as a by-product, it also captures detailed, transaction-level data on all remittance transactions moving in or out of the country.

Since June 2020, an amendment to Australia's AML/CFT21 means that data can now legally be made available "to assist in the development of government policy or to assist academic research" once personally identifiable attributes have been removed from the data. This shows the immense value in formalized data sharing agreements. The central bank, and potentially remittance service providers through researchers, now have access to all the benefits of transaction-level data with minimal investment.

South Africa – Implementing a transaction-level remittance reporting and analysis system

So far, we have focused on what can be learned by analysing a single attribute of remittance data (i.e. transaction value, location or sex). However, the real value is revealed by combining these attributes, allowing us to dig into the stories, build narratives and start driving change in the market. The South African Reserve Bank (SARB) receives daily, transaction-level data for all cross-border transactions, irrespective of the value, from all authorized reporting entities. However, not only does SARB receive the data generated by the transaction, such as the value, but it also receives supplemental data, which is captured via the Reporting Mandate form. This means that even low value remittance transactions are captured at the transaction level and include attributes such as the sex and location of senders, recipient country, currency of transaction and the sending mechanism.

We believe that South Africa is the first country to not only collect data with this level of detail, but to also develop a portal to support its analysis through the use of dashboards and data visualizations. As a net sender of remittances, SARB monitors outward flows with a keen interest in this analysis. Whilst this portal is not currently available to the public, it may, in the future, be shared with central banks within the Southern African Development Community as a tool for sharing insights to inform common policy.

With access to multiple attributes for every transaction record, SARB can run some truly innovative analysis. Users are not only able to see the geographical distribution of the value of remittances broken down by originating province – they can also break down this provincial level data by sex, destination country, currency of transfer and more. In a country such as South Africa, this filtering and segmentation of the data allows the exploration of complex gendered migration stories. For example, it allows the tracking and analysis of male migration driven by employment in the gold mines surrounding Gauteng, how this has changed over time and the economic value it has added to surrounding Southern African economies. It will also provide insights into aspects of female migration to the Western provinces from countries such as Namibia, driven by a need for domestic labour.

These insights and narratives will not be static. Continuously updated transaction-level data will continue to populate the system, allowing for detailed trend analysis of any available subset of the data. For example, it would be theoretically possible to run a trend analysis comparing the value of remittances sent by women in the Western Cape province to

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21   Australian Government, "Anti-money laundering and Counter-Terrorism Financing and Other Legislation Amendment Act 2020" (https://www.legislation.gov.au/Details/C2020A00133, accessed 14 December 2021).

Namibia with the value of remittances flowing to Malawi from Gauteng province. This system is likely to not only provide significant value to the South African economy, but could also provide insights for regional policymakers and act as a model for other markets.

These micro-level insights are not only crucial for appropriate financial, economic and migration policy: they are also vital for private sector service providers to develop and target appropriate and effective international transfer products.

SECTION 3. COMPARING APPROACHES: AGGREGATED DATA, SINGLE ATTRIBUTE DISAGGREGATION, HIGHLY DISAGGREGATED DATA AND TRANSACTION-LEVEL DATA

Unfortunately, the analysis tool developed by SARB is not publicly accessible for analysis. However, we can use a fictional example based on their model to compare the insights available with different levels of disaggregated data for a fictional economy that is highly dependent on received international remittances. We will call our fictional economy Pala.

Totally aggregated data

If the policymakers of Pala were to implement a BoP-focused data system, which only collected aggregated values of remittances, the chart in Figure 8 shows what they could expect to see.

