

Financial Access Expansion and Rural-Urban Welfare Disparities: Evidence from Zambia

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Financial Access Expansion and Rural-Urban Welfare Disparities: Evidence from Zambia

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List of abbreviations and acronyms

AIR	American Institutes for Research
ATMs	Automatic Teller Machines
DHS	Demographic and Health Surveys
EAs	Enumeration Areas
FSDP	Financial Sector Development Plan
IFI	Index of Financial Inclusion
LCMS	Living Conditions Monitoring Surveys
PCA	Principle Component Approach

Abstract

This paper investigates the welfare gains following changes in aggregate financial access. Using individual-level data collected in Zambia between 2009 and 2015, results show that increasing the number of financial access points improved the quality of life by moving users of financial services by 1.2 percentage points especially in rural areas. A monetary measure of welfare shows an overall increase in incomes by 10 percentage points over the seven-year period for urban dwellers, moving the urban poor above the income-poverty line in Zambia. Financial resources, exchanged through financial services providers located closer to users, were used to acquire and/or improve the quality of homes including the use of better cooking technologies. This choice of investment in dwellings, points to a long-term outlook in the financial decisions taken by the financially included, with prospects for sustainable development. These results highlight the need to intensify financial expansion policies that target the rural areas in the fight against poverty.

Keywords: Financial inclusion; Welfare; Pseudo-panel; Zambia.

1. Introduction

Finance and welfare is an old debate. There is substantial theoretical and empirical evidence that access to finance matters for household welfare, and the mechanisms through which finance contributes to poverty reduction, improves enterprise performance and overall growth (Fafchamps and Schündeln, 2013; Beck et al, 2007; Hulme and Mosley, 1996; King and Levine, 1993).

Proponents of the Sustainable Development Goals have advocated for broad-based financial access as a long-term solution to poverty. But barriers to financial access continue to compromise the realization of the benefits of financial access (see Demirgüç-Kunt et al, 2015). Such barriers include not only the cost of operating the bank accounts, but costs associated with getting to financial services providers or agents. There is, indeed, evidence that proximity of financial services improves people's livelihood, such as the use of mobile phone platforms like the M-PESA innovation, which is used to transfer money across regions in a country, to pay bills and to even save (Takahashi, 2016; Morawczynski, 2009).

Evidence is, however, mixed on the welfare distribution following access to financial services in terms of where the marginal benefits lie, i.e., rural versus urban dwellers, or men versus women (see Ashraf et al, 2010; Burgess and Pande, 2005), or whether the benefits are persistent or transitory (see Khandker and Samad, 2013), and whether beneficiaries indeed record improved welfare (see Diagne and Zeller, 2001). These problems are exacerbated by lack of longitudinal panel data in many developing countries for making causal inferences. Attempts have been made to use cross-country data which masks country-specific difference (Honohan, 2008; Beck et al, 2007) or randomized control experiments like Ashraf et al (2010) or Karlan and Zinman (2010) which lack external validity.

To contribute to the growing literature in this area, this paper investigates rural-urban disparities in welfare following a financial inclusion policy in Zambia between 2011 and 2015. The policy had the objective of increasing access to financial services, with a focus to under-served regions like the rural areas, which is a version of India's social banking programme of 1969. We make use of the FinScope cross-sectional data collected from Zambia between 2009 and 2015 to construct a synthetic panel using age cohorts. The exogenous variation in financial access points between these two data points is then incorporated as an instrument of financial inclusion and panel data techniques used to investigate changes in welfare outcomes as a result of changes in financial access. We argue that such access could affect welfare either directly,

by increasing the probability of individuals using financial services brought closer to them (some form of unmet demand). The indirect channel is through spillovers from increased economic activity, resulting in increased probability of employment, thereby increasing an individual's income. An individual-level index of financial inclusion is constructed from three dimensions following Sarma (2015): formal products holding, frequency of use and availability of financial services. Welfare is measured by a non-monetary wealth index constructed from possession of valuable assets plus household characteristics following the approach used in the Demographic and Health Surveys (DHS). The index is then used to construct a measure of relative poverty. In the absence of consumption data, an alternative monetary measure of welfare is constructed from personal income.

The analysis shows that between 2009 and 2015, the expansion of the financial sector improved welfare by 1.2 percentage points, moving individuals from a lower to a higher wealth quintile. While there were relatively more financial access points opened in urban than in rural areas, welfare gains were statistically significant in rural areas. Using the income measure however, results show an increase in incomes of up to ten-fold in 2009 prices, moving the financially included poor above the income poverty line. This effect is statistically significant in urban areas. While rural areas also recorded positive incomes, these incomes were not statistically significant. In terms of the transmission mechanism, it would appear that individuals used the financial services as a conduit to receive/send or save financial resources, and later use these funds to improve or increase physical asset ownership. This is evident from an increase in the probability of acquiring a dwelling, using better quality construction materials (for roofing and flooring), using more modern cooking technology and acquiring electronic items. This intuition is consistent with an evaluation of the cash transfer programme in the country where recipients used the grants to improve the quality of housing than increasing consumption (American Institutes for Research [AIR], 2015). These results are robust after controlling for previous welfare status over a period of six years, which provides some evidence of persistence of the benefits of financial access (see Khandker and Samad, 2013; Burgess and Pande, 2005).

The rest of the paper is organized as follows: Section 2 provides an overview of the inclusion drive and poverty trends in Zambia. This is followed by a conceptual framework in section 3. The methodological approach and data are presented in section 4, and results are discussed in section 5. Section 6 concludes.

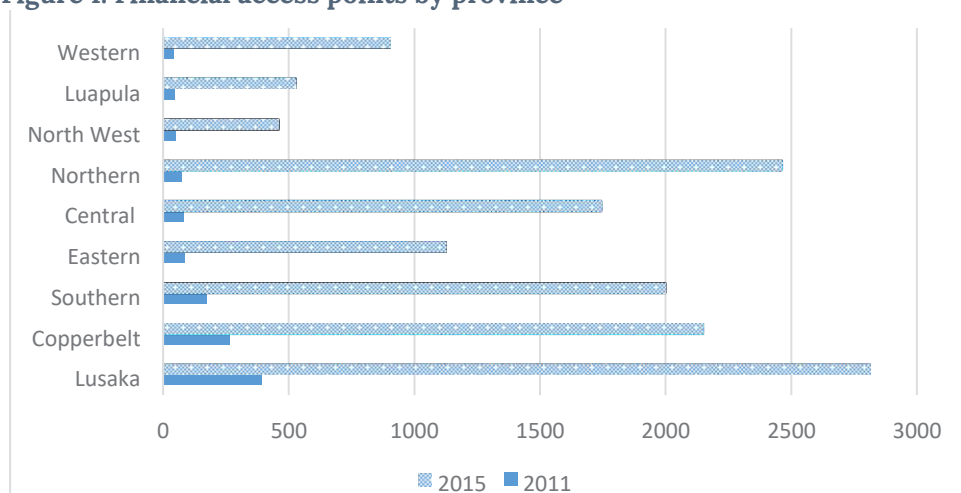
2. Financial inclusion and poverty trends in Zambia

Zambia's financial sector development plan started in the early 1990s when the country undertook its first attempt at financial sector deepening. By 2005 however, the banking sector was still small and underdeveloped, and only 8% of the population was banked (Martínez, 2006). The Bank of Zambia then embarked on a financial sector development strategy, the Financial Sector Development Plan (FSDP) in recognition of the lack of financial services especially in rural/peri-urban areas; high bank charges and account requirements; poor credit culture, and low levels of financial literacy and education. The FSDP was implemented in two phases, with FSDP I running from 2004 to 2009 and FSDP II from 2010 to 2015. This intervention led to an increase in financial access to 37% (2009) and 59% (2015). This was evidence of the enhanced access to financial services in most of the districts of Zambia, through new bank and microfinance institution branches as well as mobile banking.¹

The number of bank branches and agencies increased from 277 in 2011 to 1464 in 2015, while the number of automatic teller machines (ATMs) per 100,000 persons increased to 9.92 in 2014 up from 0.9 in 2004, averaging 5.7.² The country's mobile network operators and commercial banks started offering mobile services for bill payments and money transfers. Technological innovations were also adopted to facilitate agency banking. Figure 1 shows the aggregate number of financial service providers by province. The distribution is skewed to regions with high economic activity such as Lusaka and the Copperbelt provinces, which accounted for over 50% of the total financial access points by 2015. According to the geospatial exercise conducted in 2015 by the Bank of Zambia, these provinces also have a high concentration of mobile money agents, a key feature of the financial sector expansion programme.

