Remittance and Financial Inclusion in Refugee Migrants: Inverse probability of treatment weighting using the propensity score

Accepted version Applied Economics
Volume 52, 2020 - Issue 9

- https://doi.org/10.1080/00036846.2019.1646876

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ABSTRACT. This paper investigates the impact on remittances on financial inclusion of refugee migrants. While financial inclusion is gaining traction in the humanitarian and development literature, the linkage with the potential to improve the wellbeing of refugees, who are part of an upward spiral in numbers, has not been tackled. We examine World Bank survey data of 1041 Syrian refugees, using inverse probability of treatment weighting propensity score analysis (IPTW). The method minimises the influence of outliers and addresses unobservable and missing data biases, which can plague survey based data. We observe that common indicators of financial inclusion when applied to refugees, given their limited access to formal financial services, may introduce a bias as informal financial sector and excluded formal financial sector services do contribute to inclusiveness. We adopt a broader protocol for our data, measuring financial inclusion through six metrics stemming from G20 proposals: Bank account, ATM card, IRIS account, debit card, credit card and insurance. Overall, there is an opportunity to deepen financial inclusion for refugees who receive or send remittances. The possibility of expanding the financial inclusion options, and for this to percolate through to greater social inclusion, proffers practical commercial steps and policy enabling actions.

KEYWORDS: Financial inclusion; Remittance; Refugees; Propensity score analysis; Inverse probability of treatment weighting

JEL Classification : G00; G2; G28 ;F22

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ABSTRACT

This paper investigates the impact on remittances on financial inclusion of refugee migrants. While financial inclusion is gaining traction in the humanitarian and development literature, the linkage with the potential to improve the wellbeing of refugees, who are part of an upward spiral in numbers, has not been tackled. We examine World Bank survey data of 1041 Syrian refugees, using inverse probability of treatment weighting propensity score analysis (IPTW). The method minimises the influence of outliers and addresses unobservable and missing data biases, which can plague survey based data. We observe that common indicators of financial inclusion when applied to refugees, given their limited access to formal financial services, may introduce a bias as informal financial sector and excluded formal financial sector services do contribute to inclusiveness. We adopt a broader protocol for our data, measuring financial inclusion through six metrics stemming from G20 proposals: Bank account, ATM card, IRIS account, debit card, credit card and insurance. Overall, there is an opportunity to deepen financial inclusion for refugees who receive or send remittances. The possibility of expanding the financial inclusion options, and for this to percolate through to greater social inclusion, proffers practical commercial steps and policy enabling actions.

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1. Introduction

In this study, we examine the relationship between refugee remittances to and from refugees and their financial inclusion[1]. Our interest is motivated by the potential for social inclusion to impact social inclusion juxtaposed with the increasing tensions in several countries concerning the numbers of refugees crossing their borders.

[1] "The core essence of financial inclusion lies in its non-discriminatory principle that everyone, everywhere, should have access to essential financial services that are affordable and that meet their needs" (Pistelli 2017).

Refugees are not a homogeneous group and their respective circumstances may vary significantly. Our research focuses on a cohort based in Jordan for which reliable World Bank data are available providing the necessary input for a robust empirical analysis.

Surprisingly, there is a volume of prior research covering remittance flows but not in relation to refugees (Vargas-Silva 2017). Topics relating to the economic impact of remittances are well discussed (Rao and Hassan 2012; Adams Jr and Page 2005; Bang, Mitra, and Wunnava 2016; Narayan, Narayan, and Mishra 2011). The linkage between remittances and stimulation of financial development (Chowdhury 2016; Giuliano and Ruiz-Arranz 2009; Aggarwal, Demirgüç-Kunt, and Peria 2011) appears clear, and a limited number of studies indicate that remittances affect household financial inclusion (Ayana Aga, Martinez, and Soledad 2014; Li et al. 2014; Anzoategui et al. 2014). One can argue that remittance activities (sending or receiving money) means more access to financial services. However, there are at least three reasons why this obvious relationship is not valid in our study. First, refugees are poor individuals, so impact of remittances on borrowings is mainly associated with informal, and not the formal, financial sector. Second, formal financial institutions are not likely to offer full services (e.g.: loans, credit cards etc) to refugees since these are typically poor individuals with no collateral and no legal identifications. As an example, Anzoategui et al. (2014) report that remittances increase the probability of households having deposit accounts but not loans in on El Salvador. Third, remittances may also function as a substitute for credit thus reducing the refugees' demand for loans from formal financial institutions. Overall, the nature of the relationship between remittance and individual financial inclusion is absent, and prior research concerning remittances involving refugees is vague due

to the limited data availability. With the World Bank data set, discussed below, our work clarifies issues concerning the nexus between remittances and refugee financial inclusion.

Financial inclusion's profile is increasingly popular in humanitarian and development literature in recent decades as being synchronous with the growing number of conflicts around the world resulting in refugee movements. Refugees leave their home countries because of threats to their own lives and those of family; countries receiving refugees do so on humanitarian, not economic, grounds. Remittances are frequently a lifeline of forced displacement, helping households survive with uncertainty and helping people escape conflict (Vargas-Silva 2017). A clear understanding of remitance behaviour of refugees can assist in the development of policies that maximise their financial inclusion.

In this research, we analyse data drawn from the World Bank's microdata library website, relating to surveys of 1041 Syrian refugees in Jordan. To allow the data to tell the story, innovative methods of analysis are important to ensure reliable results are present to inform public policy, financial regulations, and in developing financial products and services that promote financial inclusion and aid in the promotion of social inclusion of refugees. This study contributes, to best of our knowledge, as the first to examine the impact of remittance on financial inclusion of refugee migrants. Extant literature reviews the determinants and impacts of remittances in the context of "economic migration." Our paper reviews remittances in the refugee setting. Second, our methodology advances previous financial inclusion studies in three important respects. Number one, we employ an inverse

probability of treatment weighting (IPTW) using the propensity score method[2]. This method minimises bias relative to the other methods of applying propensity scores (Austin 2011; Austin and Stuart 2015), Specifically, missing data, a problem recognised in the World Bank dataset, which is often seen as a source of endogeneity problems[3], is largely accounted for through the IPTW method (Austin, 2011). IPTW is similar to the use of survey sampling weights engaged to weight survey samples so that they are representative of specific populations (Morgan and Todd 2008). Number two, a propensity score method allows non-randomised studies to be designed similarly to randomised experiments (Rubin 2001). Therefore, IPTW using the propensity score method ensures that on average both treated and control groups do not differ systematically in terms of measured and unmeasured baseline characteristics. Number three, creation of a control group by matching has the distressing side-effect of throwing away large amounts of data, when a control group is shrunk to the same size as the treatment group. The IPTW avoids this problem.

Our empirical findings indicate that overall remittances increase refugees' financial inclusion. In particular, IPTW results indicate that the average ATM card ownership, debit card ownership and insurance ownership of individuals engaging with remittances is respectively, 29%, 20% and 15% higher than their counterparts, who do not engage with remittances.

The remainder of our paper is organised as follows: in section 2, we review current research, providing a useful guide our analysis. Section 3 discusses the data

[2] In statistical literature, four methods used for propensity score are: Covariate adjustment using propensity score; stratification or sub-classification on the propensity score, matching on the propensity score, and inverse probability of weighing.

[3] Apart from that reverse causality or simultaneity can create endogeneity problem in the remittances and financial inclusion relationship. In the robustness section, using IV probit model we control reverse causality/ simultaneity.

and provides an overview of financial inclusion available for Syrian refugees. Section 4 reports upon the methods of analysis employed given the properties of the dataset. Results are explained in section 5, and conclusions drawn from the results are presented in section 6.