This is the highest level of aggregation and provides only the total value of remittances, in this case inbound remittances, over time. In many countries that rely purely on supply-side data collected through BoP reporting systems, this is all that is available. This level of data allows policymakers a very macro view of the remittance market. It can tell us if the value received is going up or down, but
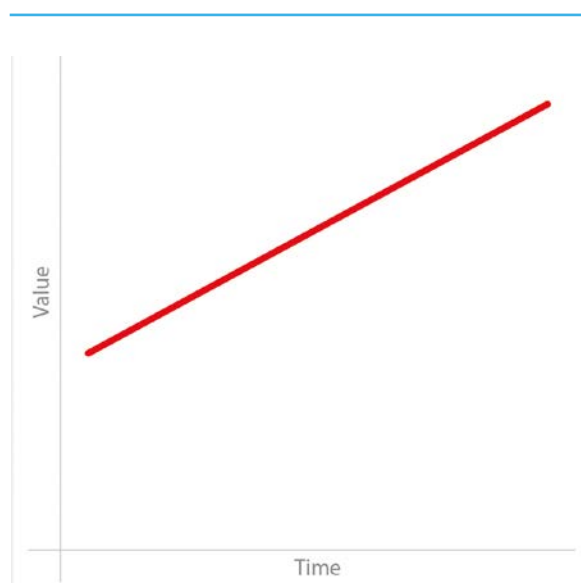

Figure 8. Pala's value of remittances over time

very little – if anything – about the drivers of remittances or how to influence or properly supervise the market.

Single attribute disaggregated data

Our fictional policymakers in Pala could opt to collect their data aggregated by a single
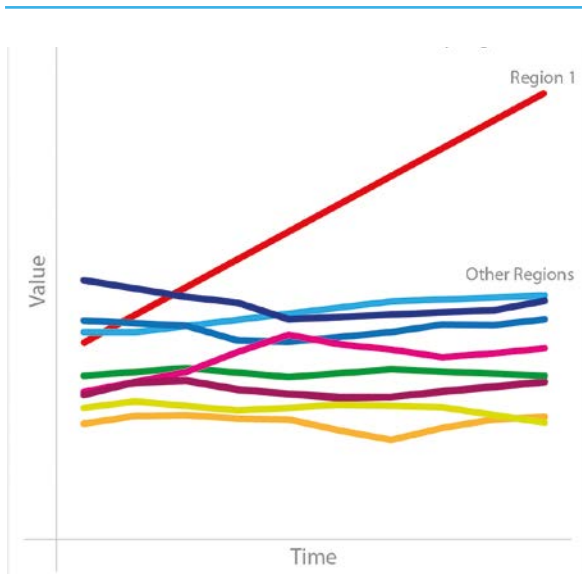
Figure 9. Pala's remittances by region of receipt

attribute, such as the country of origin or method of transfer. As the Mexico case study highlights, a carefully chosen single attribute can provide significant insights into the remittance market.

If Pala's policymakers take inspiration from Mexico and require reporting entities to report data aggregated by the country's regions, then they could expect to see this kind of chart as an output. This offers far more insight than the totally aggregated dataset. As Figure 9 shows, the steep rise in the value of remittances is heavily focused within a single region. This is an incredibly important insight, as it informs us that even though the total value is rising significantly, the domestic economic impact of this increase is highly localized and does not indicate a broad or equitable increase in household income and economic growth.

This is vastly more informative than totally aggregated data and leaves us with a much better question – "What is driving the increase in remittances in Region 1?" – but it does not offer insights into the drivers or barriers to increased usage.

Highly disaggregated data

If Pala were to follow Nepal's example and opt for a data model based on highly disaggregated data, where data is reported using a combination of two or more attributes, we might expect to see something like the chart in Figure 10. This chart allows us to see the value of remittances disaggregated by the method of transfer for each of the country's regions.

Now we are starting to see insights which we can relate to policy and the real world. This chart shows that the increase in the value received is strongly correlated with the licensing of mobile money operators to carry out international remittance transactions. This is an important measure of the success of this policy and indicates that proximity to services and price are likely drivers of an increased usage of formal remittances services.

