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No.2 / 2020

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Threshold effects of financial inclusion on income inequality*

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Abstract

Economic theory predicts an indeterminate (positive or inverse) relationship between financial inclusion and income inequality. We invoke a panel threshold model to investigate the possibility of a non-linear relationship between financial inclusion and income inequality, covering 106 countries. Our results show that financial inclusion reduces income inequality, but only up to a point, beyond which it does not reduce, and may even increase, inequality. Moreover, the effects of financial inclusion on the distribution of income vary across heterogeneous financial services and across countries at different stages of economic development.

Keywords: Financial inclusion; income inequality; panel threshold model

JEL classification: G2; F4; O5.

1. Introduction

The question of whether financial inclusion reduces income inequality has received increasing attention in the economics and finance literature in recent years. However, economic theory still provides conflicting predictions about the relationship between financial inclusion and inequality. Some theoretical models (e.g., Galor and Zeira, 1993) suggest a negative linear relationship between access to credit and income inequality. In contrast, Greenwood and Jovanovic (1990) predict a non-linear, inverted U-shaped relationship, between access to financial services and inequality, while Dabla-Norris et al. (2020) suggest that some financial inclusion policies may reduce or even increase inequality. The few existing empirical studies on this issue yield conflicting findings. Some studies find a negative relationship between

*We acknowledge, without implication, financial support from the DEGRP Research Grant (ES/N013344/2), funded by DFID and ESRC, on "Delivering Inclusive Financial Development and Growth", the ESRC-NSFC (ES/P005241/1) Research Grant on "Developing financial systems to support sustainable growth in China – The role of innovation, diversity and financial regulation", and the AXA Research Fund.

financial inclusion and income inequality (e.g., Honohan, 2007; Aslan et al., 2017), while recent cross-country evidence remains inconclusive (e.g., Park and Mercado, 2018; Dabla-Norris et al. 2020).

We make three contributions to the financial inclusion-income inequality literature. Firstly, we employ a panel threshold regression model to investigate possible non-linear effects of financial inclusion on income inequality in a panel of 106 countries over 2011, 2014 and 2017. We argue that the effects of financial inclusion on inequality may vary with the level of financial inclusion. Secondly, we examine whether the effects of financial inclusion on the distribution of incomes differ across different dimensions of financial inclusion (i.e., access and use) and across heterogeneous financial services (i.e., account ownership and credit). Thirdly, we explore the possibility that the relationship between financial inclusion and income inequality varies across countries with different income levels.

2. Panel threshold regression models

Hansen (1999) proposes a non-dynamic panel threshold model to estimate the structural break point of the threshold value. Within an individual fixed effects model, observations fall into multiple regimes, depending on whether the observation is below, above, or between threshold values. These regimes are identified by varying regression slopes. The threshold value is determined endogenously by the data, and its statistical significance is assessed by the bootstrap method. The explanatory variables are assumed to be exogenous.

A single threshold model is given as follows:

$$g_{it} = \mu_i + \beta'_1 x_{it} I(\alpha_{it} \leq \gamma) + \beta'_2 x_{it} I(\alpha_{it} > \gamma) + e_{it} \quad (1)$$

where g_{it} and α_{it} are the scalars standing for the dependent and threshold variable, respectively. Explanatory variables are denoted by x_{it}, which is a k vector. *I (.)* is the indicator function, and γ is the threshold parameter dividing the sample into two regimes. Alternatively, model (1) can be written as:

$$g_{it} = \begin{cases} \mu_i + \beta'_1 x_{it} + e_{it}, (\alpha_{it} \leq \gamma) \\ \mu_i + \beta'_2 x_{it} + eit, (\alpha_{it} > \gamma) \end{cases} \quad (2)$$