II. Refugees, Remittances and Financial Inclusion: State of current research

Remittances global continue to grow annually reaching $613 billion in 2017, up 7% from $573 billion in 2016. Inflows of remittance to low and middle income countries increase to $466 billion in 2017 from $ 419 billion in 2016 (Migration and Development Brief 2018). There is a substantial body of research concerning remittances, and among policy makers, the topics of economic impact on remittances gains coverage; notably on economic growth (Rao and Hassan 2012) , poverty (Adams Jr and Page 2005), and inequality (Bang, Mitra, and Wunnava 2016).

The evidence points to remittance stimulating financial development (Giuliano and Ruiz-Arranz 2009; Aggarwal, Demirgüç-Kunt, and Peria 2011; Chowdhury 2016). The effect of remittances on individuals' use of bank accounts arose as an important issue in policy agenda (Ambrosius and Cuecuecha 2016). Surprisingly, very few recent studies investigate the impact of remittances on the use of financial services (Aggarwal, Demirgüç-Kunt, and Peria 2011; Ambrosius and Cuecuecha 2016; Aga and Peria 2014) and the precise nature of the relationship between remittance and individual financial inclusion is silent in empirical literature.

An important and unexplored issue concerns the role of remittances in forced displacement where refugees' remittance activities occur as a consequence of population movement/ displacement (Lindley 2009). The premises surrounding remittances and migration as part of long term household strategy to maximise wealth, overcome market imperfections, and diversify individual risk (Stark and Bloom 1985; Vargas-Silva 2017) are not tested. Remittance is not likely to be the key driver of the decision for refugees to move, unlike the

case of economic migrants. Less attention has been paid to remittances involving refugees (Vargas-Silva 2017).

An emerging clarity in the literature distinguishing refugees and economic migrants is helpful. Economic migrants leave their country due to bad economic conditions. Following, the 1951 Refugee Convention, The United Nations High Commissioner for Refugees define refugee migrants as:

> A refugee is someone who has been forced to flee his or her country because of persecution, war or violence. A refugee has a well-founded fear of persecution for reasons of race, religion, nationality, political opinion or membership in a particular social group. Most likely, they cannot return home or are afraid to do so. War and ethnic, tribal and religious violence are leading causes of refugees fleeing their countries. (https://www.unrefugees.org/refugee-facts/what-is-a-refugee/)

Consideration of the concept of financial inclusion is appropriate rather than direct inferences from the economic migrant remittance stream of research. Financial inclusion, describes the access to and effective use of appropriate financial services (Demirguc-Kunt, Klapper, and Singer 2017) and has become a subject of growing interest for policy makers, and other financial sector stakeholders. The G20 leaders expressed a commitment to expanding financial inclusion and supporting efforts to meet the challenge of promoting financial inclusion around the world ("2017 Financial Inclusion Action Plan" 2017). The G20 accepts there are beneficial effects for individuals, providing both an economic and a political rationale for government policies to promote financial inclusion. The trend to broaden the initial World Bank framing of financial inclusion in the context of bank account, now embraces digital financial services (Wilson and Krystalli 2017; "Payment aspects of financial inclusion " 2016).

The remittances promote financial inclusion of individuals in two ways (Aga and Peria 2014). First, remittances increase the exposure of financial services of remittance participants, increasing awareness of financial services. Second, remittances may provide excess cash for households, leading to increases in demand for saving instruments, which eventually gives rise to accessing other financial services, such as credit and insurances (Ambrosius and Cuecuecha 2016). From the banks' perspective, remittances may increase the "credit worthiness" of borrowers. First, remittances reduce "default risk" of borrowers, because continuous remittance receipt provides additional insurance for the lender (Bugamelli and Paternò 2009; Buch and Kuckulenz 2010). Secondly, continuous remittance receivables help develop a financial history for remittance receivers, which may act positively in loan application processes (Ambrosius and Cuecuecha 2016).

Motivation for remittances encapsulate several suggestions in contemporary research, altruism, self-interest, insurance and loan repayments as major motivators to remit. Beyond the economic rationalising of remittances, the ideas of altruism and the emotional aspects of refugee family members (Bugamelli and Paternò 2009; Buch and Kuckulenz 2010) is strengthening.

Several papers suggest emotional aspects are inseparable from the economic aspects of remittances for refugees (Lindley 2009; Carling and Erdal 2014; Boccagni and Baldassar 2015). The economic functions of remittances in the context of refugees receive significant treatment (Horst et al. 2014; Díaz-Briquets and Pérez-López 1997; Lindley 2007, 2009) noting refugee remittances may help to minimize the financial risk and poverty as well as help in the development of the receiving country. From a financial institution's perspective, the altruistic motivation for remittances reduces default risk of remittance receivers and this acts as an additional "security" making them less risky borrowers.

Based evidence in prior research, we postulate:

H1: There is a significant positive impact in the financial inclusion of the refugees engaged in the remittances.

III. Data and Overview of Financial Inclusion in Syrian Refugees

Data we use have been accessed from the World Bank's microdata library website (http://microdata.worldbank.org/index.php/catalog/2908), and our subset of data are available from the authors. There are 2132 quantitative surveys of 1041 Syrian refugees and 1091 low-income Jordanians living in Jordan and The World Bank maintains the data quality. Twenty nine percent of face-to-face interviews were accompanied by a supervisor, and call-backs were made to 43% of the sample to verify responses. First language Arabic speakers conduct all interviews, completing the survey between 25 June and 15 July, and 9 August 2016 in two phases; before and after Ramadan. Survey questionnaires, technical documents and documents that explains the survey process available in following weblink in microdata library https://microdata.worldbank.org/index.php/catalog/2908/related-materials.

Dataset reliability is promoted through the care taken by the World Bank in its fieldwork sampling and post fieldwork data cleaning. Its website provides comprehensive details concerning checks for internal consistency, missing variables, blank variables, and outliers. The dataset does not require a weighting of the final data as overall population data are unreliable and not suitable for use as weighting targets. A specific method of analysis, as discussed in section 4, is necessary to ensure biases are not introduced or compounded.

Our analysis of the refugee dataset, presented in Figure 1A, points to very low access for external credit and obtaining formal credit as practically non-existent. However, refugee use of informal credit is more widespread. Refugees who have access to external credit are, in the main, receiving funds from their friends and family. The most common financial service that refugees use is IRIS scan withdrawal[4] at an ATM. Jordan is the first country in the world to use IRIS scan technology to enable refugees to access cash grants (Dunmore 2015). Refugee women are less likely than men to use financial services (Fig 1B) and there is no significant gender difference when accessing external credit.