While the example above is highly informative, it relies on Pala's policymakers having the foresight to select the right combination of attributes, in this case region and method of transfer, to allow for an informative analysis. This task is much harder than it appears, as
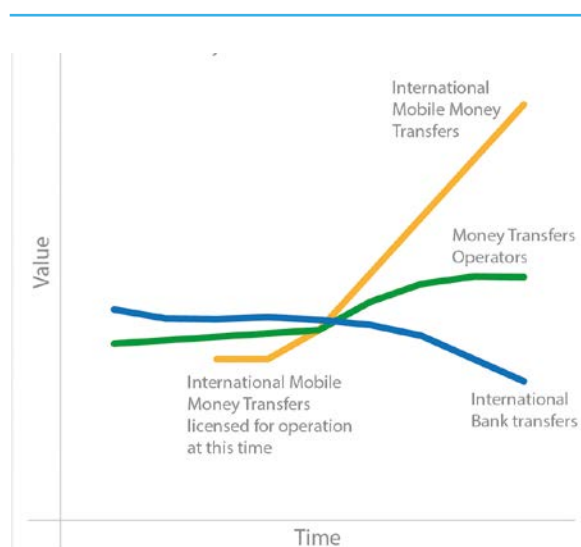

Figure 10. Pala's remittances in Region 1 broken down by method of transfer

these needs are likely to change significantly over time and are likely to change at an ever-increasing rate, given the potential of new fintech products to disrupt the market.

Highly disaggregated data adds significant complexity to reporting templates. Practicality often only allows one or two data attributes to be combined before the compliance burden on reporting institutions becomes too onerous. Highly disaggregated data also precludes things distribution analysis highlighted in the first use case.

Transaction-level data

Figure 11 shows the benefits of transaction-level data in allowing multiple data attributes to inform a single analysis. This chart shows that the increase in remittances in Region 1 is largely due to money transfers and can be accounted for by an increase in transfers by men. This suggests that women may face different barriers in the receipt of remittances, especially in the face of increased mobile money transfers. This could indicate that alleviating these barriers for women via
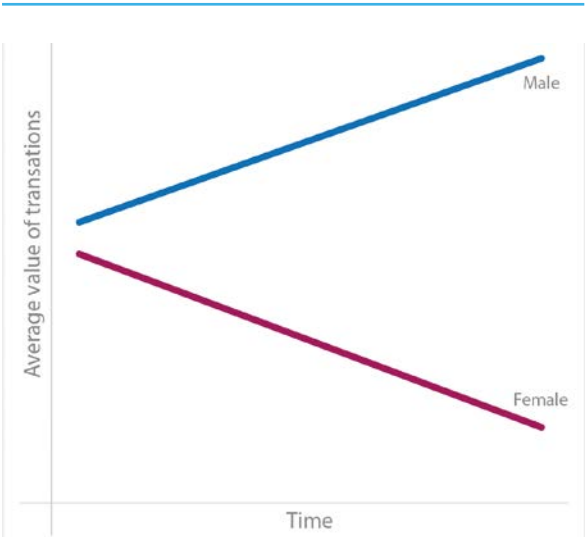

Figure 11. Pala's remittances in Region 1, by mobile money transfer and sex

policy or product development could have a significant impact in the adoption of formal remittance services.

Benefits of transaction-level data

It is a truth of data analysis that better data often generates better questions before it delivers answers. This is where transaction-level data has several distinct advantages over any kind of aggregated data.

Completeness and flexibility
Transaction-level data is the only way to generate insights as simple as the distribution analysis discussed in the first use case. Transaction-level data enables users to cut and slice data in an almost infinite combination of ways without having to go back to data providers with new data reporting templates.

Data quality
When working with aggregate data, ensuring data quality can be an almost impossible task. When aggregated at a high level, even grievous errors in the data brought about through poor formatting, data entry, transcription errors or incomplete data are made invisible and are impossible to detect. Many reporting entities use at least some manual processes to prepare aggregated returns. Reporting processes often require data to be manually exported from one or more databases, aggregated and then reformatted in line with the reporting template. Any of these steps, when carried out by a human being, significantly increases the chance of the introduction of deliberate or unintentional errors.

