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Inequality in Financial Inclusion and Income Inequality

by Goksu Aslan, Corinne Deléchat, Monique Newiak, and Fan Yang

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Inequality in Financial Inclusion, Gender Gaps, and Income Inequality

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Abstract

We investigate the link between gender inequality in financial inclusion and income inequality, with three contributions to the recent literature. First, using a micro-dataset covering 146,000 individuals in over 140 countries, we construct novel, synthetic indices of the intensity of financial inclusion at the individual and country level. Second, we derive the distribution of individual financial access "scores" across countries to document a "Kuznets"-curve in financial inclusion. Third, cross-country regressions confirm that our measure of inequality in financial access is significantly related to income inequality, above and beyond other factors previously highlighted in the literature.

JEL Classification Numbers: G19, J16, O11

Keywords: Financial inclusion, financial development, gender inequality, income inequality, sub-Saharan Africa

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I. INTRODUCTION

1. There are many reasons to examine potential drivers of income inequality. First, a more equal income distribution may be a policy goal in itself, and has indeed gained renewed attention worldwide after the global financial crisis. In addition, there are various channels through which income inequality can affect other macroeconomic variables, in particular growth. While some income inequality can provide incentives to economic activity or the minimum capital to some individuals (Lazear and Rosen 1981; Barro 2000), inequality of wealth and income can (i) lead to underinvestment in human capital (Galor and Zeira 1993) therefore resulting an inefficient allocation of talent, (ii) decrease aggregate demand (Carvalho and Rezai 2014), (iii) impede intergenerational mobility (Corak 2013), and (iv) pose social stability risks. Indeed, a large body of literature has shown that less equal income distributions are associated with lower average growth and shorter growth spells (Dabla-Norris and others 2015; Ostry, Berg and Tsangarides 2014; Hakura and others 2016).

2. By examining the impact of (gender-) inequality in financial access on income inequality, this paper contributes to the following strands of the literature.

- *Finance and inequality.* In earlier studies, financial depth is typically measured by private sector credit or broad money to GDP (reviewed in Beck, Demirguc-Kunt and Levine, 2007, and Claessens and Perrotti, 2007), while more recent papers look into the macroeconomic impact of breadth of financial access —or financial inclusion as a multidimensional concept, rather than just depth (Dabla Norris and others 2015, Han and Melecky 2013; Merothra and Yetman 2015; Sahay and others 2015). The existing empirical evidence points to a significant impact of financial development on poverty and inequality reduction, but to our knowledge there are no cross-country empirical studies of broader concepts of financial *inclusion* and income inequality.

- *The macroeconomic effects of gender*. This body of the literature finds that inequality of economic opportunities for women, in particular inequality in access to education and health, is associated with lower growth and higher income inequality overall, and especially in low-income countries (Klasen 1999; Klasen and Lamanna 2009; Gonzales and others 2015b, Hakura and others 2016, Dabla-Norris and others 2015b, IMF 2015, World Bank 2011). While a systematic bias against women's financial inclusion is well documented (Allen and others 2012; Demirguc-Kunt, Klapper and Singer 2013), no empirical study zooms into the relationship between gender biases in financial inclusion, their distribution within the population, and income inequality.[1]

[1]Amin et al. (2015) study gender inequality and growth, using a broad gender inequality index. They find a strong negative relationship between growth and gender inequality, but which mostly holds for low income countries and tends to vanish at higher income levels. Konte (2015) investigates the impact of gender-based

- *Financial access and income inequality in sub-Saharan Africa.* Our analysis is particularly relevant for sub-Saharan Africa, where both gender and income inequality are significantly higher than in other regions, and financial access to formal financial services is comparatively low, in particular for women (Allen and others 2012; Aterido, Beck and Iacovone 2013; Demirguc-Kunt, Klapper and Singer 2013; Demirguc-Kunt and Klapper 2013; IMF 2015).

3. We construct novel indices of financial inclusion based on micro-level data to capture both the level and the distribution of financial access in a country. We exploit the microeconomic data collected to build the Findex data base, consisting in world-wide GALLUP surveys on financial inclusion, with representative samples of about 1,000 individuals per country (a total of about 146,000 observations on over 140 countries, 34 of which are from sub-Saharan Africa). By relying on individual data to construct a synthetic measure of financial inclusion, it is possible to aggregate information on the types and intensity of use of different financial services by individuals. For example, one can find out whether, at the individual level, certain financial services are substitutes or complements, whereas the aggregated country data will only give information on the share of the population using either formal or informal services.

4. The micro-level data also allows to assess the equality of the distribution of financial services within each country—which follows a Kuznets-type relationship. Similarly to the construction of a Gini coefficient from individual household data, we derive Gini coefficients of inequality of financial access from the micro-level data. The pattern in the inequality in financial access is strongly reminiscent of the Kuznets curve: At lower average intensities of financial access per country, increases in financial inclusion are driven by an increase in the intensity of the use of financial services by a smaller share of the population, therefore exacerbating inequality in financial inclusion. After a turning point, however, increases in financial access are mainly driven by more people gaining access to financial services, which in turn lowers inequality in financial inclusion.

5. We find a strong association between this inequality in financial access and income inequality (Figure 1). Controlling for a wide set of structural and policy determinants of income inequality, as well as financial development and different types of gender gaps, results show that unequal financial access both overall and between men and women is significantly and robustly related to greater income inequality at the country level. In turn, the level of financial inclusion, as per our measure, does not seem to be significantly related to income inequality, implying that policies should target more equal access to a broad range of financial services across the population.

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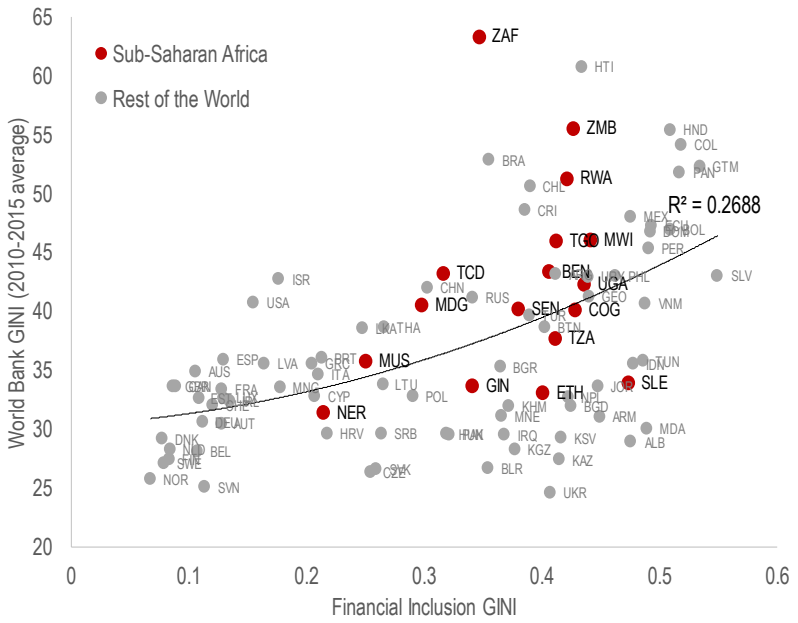
financial discrimination on economic growth in developing countries. Dabla-Norris and others (2015) calibrate their model to developing countries and show that removing barriers to access (participation cost) can benefit the poor and reduce inequality, if participation cost is the most binding access constraint. Policies that improve the depth of access by those already included could however increase inequality.

Figure 1. Inequality in Financial Access and Income Inequality



6. The remainder of the paper is structured as follows. Section II briefly reviews the relevant empirical literature. The data, the methodology used to construct the financial inclusion indices and some stylized facts are presented in Section III. In Section IV, we discuss the estimation strategy and empirical results. Section V concludes.

II. Literature Review

A. Finance and Inequality

7. A well-established strand of theoretical and empirical studies focuses on the relationship between finance and income inequality. Early theoretical models imply that financial development enhances growth and reduces inequality in the presence of financial frictions: information and transaction costs may be especially binding on the poor who lack collateral and credit histories, so that relaxation of these constraints will disproportionately benefit the poor, improving the efficiency of capital allocation (growth) and reducing income inequality by facilitating funding to poor talented individuals (Galor and Zeira 1993; Aghion and Bolton 1997; Galor and Moav 2004).