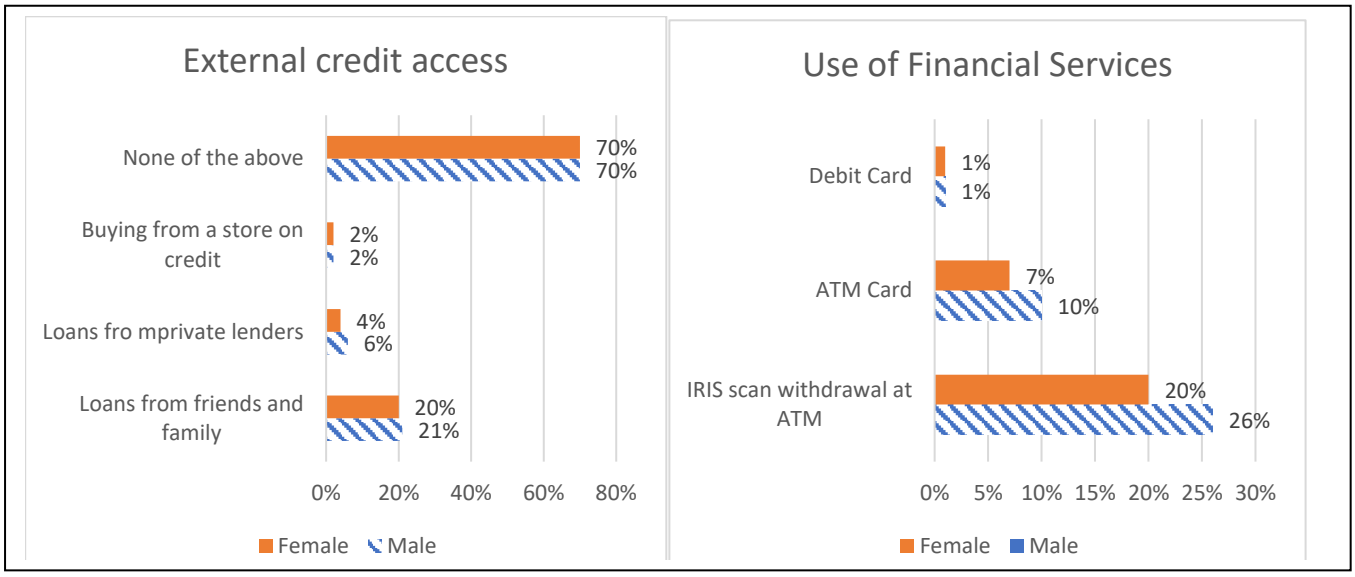

Figure 1A: External credit access ***Figure 1B: Use of financial services***

Table 1A reports remittance activities of Syrian refugees. Although only a relatively small proportion of refugees engage in remittance activities (13.2%), our

[4] International tech firm Iris Guard has developed Iris Scanning technology. Once asylum seekers arrive in Jordan, their biometric data are collected, securely stored and encoded. The information can be used to give refugees an identity that is internationally recognised, and which can be used to access aid, banking, healthcare and other services.

sample indicates refugees more highly engaged with international remittance transfers than with domestic remittance transfers.

Table 1: Remittance activities of Syrian refugees

	Domestically	Internationally	Total
Send	0.4%	6.5%	6.9%
Receive	1.2%	6.6%	7.8%
	1.6%	13.1%	14.7%
Overlap of remittance activities			1.5%
Unique adults with at least one type of remittance activity			13.2%

Source: CGAP, based on IPSOS survey, 2016

Table 1B reports that the methods of remittance transactions. From remittance active group, 40.2% transactions occurred via formal institutional channels. Above 45% of remittance transactions occurred via informal channels. Remittance transfer services e.g.: Western Union and MoneyGram are well-known for cross-border transfers, therefore, it is not suppressed that 38.7% of remittances transactions via exchange houses. Only 1.5% of remittance transactions occurred directly through bank accounts or through collection at bank branch/through cash at bank branch. The less frequency of used bank account for remittances may related with in our sample no refugees have a saving account in a bank.

Table 1B : Remittance transaction methods

Remittance transaction methods	Percentage
Through an exchange house	38.7%
*Through Bank account	1.5%
Through a family member or close friend or sent cash through someone you know	39.4%
By Bus or minibus	5.8%

**This includes transactions directly through a bank accounts and well as through collection at a bank branch/ through cash at a bank branch.*

Table 2 reports sample composition and key demographics, such as gender, age and their access to information and technology; access to financial services; digital financial services awareness; and remittance behaviour reported. Table 2 presents descriptive statistics in three panels: Panel A reports full sample, Panel B reports remittance active group and Panel C reports remittance non-active group. Descriptive statistics in Panel A show that for the whole sample only 2% of individuals have an account with a formal financial institution. However, 26% of the sample have an IRIS scan account, suggesting that new technologies, particularly retail payment systems, have become an integral part of financial inclusion among refugees. Also, IRIS scan accounts avoid the main barrier of accessing a formal financing system, viz formal identification and official residence (Hawkins and Wilson 2017). Approximately, 15% of individuals have an ATM card, and 9% have a debit card. Only 0.9% receive credit from formal financial institutions. On the other hand, a prevalence of informal credit among refugees is observable. A significant proportion of refugees engage with insurance policies. (Approximately 36%). Seven percent engage in remittance activities, such as receiving or sending remittance locally or internationally.

Mean values indicate that remittance active group (Panel B) reflect high financial inclusion levels compared to remittance inactive group (Panel C), when measuring financial inclusion as having bank account (Account), debit card (Debit_Card), IRIS scan account (IRIS_Scan) and credit. Nevertheless, the remittance inactive groups engage in insurance activities slightly more than remittance active groups. Plausibly, remittance is a hedge instrument similar to insurance when they face financial instability. This is consistent with Woodruff and

Zenteno (2007) and Giuliano and Ruiz-Arranz (2009) who report that remittances reduce demand for other financial services like insurance.

Although the full sample consists of only 47% of male refugees, male participants in the remittance activity group is high (65%). This may be because generally males earn more than females, and they have excess funds to remit. On the other hand, males in households act as the head and are, therefore, more obviously active.

The average age of a refugee captures the determinants of earnings. In our study, the average age is 36 and there are no substantial differences between remittance active and inactive groups. Only 10% of refugees who are inside the camp engaged in remittance activities. That may be because for those in the camp there might be very little paid work available.

Mobile telephone subscriptions permit access to financial services for previously underserved groups (Asongu and Moulin 2016). We report that refugees without mobile phones do not engage in remittance activities at all (mean value of non_mob group for remittance activity group is 0). In the full sample (Panel A), only 0.7% of refugees do not have access to a mobile phone. Education typically influences the earning capacity of individuals as well as their financial inclusion level (Demirgüç-Kunt and Klapper 2012) in the refugee sample.

The proxies of household size and financial responsibilities may impact remittance activities. We assume that the larger the household and higher the financial responsibilities, the more likely they are to engage in remittance activities. The average fin-circle variable indicates that refugees financial circle is small (mean value is 0.3765) with minimum value of 0 to a maximum of only 20 people. The study sample indicates that refugees with high financial literacy and employment

are more engaged in remittance activities compared to their counterparts. The study sample indicates that 47% of refugees have no internet access and refugees who have internet access are more engaged in remittance activities than their counterparts.