1 See <http://www.boz.zm/Financial-Sector-Development-Plan-II-Brochure.pdf>

2 http://www.theglobaleconomy.com/Zambia/Bank_credit_to_the_private_sector/

Figure 1: Financial access points by province

Source: United Nations Capital Development Fund (UNCDF) (2016). <http://access.i2ifacility.org/Publications/GIS4FIZambia.pdf>

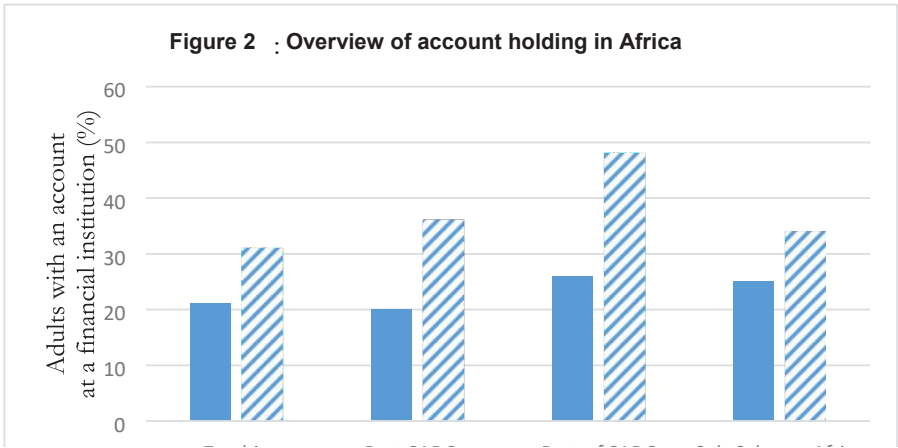
At an individual level, Table 1 shows that by 2015, up to 59.3% of Zambians were either formally or informally included compared to just 37.3% in 2009. However, formal accounts holding in Zambia is below the average for sub-Saharan Africa as shown in Figure 2. By 2014, only 6% Zambians reported borrowing from a bank, a credit union or a microfinance institution, even though there is evidence of growth in the private sector credit to GDP in the past decade (see Zambia Economic Brief, 2014). To date, over 60% of the population remains financially excluded from the banking sector, which includes SACCOs.

Table 1: Account holding and inequality in Zambia

	2005	2009	2015
Banked (formally served)	14.6	13.9	24.8
Semi-formally served (non-bank)	7.8	9.3	28.5*
Informally served	11.3	14.1	21.1
Not served or excluded	66.3	62.7	40.7
Total number of financial services points	--	1,211**	14,193

Source: FinScope Zambia Report (2015) *Uptake boosted by use of mobile money. Up to 1.1 million adults use mobile money. **figures extrapolated from 2011.

Figure 2: Overview of account holding in Africa.



Note: SADCx refers to SADC countries excluding South Africa.
Source: Author's compilation from Demirgüç-Kunt et al (2015).

According to development literature, a deep and inclusive financial sector is a catalyst for improving the welfare of a country’s citizens. As financial services become affordable and brought closer to potential users, it enables them to plan for the future or to engage in economic activities with prospects of transitioning out of poverty (Beck et al, 2007; Burgess and Pande, 2005; Fafchamps and Schüdeln, 2013). However, the extent to which the poor are positioned to take advantage of economic opportunities or navigate a negative shock and avoid slipping back into poverty, provides two states of nature - transitory or persistent poverty (Carter and Barrett, 2006; Dercon, 1998). Financial access thus provides the financial resources to either engage in economic activities or to use asset wealth as collateral in exchange for funds, to allow the poor to mitigate negative shocks. In Zambia however, the extent to which financial sector deepening has contributed to transitions out of poverty is an empirical question. The Gini coefficient has averaged 55.6% over the past decade and by 2015, 7.2 million out of 16.2 million Zambians were below the poverty line. This is against a backdrop of direct poverty reduction initiatives such as the cash transfer programme that aims to reach up to 500,000 Zambians.³ The poverty outlook can be partly attributed to the [year drought which affected the agricultural sector and subsequently food prices, a combination of which would negatively impact the welfare of those who depend on agriculture for their livelihoods. Paradoxically though, rural poverty remained constant at 0.60 between the two periods, but urban poverty increased from 0.60 to 0.61 between 2009 and 2015, leading to an overall poverty trend of 0.65 to 0.69 over a seven-year period. Notwithstanding this negative outlook, this paper attempts to establish whether the financial access drive in Zambia had any welfare benefits either nationally or by location for those who participated.

3 <http://www.worldbank.org/en/country/zambia/overview>

3. Conceptual framework

The pursuit of universal financial access by 2020 (UFA2020) by the World Bank is premised on the assumption that improving financial access can improve people's welfare. Proximity of financial institutions, for example, implies that less time and monetary resources are spent travelling to financial institutions. Saved time can be invested in more productive or income generating activities, while the finances can be saved for later use or utilized where they would offer higher returns. Time and money are relatively scarce in rural settings, yet rural areas tend to have poor financial infrastructure. Availability of formal financial institutions is likely to increase competition between formal and non-formal financial services providers in a region. This competition can lead to greater value for (and a possibility of) more affordable products such as loans. For businesses, this reduced cost of capital can increase productivity and overall profit for businesses or higher incomes for the employees. Consumer loans can also be used to acquire assets such as houses and vehicles, etc., which would otherwise not be affordable instantaneously. Compared to non-formal financial arrangements such as savings clubs, formal financial institutions provide safety for hard-earned incomes. This gives savers peace of mind which contributes to their wellbeing. Moreover, formal financial institutions can bundle products, such as credit and insurance, or credit and savings, which facilitates financial planning for the consumer while creating variable consumer records/history with the financial providers.

Finally, in some communities, having a bank account is a signal of credibility which increases one's social status and opens up opportunities. For example, one can access education facilities for children and health care using a bank account as proof of future payment. Thus, the availability and use of financial services such as credit and insurance can contribute to the expansion of businesses, investment in education and health, managing risks and weathering financial shocks, all of which can improve one's overall quality of life compared to not using formal financial products.⁴

In this setting, we consider an individual i who is not financially included (n) at an initial time $t = 0$, and therefore has a quality of life given by W_{0in} . This individual then becomes included (b) in period $t = 1$ and his/her welfare changes to W_{1ib} . Given the argument above, we expect that $W_{1ib} > W_{0in}$. The converse for an individual who starts

4 <http://www.worldbank.org/en/topic/financialinclusion/brief/achieving-universal-financial-access-by-2020>

out by being included and then leaves the formal sector is given by the outcomes W_{0ib} and W_{1in} , respectively, reversing the inequality to $W_{0ib} > W_{1in}$. But these are partial equilibria, given that it is possible for individuals to maintain their initial status of either being included or being excluded in both periods. The associated welfare outcomes for such a scenario are W_{0in} and W_{1in} if the individual remains excluded in both periods, and W_{0ib} and W_{1ib} if he is included in both periods. Analogous to poverty dynamics, this framework presents two states of transitory versus persistent inclusion or exclusion. These dynamics are summarized in a 2 x 2 matrix in Table 2, where the quadrants represent: 1= persistent financial exclusion, 2= transition into financial inclusion, 3= transition out of financial inclusion and 4= persistent inclusion.

Table 2: Framework for financial inclusion and welfare transitions

		(t = 1) Excluded	Included
(t = 0)	Excluded	1: W_{0in}, W_{1in}	2: W_{0in}, W_{1ib}
	Included	3: W_{0ib}, W_{1in}	4: W_{0ib}, W_{1ib}

Note: n = not-banked (excluded), b = banked (included).

For the poor, we would be interested in establishing whether transition into financial inclusion implies transition out of poverty. This study is focused on quadrants (2) and (4) which represent the extensive and intensive margins, respectively. Intuitive in this framework (if we extrapolate beyond one individual) is that unequal access to financial services is a potential source of inequality in the consumption of goods and services, with implications for wellbeing and society's welfare. It should be noted that while the argument presented in this section suggest that $W_{1ib} > W_{0in}$ or W_{1in} , the actual welfare outcomes remain an empirical question that is beyond the scope of this study.

4. Methodology and data

Empirical approach

In a simple framework, we can compare the welfare outcomes of those individuals that are financially included to those of the financially excluded. However, this approach presents a problem of selection bias since the financially included may possess characteristics that increase their inclusion probability. For example, one's initial wealth is related to the affordability of user fees and charges associated with financial services - a major barrier to financial inclusion. This bias, however, can be attenuated if we can track the individual's welfare before and after the financial inclusion intervention. In such a case, we can estimate a basic panel model specified as follows:

$$w_{it} = x_{it}'\beta + \pi_{finincl_{it}}\alpha_i + \mu_{it}, t = 1, \dots, T \quad (1)$$

where, x_{it} denotes a K-dimensional vector of explanatory variables, β is the parameter vector of interest, α_i are individual fixed effects and the index i refers to individuals. So, the same individual is followed over T periods of time thus producing a panel.

In the absence of a pure panel, as is the case in this study, but with a set of repeated cross-section surveys each with N unrelated observations, it is possible that the α_i 's are correlated with some of the explanatory variables such that the K moment conditions in $E\{(y_{it} - x_{it}'\beta)x_{it}\} \neq 0$.

In this case, Deaton (1985) suggests the construction of a pseudo-panel of cohorts to estimate β . Modified by Moffitt (1993), Verbeek and Vella (2005) and Verbeek (2008), the pseudo-panel approach has been used in several studies, for example, Dang and Dabalen (2017) in chronic and transient poverty analysis, Meng et al (2014) to analyse own and cross elasticity of demand for alcohol, Ananim et al (2012) to analyse perceptions towards use of financial services, Cuesta et al (2007) in the labour market, and Dargay and Vythoulkas (1999) in the motor industry, to mention but a few.