8. Other models predict a non-linear relationship between financial development and inequality. For example, Greenwood and Jovanovic (1990), argue for a Kuznets-type of relationship, with the distributional effects of financial development depending on the level

of economic development: at early stages of development, only the rich can afford to access financial markets, while the benefits of financial development are more widely distributed at higher levels of economic development. Townsend and Ueda (2006) also highlight the prevalence of non-linearities as economic growth with financial deepening and changing inequality are transitional phenomena, and caution against regression analysis in this context.

9. Other models posit that causality may run in the opposite direction, with income inequality impacting financial development. Claessens and Perotti (2007) review recent evidence suggesting that unequal access to political influence produces unequal access to finance and ultimately unequal opportunities, which can reinforce economic inequality. Perotti and Volpin (2007) find that access to finance is better in countries with more equal income distributions and in those with greater political accountability, also after controlling for legal origin and economic development.

10. Whereas the theory refers explicitly to a link between financial access and income inequality, the empirical literature has initially analyzed the link between financial depth and income inequality. Although the theory is inconclusive on the direction of causality between financial development and income inequality, empirical results point to robust and significant effects of financial development on income inequality. Beck, Demirguc Kunt and Levine (2007) find that financial development disproportionately boosts incomes of the poorest quintile and reduces income inequality. Their findings suggest that financial reforms that reduce market frictions can boost growth without the potential incentive problem associated with redistributive policies. For a panel of 22 sub-Saharan African countries between 1990 and 2004, Batuo and others (2010) find that income inequality declines as economies develop their financial sector.

11. Other studies suggest that the impact of financial development on inequality may only be indirect, working through higher labor force participation of the poor. Beck, Levine and Levkov (2007) find that commercial bank branch deregulation in the U.S. did lead to lower income inequality, but by affecting labor market conditions, not by providing the poor with greater access to finance. Similarly, Giné and Townsend (2004), in a study on Thailand, find that the main impact of finance on income inequality is through the inclusion of a larger share of the population in the formal economy and higher wages rather than through the provision of direct access to credit to the poor.

12. More recent analyses focus on financial access or financial inclusion as a broader concept, and its relationship with macroeconomic outcomes including income inequality (Beck and Demirguc-Kunt, 2008). Early studies that have attempted to measure financial outreach and exclusion look mostly at supply-side data such as number of bank branches, ATMs and number of bank deposit and loan accounts. They find very sharp differences in financial inclusion across countries with the poorest countries having the least access (Beck and others 2007; Honohan 2007; Moockerjee and Kalipioni 2011). Mockerjee and Kalipioni (2011) find that availability of financial services measured by the number of

bank branches per 100,000 people, the cost of opening an account and the number of locations where loan applications can be submitted are significantly related to income inequality in cross-country regressions.

13. Recent works study the impact of financial access on growth and inequality one dimension of overall financial development (Dabla Norris and others 2015a; Sahay and others 2015).

- In the model by Dabla Norris and others (2015a) greater financial inclusion can help reduce income inequality if it focuses on increasing access (or reducing participation costs) of the poor. However, policies that focus on relaxing the borrowing constraint can disproportionately benefit wealthy agents and increase income inequality but as new agents access credit inequality can decline.
- Sahay and others (2015) find that greater financial development increases growth but with declining marginal benefits as both inclusion and depth increase. They also document a positive relationship between the gender gap in account holding and income inequality.

B. Gender gaps and inequality

14. The literature on gender inequality and macroeconomic outcomes has been growing rapidly. The 2012 World Development Report (WDR) reviews the evidence on gender and development. The WDR notes that gender equality can enhance productivity, improve development outcomes for the next generation, and make institutions more representative. Various studies have confirmed the negative effect of gender inequality in education on growth (Dollar and Gatti 1999; Klasen 1999; Klasen and Lamanna 2009; Seguino 2010). Amin and others (2015) confirm a strong impact of gender gaps beyond those in education on economic growth but only in poor countries. Kazandjian and others (2016) find, in addition, that gender gaps may impede economic diversification, and therefore growth in low-income and developing countries.

15. A new strand of the literature has focused on the relationship between gender inequality and income inequality. Greater gender equity is associated with higher growth but also with lower income inequality. Different types of gender gaps contribute to income inequality: gender wage gaps and gaps in labor force participation rates result in inequality in male and female earnings, and thus contribute to overall income inequality, while gender gaps in education, health and finance exacerbate inequality of opportunities, resulting in higher income inequality (Gonzalez and others 2015b).

16. Most recent studies use the Findex database, an extensive cross-country database on financial inclusion. Demirguc-Kunt and Klapper (2012) present the database and key characteristics of financial inclusion worldwide and document a systematic gender gap in financial access that is persistent across all income groups in developing countries. Allen and others (2012) find that, controlling for other individual characteristics, being

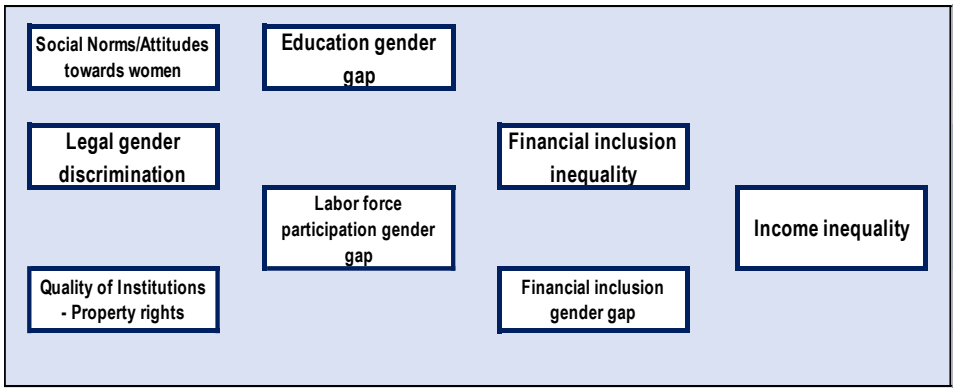
female is negatively associated with having accounts and saving, but not significantly. However, women are significantly less likely to own bank accounts. Using somewhat older World Bank enterprise surveys, Aterido and others (2013) argue that the causes of these gender gaps lie mainly outside the financial sector, in dimensions related to female participation in the market economy, including labor force participation and education.

17. Demirguc-Kunt, Klapper and Singer (2013), using the Findex database, find a different result for developing countries. After controlling for individual characteristics such as income, education, employment status, rural residency and age, they find that gender remains significantly related to usage of financial services. They also find that legal discrimination against women and gender norms may explain some of the cross-country variation in access to finance for women.

C. Putting the Pieces Together

18. In sum, inequality in financial access, and in particular gender gaps in financial inclusion, may affect income inequality both directly and indirectly. They could affect income inequality directly through enabling economic participation, providing access to productive tools, and helping to improve economies of scale. It is also possible that that gender gaps in financial inclusion are the result of other types of gender gaps (in education, health), which affect income inequality both directly or indirectly through their impact on female labor force participation (Figure 2).

Figure 2. Possible Linkages between Gender Inequality and Income Inequality



III. DATA

A. The Findex database

19. The World Bank's Findex dataset provides the most comprehensive information on financial inclusion that is comparable across countries. It offers cross-country information on a broad range of financial services and the intensity of their use based on a worldwide survey of representative samples of 1,000 individuals in over 140 countries. So

far two waves of the Findex have been conducted, in 2011 and 2014, with broadly comparable information and a plan to conduct new surveys every three years. Given that income inequality data are only available with a lag and up to 2013, in this paper we use the 2011 data for the empirical analysis but construct indices for both years.