Table 2: Descriptive statistics

Variable	Obs	Mean	Std. Dev	Min	Max	Obs	Mean	Std. Dev	Min	Max	Obs	Mean	Std. Dev	Min	Max
	Panel A: Full sample					Panel B: Remittance-active					Panel C: Remittance-inactive				
Account	1041	.0019	.0438	0	1	72	.0139	1178	0	1	969	.0010	.0321	0	1
Debit Card	176	.0852	.2800	0	1	15	.1333	.3518	0	1	161	.0807	.2732	0	1
IRIS_Scan	910	.2571	.4373	0	1	61	.2622	.4435	0	1	849	.2567	.4371	0	1
ATM	565	.1486	.3560	0	1	38	.2632	.4462	0	1	527	.1404	34774	0	1
Credit	1041	.0086	.0926	0	1	72	.0139	.1178	0	1	969	.0082	.0905	0	1
Insurance	1041	.3592	.4800	0	1	72	.3472	.4794	0	1	969	.3601	.4802	0	1
Remittance	1041	.0692	.2539	0	1										
Male	1041	.4640	.4989	0	1	72	.6528	.4794	0	1	969	.44994	.4977	0	1
Age	1041	36.05	12.43	18	86	72	35.43	11.61	19	62	969	36.10	12.49	18	86
Inside_Camp	1041	.1969	.3978	0	1	72	.0972	.2983	0	1	969	.2043	.4034	0	1
H_tech_mob	1041	.5812	.4936	0	1	72	.2222	.4186	0	1	969	.5675	.4956	0	1
Med_tec_mob	1041	.3936	.4883	0	1	72	.7638	.4276	0	1	969	.4066	.4914	0	1
No_mob	1041	.0077	.0873	0	1	72	.0417	.2012	0	1	969	.0082	.0904	0	1
No_ed	1041	.7012	.4579	0	1	72	.6944	.4638	0	1	969	.7017	.4577	0	1
Sec_ed	1041	.2181	.4131	0	1	72	.1666	.3752	0	1	969	.2218	.4157	0	1
High_ed	1041	.0807	.2725	0	1	72	.1389	.3482	0	1	969	.0764	.2656	0	1
House_Size	1041	6.07	2.79	1	30	72	5.555	2.827	1	14	969	6.107	2.785	0	30
Fin_Res	1041	.6196	.4857	0	1	72	.6944	.4638	0	1	969	.6140	.4871	0	1
Fin_Circle	1041	.3765	1.241	0	20	72	1.236	2.635	0	20	969	.3126	1.042	0	11
Literacy	1041	.8174	.3864	0	1	72	.875	.3330	0	1	969	.8132	.3899	0	1
High_ internet	1041	.4217	.4941	0	1	72	.6666	.4747	0	1	969	.4035	.4908	0	1
Med_internet	1041	.0528	.2238	0	1	72	.0417	.2012	0	1	969	.0537	.2253	0	1
No_internet	1041	.4697	.4993	0	1	72	.2361	.4276	0	1	969	.4871	.5000	0	1
Employee	1041	.1758	.3808	0	1	72	.375	.48752	0	1	969	.16099	.3677	0	1

IV. Methodology

Measuring Financial Inclusion and Remittances

The G20 financial inclusion indicators (2016) suggests the main indicators to consider when measuring financial inclusion are Access, Usage and Quality. The appropriateness of these forms of financial inclusion indicators for refugees, given their limited access to formal financial services, may introduce a bias as informal sector and other formal sector services provide financial inclusiveness. The revised G20 Financial Inclusion Indicators (2016) propose that having an account, (individually or jointly) with a formal financial institution or a mobile money provider are the main usage indicators for financial inclusion. Further, Adult with a savings account at a formal financial institution is also a common financial inclusion indicator used in prior studies (See Demirgüç-Kunt & Klapper, 2012). In our sample no refugees have a saving account.

Access, usage and quality of financial service measurement when broadened provide a wider understanding. We adopt a broader protocol for our data, measuring financial inclusion through six metrics: ownership of bank account, ATM card, IRIS Scan account, debit card, credit card and insurance.

To capture the impact of remittances, we follow Anzoategui et al. (2014), using a dummy variable rather than the actual amount of remittance received or sent. The main reason is, the actual amount of remittance is more inclined to measurement errors, leading to biased estimation. Individuals are more likely to report involvement in a transaction, receive/sent remittance, than the actual amounts involved. We opt for this approach, using a dummy variable for transaction.

Several covariates are taken into account. We include gender, age, education, employment status and financial literacy level as main demographic factors. These variables are common in studies relating to migrants and remittances. We have used the experience of prior research in related areas to assist in guiding our choice of variables.

Female migrants transmit approximately the same number of remittances as male migrants, but research indicates that women tend to send a higher proportion of their income, more regularly and for longer periods of time ("Gender, Migration and Remittances" 2007). Li et al. (2014) report that migrants' remitting behaviour is influenced by several factors, including age. At a macro level, two papers by Faini (2007) and Niimi, Ozden, and Schiff (2010) show that migrants' remittances decrease with their educational level. On the other hand, better educated migrants have a higher income, and are more likely to have formal bank accounts and access to less costly transfer (Docquier and Rapoport 2012). Concurrently, employment status (Soumaré, Tchana Tchana, and Kengne 2016) and financial literacy level of the individual (Grohmann, Klühs, and Menkhoff 2018) may impact on remittances and financial inclusion.

Freixas and Rochet (2008), report that technology can reduce transaction cost and perhaps the ex-ante form of informational asymmetry (adverse selection). Mobile technology, according to Rasmussen (2010), bridges the gap in some African countries, such as Kenya (e.g. Safaricom's M-PESA; see also (Donovan 2012; Jack and Suri 2011; Kpodar and Andrianaivo 2011). Accordingly, we control mobile access in our remittance - financial inclusion relationship. Location is likely to influence access to financial inclusion and remittance activities.

Chehade and Navarro (2017) report that Syrian refugees who are inside camps have different levels of financial service engagement than those outside camps.

Recent research by Fenoll and Kuehn (2018) reports that immigrant networks may impact on remittances and remittance costs. From this we infer that financial circles of refugees may have an impact on the remittance - financial inclusion relationship. Household size may similarly impact the relationship if the findings of (Anzoategui et al. 2014) are repeated with refugees.

Table 3 presents our financial inclusion proxies and covariates derived from the survey questions that are germane to the refugee remittance - financial inclusion relationship. The analysis which follows includes these variables.

Table3: Data description and sources

Variable	Indicator	Dimension	Source
Dependent variable			
Adult with an account at a formal financial institution	Account	Dummy variable: equals one if the refugee has any of the following accounts: a) A current checking account at bank b) A saving account at a bank c) A current checking account at Jordan Post d) A saving account at Jordan Post; Otherwise 0.	("G20 Financial Inclusion Indicators ", 2016) (Demirgüç-Kunt & Klapper, 2012)
Adult with debit Card	Debit_Card	Dummy variable: equals one if the refugee has debit card, otherwise 0	(Wang & Guan, 2017)
Adult with a IRIS Scan	IRIS_Scan	Dummy variable: equals one if the refugee has IRIS scan at ATM; otherwise 0	
Adult with a ATM card	ATM	Dummy variable: equals one if the refugee has ATM card; otherwise 0	
Adult with loan from formal	Credit	Dummy variable: equals one if the refugee has any of the following accounts:	("G20 Financial Inclusion

financial institutions		a) A credit card b) Micro-finance Loan c) Bank Loan d) Loan from Jordan Post; otherwise 0	Indicators ", 2016) (Demirgüç-Kunt & Klapper, 2012)
Adult with insurance	Insurance	Dummy variable: equals one if the refugee has any of the following insurances: a) Home b) Life c) Car d) Health e) Credit life insurance; otherwise 0	("G20 Financial Inclusion Indicators ", 2016) (Demirgüç-Kunt & Klapper, 2012)
Independent variable			
Adult Given or Sent any Money or Adult received any money	Remittance	Dummy variable: equals one if the refugee has given or sent money to a relative or friend in the past 12 months; otherwise 0.	(Anzoategui et al., 2014)
Control variable			
Gender	Male	Dummy variable: equals one if the refugee is male; otherwise 0	(Johnson, 2004)
Age	Age	Continuous variable. Age of the refugee	(J. J. Li et al., 2014)
Location	Inside_Camp	Dummy variable: equals one if the refugee is inside camp; otherwise 0	(Chehade & Navarro, 2017)
Access to mobile	H_tec_mob	Categorical variable: equals one if refugee has personal or shared mobile with 1 or 2 of following: connects to internet, has 3G/4G, has touchscreen	(Andrianaivo & Kpodar, 2011) (Suri & Jack, 2016)
	Med_tech_mob	Equals one if refugee has personal or shared basic phone	
	No_mob	Equals one if the refugee does not have mobile phone	
Highest level of education	No_ed	Categorical variable: equals one if refugee has primary education or no formal education	(Demirgüç-Kunt & Klapper, 2012)