A member or cohort of the pseudo-panel is defined as a sub-group of the population with fixed membership, and the individuals therein can be identified as if they appear in the repeated cross-sections. A cohort C is constructed comprising individuals, say, born in a particular year and/or with a certain ethnic background. In this approach,

individuals are replaced with sub-group means. The sub-groups are then tracked through time in the repeated cross-sections as if a panel was available. In this study, the sub-groups are defined by year of birth starting at 16 years.⁵ Observations are then aggregated to cohort level to obtain the following estimable model:

$$\bar{w}_{ct} = \pi \overline{IFI}_{ct} + \beta \bar{x}'_{ct} + \bar{\alpha}_c + \bar{\epsilon}_t + \bar{\mu}_{ct}, \quad c = 1, 2, \dots, C; t = 1, 2 \quad (2)$$

where, \bar{w}_{ct} is the average welfare value of all observed w_{it} 's in cohort c in period t . The independent variables on the other hand include the mean of the financial inclusion (IFI) for each sub-group, a vector of covariates (\bar{x}) that impact welfare such as own income, education attainment, region, gender and marital status (see Glewwe, 1991; Teal, 2004). These also enter as mean of income, mean of education, mean of marital status in each sub-group, mean regional dwelling, etc. $\bar{\alpha}_c$ and $\bar{\epsilon}_t$ are cohort and time fixed effects, respectively, and $\bar{\mu}_{ct}$ is the mean of cohort unobserved characteristics. Equation 2 is used as the base model to estimate the impact of financial inclusion on welfare.

A second source of bias is the distance to financial services whereby, proximity is likely to increase the probability of financial inclusion. Indeed, distance has been reported to be a key barrier to financial inclusion especially in rural areas, where potential clients cannot afford to leave their businesses to trek long distances to financial agents or banks. While it is possible for an individual to reside close to financial service providers, it is often the service providers who choose their locations based on potential profit and demand. For example, banks are less likely to locate in rural areas (see Burgess and Pande, 2005). With the advent of financial innovations such as mobile money which uses the cellular telephone to make financial transactions, the gravity of this bias is minimized. However, these services too require mobile money agents who choose their locations endogenously as do other financial service providers. To circumvent the effect of this bias, this paper makes use of the financial sector deepening policy undertaken in Zambia, as described in section 2. This policy sought to minimize the distance between potential users and providers of financial services. We construct an instrumental variable from the variation in financial service access points between the two periods of the surveys (see Figure 1). Table 3 shows the variation in this variable by province.

⁵ Various criteria have been used to construct the cohorts. For example, Browning et al. (1985) use cohorts of households based on five-year age bands subdivided as to whether the head-of-the-household is a manual or non-manual worker; Blundell et al. (1998) employ year-of-birth intervals of ten years, interacted with two education groups; Banks et al. (1994) use five-year age bands, while Propper et al. (2001) use seven date of birth groups and ten regions to construct cohorts. These criteria could not be adopted for fear of loss of generality.

Table 3: Financial sector expansion in Zambia and the intensity of inclusion (2009–2015)

Province	(1)	(2)	(3)	(4)
	Number of financial access points	of financial access points	Financial access points per 100,000 people per km ² (intensity of inclusion, (10 ⁻⁴))	
			2009	2015
Central	82	1745	6.298	134.04
Copperbelt	263	2148	20.201	164.99
Eastern	86	1128	6.606	86.64
Luapula	46	530	3.533	40.71
Lusaka	393	2814	30.187	216.15
Northern	73	2462	5.607	189.11
North West	51	462	3.917	35.49
Southern	175	1999	13.442	153.55
Western	42	905	3.226	69.51

Note: Figures in columns 1 and 2 were obtained from the UNCDF (2016) report on mobile money for the poor, while figures in columns 3 and 4 were computed using additional data from the Zambian Statistics Office.

The IV is constructed as the number of access points in a region per region's population, per region's size/area, which gives us the intensity of financial inclusion. The region in this study is the province since data was not available at lower administrative levels. The case for this variable is that the location of financial access points is exogenous to the individual and it will only affect one's welfare: i) directly, through the use of financial services in a manner that enables him to alter his consumption, investment and economic decisions for better welfare; ii) indirectly, if the individual becomes a secondary beneficiary because of increased economic activity at community level, for example through employment. As mentioned earlier, a key concern to this identification strategy is the non-random placement of the financial services providers. Indeed, in a similar study by Muto and Yamano (2009), they find that changes in mobile phone networks, a platform for mobile banking, are associated with community characteristics. We control for the non-random placement of the access points by using average regional (provincial) incomes. We then argue that the increase in the financial access points can only affect one's welfare if the individual uses financial services provided by these access points, otherwise the expansion

on its own has no direct impact on one's welfare. This exclusion restriction leads to the estimation of a two-stage form regression in Equation 3 wherein the first stage, financial inclusion (IFI) is regressed on the exogenous variable (access points per capita or the intensity of inclusion) as in Equation 4, and the predicted values of IFI then used as regressors in the welfare regression (Equation 3).

$$\bar{w}_{ct} = \pi \widehat{IFI}_{ct} + \beta \bar{x}'_{ct} + \bar{\alpha}_c + \bar{\varepsilon}_t + \bar{\mu}_{ct}, \quad (3)$$

$$\widehat{IFI}_{ct} = \tau \overline{FinAcc}_{ct} + \rho \overline{inc}_{jt} + \bar{\omega}_{ct} \quad (4)$$

where; \widehat{IFI}_{ct} is the predicted financial inclusion from the first-stage regression (4), \overline{FinAcc}_{ct} is the exogenous financial inclusion variable, \overline{inc}_{jt} is the average individual income in province (j) at time (t) - a proxy for provincial level characteristics, $\bar{\alpha}_c$ and $\bar{\varepsilon}_t$ represent cohort and year fixed effects, respectively, and \bar{x}'_{ct} are cohort level characteristics as defined before.

Finally, we may be concerned about the potential reverse causality between welfare and financial inclusion at an individual level. As the Global Findex data shows, bank account holding is positively correlated with income; a possible implication is that more well-off individuals are likely to use formal financial services. A contra argument could be that this relationship reflects a more stable income stream rather than the amount earned. Assuming that the positive relation was a valid argument, our approach of instrumenting for inclusion would attenuate the resulting bias, since there are both direct and indirect transmission mechanisms as discussed in section 4. Nonetheless, we estimate an additional model incorporating one's initial welfare in the panel regression. Equation 3 thus becomes the final estimable equation in the form of the panel-IV model; however, analysis is also conducted on the pooled cross-sections as a baseline.

Measuring welfare

A wealth index is constructed from ownership of assets and dwelling characteristics as in the Demographic and Health Surveys (DHS) using the Principle Component Approach (PCA).⁶ Table 4 reports the proportion of ownership of these items as well as dwelling characteristics, with the sample split into users versus non-users of formal products in the two cross-sections. The table reports only those items that were consistent across surveys and were thus used to construct the wealth index. While indicators of deprivation would have provided an alternative subjective measure of welfare, these were not consistent in the cross-sectional surveys used in this study. However, an asset approach is often used in poverty studies, and we believe that assets are relevant when using the financial sector to mitigate the effects of negative shocks.

6 See Filmer and Pritchard (1998)[PRITCHETT? CHECK REF LIST] on the technical aspects of the PCA.

Table 4: Summary of the measure of welfare in Zambia (2009-2015)

	2009 (N = 4000)			2015 (N = 8479)			DHS
	Excluded	Included	Total	Excluded	Included	Total	2013-14
Own land	0.347	0.341	0.346	0.508	0.398	0.484	0.617
Own house	0.277	0.445	0.300	0.340	0.554	0.388	N/A
Concrete floor	0.404	0.712	0.446	0.448	0.847	0.537	0.452
Roof material							
Grass	0.516	0.257	0.481	0.393	0.0833	0.324	---
Asbestos	0.201	0.376	0.225	0.107	0.271	0.143	---
Iron Sheets	0.282	0.367	0.294	0.500	0.646	0.533	---
Cooking material							
Charcoal/wood	0.83	0.593	0.798	0.9236	0.621	0.856	0.873
Electricity/paraffin	0.170	0.407	0.202	0.0764	0.379	0.144	0.123
Possession of television	0.299	0.632	0.345	0.337	0.774	0.435	0.36.1
Possession of cellular phone	0.506	0.778	0.543	0.708	0.938	0.769	0.664
No. of people per sleeping room	2.707	2.633	2.697	5.253	4.985	5.193	N/A

Source: Author's compilation from FinScope Zambia (2009-2015) and the Demographic and Health Survey for Zambia (2013-14).

Table 4 shows that there are differences in asset possession between the financially included and their excluded counterparts. Here financial inclusion is simply the use of at least one formal financial service. There is no statistically significant difference in the ownership of land between the two groups even though ownership is higher among the excluded. But there is a higher percentage of ownership of a dwelling place or a house among the included, 44.5% (2009) and 55.4% (2015) compared to 27.7% and 30.0%, respectively, among the excluded over the same period. Users also report better quality of their dwelling places with concrete floors, asbestos and iron roofs and they use modern cooking facilities like electricity and paraffin as opposed to non-concrete floors, grass roofs and use of wood as is the case for the financially excluded. Possession of electronics such as television and cellular phones is high among the financially included, and they also report fewer people sharing a sleeping room. Overall, there is an increase in the ownership of land between 2009 and 2015. There is also an increase in the use of concrete material for floors and less use of alternatives like mud; less use of grass as roofing material, and, less use of modern cooking facilities such as electricity in favour of charcoal and firewood. But the decline in the use of electricity could also be linked to electricity outages reported in the country.⁷ Finally, there is evidence of an increase in electronics especially cellular phones, which reflects the mobile expansion policy undertaken by the country during this period. These statistics are reasonably comparable (where possible) with those

7 See <http://www.worldbank.org/en/country/zambia/overview>

obtained from the Zambia DHS of 2013-14 as shown in the last column of Table 4. Table 5 shows the summary of the composite wealth index constructed from assets in Table 4. The index ranges from -0.985 to 1.415 in 2009 and -1.738 to 0.825 in 2015. The associated median wealth is 0.484 and 0.395 for 2009 and 2015, respectively. There is evidence of an overall decline in welfare between 2009 and 2015. The decline is greater in the rural areas, where the median wealth declined from 0.288 (2009) to 0.147 (2015), than in the urban areas where welfare increased from 0.195 to 0.256 over the same period. Moreover, non-users of formal financial products recorded lower median welfare than users (-0.102 versus 0.628 in 2009 and -0.175 versus 0.472 in 2015). The overall decline in wealth is corroborated by the poverty trend over the period as shown in section 2.