20. The Findex complements other datasets by focusing on individuals, rather than financial institutions or aggregate measures of financial depth, such as the IMF's Financial Access Survey data and World Bank Enterprise Surveys.[2] Yet, to our knowledge no other studies have exploited this wealth of individual-level data and related it to macroeconomic outcomes. In addition, our study is the first to construct a synthetic, micro-based measure of financial inclusion capturing both access to and intensity of use of a broad range of financial services. Even the studies using the micro data (Allen and others 2012; Demirguc-Kunt, Klapper and Singer 2013), tend to look at the drivers of financial inclusion measures one by one - e.g. having an account, and, conditional on having an account, saving and borrowing.

21. Notwithstanding the advantages of the Findex data, they have some limitations. First, the lack of a time dimension greatly limits the possible econometric methodologies and plausible controls for endogeneity, as well as an analysis of how financial inclusion changes over time and how these changes affect macroeconomic outcomes. Second, individuals are not traceable between different Findex waves. Another limitation is that there is no household-level information in addition to the basic individual characteristics (age, gender, education, income and formal employment status). Data on marital status, whether the person surveyed is head of household, number of dependents in the household would have allowed for a much more in-depth analysis of the drivers and impacts of financial inclusion world-wide.

B. Constructing a Novel Index of Financial Inclusion

22. We use the Findex micro-level information to construct country-aggregates of financial inclusion for the 2011 and 2014 Findex waves. We start by constructing individual-level scores of financial inclusion using correspondence analysis, the principal component analysis equivalent for categorical data (see Annex I for a description of the methodology). Questions that enter the index should (i) be directly related to financial access, and (ii) not include information on individuals' personal characteristics or environment to not later bias the empirical estimations. The selected questions capture access to and use of formal financial services.[3]

[2] See Demirguc-Kunt and Klapper (2012) for a description of the database and descriptive statistics of financial inclusion worldwide.

[3] Further work will explore the relationship between formal and informal financial inclusion, and the extent to which these two forms of inclusion are substitutes or complements, particularly in developing countries. It would be also important to investigate whether similar macroeconomic benefits are linked to the use of informal as compared to formal financial services.

- We thus use 8 questions to construct the 2011 Financial Inclusion Index. These questions are related to the access to certain financial infrastructure (e.g. having an account at a financial institution) and use of financial services (e.g. using mobile phone to pay bills) (Table 1, panel 1).

- For the 2014 wave, as more information is available, we select a total of 12 questions that relate to the same categories, in addition to a question on the general accessibility to financing (availability of emergency funds) (Table 1, panel 2).

- The following charts present the 2014 index to showcase the latest data. Charts using the 2011 index are qualitatively similar.

Table 1. Questions to Construct the Financial Inclusion Index

2011 Financial Inclusion Index

Questionnaire Number	Question	Possible Responses
Q1	Has an account at a financial institution/post office/MFI	Yes/No/missing
Q3a	If has a debit card	Yes/No/missing
Q3b	If has a credit card	Yes/No/missing
Q8b	If has an account, uses electronic payments	Yes/No/missing
Q13a	Saved at financial institution in the last 12 months	Yes/No/missing
Q14a	Borrowed from financial institution in the last 12 months	Yes/No/missing
Q15a-Q15b	Has loan from financial institution for home purchase or construction	Yes/No/missing
Q15a1a-Q15a1b Q15a1c	Has used mobile phone to pay bills, send money or receive money	Yes/No/missing

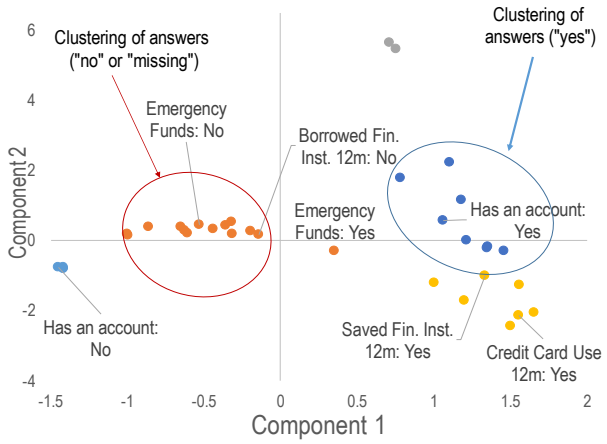
2014 Financial Inclusion Index

Questionnaire Number	Question	Possible Responses
Q1	Has an account	Yes/No/missing
Q3	If has a debit card, card is in own name	Yes/No/missing
Q4	If has a debit card, used card in the last 12 months	Yes/No/missing
Q6	If has a credit card, used card in the last 12 months	Yes/No/missing
Q9	If has an account, made deposit into account in the last 12 months	Yes/No/missing
Q11	If has an account, made withdrawal in the last 12 months	Yes/No/missing
Q14	If has an account, made transaction with mobile phone	Yes/No/missing
Q16	Made Internet Payments	Yes/No/missing
Q18a	Saved at financial institution in the last 12 months	Yes/No/missing
Q20	Borrowed from financial institution in the last 12 months	Yes/No/missing
Q21a	Has loan from financial institution for house, apartment, or land	Yes/No/missing
Q24[4]	Possibility of coming up with emergency funds	Very possible/Somewhat Possible/Not very possible/Not at all possible/missing

[4] We used a modified version of Q24. The responses "Very possible" and "Somewhat Possible" were combined as a category "Very or somewhat possible", while "Not very possible" and "Not at all possible" were combined as "Not very or at all possible".

23. Figure 3 highlights the variation of answers in the 2014 survey (Table, panel 2), along the two main axes according to the correspondence analysis.

Figure 3. Components of Financial Inclusion according to Correspondence Analysis



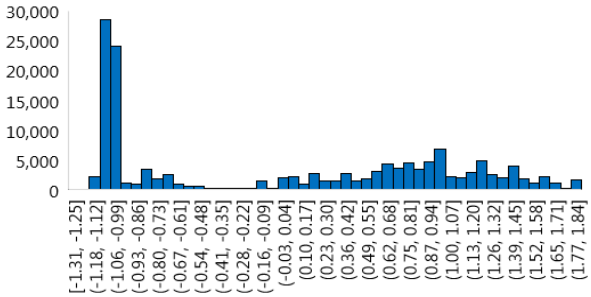
- The interpretation of the outputs from Correspondence Analysis are very similar to that of Principle Component Analysis but charts are displaying chi-square distances, and distances between points describe qualitative differences. In Figure 3, the origin is by design, the "center of gravity" of the point-cloud; it is the location that represents the "average" response. The main axis is the horizontal one, in which the different questions are spread around the center (zero).
- Responses that indicate having financial access of some kind are in the right half of the plane. "Missing" and "no" answers are clustered on the left-hand side.[5] Having a credit/debit card appears on the far right of the x-axis because 1) relatively few individuals have them and 2) those who answered "Yes" to these questions also answered their entire questionnaire quite differently from the "average" questionnaire. A "Yes" response to "*Do you have access to emergency funds*?" appears in between the origin and having access to credit cards. A person who made this response generally had responses more similar to the center, and the response is not extremely rare.
- This principal, horizontal axis helps explain about 90 percent of the variation in the data. On the other hand, the second principal axis (the vertical axis in Figure 3), only explains an additional 5 percent of the variation, and is therefore not relevant for our analysis.

24. The index provides a sense of the intensity of the use of financial services, as it captures the variety of services used. Since we define an individual's inclusion score as being approximately the sum of the x-axis positions of the responses made in Figure 3, a higher inclusion score is attributed to an individual having access to more services and having access to rarer services than those in the "center". Two responses can appear close together because they are often answered together; for example, individuals tend to answer "No" to having borrowed in the last 12 months if they also answered "No" to having an account. Different response options from the same question cannot appear together for an individual. For categories in proximity, it implies that the questionnaire responses associated with these groups are similar, and vice versa for being dissimilar.

[5] The procedure is agnostic on what "Yes" and "No" indicate; there is no information in the procedure that encode what each variable means in terms of financial inclusion.