			(Anzoategui et al., 2014)
	Sec_ed	Equals one if refugee has Secondary education or Post-primary technical/vocational school education or Post-secondary technical/vocational school	
	High_ed	Equals one if refugee was University undergraduate or postgraduate	
Household size	House_ Size	Continuous variable: Number of people live in household	(Anzoategui et al., 2014)
Responsible for making financial decisions in your household	Fin_Res	Dummy variable: equals one if the refugee (interviewee) takes financial decision; otherwise 0	
Financial connection	Fin_ Circle	Number Number of people have a financial connection with refugee	(Agwu, 2017) (Fenoll & Kuehn, 2018)
Literacy	Literacy	Dummy variable: equals one if the refugee answers following question correctly,("What does 100 plus 330 equal?") otherwise 0	(Grohmann & Schoofs, 2018)
Internet access	High_internet	Categorical variable: equals one if refugee has frequently access to internet	(Donovan, 2012b)
	Med-internet	Categorical variable: equals one if refugee has moderate level of access of internet	
	No_internet	Categorical variable: equals one if refugee has a few times a year or no access to internet	
Working situation	Employee	Dummy variable: equals one if the refugee has fulltime or part-time paid employment or self-employment; otherwise 0	(Docquier & Rapoport, 2012)

Method

Observational studies estimating the effect of treatments, exposures, and interventions on an outcome are relatively common. Randomised trial estimation of effects by directly comparing outcomes between a "treatment" group and non-treatment group frequently appears in prior research. Their rationale is that, on

average, the treated group does not systematically differ from a control group in both measured and unmeasured baseline characteristics (Austin and Stuart 2015).

In non-randomised studies, the effect of treatment cannot be estimated by simply comparing outcomes between treatment groups. Interestingly, in recent literature, propensity score methods appear with increasing frequency as the technique to estimate treatment effects using observational data (Khandker, Koolwal, and Samad 2010). The propensity score is a balancing score, under conditional independence and common support assumptions (Khandker, Koolwal, and Samad 2010). Non-responses in surveys raise a number of problems (Steeh et al. 2001; Härkänen et al. 2014). According to the Härkänen et al. (2014), missing data problems occurring in survey samples stem from three sources: first, missing by design: only part of the finite population is selected in the sample; second, unit-nonresponse: not all individuals in the sample respond, and third, item-nonresponse: some survey participants do not respond to one or more individual questions. This suggests unobserved determinants of financial inclusion may be correlated with remittance behaviour, requiring careful handling in our work.

In the literature two approaches addressing the missing data issue are common: (i) Instrumental variable (IV) regression; and (ii) propensity score matching model. IV regression commonly poses difficulties in determining and testing valid instruments (López-Videla and Machuca 2014). The propensity score matching method directly forms matches within a data set (Rosenbaum and Rubin 1983, 1985). Some matching methods discard and retain participants in the matching routine to exhibit a balance in the covariates (Thoemmes and Ong 2016).

In small samples, like our study, discarding a large amount of data significantly reduces the power estimators.

An inverse probability of treatment weighting (IPTW) technique uses the propensity score to form a weight, which is similar to a survey sampling approach. IPTW creates a pseudo-population from the sample in which the distribution of covariates is independent of "treatment" (Austin 2011), minimising the bias in other propensity score methods (Austin 2013). First, IPTW minimises the influence of outlying weights (Vaughan et al. 2015). Second, missing data biases are largely accounted for (Molenberghs and Kenward 2007; Iachina 2009). Additionally, a propensity score estimator addresses unobservable heterogeneity biases (López-Videla and Machuca 2014).

An outcome variable (Y) uses financial inclusion proxies, and Remittance is the binary treatment variable (Z), with 1 for treated and 0 otherwise. X is a row vector of confounders for the probability of treatment (remittances) and outcome (financial inclusion) and φ is the propensity score. Assuming, a total N subjects in a dataset, n_1 subjects indicates who are involved with remittances. Therefore, n_0, who are not involved with remittances equals N- n_1.

The probability of involvement with remittances (without considering covariates) is $p=n_1/N$, and the probability of not being involved with remittances is 1-p. The propensity score $\varphi = prob\,(z = 1|\, X_i)$ is the probability of involvement with remittances given the observed covariates X_i.

Logistic regression estimates the unit non-responsiveness probabilities:

$$\varphi_i = \frac{\exp(X_i\beta)}{1 + \exp((X_i\beta)}$$

With the covariates (X_i) in the propensity score model using IPTW as weights,
if z= 1 then,

$$W_i = \frac{1}{\varphi_i}$$

And if z= 0, then

$$W_i = \frac{1}{1 - \varphi_i}$$

where, W_i denotes the IPTW for subject i.

Following Rosenbaum (1987), an inverse probability of treatment weighting can be defined as:

$$W_i = \frac{Z_i}{\varphi_i} + \frac{(1 - Z_i)}{1 - \varphi_i}$$

Assuming that Y_i denotes the outcome (*financial inclusion*) on the i^{th} subject, Lunceford and Davidian (2004) estimate average remittance effects (ATE) as follows:

$$ATE = \frac{1}{n}\sum_{i=1}^{n}\frac{Z_i Y_i}{\varphi_i} - \frac{1}{n}\sum_{i=1}^{n}\frac{(1 - Z_{i)}Y_i}{1 - \varphi_i}$$

Following Li (2013), we used four major steps to take place to estimate propensity score causal effect: first (1) estimate the propensity score using observational covariates; (2) check balance of propensity scores stratum after stratify the propensity scores into different strata; (3) calculate the treatment effect by selecting appropriate propensity score methods (we used Inverse probability of treatment weighting (IPTW)); and (4) conduct a sensitivity test to justify that the estimated average treatment effect is robust.

V. Results

Variable Selection for the Propensity Score Models

There is no clear guideline in the applied literature as to which variable to include in the propensity score model. According to Austin (2011), the possible sets of variables for inclusion in the propensity score model belong to four categories: (i) all measured baseline covariates; (ii) all baseline covariates that are associated with treatment assignment (Remittance fits here); (iii) all covariates that affect the outcome (financial inclusion fits here); and (iv) all covariates that affect both treatment assignment and the outcome (both remittances and financial inclusion fit here). Following prior literature, we have identified covariates for our study (see Table 2).

Stratifying and Balancing the Propensity Scores

The next step is to sub-classify propensity scores into different strata such that these blocks are balanced on propensity scores. The number of balanced propensity score blocks depends on the number of observations in the data set (Rosenbaum and Rubin 1983). Five blocks are a good starting point to stratify the propensity scores (Rosenbaum and Rubin 1983). In this study, the optimal number of blocks is 7. This number of blocks ensures that the mean propensity score is not different for the treated and controls in each block. Our study reports that the balancing property is stratified. Table 3 shows the inferior bound, the number of treated, and the number of controls for each block. We have selected the propensity score matching with common support option. (Estimation of propensity score and description is reported in Appendix I).