Table 5: Summary of the wealth index

	Mean	2009 SD	Min	Max	Mean	2015 SD	Min	Max
Overall wealth index	-1.41e-06	0.941	-0.985	1.415	3.38e-08	0.926	-1.738	0.825
Median overall wealth	0.484	0.500	0	1	0.395	0.489	0	1
Median urban wealth	0.195	0.396	0	1	0.256	0.436	0	1
Median rural wealth	0.288	0.453	0	1	0.147	0.355	0	1
Financially excluded								
Overall wealth	-0.102	0.918	-0.985	1.415	-0.175	0.967	-1.738	0.824
Median overall wealth	0.436	0.496	0	1	0.301	0.459	0	1
Median urban wealth	0.161	0.368	0	1	0.173	0.378	0	1
Median rural wealth	0.277	0.448	0	1	0.138	0.345	0	1
Financially included								
Overall wealth	0.628	0.837	-0.942	1.414	0.472	0.587	-1.738	0.825
Median overall wealth	0.789	0.409	0	1	0.711	0.453	0	1
Median urban wealth	0.408	0.492	0	1	0.532	0.499	0	1
Median rural wealth	0.355	0.479	0	1	0.179	0.383	0	1

Source: Author's own computations. The composite wealth index ranges from -1.734 to 1.415, with the following wealth quintiles: Poorest (quintile 1): -1.734 - -0.9387; Poor (quintile 2): -0.937 - -0.475; Average wealth (quintile 3): -0.475 - 0.619; Wealthy (quintile 4): -0.619 - 0.946; Wealthiest (quintile 5): -0.946 - 1.415.

Measuring financial inclusion

A composite index for financial inclusion (IFI) is constructed following a similar approach as in Sarma (2015). According to Sarma, financial inclusion is characterised by demand and supply factors, that is, penetration (actual products used by an individual), usage or frequency of use of products and availability of infrastructure or proximity of financial services. While account holding can give an indication of inclusion, taken independently it may mask the true welfare benefits of financial inclusion especially if individuals use other platforms such as mobile phones for transfers and remittances. Considering these arguments, three dimensions are used to construct a composite index of financial inclusion: i) penetration - which is constructed as the intensity of use of financial services and products from the formal or semi-formal financial institution including mobile platforms.⁸ There are four categories of products in this setting: transactions including transfers and payments and mobile money transactions; credit and loans; insurance; and savings and investment. An individual is assigned zero if he/she uses none of these products in the formal setting; 1 if he uses any one product, 2 if he uses any two products, 3 if he uses any three, and finally 4 if he uses products from all four categories. ii) usage - which captures the frequency of using financial services including remittances or transfers or bank transactions made in the past six to 12 months. These services include transfers and payments, borrowing in cash or in kind (such as agricultural supplies, food and other material requirement for home consumption or business inputs), insurance pay-in or cash-out, and frequency of saving. Non-cash transactions were considered for institutions such as agricultural cooperatives (semi-formal) which advance agricultural inputs to farmers. iii) availability - which is proxied by the time taken to get to the nearest point to access financial services such as bank branches or ATMs or mobile money agents. This assignment rule is consistent with financial intermediation and inclusion literature that advocate for reducing transaction cost as barriers to inclusion such as travelling long distances to financial institutions, which costs money and time for potential customers. Moreover, the opportunity cost of these two resources is high especially for the poor (Demirgüç-Kunt et al, 2015). Based on the data collected, travel time varied from less than 30 minutes to over several hours. So, if an individual takes 30 minutes or less, he is capped at 30 minutes and an individual who takes more than one hour is capped at one hour plus (60+) of access time.

To deviate slightly from Sarma (2015), who constructs a country-level IFI, the IFI in this study is constructed at an individual level, as an average of the three sub-indexes constructed from the three dimensions. A dimension index d_i is constructed according to the expression below:

⁸ Formal financial services or products are offered by traditional financial institutions such as banks, insurance companies, etc., while semi-formal products are offered by institutions whose main function is not financial services provision such as cooperatives, retailers, mobile phone agents, group savings and credit schemes that have a formal structure (e.g., SACCOs), etc.

$$d_i = w_i \frac{A_i - m_i}{M_i - m_i} d_i = w_i \frac{A_i - m_i}{M_i - m_i}, i = 1, 2, 3 \quad (5)$$

Where;

- w_i = weight attached to dimension i , $0 \leq w_i \leq 1$
 A_i = actual value of dimension i ,
 m_i = lower bound on dimension i , fixed by some pre-specified rule
 M_i = upper bound on dimension i , fixed by some pre-specified rule

The dimensions are weighted equally. A higher value of d_i is desired, and it ranges between 0 and $W = (w_1, w_2, w_3)$. Everyone has a score $X = (d_1, d_2, d_3)$. An individual is considered included if his/her score is as close to W as possible. This score is the average of the normalized Euclidean distance between X and O (call it X_1) and the normalized inverse Euclidean distance between X and W (call it X_2), given by Equation 4 and Equation 5, respectively. The corresponding IFI is thus given by⁹

$$X_1 = \frac{\sqrt{d_1^2 + d_2^2 + d_3^2}}{\sqrt{w_1^2 + w_2^2 + w_3^2}} \quad (6)$$

$$X_2 = 1 - \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + (w_3 - d_3)^2}}{\sqrt{w_1^2 + w_2^2 + w_3^2}} \quad (7)$$

$$IFI = \frac{1}{2} [X_1 + X_2] \quad (8)$$

Table 6 shows the summary of the constructed composite index of financial inclusion and the three sub-indexes. The distribution of the composite index is skewed towards the right (see also Figure 3), implying that a large proportion of the population is generally above average inclusion. Although there appears to be limited holding of formal products as shown by the mean of the penetration sub-index, there is a reasonable frequency of use of financial services for those who have the formal products. There is evidence of sufficient infrastructure shown by the mean of the availability sub-index relative to the other two sub-indexes (which is the evidence of the financial sector expansion policy).

⁹ See Sarma (2015) for the conceptual argument of this approach.

Table 6: Distribution of the composite and sub-indices

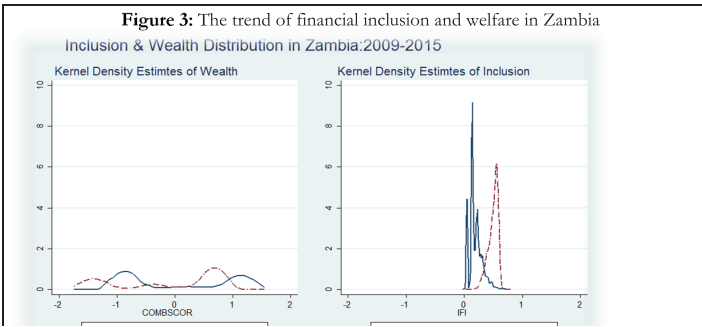
Variable	Obs.	Mean	Std. Dev.	Min	Max
Index of Financial Incl.	11,833	0.339	0.188	-1.27e-08	1
Frequency (D1)	11,833	0.084	0.073	0.000	0.330
Availability (D2)	11,833	0.194	0.194	0.000	0.330
Penetration (D3)	11,833	0.047	0.047	0.000	0.330

Note: Author’s calculations from the FinScope surveys of Zambia (2009–2015).

Figure 3 shows the distribution of financial inclusion and of welfare based on our constructed variables. There is a positive shift in the distribution of financial inclusion, while there is an apparent shift to negative territory for welfare. These two observations are in line with the World Bank report on poverty in Zambia and the Financial Sector Development report for Zambia for 2015. This provides some level of confidence that the measures of welfare and financial inclusion constructed in this study do capture the country’s dynamics for the period under review.

Figure 4 then shows the relationship between welfare and the index of financial inclusion. This figure shows a somewhat non-linear relationship between these two variables, a result that was also reported in Nanziri (2017) for South Africa. The figure shows that lower levels of financial inclusion are associated with negative welfare, but this might be related to the initial welfare position of the individual. Otherwise, there is a positive and monotonically increasing relationship until an optimal level of inclusion is reached, at which point there are no further welfare gains, irrespective of the increase in financial inclusion. The implication of this result is that we should expect varying welfare outcomes following financial inclusion for different individuals. A non-linear relationship between finance and welfare has also been reported at macro level. According to Greenwood and Jovanovic (1990), it is possible to have an increase in inequality due to financial resources being extended to the incumbent users (the intensive margin) or to those entrepreneurs with political connections. In our case, this would be captured in the scores for the different domains used to construct the composite index of financial inclusion.