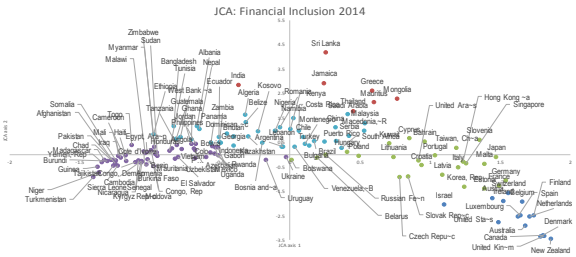
25. The distribution of individual scores is highly skewed towards low-level scores, while country level scores appear to be highly scattered across countries' income groups. Figure 4 highlights the distribution of individual scores across bins for the 2014 index, with higher value bins representing higher financial inclusion for the respective individual.[6] It highlights that, while the intensity of financial inclusion is relatively equally distributed at higher levels of financial inclusion, it is concentrated in two bins on the low inclusion side, mainly driven by low-income countries, in particular sub-Saharan African ones.

Figure 4. Distribution of Individual Financial Inclusion Scores, 2014



26. Financial inclusion scores are closely related to countries' level of development. At the aggregate level, Figure 5 highlights that countries' financial inclusion level is clustered at countries' income levels, with low-income countries at lower financial inclusion scores, and high-income countries at higher levels of financial inclusion.

Figure 5. Distribution of Individual Financial Inclusion Scores



C. Assumptions and Caveats

27. Several assumptions determine the interpretation of the index, and, as with most indices, there are caveats to be aware of when using it.

- Relatively rarer services are implicitly assumed to be indicators of "higher" levels of financial inclusion, which is not necessarily the case. Higher technology services may be correlated with higher average income, infrastructure, and capital. However, testing for robustness by including and excluding such questions, we found broadly similar results.
- The origin is defined as the location in the point-cloud centered by the normalized column totals (Annex I). It would be possible to create a synthetic dataset where the center corresponds to a completely different set of "average" responses. Likewise, although the extreme points in our dataset correspond to answering "Yes" or "No" to all questions, we can construct a dataset in which the least/most inclusive score are not as "extreme".
- Related to the previous caveats, the input for our index is qualitative, and so is the output; it is thus difficult to form quantitative interpretations of the differences in "degree of inclusion". An individual with a score of 1 (all services) unambiguously has access to more services than one with a score of 0 (no services) but comparing the distances of values

[6] The distribution for the 2011 index shows a similarly skewed picture.

between 0 and 1 only makes sense if we accept the assumptions imposed by the use of the chi-square metric and other caveats.

- The selection of questions for the index is based on the authors' judgement. For robustness, many combinations of different questions were tested with broadly similar results. Since we did not see strong indications of bias, we ultimately chose to include several "rarer" responses in order to increase the resolution of our index.

D. Constructing an Index of Inequality in Financial Access

28. We derive our measure of inequality in financial access from the standard Gini-coefficient calculation. We use the individual financial access scores which are calculated from Global Findex 2011 survey data to calculate a Gini index of financial inclusion. The procedure covers covariance-based expressions for the generalized Gini. Concentration coefficients are particularly convenient for calculations from unit-record data (Box 1). Figure 6 shows that inequality in financial access varies strongly across countries: darker shades in red and higher levels of the Gini depict higher levels of inequality of financial access.

Box 1. Deriving a Gini-Index of Financial Access

The covariance-based Gini coefficient as mentioned by Yitzhaki (1998) is derived as follows:

$$GINI(X) = -2Cov\left(\frac{X}{\mu(X)},\ (1 - F(X))\right)$$

Where X is a random variable of interest with mean $\mu(X)$ and $F(X)$ is its cumulative distribution function. The Concentration coefficient measures the association between two random variables and can be expressed as

$$CONC(X,Y) = -2Cov\left(\frac{X}{\mu(X)},\ (1 - G(Y))\right)$$

Where $G(Y)$ is the cumulative distribution function of Y. $CONC(X,Y)$ reflects how much X concentrated on observations with high ranks in Y.

A single-parameter generalization of the Gini coefficient has been proposed by Donaldson & Weymark (1980, 1983) and Yitzhaki (1983). The generalized Gini coefficient (S-Gini, or extended Gini coefficient) can also be expressed as a covariance:

$$GINI(X;v) = -vCov\left(\frac{X}{\mu(X)}, (1 - F(X))^{v-1}\right)$$

Where v is a parameter tuning the degree of 'aversion to inequality'. The standard Gini corresponds to v=2

The fractional ranks are calculated as follows:

Consider a sample of N observations on a variable Y with associated sample weights: $\{(y_i, w_i)\}_{i=1}^{N}$. Lek K be the number of distinct values observed on Y, denoted $y_1^* < y_2^* < \cdots < y_k^*$, and denote by π_k^* the corresponding weighted sample proportions:

$$\pi_k^* = \frac{\sum_{i=1}^{N} w_i 1(y_i = y_k^*)}{\sum_{i=1}^{N} w_i}$$

(1(condition) is equal to 1 if condition is true and 0 otherwise). The fractional rank attached to each y_k^* is given by

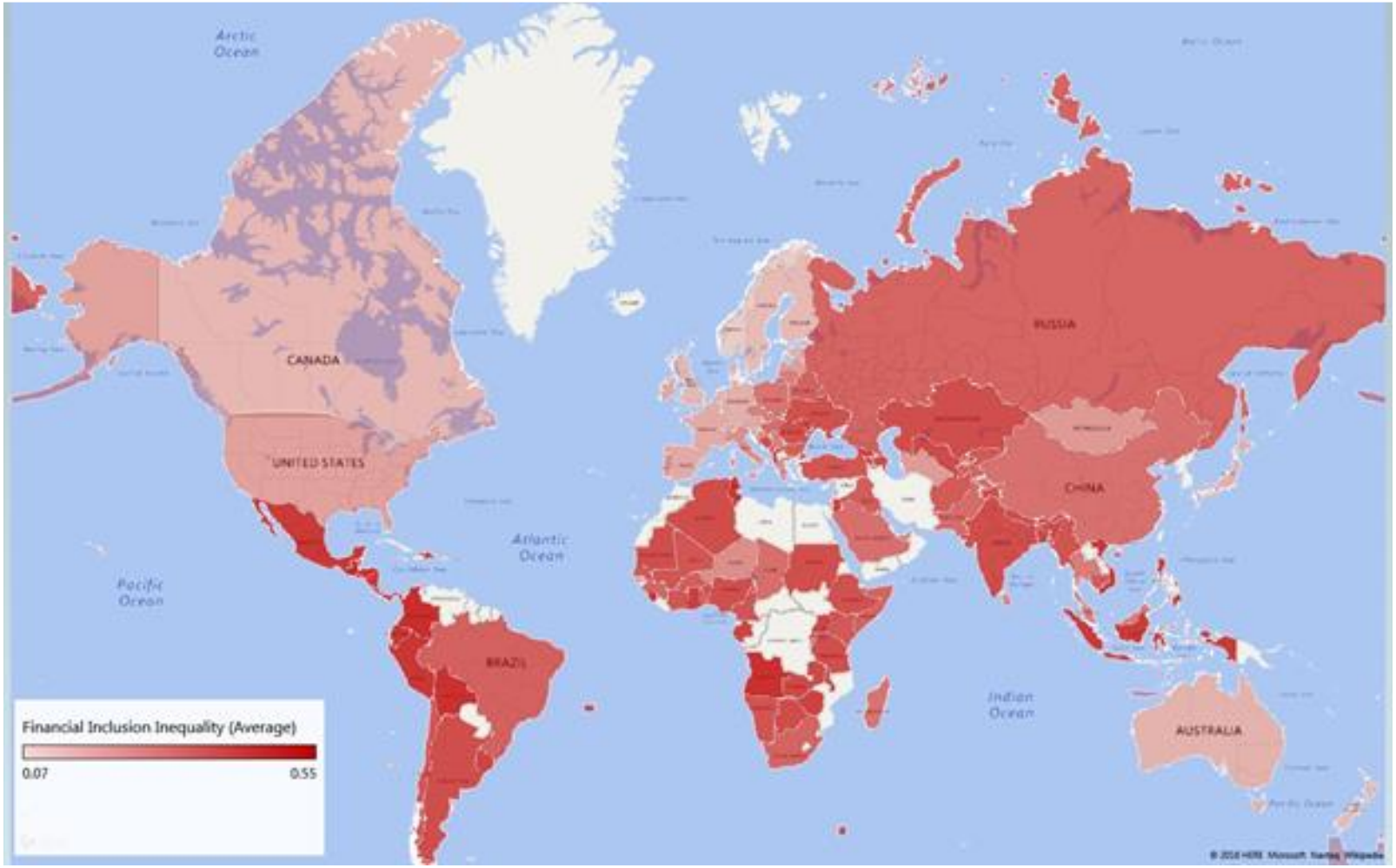
$$F_k^* = \sum_{j=0}^{k-1} \pi_j^* + 0.5\pi_k^*$$