Table 4: The balancing property

	Remittance		
Inferior of block of pscore	0	1	Total
.0075899	514	15	529
.05	267	20	287
.1	145	23	168
.2	29	12	41
.4	3	1	4
.6	1	0	1
.8	0	1	1

Note: the common support option has been selected

Inverse Probability of Treatment Weighting (IPTW) using Propensity Score

Researchers use four different propensity score methods (1. Propensity score matching, 2. stratification on the propensity score, 3. Inverse probability of treatment weighting (IPTW) using propensity score, and 4. covariate adjustment using propensity score) for removing the effects of confounding when estimating the effect of treatment on an outcome variable (Austin 2011). Given a small sample size, this study employs Inverse Probability of Treatment Weighting (IPTW) using propensity score as a propensity score method in this sample.

Table 5 presents the results of our IPTW using the propensity score analysis. Outcome variables are financial inclusion proxies(s). Panel A, financial inclusion proxy (outcome variable) is ownership of ATM card and Average treatment effect (ATE) is .2922. This coefficient indicates that the average ATM card ownership of individuals engaging with remittances is approximately 29% higher than their counterparts, who do not engage with remittances. Further, the coefficient of potential-outcome means (POmean) indicates that the average ATM

card ownership of individuals who do not engage with remittance activities is approximately 14%.

Panel B, the financial inclusion proxy (outcome variable) is ownership of debit card and Average treatment effect (ATE) is .1970, indicating that the average debit card ownership of individuals who engage with remittances is approximately 20% higher than their counterparts, who do not engage with remittances. Further, the coefficient of POmean indicates that the average debit card ownership of individuals who do not engage with remittance activities is approximately 14%.

Panel B, the financial inclusion proxy (outcome variable) is ownership of an insurance policy and Average treatment effect (ATE) is .1457, indicating that the average insurance ownership for individuals who engage with remittances is approximately 15% higher than their counterparts, not engaging with remittances. Further, the coefficient of POmean indicates that the average insurance ownership of individuals who do not engage with remittance activities is approximately 35%.

However, other financial inclusion proxies used in this study, i.e. ownership of credit card, IRIS scan account and formal bank account are not statistically significant.

Table 5: Treatment effect estimation using inverse-probability weights

Panel A : ATM card			
Atm_Card	Coef.	Robust Std.err	P>[z]
ATE Remittance (1 vs 0)	.2922	.1258	0.020
POmean Remittance 0	.1398	.0150	0.000
Obs	565		

Over-identification test for covariate balance H0: Covariates are balanced: chi2(16) = 8.4160 Prob > chi2 = 0.9355			
Panel B : Debit Card			
Debit_card	Coef.	Robust Std.err	P>[z]
ATE Remittance (1 vs 0)	.1970	.0840	0.019
POmean Remittance 0	.1409	.0151	0.000
Obs	910		
Overidentification test for covariate balance H0: Covariates are balanced: chi2(16) = 7.372 Prob > chi2 = 0.882	.0012	.0012	0.314
Panel C : Insurance			
Insurance	Coef.	Robust Std.err	P>[z]
ATE Remittance (1 vs 0)	.1457	.0765	0.057
POmean Remittance 0	.3552	.0152	0.000
Obs	1041		
Overidentification test for covariate balance H0: Covariates are balanced: chi2(16) = 15.5794 Prob > chi2 = 0.4827	.2559	.0149	0.000
Obs	910		
Overidentification test for covariate balance H0: Covariates are balanced: chi2(16) = 12.207 Prob > chi2 = 0.7296			
Panel D : Credit			
credit_card	Coef.	Robust Std.err	P>[z]
ATE Remittance (1 vs 0)	-.0013	.0068	0.841
POmean Remittance 0	.0079	.0028	0.005

Obs	1041		
Over-identification test for covariate balance H0: Covariates are balanced: chi2(16) = 15.5794 Prob > chi2 = 0.4827			
Panel E : IRIS Account			
IRIS_acc	Coef.	Robust Std.err	P>[z]
ATE Remittance (1 vs 0)	. 0518	.0686	0.451
POmean Remittance 0	.2558	.0149	0.000
Obs	910		
Over-identification test for covariate balance H0: Covariates are balanced: chi2(16) = 12.207 Prob > chi2 = 0.7296			
Panel F : Bank			
Bank_acc	Coef.	Robust Std.err	P>[z]
ATE Remittance (1 vs 0)	-.0002	.0015	0.873
POmean Remittance 0	.0012	.0012	0.314
Obs	1041		
Over-identification test for covariate balance H0: Covariates are balanced: chi2(16) = 15.5794 Prob > chi2 = 0.4827			

Note: Individual level covariates are included in all models for gender (male), age of refugee (age), location (inside_camp), mobile phone (med_tech_mob, h_tech_mob), education level (no_ed, Sec_ed), household size (house_size), financial responsibility (Fin_res), financial circle (fin_circle), financial literacy (literacy), employment status (employee), income varies (Income Vary), and internet usage (High internet, no Internet).

Balance of Covariates after matching by a Propensity Score

In this section we report two methods for assessing balance in observed baseline covariates between treated and control subjects in a sample weighted by inverse probability of treatment. In their study, Austin and Stuart (2015) observe that although the use of IPTW has increased in recent years, only a few studies examine

weighting balance measures of covariates between treatment groups. If the reweighting is successful, then the weighted distribution of each covariate should be the same across treatment groups. In such cases, we can say that the treatment model "balanced" the covariates.

Over-identification tests (Guo and Fraser 2014)

According to the over-identification test for covariate balance figures shown in Table 5, we cannot reject the null hypothesis that the covariates are balanced for all outcomes. In particular, all Prob > Chi^2 values are greater than 0.05. This result indicates that we have completed an adequate job of balancing the covariates to trust the estimated treatment effect.

Covariate balance summary

The covariance balance summary (Appendix II) lists significant outcome proxies, reflecting the model-adjusted difference in means and ratio of variances between the treated and untreated groups for each covariate. For all reported results, the differences in weighted means are negligible, and variance ratios are all near one[5]. The Raw columns show where we started, and we notice that the before weighting, differences are large.

Balance diagnostics indicates that propensity score model has been adequately specified.

[5] In here, reported rebalance summary for significant outcome variables only.

VI. Robustness tests

Probit model

As a robustness test, given the dichotomous nature of both financial inclusion and Remittance variables, we use a discrete probability model. In a recent FI study, Ambrosius (2016) uses a logit model to estimate the relationship between household financial access and effect of receiving remittances. Top panel (panel A) in Table 6 presents probit regression results for ATM and Debit card as dependent variables. Panel B records probit regression results for Insurance and IRIS account as dependent variables. Panel C shows probit regression results for credit card as dependent variable.

The results point to remittance affecting financial inclusion, suggesting that refugees who engaged with remittances may have greater access to, and usage of, financial services. Coefficient for Remittances have a significant and positive impact on ATM card ownership, with a marginal effect of .1493 (at 1% significance level). Comparing probit to the propensity score method (IPTW), we see that ME in the marginal probit is smaller but in the same order of magnitude as the ATT. Further, the coefficient indicates remittance has a significant and positive impact on debit card ownership (at 1% level), with a marginal effect of .2508.

Panel B reports that the remittance has a significant and positive impact on insurance ownership (at 1% level), with a marginal effect of .3590. Also, Panel C reports that the remittance has a significant and positive impact on credit card ownership (at 1% level), with a marginal effect of .0108. Although coefficients indicate that remittance has a positive impact on IRIS account ownership, the results are not statistically significant. Overall, the probit model suggests that remittance has positive impact on refugees' financial inclusion level.