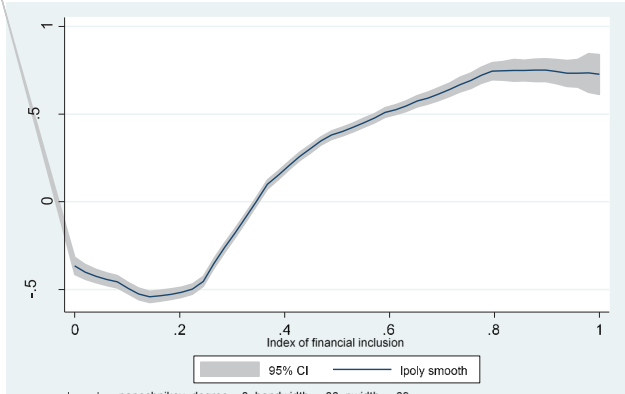
Figure 3: The trend of financial inclusion and welfare in Zambia



Source: Author's compilation of the FinScope surveys for Zambia (2009-2015)

Figure 4: The relationship between the index of financial inclusion and wealth scores in Zambia

Figure 4: The relationship between the index of financial inclusion and wealth scores in Zambia



Source: Author's compilation of the FinScope surveys for Zambia (2009-2015)

Data description

The study uses two repeated cross-sections of the FinScope surveys for Zambia for the period 2009 and 2015. The surveys are part of the Government of the Republic of Zambia’s commitment to expanding financial inclusion in the country. They are nationally representative surveys of consumers’ perceptions and use of financial services, conducted among individuals aged 16 and above. The initial survey was conducted in 2005 but it was not readily available. For the two cross-sections, 400 and 866 enumeration areas (EAs) were selected for 2009 and 2015, respectively, from the census sampling areas, ensuring provincial, rural and urban representation. Ten households were then randomly selected from the EAs and finally, one individual (aged 16 or above) was selected using a Kish table, for a face-to-face interview using a structured questionnaire. Data was collected on access and use of formal and non-formal financial services, and on indicators of wellbeing including housing

characteristics and possession of durable items. The sample size is 4,000 and 8,500 respondents in 2009 and 2015, respectively, weighted to be nationally representative.

Table 7: Summary of the data

		(1)	(2)	(3)	(4)
		2009	2015	Pooled Excluded	Included
Variable		Mean	Mean	Mean	Mean
Gender	Male	0.489	0.490	0.466	0.595
	Female	0.511	0.510	0.534	0.405
Marital Status	Never married	0.283	0.222	0.255	0.223
	Living with partner	0.604	0.637	0.611	0.672
	Separated/Divorced	0.056	0.070	0.067	0.051
	Widowed	0.056	0.071	0.067	0.055
Education	No formal education	0.084	0.065	0.087	0.014
	Primary school	0.474	0.615	0.612	0.293
	High school	0.374	0.310	0.290	0.551
	Post high school	0.068	0.011	0.012	0.142
Monthly income	No income	0.466	0.441	0.490	0.293
	Up to K200	0.212	0.158	0.205	0.070
	K201 – 600	0.165	0.164	0.178	0.112
	K601 – 1000	0.062	0.083	0.063	0.121
Region	Over K1000	0.094	0.155	0.064	0.403
	Rural	0.625	0.548	0.619	0.420
	Urban	0.375	0.452	0.381	0.580
	Central	0.113	0.096	0.103	0.102
Province	Copperbelt	0.176	0.166	0.172	0.163
	Eastern	0.126	0.113	0.119	0.120
	Luapula	0.073	0.070	0.076	0.050
	Lusaka	0.148	0.193	0.167	0.202
Source of money	Northern	0.120	0.133	0.128	0.125
	North West	0.055	0.051	0.052	0.054
	Southern	0.117	0.115	0.111	0.137
	Western	0.073	0.064	0.072	0.048
Source of money	Salary	0.162	0.192	0.114	0.442
	Farming	0.435	0.194	0.314	0.160
	Family	0.024	0.336	0.245	0.124
	Self-employed	0.337	0.211	0.263	0.238
N	Other	0.041	0.067	0.063	0.037
		4,000	8,479	9,984	2,495

Source: Author's compilation from the FinScope surveys for Zambia (2009–2015).

Table 7 shows the summary of the data by financial inclusion status per year. Columns 1 and 2 show a slightly higher proportion of females than males. Up to 60% of the sample is married or living with a partner, and up to 92% have at least primary school level of education. However, 46% report no monthly income, although this figure slightly decreased to 44% in 2015. There is a rural-urban balance over the period of this study, similarly for the provincial distribution except for Luapula, North West and Northern provinces. The data also shows that by 2015, fewer people reported farming and self-employment, which were the major sources of money in 2009. For example, farming declined from 43% to 19%, while self-employment declined from 33% to 21% in 2009. The reduction in farming can be attributed to the rain shocks highlighted in section 2. Another striking statistic is the increase in the number of individuals who reported family/other sources as their major source of income in 2015. However, it is not clear whether these are transfers/remittances or family payment for services rendered. Disaggregating the pooled data by inclusion status, columns 3 and 4 show that, the included are mainly males, married or living with a partner, with at least high school level of education, earning over K1000, urban dwellers and mainly

salaried. On the other hand, the excluded are predominantly females with primary school level of education, rural dwellers and earning no income. This distribution is consistent with global trends as summarized in Demirgüç-Kunt and Klapper (2013) and Demirgüç-Kunt et al (2015).

Age cohorts are constructed from these two surveys using one-year age range starting from 16 years, which is the legal age for engagement in the financial sector. Age is capped at 65 years, which is in line with Zambia's retirement age. This age cut-off was also used by Deaton (1985) when analysing consumption, poverty and welfare arguing that there is limited contribution to economic activity beyond this age. An additional 16% of the 2015 sample were not assigned to any cohort and were thus dropped. These are individuals who were between 10 and 15 years in 2009 and they were thus not eligible for the survey because they were below the age for financial sector participation. Overall, cohort composition ranges from five to 485 individuals. However, Verbeek and Nijman (1992; 1993) recommend that in empirical studies, cohorts should have a minimum of 100 individuals to minimize bias and imprecision of estimates. Subsequently, cohorts with less than 100 members were dropped from the estimation for sensitivity of results. After all these considerations, a total of 50 cohorts were obtained, corresponding to one-year age groups, yielding a usable sample of 10,300 individuals. Appendix Table A1 shows the summary of the final cohorts used for the analysis.

5.0 Results

Multivariate estimates of the effect of financial inclusion on welfare

Table 8 reports the estimation results for model 3. Columns 1 to 3 show the cross-section results for the pooled sample. We see that financial inclusion significantly improved welfare between 2009 and 2015 either directly or indirectly through the mechanisms discussed in the preceding section. Given that the financial sector deepening policy emphasized improving access in rural areas, we split the sample by location. Results in column 3 suggest that the policy can be associated with a positive welfare in rural areas, although at a lower level of significance compared to the urban results in column 2.

Our best results are the panel-IV results in column 4 which show that the positive effect is even larger. The effect is significant when we control for all possible observable characteristics and year and cohort fixed effects where financial inclusion led to an increase in average welfare by 1.2 percentage points in 2015. These results suggest that financial inclusion had the effect of moving individuals from a lower to a higher wealth quintile. Consider the cut-off points for the wealth quintiles constructed from the wealth index: Poorest (quintile 1): -1.734 - -0.9387; poor (quintile 2): -0.937 - -0.475; average (quintile 3): -0.475 - 0.619; wealthy (quintile 4): -0.619 - 0.946; wealthiest (quintile 5): -0.946 - 1.415. If, for example, we consider the bounds in each quintile, and increase them by 1.2 percentage points, we notice the resulting values correspond to a higher quintile, i.e. -1.713, -0.927, -0.469, 0.626, 0.957 especially for individuals close to the upper bounds. Thus, in terms of wealth/poverty, we can intimate the potential role of financial sector deepening initiatives in assisting individuals to transition out of poverty, although not for the very poor. These results are consistent with empirical work such as Burgess and Pande (2005) for India. The panel results for the sub-samples are presented in columns 5 and 6. They show that the effect of financial inclusion is significant only in the rural areas.

Initial welfare is accounted for in columns 7 to 9. The positive effect of financial inclusion on welfare persists, although neither previous welfare nor its interaction with financial inclusion is significant in the model. A possible explanation for this lack of significance might be the seven-year gap between current and past welfare. In other words, one's welfare in 2009 does not seem to influence his financial sector engagements to impact current welfare outcomes in 2015. Although results are not shown here, we control for past inclusion status and we find no statistical significance

that financial inclusion in 2009 affects current inclusion and welfare in this setting. A few studies, however, have reported a positive long-term welfare trajectory following financial inclusion. For example, Khandker and Samad (2013) report positive welfare outcomes after following entrepreneurs for 20 years. On the other hand, Burgess and Pande (2005) find improved welfare of poor rural farmers in the period immediately after the rural bank expansion experiment in India, but the effect becomes insignificant in the long run. We can, therefore, infer from our results that we are in the world of Burgess and Pande (2005).

Although results are somewhat noisy, the subsample results in columns 8 and 9 show consistency once again, in rural areas than in urban areas. Previous welfare seems to reverse the positive welfare outcomes in urban areas that are observed in the cross-sections. However, this result should be interpreted with a caveat. First, we are not able to establish whether the rural and urban locations were stable between 2009 and 2015. According to the Zambia Central Statistics Office, the population of Zambians in urban areas increased from 37% to 42% between 2006 and 2016. This implies that urban areas might have expanded, perhaps to absorb some rural areas. This leads to the second phenomenon of rural-urban migration. Quite often migrants move in search of better welfare prospects. In this case, we can argue that the observed welfare outcomes are a combination of the less wealthy migrants to urban areas, subsequently putting a downward pressure on the longitudinal welfare outcomes in urban areas. The consistency of the rural subsample results, however, suggest that indeed the rural areas benefitted from the financial inclusion through the financial sector deepening policy.