where $\pi_0^* = 0$ (Lerman & Yitzhaki, 1989, Chotikapanich & Griffiths, 2001). Each observation in the sample is then associated with the fractional rank

$$F_k^* = \sum_{k=1}^{K} F_k^* 1(y_i = y_k^*)$$

This procedure ensures that tied observations are associated with identical fractional ranks and that the sample mean of the fractional ranks is equal to 0.5. $\{(F_i, y_i, w_i)\}_{i=1}^{N}$ can then be plugged in a standard sample covariance formula. This makes the resulting Gini coefficient estimate independent on the sample/population size.

Figure 6. Inequality in Financial Access 2014

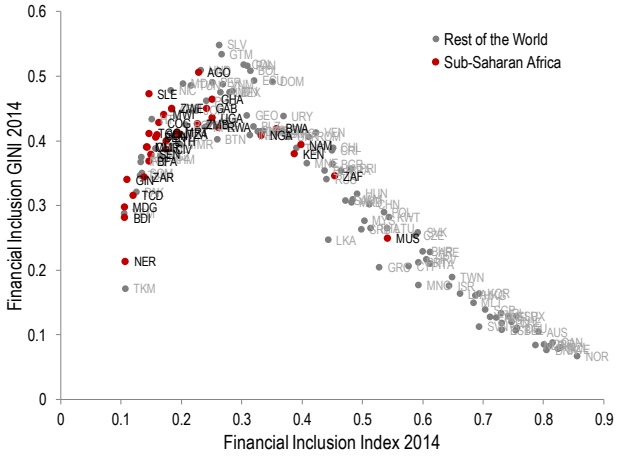


Sources: Global Findex, and authors' calculations.

29. Inequality in financial access follows a Kuznets-type relationship. Figure 7 plots the average financial inclusion score by country against the level of inequality in financial inclusion at the country level:

- At lower levels of financial inclusion, increases in the country's average financial inclusion scores, increases in these scores appear to be mainly driven by a smaller group of individuals intensifying their use of financial services, inequality of financial inclusion therefore increases.
- At later stages of financial inclusion, once a turning point is reached, increases in average financial inclusion scores seem to be mainly driven by additional people joining the financial system, and this increase in the extensity of financial inclusion decreases inequality in financial access.

Figure 7. Financial Inclusion and Inequality in Financial Inclusion

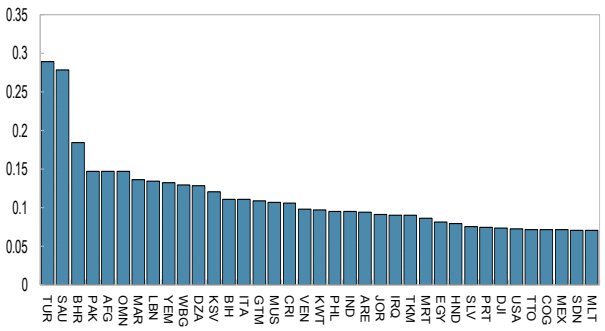


Sources: Global Findex and own calculations.

30. Gender inequality in financial inclusion explains a substantial share of overall inequality in financial inclusion. A decomposition of this inequality in financial inclusion shows that it is driven by up to 30 percent by inequality in financial access across genders (Figure 8), derived according to the following decomposition (Equation 1)

$$G = \frac{\sum_{i=1}^{n} w_i \sum_{j=1}^{n} w_j |y_i - y_j|}{2 \sum_{i=1}^{n} w_i \sum_{i=1}^{n} w_i y_i} = G_w + G_{nb} + G_t \quad (1)$$

Figure 8. Selected Countries: Proportion of Gender Contribution to Inequality in Financial Access



Sources: Global Findex and own calculations.

Where,

- G_w is the Within (inequality among males + inequality among females)
- G_{nb} is the net between component capturing the contribution of gender inequality
- and G_t represents the transvariation contribution

IV. Testing the Link Between Inequality in Financial Access and Income Inequality

A. Specification

31. This section assesses the relationship between inequality in financial access and income inequality. With financial inequality, likely to be associated with differences in income according to the theoretical literature, this section estimates the association between inequality in financial access and income inequality in general, and gender gaps in financial access and income inequality in particular. The estimated relationship is given in equation (2) below:

$$Gini_i = FinInequality_i + Structural_i + Policies_i + \epsilon_i \quad (2)$$

In which

- $Gini_i$ refers to the level of income inequality as measured by the World Bank's Gini coefficient of income inequality in country *i* (World Bank Development Indicators 2016). As availability of these data is relatively scarce, particularly for low-income countries, we take four-year averages (2010-13) of the index. We use other measures of inequality (top income levels, market Gini—the Gini coefficient before taxes and transfers) in the robustness checks.
- $FinInequality_i$ depicts our measure of overall inequality in financial access. We expect that inequality in financial access is positively associated with income inequality. We interact this measure with indicator variables by income level to test for a differentiated effect by level of development.
- $Structural_i$ represents structural country characteristics, such as the log of income per capita and the share of agricultural production in total production. In line with the labor intensity of this sector, we expect the share of agricultural output in total production to be negatively associated with income inequality. We also test for the effect of the share of the rural population as well as the growth in the dependency ratios in robustness checks.
- *Policies* capture country-level policies, such as the openness to trade, the quality of macroeconomic management (proxied by the level of inflation) and the level of infrastructure (measured by the percent of the rural population having access to electricity). We expect all of these factors to be negatively associated with income inequality. To capture the fact that at low levels of overall human capital in an economy, increases in human capital could exacerbate income inequality but decrease income inequality at higher levels, we include the average years of schooling both with its level and a squared term into the regressions. We also control for an aggregate measure of gender inequality in the regressions. This variable is expected to be positively associated with income inequality and the level of financial sector development which could itself be associated positively with income inequality since credit may be concentrated and financial inclusion may not

keep pace with financial deepening.[7] We use ordinary least squares to estimate the above relationship.

B. Empirical Results

32. Inequality in financial access. Table 2 highlights the results of the OLS regressions.

Table 2. Factors Associated with Income Inequality
Dependent Variable: Gini Coefficient (WDI)

	(1)	(2)	(3)	(4)
Inequality in financial access	0.324***	0.346***	0.266***	0.271***
	(0.069)	(0.063)	(0.069)	(0.071)
Structural country characteristics				
Log real GDP per capita	-0.096	-0.080	-0.215*	-0.048
	(0.096)	(0.084)	(0.116)	(0.150)
Log real GDP per capita squar	0.002	0.001	0.010	0.001
	(0.005)	(0.005)	(0.006)	(0.008)
Share of agriculture in GDP	-0.004***	-0.004***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Policies				
Openness to trade	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Inflation		-0.003***	-0.002	-0.002
		(0.001)	(0.002)	(0.002)
Human capital			0.183*	0.194*
			(0.106)	(0.110)
Human capital squared			-0.041**	-0.042**
			(0.018)	(0.019)
Gender inequality index			0.237**	0.211**
			(0.094)	(0.094)
Financial development			0.066	0.079
			(0.065)	(0.065)
Access to electricity, rural				-0.081
				(0.051)
Constant	1.014**	0.961**	1.166**	0.393
	(0.439)	(0.381)	(0.542)	(0.662)
Observations	84	84	76	76
R-squared	0.42	0.45	0.61	0.62

Robust standard errors in pare
*** p<0.01, ** p<0.05, * p<0.1

- Inequality in access to financial services is positively and significantly related to income inequality, in addition to standard drivers of income inequality highlighted in the literature. We also find that it is indeed the degree of inequality—rather than the level—in the access of financial services which is related with income inequality since the level of financial inclusion does not enter our specification significantly (not shown).[8]

- Other determinants enter the regression with the correct sign but some with limited significance, likely also reflecting the small size of the sample. Consistently with the labor intensity in this sector, a higher share of agriculture in GDP is associated with lower income inequality. Higher human capital levels are associated with lower levels of income inequality when human capital levels reached a critical size, while higher levels of overall gender inequality are positively related to income inequality. Better macroeconomic management, as proxied by the inflation rate, is associated with lower levels of income inequality. Other variables, such as openness to trade, access to electricity or financial development enter with the expected signs but are not significant at standard levels, also partly reflecting the small size of the sample.