Transaction-level data, on the other hand, requires these processes to be systematized, removing the need for human intervention in the preparation of the data. Even where errors or legitimate outliers do occur, they can be flagged using predefined and systematized validation rules, allowing errors or anomalies to be investigated.

Relevance for different audiences

Transaction-level data allows analysis that meets a myriad of needs for different audiences. We have seen through the examples above that detailed insights on remittances to inform smart decision-making is needed not only by financial regulators but also more broadly by government and private sector service providers. Transaction-level data allows bespoke analysis tools to be developed for different audiences, answering varied and highly specific use cases without the need for the same data to be reported to a range of bodies or the need for multiple data reporting templates.

Future proofing analysis

Transaction-level data future proofs analysis requirements by collecting all the relevant variables for every transaction. This means that should analysis needs change in the future, the data can be filtered and cut up to meet the evolving use case. This cannot be said for aggregated data reporting, where you are entirely limited to the scope of analysis defined by the limited attribute or attributes used to aggregate the data.

Benefits and limitations of aggregated and transaction-level data

	Aggregated Data	Transaction-level Data
Insight generation	Data aggregated by a single attribute, such as country of origin, can help answer specific questions around remittances but rarely provide insights detailed enough to inform policy, product development or investment. This kind of analysis helps policymakers and service providers to ask better questions about the market, but is of very limited use in providing answers.	Detailed transaction-level data allows the most detailed analysis of the data possible. It allows data to not only be filtered, cut and analysed using attributes such as country of origin, time, currency, location and sex, but also allows these filters to be combined in multiple ways, creating new lenses for insight generation.
Quality	Aggregate data reporting often involves a reporting entity exporting the required data from a database system then manually manipulating and reformatting this data to fit the template provided by the central bank. This process creates multiple opportunities for the introduction of errors such as • transcription errors • incomplete submissions • category misclassifications	ransaction-level data reporting should be coupled as far as possible with system-to-system data transmission. This means that all records are submitted by the reporting institution directly from their data management system without aggregation or other manipulation. This method removes the possibility of introducing errors into the data to a large degree. It also allows central banks to examine individual outlier transactions for both data quality and supervision purposes.

	Aggregated Data	Transaction-level Data
Quality (continued)	Data aggregation not only means that more errors are introduced to the data but it also means that it can be extremely hard or impossible for the central bank to spot these errors. Even where the central bank suspects that the data quality is bad, they often do not have enough information on the errors to require the reporting entity to amend and resubmit the data.	Transaction-level data also lends itself readily to the implementation of data validation systems which can check received data against a predetermined set of rules for data quality which can be as simple as ensuring dates are formatted correctly to more complex rules which can highlight suspicious patterns of transactions within and across reporting institutions.
Ease of reporting	Aggregated data reporting has the advantage that most central banks and most reporting entities are familiar and comfortable with this process. Preparing and submitting aggregated data can take a significant amount of effort on the part of the reporting entity and can be a significant burden.	Whilst transaction-level reporting requires more data to be submitted it removes the requirement for the data to be processed in any way. For some providers, especially those with heavily siloed or legacy systems, this can require an investment in updating their systems to be able to export the required transaction data. Once this initial investment is made however, the reporting entity will no longer have to invest in human resources to prepare the returns.
Flexibility	While central banks can vary the attributes that they use to disaggregate the data (for example, they could require data to be reported disaggregated by country of origin one year and by channel or product the following year), this is rarely done as it imposes a significant burden both on reporting entities and the data processing team or system within the central bank.	Because transaction-level data collects data at the most granular level, it allows any combination of data attributes such as channel or product, currency, country of origin, sex of recipient and location to be combined in any number of ways. This provides significant benefits in terms of the flexibility of the data and allows for exploratory and proactive exploration of the data for novel insights rather than being limited to reactive analysis using a limited set of predefined variables. This flexibility allows the data to be used in myriad ways to generate insights to inform both financial and non-financial policy and regulation as well as providing valuable insights to allow a central bank to provide insights to service providers to encourage and support investment and the design of more appropriate remittance products.