Table 8: Multivariate estimates of financial inclusion and welfare in Zambia (2009–2015)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pooled cross-sections (2SLS)			Pseudo-panel IV			Pseudo-panel with lagged welfare		
	Full sample	Urban	Rural	Full sample	Urban	Rural	Full sample	Urban	Rural
Financial Inclusion	0.996*** (0.170)	0.593*** (0.198)	0.444* (0.269)	1.230*** (0.351)	-0.963 (0.650)	2.522* (1.250)	2.675*** (0.779)	-0.975 (2.835)	7.441* (4.196)
Previous welfare							-0.929 (1.948)	-1.030 (1.774)	-3.134 (2.126)
Inclusion*welfare _{t-1}							2.258 (5.389)	2.557 (4.008)	10.360 (8.029)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.253***	-0.156	-1.117***	-0.510**	1.060	-0.375	-1.100	0.724	-2.882**

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Covariates include age, education, gender, income, marital status, province and provincial average income (proxy for location-level characteristics). The sample size declines when welfare is lagged.

Robustness

Income as a measure of welfare

Income has often been used as a measure of welfare in many living conditions surveys because the consumption of goods and services depends on the amount of income available to an individual (LCMS, 2016). Although criticized for measurement error due to misreporting by respondents, we nonetheless compute the median income of individuals as an alternative measure of welfare and re-estimate model 3. A quick overview of changes in personal incomes, deflated using 2009 as base year, is provided in Appendix Table A2, for the period under review. First, there is evidence of an increase in incomes across income categories. There are also fewer individuals reporting 'no income' in 2015. Possible sources of these changes in incomes include the social welfare support programmes which Zambia has implementing since 2010. This would account for the reduction in the 'no income' respondents. A second source would be the increase in economic activity in the respective regions, which would indirectly benefit inhabitants as discussed earlier. Indeed, Fafchamps and Schündeln (2013) find that financial development (existence of banks) increases firms' investment and productivity. A key factor input in such investments would be labour, which attracts incomes as wages or as profits for the investors.

Results in Table 9 show estimates of model 3 replacing the wealth index with the log of income. The results are almost similar although the pseudo-panel model seems to have more explanatory power. Overall, the results suggest that the increase in financial inclusion had the effect of increasing incomes by between 13.12% and 15.83%. In the sub-samples, while the effect is positive, it is only statistically significant in urban areas, ranging from 19.62% to 20.89%. To put these results into perspective, the average incomes for the extremely poor in Zambia were kwacha 546,000 and 745,000 for 2009 and 2015, respectively (figures reported in 2009 prices before the re-basing policy¹⁰). Thus a 13.12% increase in an income of kwacha 546,000 (in the panel setting) would translate into kwacha 617,635 in 2015. Thus, although incomes increased for a financially included individual, the increase was not sufficient to move above the poverty line in 2015. Thus, even when we consider the negative macro-economic environment in the country over the period of this study, this result shows that the financial sector deepening had some positive welfare gains for the financially included "income poor" people.

Reconciling these results with those in the previous section, it appears that the wealth index is more sensitive in rural areas while the income measure is more sensitive in urban areas. A possible interpretation of these results can be found in

10 The Zambian kwacha was rebased on January 1, 2013. The exercise saw the currency divided by one thousand (1000), which was equivalent to removing three zeros (000). For more information on the exercise see <http://www.boz.zm/17-2012.pdf>, downloaded on August 04, 2018.

the evaluation of the cash transfers. According to the America Institutes for Research (2015), cash transfers to poor households (often disbursed through formal financial mechanisms) were used to improve the quality of housing as opposed to consumption. These changes in the quality of dwellings are what we captured in the wealth index (i.e., material used for the floor, roofing and walls of dwellings and the cooking technologies). Majority of social grants recipients are also based in rural areas. The value of the cash transfer is small compared to incomes in urban areas. Hence, even though incomes rise in rural areas, the increase is not significant compared to the increase in incomes in urban areas.

Table 9: Multivariate estimates of financial inclusion and income

	(1)	(2)	(3)	(4)	(5)	(6)
	Pooled cross-sections (2SLS)			Pseudo-panel (IV)		
Variables	Full sample	Urban	Rural	Full sample	Urban	Rural
Financial Inclusion	15.830*** (2.193)	19.620*** (3.521)	8.539 (5.872)	13.120*** (2.584)	20.89*** (3.855)	2.081 (5.717)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cohort FE	No	No	No	Yes	Yes	Yes
Constant	-11.110** (4.793)	-9.574 (6.535)	-15.410*** (5.044)	-63.198** (26.165)	-42.286* (23.360)	-6.196 (35.61)
Observations	10,248	5,279	4,969	86	86	86
R-squared	0.117	0.039	0.106	0.765	0.719	0.496

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The dependent variable is log of income as a proxy for welfare. Covariates include gender, marital status, rural/urban dummy (except in the subsample), education and province.

Extension of the analysis

The intuition behind a change in the value of an index is not often straightforward especially for policy. For example, the results in the preceding sections show that an increase in the Index of Financial Inclusion can improve welfare by 1.2 percentage points in general and by up to 2.5 percentage points in rural areas (Table 8). Which dimension of the financial inclusion index is driving the results, or which category of items in the wealth index is responding to the inclusion? In this section, we disaggregate the Index of Financial Inclusion into its three dimensions and the wealth index into the respective items, and we re-estimate the main model 3.

Disaggregating the index of financial inclusion

Recall the dimensions of financial inclusion: penetration (which is the number of products held ranging from 0 to 4), availability (which is proxied by the time in minutes taken to get to financial service points and coded as 0 to 3), and frequency (which is a binary variable, in response to whether one has made use of financial services in

the past 12 months). Dummies are generated for the categories of the penetration and the availability dimensions and used as regressors in model 3.

Results reported in Table 10 compare the pooled cross-section and the pseudo-panel estimates as before. Notwithstanding the bias associated with estimating a linear model in this setting, results in column 1 show that proximity and a greater number of product holding increase the user's welfare on average. That is, proximity of less than 60 minutes is associated with better welfare as is holding at least one financial product. On the other hand, frequency of use does not significantly affect one's welfare. In the panel setting, results in column 2 show that being farther away from financial services is actually associated with better welfare. This result suggests that the inclusion policy actually reached rural areas. As mentioned earlier, distance to financial institutions is a barrier to financial inclusion globally (see for example Allen et al, 2012; Demirgüç-Kunt et al, 2015). These results provide some evidence that removing such barriers can have a positive impact on financial services users. On the other hand, frequency of use is insignificant and intensity of use is only significant at one product. The intuition of this result can be exemplified by say, holding a savings account. What matters to a savings account holder might not necessarily be the frequency of deposits but rather the availability of funds when the need arises. Demirgüç-Kunt et al (2015) argue that a transactional account is good enough because it can spur the use of additional products. We can, therefore, argue that proximity of financial services is a necessary condition for intensity of product holding and frequency of use. Appendix Figure A1 shows that major changes in product uptake were recorded in the categories of transactions (including mobile money accounts for remittances and bill payments), insurance and savings. An extension of this study would be to conduct analysis by product category.

Table 10: Disaggregating the index of financial inclusion

Variables	(1)	(2)
	Pooled 2SLS	Pseudo-panel (IV)
Availability		
Over 60 minutes	-0.208*** (0.027)	0.832* (0.449)
Between 31 and 60 minutes	0.291*** (0.029)	0.308 (0.497)
Up to 30 minutes	0.715*** (0.025)	0.354 (0.508)
Penetration = No. of products		
1	0.317*** (0.024)	0.710 (0.474)
2	0.463*** (0.046)	1.017 (1.176)
3	0.459*** (0.078)	0.855 (1.880)
4	-0.258 (0.780)	-1.580 (8.340)
Frequency =		
Actively using services	-0.021 (0.021)	-0.459 (0.281)
Covariates	Yes	Yes
Year FE	Yes	Yes
Cohort FE	No	Yes
Constant	0.039 (0.035)	-0.911 (0.558)
Observations	9,004	86
R-squared	0.308	0.868

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The dependent variable is welfare proxied by the wealth index. Covariates include income, education, gender, region (rural/urban and province).

Disaggregating the wealth index

As argued in the preceding sections, asset wealth is crucial in the reduction of poverty, and it can be built with access to finance. But which one of the items used to construct the wealth index was affected by financial inclusion in this setting? The items used to construct the wealth index were all captured as binary variables in response to whether an individual 'owned/used' or 'did not own/use' a particular item. A linear estimation of model 3 for each of the items, however, would yield coefficients that

are either below zero or above one, thus violating the probability range of (0 – 1). We, therefore, estimate a fixed effects logit model for panel data which allows us to obtain consistent estimates of β and π . This model also has an added advantage that we do not have to worry if unobserved time invariant cohort effect $\bar{\alpha}_c$ are related to the observable characteristics \bar{x}_{ct}' to influence the welfare outcomes. The key assumption here is that welfare (in this case asset possession), changed between the two periods (2009 and 2015), so that we condition the probability that one acquired an asset, on the sum of the outcomes \bar{w}_{c1} and \bar{w}_{c2} to get rid of the cohort effects (see Wooldridge, 2005). To illustrate this, let us start from a simplified version of model (3) as $W_{ct} = \delta X_{ct} + \bar{\alpha}_c$, where W is a vector of the assets, X is a vector of cohort characteristics including financial inclusion plus a constant, and other arguments are omitted for illustrative purposes only. We can then write the probability expressions for the outcomes in periods 1(2009) and 2(2015) given characteristics in both periods as:

$$\Pr(\bar{Y}_{c1} = 0, \bar{Y}_{c2} = 1 | \bar{X}_{c1}, \bar{X}_{c2}, \bar{\alpha}_c) = \frac{1}{1 + \exp(\bar{X}_{c1}\delta + \bar{\alpha}_c)} \frac{\exp(\bar{X}_{c2}\delta + \bar{\alpha}_c)}{1 + \exp(\bar{X}_{c2}\delta + \bar{\alpha}_c)} \quad (9)$$