[7] The index captures both inequities in outcomes as well as opportunities. In particular, it captures the gap between male and female labor force participation, the share of female seats in parliament, the gender gap in secondary completion rates, the maternal death ratio as well as adolescent fertility rates).

[8] The robustness check included introducing regional fixed effects, and regional and income-level interactions, the inclusion of separate dimensions of gender inequality (education gaps, labor force participation gaps), other and additional structural country characteristics (oil exporter dummy, squared GDP term, output per worker), and additional policy variables, such as the level of government spending. In all these specifications, inequality in financial access remained positively related to income inequality.

C. Robustness Checks

33. We perform a range of robustness checks, with similar results. While the number of observations for our cross-sections limits the possibility for extensive alterations in sample and variable selection, this section provides a number of alterations to our specifications, in particular (see tables in Annex IV):

- First, we include interaction terms of our measures of financial access inequality with low-income, middle-income, and high-income dummies (Annex Table 1). Insignificant coefficients on the interactions suggest that the link between financial access inequality and income inequality is not significantly different across income groups (columns 1–3). One exception is when we test for the impact on the market Gini instead of the World Banks Gini, as here the link between the two concepts appears to be stronger for low-income countries (column 4).

- Second, the results are similar when we use other measures of inequality. In particular, the results are robust to using the market Gini, and the top 10 and 20 income percentiles (Annex Table 2).

- Third, the results are robust to an inclusion of regional dummies (Annex Table 3).

- Fourth, we test for the impact of gender gaps in access to finance in our regressions. We first include the ratio of female-to-male financial access into the regressions directly, and find that a higher ratio is significantly related to lower income inequality (Annex Table 4, columns 1 and 2). As gender inequality in financial access is partially driving overall inequality in financial access—as discussed above—the significance of the gender gap in financial inclusion may be reflecting gender equality merely representing a proxy. To test for the effect of gender inequality separately, we therefore eliminate the gender-relevant part from overall inequality in financial access by regressing overall inequality in financial access on the gender gap in financial access, and including the residual from this equation jointly with the gender gap in financial access into the regression. Annex Table 4, columns 3–4 highlight that greater gender inequality in financial access is strongly associated with higher income inequality beyond other drivers which may explain inequality in financial access.

- Fourth, we test whether excluding some questions from the index would significantly alter the index's assessment of financial access across countries. Annex Table 5 shows that excluding certain components that may not be as important in a developing country context do not significantly alter the index, as correlations between the original index and the streamlined indices are below 0.95.

- The results are also robust to including other regressors, such as the share of the rural population of the level of our financial access index (not shown).

V. Conclusions and Policy Recommendations

34. Beyond the drivers of income inequality identified in the existing literature, this study finds a particularly important role for inequality in access to financial services, with a significant share of that inequality driven by gender differences in financial access. In particular, our results suggest at least a strong association between inequality of access in formal financial inclusion, and in particular of gender gaps in financial inclusion and income inequality. The analysis is limited by the lack of a time series dimension and the relatively small size of the sample, but results are nonetheless consistent with other empirical findings (Batuo et al., 2010, Mockerjee and Kalipioni, 2011). This study's particular contribution is to highlight that, more than the level of financial development or overall financial inclusion, it is the distribution of financial access in the population that matters for income inequality. Furthermore, we show that a significant share of that distribution in financial access is driven by systematic differences across genders. The policy implications are important: policies that can foster broad-based access to a range of financial services across the population, and policies aiming at reducing the gender gap in financial access, would also promote greater income equality.

35. Much work however remains to be done to better understand the channels through which gender inequality in financial access affect income inequality. Going back to individual-level data would help understand the drivers of financial inclusion and exclusion, and the linkages between gender gaps in financial inclusion and other gender gaps, such as education and labor force participation. We aim to address some of this questions in further research (Deléchat and others, forthcoming).

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Annex I: Correspondence Analysis

This annex provides a brief overview of the central concepts in Correspondence Analysis (CA).

Motivation

Categorical variables often do not have comparable scale and distance properties. For example, a question may leave interviewees multiple choices to answer (e.g. degree of access to emergency funds), another may leave only "yes" or "no" as an answer (e.g., whether an individual has borrowed from a financial institution within the past 12 months). The analyst may be interested in knowing if people who answered "Yes" to the second question may be more likely to answer the first question with a particular answer. With are large number of questions, it becomes difficult to simultaneously analyze the data with simple frequencies, while visualization becomes impossible. Correspondence Analysis solves the problem ingeniously giving nominal variables a notion of distance. Correspondence Analysis is an established method in the fields of biometrics, psychometrics, marketing, ecology, and the interdisciplinary fields of the computational sciences.

Simple Correspondence Analysis

This paper utilized Joint Correspondence Analysis, one of many methods in the class of CA. In all approaches, the central concept is to construct a point-cloud using some metric that allows to treat all variables simultaneously and agnostically through Singular Value Decomposition (SVD). In the following, we will provide a simple step-by-step example of Simple Correspondence Analysis to develop the basic concepts used in CA.

Suppose we have two questions in a questionnaire of interest, each with three possible responses – "yes", "no", and "missing" (Table A1).

Table A1. Sample Questionnaire

Question	Possible Responses
Please rate access to emergency funds from "very or somewhat possible" (1) to "not very or at all possible" (3).	1, 2, or 3 (else Missing)
Did you borrow from a financial institution within the past 12 months?	Yes or No (else Missing)

A contingency Table then allows to look at the associations between responses (Table A2).

Table A2. Example Contingency Table

	Q2 (Yes)	Q2 (No)	Q2 (Missing)	Row Totals
Q1 (1)	n_{11}	n_{12}	n_{13}	n_{1+}
Q1 (2)	n_{21}	n_{22}	n_{23}	n_{2+}
Q1 (3)	n_{31}	n_{32}	n_{33}	n_{3+}
Q1 (Missing)	n_{41}	n_{42}	n_{43}	n_{4+}
Column Totals	n_{+1}	n_{+2}	n_{+3}	n_{++}

Note: n_{rc} is the number of respondents who made response *r* and *c*. n_{r+} and n_{+c} are the sums of the row and column values, respectively. For all *r* and *c*, $n_{rc} = n_{cr}$. The grand total n_{++} is equal to the sums of the row totals, and thus also that of the column totals.