We hope that this paper has provided insight into the potential benefits of transaction-level supply-side data on remittances and has catalysed thoughts of how it could be used to benefit your economy. This paper is part of a series to support central banks to better understand and implement transaction-level reporting systems for remittances. The series includes:

A Guide to Assess the National Remittance Data Collection Landscape

This guide aims to support regulators and development partners in their journeys to develop remittance reporting and analysis systems to obtain better data and insights on remittance transfers, which are critical for making informed remittance-related policy decisions.

This guide provides instructions for assessing the current data collection landscape of a country to understand the existing processes and systems, and for identifying existing barriers and opportunities to the implementation of remittance reporting and analysis systems, as well as tools designed to facilitate comprehensive research.

Lessons Learned on Building an International Transaction Reporting System to Collect Remittance Data. Experiences across Central Banks

Central banks have designed various methods and tools to understand remittance markets and capture and monitor remittance flows in their countries. Many central banks have invested in an International Transaction Reporting System (ITRS) to capture, monitor and analyse cross-border transactions and financial positions. Their range of experience and knowledge offers lessons for peers globally. The paper aims to share those experiences and assist central banks in least developed countries (LDCs) in the development of tools and systems to improve the collection of remittance flow data. UNCDF conducted structured interviews with key representatives of 13 central banks' BOP departments.

A Model for the Systematic Capture, Management and Analysis of Remittances by Central Banks

This is a technical paper which explores detailed aspects of a Remittance Reporting and Analysis System. The paper takes a modular approach to provide the flexibility required to be relevant in a diverse range of markets. The paper includes:

- Detailed suggested data requirements

- Data transmission

- Data validation

- Data storage and application hosting

- Data analysis

This paper is aimed at a technical audience responsible for the design and implementation of the technical aspects of the system. A summary paper, providing a less technical overview of the system model, is also available for policymakers.

A Guide for Designing and Implementing a Remittance Reporting and Analysis System

This guide outlines an outcome focused approach to system design which aims at ensuring that technical solutions address real world issues and genuinely support data-driven decision-making. It outlines the steps necessary to design and develop a system to generate actionable insights. This includes:

- Defining your audience

- Developing detailed use cases

- Defining data requirements to meet use cases

- Resource mapping (policies and processes, existing systems and human resources)

- Potential to integrate with existing systems

- Feasibility study

- Cost-insight analysis

The guide includes relevant questions and exercises and acts as a step-by-step guide to the first part of the system design process.

LEAVING NO ONE BEHIND IN THE DIGITAL ERA

The UNCDF Strategy 'Leaving no one behind in the digital era' is based on over a decade of experience in digital finance in Africa, Asia and the Pacific. UNCDF recognizes that reaching the full potential of digital financial inclusion in support of the Sustainable Development Goals (SDGs) aligns with the vision of promoting digital economies that leave no one behind. The vision of UNCDF is to empower millions of people by 2024 to use services daily that leverage innovation and technology and contribute to the SDGs. UNCDF will apply a market development approach and continuously seek to address underlying market dysfunctions

THE UNITED NATIONS CAPITAL DEVELOPMENT FUND

UNCDF makes public and private finance work for the poor in the world's 46 least developed countries (LDCs).

UNCDF offers 'last mile' finance models that unlock public and private resources, especially at the domestic level, to reduce poverty and support local economic development.

UNCDF's financing models work through three channels: (i) inclusive digital economies, which connect individuals, households and small businesses with financial eco-systems that catalyse participation in the local economy and provide tools to climb out of poverty and manage financial lives; (ii) local development finance, which capacitates localities through fiscal decentralization, innovative municipal finance and structured project finance to drive local economic expansion and sustainable development; and (iii) investment finance, which provides catalytic financial structuring, de-risking and capital deployment to drive SDG impact and domestic resource mobilization.