The size of the impact of remittance (i.e. size of the coefficients) for financial inclusion in the probit model differ from IPTW due to uncontrolled bias in probit model. In non-randomized observational data, as in this analysis, the treatment group may be associated with measured and unmeasured covariates (Vaughan et al. 2015); however, a probit model estimates, treatment effects in observational data only. Propensity scores reduce bias due to systematic differences between the treated and comparison groups (Dehejia and Wahba 2002). Additionally, by applying propensity scores using inverse probability of treatment weights (IPTW) we reduce the influence of outlying weights (Vaughan et al. 2015). The comparison of techniques demonstrates how ignoring the unobserved determinants of financial inclusion that may be correlated with remittance behaviour significantly affects estimation of remittance – financial inclusion relationship.

IV Probit with Continuous Value of Remittance

Until recent years, studies assume remittance is exogenous to economic impact (Taylor 1992; Taylor and Wyatt 1996; Yang and Martinez 2006; Wouterse and Taylor 2008). However, recently treatment of remittances as endogenous has appeared to more explicitly model selection bias in migration (Bang, Mitra, and Wunnava 2016). However, another potential concern in remittances and financial inclusion is reverse causality. The nexus between remittances and financial inclusion in previous research has indicated the tendency for a bi-directional causality. According to Ambrosius and Cuecuecha (2016), higher remittance activities leads to increase use of bank accounts. On the reverse, high level of financial inclusion by individuals might increase the ease of remittances activities, and therefore, this might increase the likelihood of refugees' remittance activities. To control for reverse causality endogeneity biases we use an instrumental variable

model. Bang, Mitra, and Wunnava (2016) use mobile phone ownership and non-agricultural land ownership as instrumental variables for their remittance and income inequality study. Anzoategui et al. (2014) use three sets of instrument variables: (i) municipality-level weighted average measures of economic condition in US states; (ii) municipality percentage of households that receive remittances and the annual average amount received per municipality; and (iii) lagged values of current values of remittances.

We use income_vary as a proxy for the Remittance. It has a value of 1 if the refugee said yes to the following statement in the survey, "Does your household income vary from month to month?" otherwise it takes a value 0. The intuition here is that, if household income varies significantly that will affect the likelihood of sending/receiving remittances.

Valid instrumental variables need to satisfy two conditions: (i) they are uncorrelated with error term (u), and (ii) they are moderately associated with the suspect endogenous variables, once the other independent variables are controlled. Since (u) is unobservable, the most common guideline for determining whether the selected instruments are relevant in the first stage equation is the F-test for joint significance. If the F-test exceeds the value 10, then the selected instrument is accepted as relevant. The F-test for instrument relevance for our instrument variable income_vary is above 10, enhancing confidence that the instrument is appropriate.

Table 6 lower panel reports IV regression results. Comparing IV results with IPWT for remittance impact on FI, the finding also suggests that the remittance has a positive impact on financial inclusion. This finding further supports the conclusion that failure to account for endogeneity will underestimate/overestimate the impact of remittance on FI.

Table 6: Probit and IV probit results.

Panel A:	Coef	Z	ME	Coef	Z	ME
	ATM			Debit card		
Remittance	.5870***	2.47	.1493***	2.192***	3.27	. 2508***
Observations	565			166		
Wald chi test p=0[p value]	X^2 (15)=64.50 [0.000]			X^2 (15)=394.02 [0.000]		
Impact of the instrument on remittance ***Income_vary***	4.119***			-2.160		
Obs	565			166		
Wald test instrument=0[p value]	14.62[0.0001]			0.45 [0.5029]		

Panel B	Coef	Z	ME	Coef	Z	ME
	Insurance			IRIS		
Remittance	.1079	0.62	.3590***	.0904	0.48	.0201
Observations	1041			910		
Wald chi test p=0[p value]	X^2 (15)=160.01 [0.000]			X^2 (15)= 81.54 [0.000]		
Impact of the instrument on remittance ***Income_vary***	3.990***			.2565***		
Obs	1041			910		
Wald test instrument=0[p value]	3.84[0.0502]			9.40[0.0022]		

Panel C	Coef	Z	ME
	Credit		
Remittance	.5726	1.41	.0108***
Observations	836		
Wald chi test p=0[p value]	X^2 (15)=159.27 [0.000]		
Impact of the instrument on remittance ***Income_vary***	-3.418**		
Obs	836		
Wald test instrument=0[p value]	0.93[.3360]		

Notes: Individual level covariates are included in all models for gender (male), age of refugee (age),location (inside_camp), mobile phone (med_tech_mob, h_tech_mob), education level (

no_ed, Sec_ed), household size (house_size), financial responsibility (Fin_res), financial circle (fin_circle) , financial literacy (literacy), employment status (employee), income varies (Income Vary), and internet usage (High internet, no Internet).

Due to limited observations “Bank” logit regression results are excluded.

VII. Summary and Directions

The possibility of ameliorating and reducing the economic and social difficulties facing refugees provides a challenge which can be actioned. The urgency, against a backdrop of 65m million refugees, the largest number since World War II ("Global Trends" 2017), is pressing. Refugees around the world engage with remittances and our research points clearly toward remittances impacting significantly upon financial inclusion of refugees. We find that after controlling for missing data and unobservable factors with the inverse probability of treatment weighting using the propensity score analysis (IPTW) method, that remittances have a positive impact on financial inclusion. The possibility of expanding the financial inclusion options and this in turn percolating through to greater social inclusion is real in terms of practical commercial steps and policy enabling actions.

Public policy has a role to play in pooling risks and making these more transparent to financial service providers. Identity, encouragement of financial literacy, security of property rights, and access to legal services are part of the institutional infrastructure in the public policy domain. Without surety, contracting, and confidence in the law, financial inclusion is problematic and the price of risk too high for financial sector financial institutions.

Commercially, there is scope to improve the range of services that are attractive and tractable for refugees. Smartphone hardware is relatively high and multiple language financial transaction software is a key missing ingredient. The incentive for a financial institution to become involved could be large. At the philanthropic end of the spectrum, it might be seen as corporate social responsibility (CSR) or social (S in ESG), using financial market mnemonics.

The acceptability of financial products to refugees of varying cultural and religious backgrounds presents problems for financial institutions. Public policy issues concerning inclusiveness can provide a framework in which providers on equity grounds need to deal with cultural and religious needs. Social inclusion is not achievable if culture and religion are the base for financial exclusion. Non-formal institutions arise to meet refugee financial needs but these may stimulate social bonding, which is not inclusive.

Technology is important to stimulate financial inclusiveness. Remittances, for example, in our study, typically came through informal financial agents rather than formal financial institutions. If access to foreign exchange dealing through, for example, banks is not readily available then this pushes the dealing to other groups. Money lenders who will arrange remittances for a fee quickly take advantage of barriers to transactions. The inclusiveness of technology is important.

The payment or receipt of interest raises problems for some refugees. The difference between an account with a bank and a credit union may seem negligible. However, where the latter is based on the sale of share units this is a very different proposition. Where credit unions or building societies provide full electronic banking they are particularly well suited to servicing refugees. Banks can quickly establish a credit union subsidiary and run it as a Halal financial service. Public policy and central banks seem to be a bit slow on the uptake. Bad habits are hard to break, so it is imperative that financial inclusion is practiced from the very beginning of a refugee status being granted. Online service is of minimal cost compared to the social exclusiveness and lasting divisions in society resulting from financial exclusion when people are at their most vulnerable.