Consider two extreme cases. If the rows and columns are completely independent, the usual chi-squared test of independence (H0: no difference between distributions) would not be rejected. On the other hand, rejecting H0 would suggest the existence of interesting associations. Correspondence analysis pinpoints these associations. The weighted chi-square distances between two individual columns can be found by applying the following formula over the values in Table 2:

$$d_{\chi^2}(c, c') = \sqrt{\sum_{r=1}^{R} \frac{n_{++}}{n_{r+}} \left(\frac{n_{rc}}{n_{+c}} - \frac{n_{rc'}}{n_{+c'}} \right)^2},$$

where *r* is the row index and *c* is the column index. The intuition of this measure can be seen by considering if "Yes" and "No" to Question 2 are "independent". The distance between the two responses (columns) would be zero if they are identical across all responses to Question 1, and something greater than zero if not. Each response to Question 2 has a chi-square distance to this "average" response (c*):

$$d^2_{\chi^2}(c, c^*) = \sum_{r=1}^{R} \frac{n_{++}}{n_{r+}} \left(\frac{n_{rc}}{n_{+c}} - \frac{n_{r+}}{n_{++}} \right)^2.$$

We then modify the distance from the "center of gravity" by weighing it with the column mass to obtain a weighted distance from the center called *inertia*. Responses with greater total volumes hold more leverage for that particular point's measure of deviation:

$$\text{Inertia} = \sum_{c=1}^{J} \frac{n_{+c}}{n_{++}} d^2_{\chi^2}(c, c^*),$$

where *J* is the number of columns. If column variables are completely independent, all of our column points will be identical, and the data cloud would be a single point.

We can now proceed by treating the point-cloud in a similar way as we would in conventional PCA. Analogous to PCA, we are interested in finding a lower dimensional subspace that maximizes total inertia. Of course, the same application of the SVD is used to find the best least squares approximation of a rank $K \leq \min(M - 1, N - 1)$ subspace in CA.

Multiple Correspondence Analysis

Multiple Correspondence Analysis extends the just described simple CA. Here, we first construct a complete disjunctive Table – an N x Q indicator matrix $\boldsymbol{Z}$, where Q is the number of questions and N the number of individuals. This Table would have an expanded set of column variables that take on value 1 for having selected the question response and 0 otherwise. To draw a parallel with the simple case, the matrix $\boldsymbol{Z}$ can be cross multiplied with itself to form a Q x Q matrix $\mathbf{B} = \boldsymbol{Z}^{\mathbf{T}}\boldsymbol{Z}$ such that each possible response is to be cross tabulated with each other possible response in a pairwise fashion. This matrix is then centered and standardized (using marginal totals) to find $\boldsymbol{S}$, on which the algorithm described above is applied.

In the MCA case, clearly one problem is the influence of the meaningless diagonals of **B** on the measures of inertia. Joint Correspondence Analysis (JCA) was developed to address this problem, and is an iterative method of finding a best fit using only the off-diagonal values of **B**. In our paper, we tried both MCA and JCA, with broadly similar results, but ultimately using JCA for the sake of robustness.

Annex II: List of Countries Included in the Sample

Whole Sample:
Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belarus, Belgium, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Chad, Chile, China, Colombia, Congo, Dem. Rep., Congo, Rep., Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Estonia, Finland, France, Gabon, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Haiti, Honduras, Hong Kong, SAR, China, Hungary, India, Indonesia, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea, Rep., Kuwait, Kyrgyz Republic, Latvia, Lebanon, Lithuania, Luxembourg, Macedonia, FYR, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Rwanda, Saudi Arabia, Senegal, Serbia, Sierra Leone, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Sweden, Tajikistan, Tanzania, Thailand, Togo, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Venezuela, RB, Vietnam, Yemen, Rep., Zambia, Zimbabwe.

Emerging and Developing Markets

Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Bahrain, Bangladesh, Belarus, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Chad, Chile, China, Colombia, Congo, Dem. Rep., Congo, Rep., Costa Rica, Croatia, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Gabon, Georgia, Ghana, Guatemala, Guinea, Haiti, Honduras, Hungary, India, Indonesia, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyz Republic, Lebanon, Macedonia, FYR, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Panama, Peru, Philippines, Poland, Romania, Russian Federation, Rwanda, Saudi Arabia, Senegal, Serbia, Sierra Leone, South Africa, Sri Lanka, Sudan, Tajikistan, Tanzania, Thailand, Togo, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, Uruguay, Uzbekistan, Venezuela, RB, Vietnam, Yemen, Rep., Zambia, Zimbabwe.

Sub-Saharan Africa:

Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Chad, Congo, Dem. Rep., Congo, Rep., Gabon, Ghana, Guinea, Kenya, Madagascar, Malawi, Mali, Mauritius, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Annex III. List of Variables

Variable name	Explanation	Source
Structural Characteristics		
Gini coefficient	Net inequality	SWIID 5.0
World Bank Gini coefficient	WB Gini coefficient	World Bank
Log of real GDP per capita	Log of real GDP divided by population	Penn World Table 8.0
Agriculture to GDP	Agriculture, value added (% of GDP)	World Bank
Policies		
Trade to GDP	Sum of import and exports as share of GDP	World Bank
GII	Gender Inequality Index	UNDP and Gonzales and others (2015b)
Government consumption expenditure to GDP	General government final consumption expenditure (% of GDP)	World Bank
ICRG composite risk rating	International Country Risk Guide	Composite Political, Financial, Economic Risk Rating for a country (CPFER) = 0.5 ((Political Risk + Financial Risk + Economic Risk) Ranging from Very High Risk (00.0 - 49.5) to Very Low Risk (80.0 - 100). The higher the points, the lower the risk.
Infrastructure		
Electricity access	Access to electricity (% of population)	World Bank
Rural electricity acces	Access to rural electricity (% of rural population)	World Bank
Financial variables		
Intensity of financial inclusion within country	Correspondence-analysis constructed index of financial inclusion, covering 12 dimensions of financial inclusion as described in the main text	IMF staff calculation from World Bank Findex 2014 dataset
Inequality of financial access	Within-country gini-coefficient of the intensity of financial inclusion	IMF staff calcluation from the calculated individual financial inclusion scores using World Bank Findex 2014 dataset
Financial Development	Financial Development Index covering financial markets and institutions in their depth, access and efficiency	Sahay and others (2015).

Annex IV. Robustness Checks

Table 1. Testing the Link Between Inequality in Financial Access and Income Inequality, by Income Group

	(1) Gini (WB)	(2) Gini (WB)	(3) Gini (WB)	(4) Market Gini	(5) Market Gini	(6) Market Gini
Inequality in financial access						
Inequality in financial access	0.271**	0.210*	0.331***	0.556	-0.577	25.21*
	(0.08)	(0.10)	(0.09)	(11.25)	(13.28)	(10.95)
*low-income	0.0175			52.59*		
	(0.19)			(22.06)		
*middle-income		0.0765			8.881	
		(0.14)			(15.58)	
*high-income			-0.209			-32.95
			(0.14)			(16.89)
Structural country characteristics						
Log real GDP per capita	-0.312	-0.0999	-0.0598	-18.94	17.67	3.879
	(0.20)	(0.19)	(0.14)	(28.46)	(21.88)	(14.82)
Log real GDP per capita squared	0.0139	0.00231	-0.000405	0.878	-1.19	-0.552
	(0.01)	(0.01)	(0.01)	(1.57)	(1.27)	(0.90)
Share of agriculture in GDP	-0.00388*	-0.00452**	-0.00378*	-0.480*	-0.491**	-0.390**
	(0.00)	(0.00)	(0.00)	(0.21)	(0.15)	(0.13)
Policies						
Openness to trade	-0.000141	-0.000101	-0.0000536	-0.0101	0.00149	0.00309
	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
Inflation	-0.00163	-0.000998	-0.00198	-0.293*	-0.172	-0.182
	(0.00)	(0.00)	(0.00)	(0.14)	(0.14)	(0.12)
Human capital	0.162	0.17	0.207	10.34	10.38	13.95
	(0.11)	(0.11)	(0.11)	(13.56)	(12.91)	(12.24)
Human capital squared	-0.0375	-0.0386*	-0.0450*	-2.418	-2.471	-3.035
	(0.02)	(0.02)	(0.02)	(2.46)	(2.35)	(2.24)
Gender inequality index	0.189	0.228	0.319*	2.826	14.77	19.42
	(0.10)	(0.12)	(0.13)	(8.81)	(10.58)	(10.43)
Financial development	0.0713	0.0875	0.108	6.411	12.7	14.57
	(0.07)	(0.08)	(0.07)	(7.74)	(7.75)	(7.41)
Access to electricity, rural						
Share of rural population	-0.00082	-0.000914	-0.000775	-0.021	0.00026	0.0131
	(0.00)	(0.00)	(0.00)	(0.06)	(0.05)	(0.05)
Low-income dummy	-0.052			-24.14		
	(0.11)			(12.15)		
Middle-income dummy		-0.0581			-12.63	
		(0.08)			(9.33)	
High-income dummy			0.165			28.41**
			(0.09)			(10.33)
Constant	1.79	0.83	0.50	140.70	(22.58)	18.72
	(0.92)	(0.80)	(0.70)	(124.10)	(89.79)	(65.45)
N	76	76	76	70	70	70
R-sq	0.631	0.63	0.648	0.35	0.44	0.489
adj. R-sq	0.553	0.553	0.575	0.2	0.31	0.37
AIC	-208.8	-208.7	-212.6	446.7	436.3	429.9
BIC	-176.2	-176.1	-180	478.2	467.8	461.4