The main assumption for the identification of β_1 and β_2 concerns the fact that the components of x_{it} and α_{it} are not time invariant. In addition, x_{it}, α_{it} and e_{it} are assumed to be independent and identically distributed (i.i.d). The initial step is to eliminate fixed effects using within transformation, followed by estimating γ by the least squares estimation, and to establish the value minimising the concentrated sum of the squared errors to obtain the following:

$$\hat{\gamma}=\underset{\gamma}{argmin} S_1(\gamma) \tag{3}$$

where $S_1(\gamma)=\hat{e}^*(\gamma)'\hat{e}^*(\gamma)=Y^{*'}(I-X^*(\gamma)'(X^*(\gamma)'X(\gamma))^{-1}X^*(\gamma)')Y^*$ and I denotes the identity matrix. After obtaining $\hat{\gamma}$, residual vector $\hat{e}^*=\hat{e}^*(\gamma)$ and residual variance $\hat{\sigma}^2=\frac{1}{n(T-1)}\hat{e}^{*'}\hat{e}^*=\frac{1}{n(T-1)}S_1(\hat{\gamma})$ are computed.

In order to test the significance of the threshold effect, the hypothesis of no threshold (i.e. $H_0{:}\beta_1=\beta_2$) is tested using the likelihood ratio of $F_1=(S_0-S_1(\hat{\gamma}))/\hat{\sigma}^2$ (S_0 is the sum of squared residuals for a no threshold case) having a non-standard distribution. A bootstrap procedure is implemented, in order to obtain a first order asymptotic distribution, in which the valid p values are constructed. If the null is rejected, a further test can be conducted, in order to distinguish between one and two thresholds, based on the likelihood ratio $F_2=(S_1(\hat{\gamma}_1)-S_2(\hat{\gamma}_2{}^{\gamma}))/\hat{\sigma}^2$ of one versus two thresholds, which can be repeated to test for more than two threshold cases.

3. Financial inclusion and income inequality: A panel threshold analysis

We investigate the relationship between financial inclusion and income inequality using a balanced panel of 106 developed and developing countries for 2011, 2014 and 2017. The equation of interest with one potential threshold γ takes the following form:

$$inequality_{it}=\mu_i+\beta'_1 fi_{it} I(\alpha_{it}\leq\gamma)+\beta'_2 x_{it} I(fi_{it}>\gamma)+jW_{it}+e_{it} \tag{4}$$

where $I(.)$ is the indicator function and the threshold variable α_{it} divides the observations into two different regimes, characterised by two different slopes β_1 and β_2. The dependent variable is income inequality, which is measured by the Gini coefficient of disposable income [1].

[1] Data on financial inclusion were obtained from the Global Findex database. All the other data were collected from the World Bank's World Development Indicators database.

The financial inclusion variable *fi* serves as the regime-dependent regressor and threshold variable. The parameters β_1 and β_2 correspond to the effect of financial inclusion on inequality in the low and high regime, respectively. We use two different measures of financial inclusion that capture the "access" and "use" dimensions of an inclusive financial system, namely: (1) the percentage of the adult population having an account at a formal financial institution and (2) the percentage of adults borrowing from a formal institution. *W* represents a set of regime-independent regressors that are often used as control variables in the financial inclusion-inequality literature, including trade, inflation, government spending, education and population growth (e.g., Park and Mercado, 2018). Finally, μ_i is a country fixed effect, and e_{it} the error term. We also control for potential endogeneity [2] .

Table 1 reports the results of estimating Eq. (4) using these two different measures of financial inclusion for the whole sample and for the sub-samples of high-, middle-, and low-income countries. The upper panel shows that the null hypothesis of no threshold can be rejected at the 5% significance level, while the alternative hypothesis of a single threshold can be accepted.

Our results indicate that financial inclusion has a non-linear effect on income inequality. Furthermore, the impact of financial inclusion on inequality varies with the type of financial service, as well as with the level of economic development. The analysis of the two regime-dependent financial inclusion coefficients β_1 and β_2 show that account ownership has a significant negative effect on income inequality only up to a certain point, beyond which this effect becomes insignificant in most cases. The threshold estimates, denoted by γ, range from 29.177 (low-income countries) to 62.144 (high-income countries). This indicates that the threshold beyond which an increase in account ownership no longer results in a reduction in income inequality is reached when 29%, 30% and 62% of adults in low-, middle- and high-income countries, respectively, have an account at a formal institution. One possible explanation for this is related to the access-use gap in financial inclusion. Globally, 20% of account owners do not make use of the savings and payments services their accounts provide. This share is especially high in many low- and lower-middle- income countries, such as Nepal and India (Demirgüç-Kunt et al., 2018).