Financial planning services, educational initiatives, and ensuring that leverage of kinship relations are advanced in financial inclusion, build business for a financial institution and is an imperative challenge for public policy to achieve social inclusion.

Further research providing studies in other refugee settings will enhance understanding and strengthen both practical steps for financial institutions to promote financial inclusion and stimulate a more social inclusive nation. Similarly, more information will assist the formulation and promulgation of public policies to create greater wellbeing in society.

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Appendix I

```
Algorithm to estimate the propensity score
************************************************


The treatment is Remittance

  Remittance|      Freq.     Percent        Cum.
------------+-----------------------------------
          0 |        969       93.08       93.08
          1 |         72        6.92      100.00
------------+-----------------------------------
      Total |      1,041      100.00


Estimation of the propensity score

Iteration 0:   log likelihood = -261.78212
Iteration 1:   log likelihood = -233.40399
Iteration 2:   log likelihood = -232.62506
Iteration 3:   log likelihood = -232.62154
Iteration 4:   log likelihood = -232.62154

Probit regression                               Number of obs   =       1041
                                                LR chi2(15)     =      58.32
                                                Prob > chi2     =     0.0000
Log likelihood = -232.62154                     Pseudo R2       =     0.1114

------------------------------------------------------------------------------
-------
   Remittance|      Coef.   Std. Err.      z    P>|z|     [95% Conf.
Interval]
-------------+----------------------------------------------------------------
        male |   .1901019   .1537516     1.24   0.216
-.1112457    .4914496
         age |   .0048616   .0058273     0.83   0.404
-.0065598    .0162829
 inside_camp |  -.1849061   .2018535    -0.92   0.360
-.5805317    .2107196
 med_tec_mob |  -.2964065   .3593594    -0.82   0.409    -
1.000738     .407925
  h_tech_mob |  -.1778907   .3904417    -0.46   0.649
-.9431423     .587361
       no_ed |  -.1871956   .2032995    -0.92   0.357
-.5856552    .2112641
      sec_ed |  -.4598073   .2379706    -1.93   0.053
-.926221    .0066064
   hose_size |   -.023394   .0251949    -0.93   0.353
-.0727752    .0259871
     fin_res |   .0636224   .1490723     0.43   0.670
-.2285538    .3557987
  fin_circle |   .1440823   .0410974     3.51
0.000     .0635329    .2246317
    literacy |   .1166067   .1932262     0.60   0.546
-.2621097     .495323
```

```
    employee |   .3134016   .1743276     1.80   0.072
-.0282742    .6550774
 high_inter~t |    .214457   .2116704     1.01   0.311
-.2004092    .6293233
  nointernet |  -.2450771   .2652709    -0.92   0.356
-.7649986    .2748443
       _cons |  -1.571323   .5421247    -2.90   0.004    -2.633867
-.5087778
------------------------------------------------------------------------------
-------


Note: the common support option has been selected
The region of common support is [.00758993, .95174137]


Description of the estimated propensity score
in region of common support

                  Estimated propensity score
-------------------------------------------------------------
      Percentiles      Smallest
 1%      .009225       .0075899
 5%     .0139649       .0076733
10%     .0177316       .0080299       Obs                 1,031
25%     .0266301       .0084662       Sum of Wgt.         1,031

50%     .0483411                      Mean           .0696005
                       Largest       Std. Dev.      .0712021
75%     .0872467       .5733495
90%     .1423252       .5863292       Variance       .0050697
95%     .1969581       .6680425       Skewness        4.29686
99%     .3143635       .9517414       Kurtosis       37.26019


**********************************************************
Step 1: Identification of the optimal number of blocks
Use option detail if you want more detailed output
**********************************************************


The final number of blocks is 7

This number of blocks ensures that the mean propensity score
is not different for treated and controls in each blocks


**********************************************************
Step 2: Test of balancing property of the propensity score
Use option detail if you want more detailed output
**********************************************************


The balancing property is satisfied
```

This table shows the inferior bound, the number of treated
and the number of controls for each block

Inferior of block of pscore	Remittance 0	Remittance 1	Total
.0075899	514	15	529
.05	267	20	287
.1	145	23	168
.2	29	12	41
.4	3	1	4
.6	1	0	1
.8	0	1	1
Total	959	72	1,031

Note: the common support option has been selected

****
End of the algorithm to estimate the pscore

Appendix II

Covariates balance summary

ATM Card	Raw	Weighted
Number of obs	565	565.0
Treated obs	38	289.3
Control obs	527	275.7

	Standardized differences		Variance ratio	
	Raw	Weighted	Raw	Weighted
Male	.3025188	-.1541561	.9553312	.9708533
age	.1546482	.1307195	1.103911	.9330454
inside_camp	-.1846677	.3758859	.6878375	1.588862
med_tec_mob	-.2297438	.246542	.8527002	1.079286
h_tech_mob	.20605	-.2337099	.8886583	1.059674
no_ed	-.1056436	-.2381778	1.086114	1.097784
Sec-ed	-.031536	.1930958	.9869167	1.194421
hose_size	-.1354314	.0638265	1.100705	1.10916

Fin-res	.0663951	.1487794	.9771384	.884863
fin_circle	.3206675	.0090438	8.820599	1.029925
literacy	.0886668	.0371915	.8577445	.9310094
employee	.223742	-.1348892	1.350761	.7905124
High internet	.3257212	-.111307	.9574022	.9789263
No-internet	-.3749484	.1342316	.8066016	1.02037

Debit Card	Raw	Weighted
Number of obs	565	565.0
Treated obs	38	281.3
Control obs	527	283.7

	Standardized differences		Variance ratio	
	Raw	Weighted	Raw	Weighted
Male	.3025188	-.0455695	.9553312	.9963363
age	.1546482	.1343892	1.103911	.9565941
med_tec_mob	-.2297438	.1057365	.8527002	1.049417
h_tech_mob	.20605	-.1020425	.8886583	1.039923
no_ed	-.1056436	-.1335015	1.086114	1.069217
Sec-ed	-.031536	.0879395	.9869167	1.096869
hose_size	-.1354314	-.0164766	1.100705	1.145365
Fin-res	.0663951	.1312491	.9771384	.9003841
fin_circle	.3206675	.0330795	8.820599	1.055402
literacy	.0886668	-.0515112	.8577445	1.094544
employee	.223742	-.0133197	1.350761	.979842
High internet	.3257212	-.111307	.9574022	.9789263
No-internet	-.3749484	.1342316	.8066016	1.02037

Insurance	Raw	Weighted
Number of obs	1,041	1,041.0
Treated obs	72	530.1
Control obs	969	510.9

	Standardized differences		Variance ratio	
	Raw	Weighted	Raw	Weighted
Male	.4150619	-.1101449	.9277532	.9718331
age	-.0560164	.0375045	.8628993	.8549615
inside_camp	-.3019004	.2596765	.5468902	1.349747
med_tec_mob	-.403897	.1274767	.7256918	1.03932
h_tech_mob	.4240344	-.1078262	.7444631	1.023882
no_ed	-.0158633	-.1611396	1.027056	1.118464
Sec-ed	-.1394143	.0743725	.81495	1.098728
hose_size	-.1965725	.1013025	1.030366	1.173546
Fin-res	.1690637	.092497	.9070107	.9466824
fin_circle	.460831	.0684754	6.387504	.7556402
literacy	.1704048	.1901454	.7294349	.6813035
employee	.4956308	-.0950578	1.7578	.8361006
High internet	.5450085	-.0740776	.9353113	.9711295
No-internet	-.5394217	.0267054	.7313437	1.002475