Standard errors in parentheses
* p<0.05

Table 2. Testing the Link between Inequality in Financial Access and Income Inequality, Different Measures of Income Inequality

	(1) Market Gini	(2) Market Gini	(3) Market Gini	(4) Top 10 %	(5) Top 20%
Inequality in financial access					
Inequality in financial access	0.556	-0.577	25.21*	15.45*	17.12*
	(11.25)	(13.28)	(10.95)	(7.51)	(8.18)
*low-income	52.59*				
	(22.06)				
*middle-income		8.881			
		(15.58)			
*high-income			-32.95		
			(16.89)		
Structural country characteristics					
Log real GDP per capita	-18.94	17.67	3.879	-1.04	-5.569
	(28.46)	(21.88)	(14.82)	(14.49)	(16.04)
Log real GDP per capita squared	0.878	-1.19	-0.552	-0.0586	0.19
	(1.57)	(1.27)	(0.90)	(0.80)	(0.89)
Share of agriculture in GDP	-0.480*	-0.491**	-0.390**	-0.295*	-0.344*
	(0.21)	(0.15)	(0.13)	(0.14)	(0.15)
Policies					
Openness to trade	-0.0101	0.00149	0.00309	-0.00942	-0.0126
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Inflation	-0.293*	-0.172	-0.182	-0.167	-0.164
	(0.14)	(0.14)	(0.12)	(0.20)	(0.21)
Human capital	10.34	10.38	13.95	16.02	21.51
	(13.56)	(12.91)	(12.24)	(10.94)	(11.54)
Human capital squared	-2.418	-2.471	-3.035	-3.482	-4.504*
	(2.46)	(2.35)	(2.24)	(1.81)	(1.94)
Gender inequality index	2.826	14.77	19.42	23.18**	24.76**
	(8.81)	(10.58)	(10.43)	(8.02)	(8.54)
Financial development	6.411	12.7	14.57	6.836	5.989
	(7.74)	(7.75)	(7.41)	(6.63)	(7.42)
Access to electricity, rural				-1.672	-3.353
				(6.33)	(6.94)
Share of rural population	-0.021	0.00026	0.0131		
	(0.06)	(0.05)	(0.05)		
Low-income dummy	-24.14				
	(12.15)				
High-income dummy			28.41**		
			(10.33)		
Constant	140.70	(22.58)	18.72	16.09	46.04
	(124.10)	(89.79)	(65.45)	(63.28)	(69.61)
N	70	70	70	59	59
R-sq	0.35	0.44	0.489	0.674	0.681
adj. R-sq	0.2	0.31	0.37	0.598	0.606
AIC	446.7	436.3	429.9	352.9	361.5
BIC	478.2	467.8	461.4	377.9	386.5

Standard errors in parentheses
* p<0.05

Table 3. Testing the Link between Inequality in Financial Access and Income Inequality, Regional Dummies

	(1) Gini (WB)	(2) Gini (WB)	(3) Gini (WB)	(4) Gini (WB)	(5) Gini (WB)
Inequality in financial access					
Inequality in financial access	0.252***	0.256***	0.177*	0.253***	0.160*
	(0.07)	(0.07)	(0.07)	(0.07)	(0.06)
Structural country characteristics					
Log real GDP per capita	-0.103	-0.168	-0.236*	-0.199	0.0606
	(0.17)	(0.11)	(0.10)	(0.13)	(0.17)
Log real GDP per capita squared	0.00297	0.0054	0.00955	0.00793	-0.00632
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Share of agriculture in GDP	-0.00375*	-0.00440**	-0.00367*	-0.00432**	-0.00188
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Policies					
Openness to trade	-0.000127	-0.000039	-0.0000267	-0.00013	0.0000438
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Inflation	-0.00145	-0.00175	-0.00134	-0.00137	-0.00179
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Human capital	0.169	0.181	0.146	0.161	0.171*
	(0.12)	(0.11)	(0.07)	(0.11)	(0.08)
Human capital squared	-0.0378	-0.0391*	-0.0308*	-0.037	-0.0313
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
Gender inequality index	0.185	0.238*	0.114	0.195	0.0927
	(0.10)	(0.09)	(0.09)	(0.10)	(0.09)
Financial development	0.0831	0.119*	0.141**	0.0752	0.201***
	(0.07)	(0.06)	(0.05)	(0.07)	(0.05)
Access to electricity, rural					
Share of rural population	-0.000954	-0.00119*	0.000177	-0.000918	0.000199
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Sub-Saharan Africa	0.0326				0.0942*
	(0.04)				(0.04)
Middle East and North Africa		-0.176***			-0.0812**
		(0.03)			(0.03)
Latin America and the Caribbean			0.103***		0.128***
			(0.03)		(0.02)
Euro Area				0.00079	0.00369
				(0.02)	(0.02)
Constant	0.78	1.130*	1.414**	1.269*	(0.07)
	(0.84)	(0.54)	(0.48)	(0.57)	(0.81)
N	76	76	76	76	76
R-sq	0.633	0.674	0.732	0.625	0.802
adj. R-sq	0.563	0.611	0.681	0.554	0.753
AIC	-211.3	-222.3	-235.3	-209.7	-254.4
BIC	-181	-194.3	-205	-179.4	-219.5

Standard errors in parentheses
* p<0.05

Table 4. Testing the Link between Gender Inequality and Income Inequality
Dependent Variable: Gini Coefficient (WDI)

	(1)	(2)	(3)	(4)	(6)
Inequality in financial access					
Female/male ratio of financial access	-0.155**	-0.153**	-0.126*	-0.195***	-0.196***
	(0.075)	(0.073)	(0.071)	(0.063)	(0.060)
Inequality in financial access (purged from gender				0.306***	0.329***
				(0.069)	(0.063)
Structural country characteristics					
Log real GDP per capita	0.074	0.097	0.494**	-0.110	-0.094
	(0.095)	(0.093)	(0.206)	(0.095)	(0.083)
Log real GDP per capita squar	-0.007	-0.008	-0.029**	0.003	0.002
	(0.005)	(0.005)	(0.011)	(0.005)	(0.004)
Share of agriculture in GDP	-0.004**	-0.004**	-0.003**	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Policies					
Openness to trade	-0.000*	-0.000*	-0.000	-0.000*	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation		-0.002**	-0.001		-0.003***
		(0.001)	(0.001)		(0.001)
Financial development			0.082		
			(0.070)		
Access to electricity, rural			-0.152**		
			(0.072)		
Constant	0.523	0.442	-1.413	1.408***	1.365***
	(0.438)	(0.426)	(0.940)	(0.463)	(0.394)
Observations	84	84	83	84	84
R-squared	0.32	0.34	0.40	0.43	0.47

Robust standard errors in pare
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Correlations between Different Indices of Financial Access Inequality

	Main index	Excluding debit card	Excluding credit card	Excluding home loan	Excluding debit card, credit card and home loan
Main index	1				
Excluding debit card	0.990***	1			
Excluding credit card	0.991***	0.977***	1		
Excluding home loan	0.987***	0.966***	0.976***	1	
Excluding debit card, credit card and home loan	0.963***	0.960***	0.974***	0.972***	1