Then conditioning on $\bar{Y}_{c1} + \bar{Y}_{c2} = 1$ $\bar{Y}_{c1} + \bar{Y}_{c2} = 1$,

$$\Pr(\bar{Y}_{c1} = 0, \bar{Y}_{c2} = 1 | \bar{X}_{c1}, \bar{X}_{c2}, \bar{\alpha}_c, \bar{Y}_{c1} + \bar{Y}_{c2} = 1) = \frac{\exp(\bar{X}_{c2}\delta + \bar{\alpha}_c)}{\exp(\bar{X}_{c1}\delta + \bar{\alpha}_c) + \exp(\bar{X}_{c2}\delta + \bar{\alpha}_c)} \quad (10)$$

Such that,

$$\Pr(\bar{Y}_{c1} = 0, \bar{Y}_{c2} = 1 | \bar{X}_{c1}, \bar{X}_{c2}, \bar{Y}_{c1} + \bar{Y}_{c2} = 1) = \frac{\exp(\Delta \bar{X}_{c2}\delta)}{1 + \exp(\Delta \bar{X}_{c2}\delta)} \quad (11)$$

$$\Pr(\bar{Y}_{c1} = 1, \bar{Y}_{c2} = 0 | \bar{X}_{c1}, \bar{X}_{c2}, \bar{Y}_{c1} + \bar{Y}_{c2} = 1) = \frac{1}{1 + \exp(\Delta \bar{X}_{c2}\delta)} \quad (12)$$

With a resulting log likelihood function given by,

$$\log L = \sum_{c=1}^N \left\{ d_{01c} \ln \left(\frac{\exp(\Delta \bar{X}_{c2}\delta)}{1 + \exp(\Delta \bar{X}_{c2}\delta)} \right) + d_{10c} \ln \left(\frac{1}{1 + \exp(\Delta \bar{X}_{c2}\delta)} \right) \right\} \quad (13)$$

We then maximize the log likelihood function to obtain consistent coefficients because the cohort unobserved fixed effects are eliminated from the final expression (13). Given that the items/assets are not necessarily mutually exclusive, it is not possible to group them in any way. We, therefore, run a regression for each of them. These regressions yield the probabilities of acquiring or using a particular item if an individual is financially included.

Table 11 reports the pseudo-panel estimates from the fixed effects logit model. Firstly, the probability of owning land declines the shorter the time taken to get to

financial services, as with holding of multiple products as shown in column 1. In fact, being more than 60 minutes away from a financial services access point is not significant at all. Land is often a rural phenomenon and rural areas are poorly serviced by financial institutions. The result is probably capturing distance away from urban areas where financial services are relatively closer to individuals. Land is also either customary or it belongs to the state. Overall, there is probably no direct relationship between land and financial services per se in Zambia. Indeed Smith (2004) found that agricultural development indicators such as access to credit are negatively related to, for example, matrilineal land acquisition in Zambia.

A second result is that proximity and a higher number of product holding increase the probability of owning a dwelling place or house as shown in column 2. Suffice to say that multiple product holding is a common practice in the financial sector, especially with credit facilities. For example, a mortgage account would attract a transactions account and an insurance product to protect the property. Also, a house can be used as collateral in the acquisition of investment funds. In this regard, we cannot disentangle whether it is a case of more products leading to better welfare outcomes, or if it is the ownership of the dwelling that leads to the use of financial products. Nonetheless, proximity makes either argument possible, thus improving one's overall welfare.

Thirdly, proximity, and to a certain extent intensity of products holding, increases the probability of using concrete material for dwelling floors (column 3) and/or using iron sheets for dwelling roofs compared to using lower quality materials like grass for roofing (see column 4). There is also evidence of a higher probability of using modern cooking methods like electricity and paraffin (column 5) and even owning a television (column 6). To some extent, these characteristics are peculiar to urban or wealthier households, but the results show that the changes observed in the descriptive statistics provided in Table 4 are significant. The probability of owning a cellular phone increases with proximity to financial access point (column 7). However, in the wake of the mobile money technology, the significance of this result could be reflective of low usage of mobile phones for financial transactions in Zambia. With a cellular phone penetration of 77%, only 18% of Zambians in 2016 used mobile money accounts up from 2% in 2014.¹¹ This is a very low fraction compared to over 66% of the population in Kenya, Rwanda, Tanzania and Uganda.¹² But like other indicators, the probability of acquiring cellular phones increased for holders of multiple financial products, which might be an indicator of affordability.

Finally, column 8 shows that the probability of many people sharing a sleeping room increases with distance from financial access points, but decreases with holding

11 See <http://www.uncdf.org/article/2541/the-state-of-the-digital-financial-services-dfs-industry-in-Zambia>, downloaded on August 04, 2018.

12 See GSMA's 2017 State of the Industry Report on Mobile Money from <https://www.gsma.com>

just one financial product although at a 10% level of significance. In poverty surveys, such as the Demographic and Health Surveys (DHS) and the Living Conditions Monitoring Surveys (LCMS), a large number of people sharing a sleeping room are associated with rural areas or less wealthy households that cannot afford large dwellings or houses. It is worth noting that proximity alone cannot influence this indicator, but rather that households use the relevant services offered by the now closer service providers to improve their living conditions. Thus, compared to the summary statistics in Table 4, this result suggests that the use of at least one financial product reduces the probability of many people sharing a sleeping room, which is indicative of better welfare.

Overall, this disaggregation shows that ownership of more durable or valuable items such as a dwelling, and items related to the quality of the house were positively affected by the financial inclusion drive. The proximity dimension of financial inclusion, and to some extent the number of products held, facilitated this positive effect. For Zambia, as noted earlier, these results corroborate findings from the evaluation of the social grants programme which showed that recipient households improved their long-term welfare outlook by investing in their dwellings than focusing on immediate consumption.

Table 11: Disaggregating the wealth index

Variables	Own land (1)	Own house (2)	Concrete floor (3)	Iron roof (4)	Cook modern (5)	Own TV (6)	Own cellphone (7)	No. of people sharing room (8)
Availability								
Over 60 minutes	0.127 (0.249)	-0.316 (0.210)	0.071 (0.135)	0.285** (0.131)	-0.059 (0.0956)	0.031 (0.129)	0.240 (0.145)	3.195*** (0.995)
Between 31 and 60 minutes	-0.764** (0.310)	0.349 (0.261)	0.190 (0.168)	0.321* (0.163)	0.180 (0.119)	0.345** (0.161)	0.368** (0.181)	2.038 (1.239)
Up to 30 minutes	-1.430*** (0.209)	0.935*** (0.176)	0.686*** (0.113)	0.564*** (0.110)	0.482*** (0.080)	0.638*** (0.108)	0.660*** (0.122)	0.107 (0.834)
Penetration = no. of products	0.810***		0.185	0.199	-0.028	0.033	0.060	-1.929*
1	(0.265)	-0.659*** (0.223)	(0.143)	(0.140)	(0.102)	(0.137)	(0.155)	(1.060)
2	2.180*** (0.544)	-1.455*** (0.458)	-0.211 (0.294)	-0.266 (0.286)	-0.128 (0.209)	-0.021 (0.282)	-0.409 (0.317)	1.702 (2.172)
3	2.109 (1.279)	-1.388 (1.077)	-0.711 (0.691)	-0.243 (0.673)	0.352 (0.490)	-0.944 (0.663)	-1.133 (0.745)	4.602 (5.110)
4	3.210 (4.827)	-2.107 (4.065)	-2.650 (2.609)	0.891 (2.542)	-1.023 (1.852)	-3.739 (2.502)	-4.999* (2.812)	-11.04 (19.29)
Frequency = Actively		0.157	-0.127	0.0134	-0.0161	-0.0524	-0.167	-0.034
using services	0.395** (0.192)	(0.162)	(0.104)	(0.101)	(0.074)	(0.099)	(0.112)	(0.767)
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	(0.049)	(0.041)	(0.026)	(0.026)	(0.019)	(0.025)	(0.028)	(0.194)
Constant	0.054 (0.371)	0.606* (0.313)	0.420** (0.201)	0.031 (0.195)	0.028 (0.142)	0.404** (0.192)	0.623*** (0.216)	2.007 (1.483)
Observations	86	86	86	86	86	86	86	86
R-squared	0.698	0.634	0.767	0.859	0.529	0.776	0.889	0.940

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The table shows separate fixed effects panel estimates of financial inclusion indicators on various assets. All the variables shown in the table enter as dummies in the regressions. The dependent variable appears at the top of each column. Covariates include income, education, gender, region.

6. Conclusion

The objective of this study was to investigate the nature of welfare gains following a financial access policy. Using individual level cross-section survey data from Zambia, we construct a pseudo-panel to allow for inference in a panel setting. This makes the results of this study both relevant and novel for this country and for similar parts of Africa where panel data is scarce and financial inclusion initiatives are being tested.

The analysis reveals differences in welfare outcomes based on the measure of welfare and on the location of the individual. Using an asset-based wealth index, our results show that there were relatively higher welfare gains in rural areas. On the other hand, a monetary measure such as personal income shows that financial inclusion was accompanied by an increase in incomes, but the effect is significant in urban areas. Irrespective of the measure used however, the effect of financial access changes was to move individuals from lower wealth quintiles, but not above the income poverty line. These results are robust when we account for location-specific characteristics as well as personal initial welfare.

There is evidence of investment of items with a long-term outlook, and which improve the quality of life (such as acquiring homes, improving the quality of homes, using better cooking technologies). Disaggregating the composite index of financial inclusion shows that proximity to financial services points of below 60 minutes had a positive and significant effect on welfare. This emphasizes the point on getting financial services closer to households. A key observation from the study is that the intensity of products holding is only secondary after financial access has been guaranteed. Thus, studies which use the extent of product holding as a proxy for financial inclusion (see Demirgüç-Kunt et al, 2015), assume that proximity/access is guaranteed in the first instance, which is not often the case.

There are a few limitations. Given that there were other poverty reduction initiatives pursued during the period of this study (such as social support grants and agricultural subsidies), there isn't enough information in the data to tease out their effect. However, it appears that these initiatives were complemented by the changes in financial access, the combined effect of which was the positive welfare outcomes we observe. The second limitation relates to information on rural-urban migration over the period of the study, which makes the results of our subsample analysis ad hoc and not conclusive. Relatedly, we are not able to confirm that rural and urban locations remained as such over the period of our study. An example is the creation

of the 10th province. This change in boundary lines has implications for the domicile affiliation of individuals over the years. Finally, over a seven-year period, there were negative macro-economic shocks that could not be thoroughly accounted for. However, these would only make our results under-estimates of the true effect of the financial inclusion drive. In considering these shortcomings, our results can be interpreted as average treatment effects.

The main policy implication from these results is to reinforce the expansion of financial services to rural areas and to make credit more attractive since there was least use of credit services. Credit services could also improve rural incomes. The evident investment in long-term assets suggests that indeed financial access policies have the potential of reducing rural poverty.

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Appendix

Table A1: Summary of the cohorts

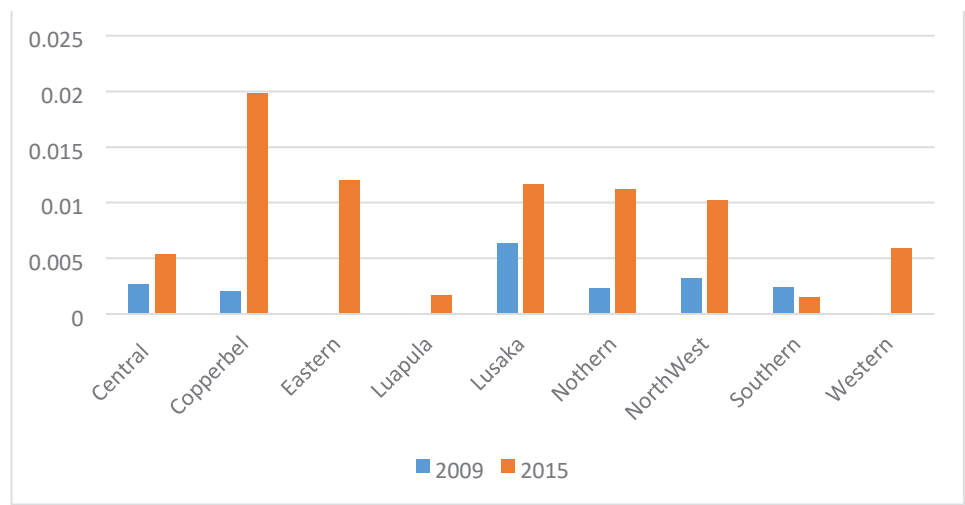
1 Year cohort	2009	2015	Total
16-16	105	322	427
17-17	119	345	464
18-18	144	270	414
19-19	113	358	471
20-20	138	283	421
21-21	104	244	348
22-22	140	345	485
23-23	122	213	335
24-24	135	328	463
25-25	145	171	316
26-26	142	320	462
27-27	133	173	306
28-28	122	201	323
29-29	134	293	427
30-30	135	170	305
31-31	97	153	250
32-32	123	194	317
33-33	106	167	273
34-34	92	197	289
35-35	132	110	242
36-36	89	174	263
37-37	76	124	200
38-38	73	73	146
39-39	77	152	229
40-40	81	96	177
41-41	74	83	157
42-42	64	84	148
43-43	40	73	113
44-44	38	130	168
45-45	73	70	143
46-46	36	79	115
47-47	46	60	106
48-48	52	70	122
49-49	45	72	117
50-50	44	68	112
51-51	34	41	75
52-52	39	57	96
53-53	30	40	70
54-54	25	68	93
55-55	31	43	74
56-56	27	56	83
57-57	33	39	72
58-58	24	33	57
59-59	22	63	85
60-60	27	0	27
61-61	26	0	26
62-62	31	0	31
63-63	18	0	18
64-64	15	0	15
65-65	27	0	27
Total	3,798	6,705	10,503

Table A2: Changes in monthly personal income in Zambia (2009–2015)

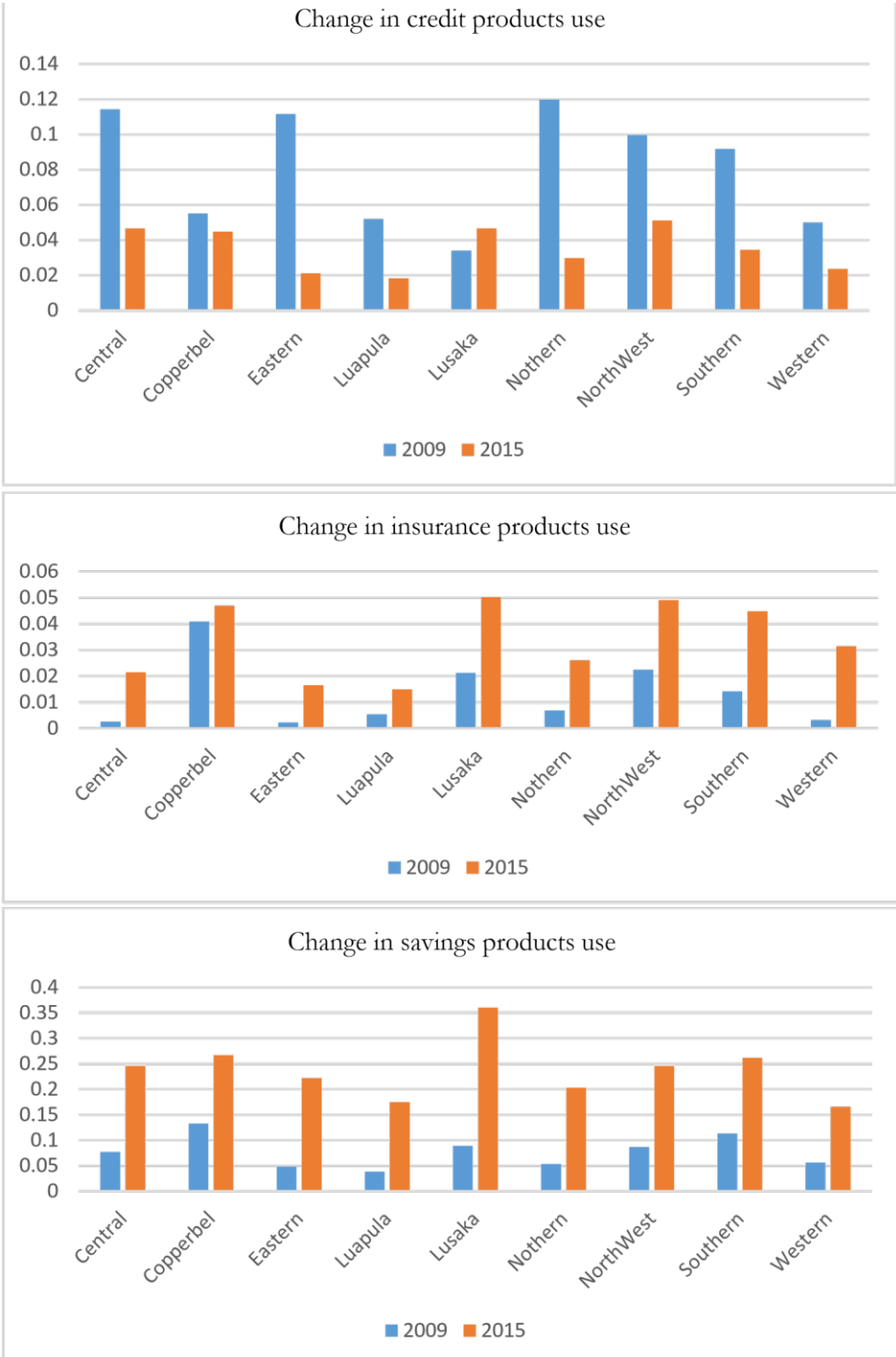
Monthly income in ‘000s	2009	2015
No income	54.9	42.94
Less than K50	3.55	6.26
K51 - K100	6.48	6.27
K101 - K150,	3.77	4.13
K151 - K200	3.92	4.89
K201 - K300	5.7	3.61
K301 - K400	3.98	6.86
K401 - K600	4.95	4.73
K601 - K800	2.7	5.19
K801 - K1,000	1.93	2.32
K1,001 - K5,000	7.42	11.45
K5,001 - K10,000	0.55	1.04
Over K10,000	0.15	0.29

Source: Author’s compilation from FinScope surveys (2009–2015). Income is reported in the 2009 values before rebasing and adjusted for inflation using 2009 as the base year.

Figure A1: Changes in the use of financial services in Zambia (2009–2015)



Source: Author’s own computation. The figure shows the proportion of individuals who reported using formal financial products in each category between 2009 and 2015. The data is weighted to be nationally representative.





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