We also find that increases in borrowing are associated with decreases in income inequality but only up to a certain threshold level of borrowing. Beyond that level, further

[2] To control for potential endogeneity in our model, we regress financial inclusion on a set of instruments identified in the finance-inequality literature, and use the predicted values in our estimation. Specifically, the set of instruments we identified from the literature are a country's legal origins and the quality of institutions, in line with Mookerjee and Kalipioni (2010).

increases in borrowing lead to increases in inequality in all countries, and especially in low- and middle-income countries. The point beyond which the use of formal credit increases income inequality is reached when 6.9%, 6.8% and 10.6% of the adult population borrow from formal institutions in low-, middle- and high-income countries, respectively. This finding implies that promoting financial inclusion through credit may cause financial instability and thereby worsen income inequality. For example, microcredit may adversely affect the poor by causing over-indebtedness.

4. Conclusion

We provide new evidence of a non-linear, U-shaped relationship between financial inclusion and income inequality. The effects of financial inclusion on income distribution depend on a country's level of financial inclusion and economic development, as well as the types of financial inclusion policies adopted (i.e., credit-based or otherwise). Overall, the more financial inclusion a country achieves, the greater the reduction in income inequality; however, this holds true at lower levels of financial inclusion. At higher levels of financial inclusion, for heterogeneous types of financial products, and for low- and middle-income countries, more financial inclusion may not deliver better outcomes in terms of income inequality reduction.

Table 1
The financial inclusion-income inequality nexus.

	Financial inclusion: Account (Access)				Financial Inclusion: Borrowing (Use)			
Variables	(Whole sample)	(High Income)	(Middle Income)	(Low Income)	(Whole sample)	(High Income)	(Middle Income)	(Low Income)
Test for the number of thresholds								
H_0: No threshold (K=0)	0.021	0.035	0.019	0.022	0.011	0.023	0.034	0.016
H_0: At most one threshold (K= 1)	0.140	0.450	0.170	0.336	0.123	0.132	0.223	0.154
Threshold estimates and confidence intervals								
$\hat{\gamma}$	31.319	62.144	30.329	29.177	6.840	10.569	6.840	6.880
95% confidence interval	31.317-31.436	59.687-62.500	28.176-31.020	28.610-34.672	6.820-6.880	8.933-11.752	6.801-6.904	6.840-6.940
Coefficients of Regime-dependent regressors								
β_1	-0.091***	-0.021*	-0.077**	-0.059**	-0.365**	-0.109*	-0.588*	-0.241**
	(0.031)	(0.011)	(0.034)	(0.024)	(0.177)	(0.065)	(0.327)	(0.116)
β_2	0.016	0.008	0.038	0.146**	0.049*	0.005*	0.022*	0.131**
	(0.019)	(0.008)	(0.045)	(0.057)	(0.029)	(0.003)	(0.014)	(0.056)
Regime-independent regressors								
Economic growth	0.037*	0.017*	0.131*	0.078	0.056*	0.021**	0.023	0.111*
	(0.022)	(0.009)	(0.072)	(0.062)	(0.032)	(0.009)	(0.019)	(0.062)
School enrolment	-0.008*	-0.014**	-0.020*	-0.007*	-0.012**	0.015	-0.017*	-0.011**
	(0.005)	(0.006)	(0.012)	(0.004)	(0.006)	(0.016)	(0.010)	(0.005)
Trade	-0.015*	-0.009*	-0.041*	-0.031	-0.011*	-0.011*	-0.055	-0.031**
	(0.008)	(0.005)	(0.022)	(0.025)	(0.006)	(0.006)	(0.042)	(0.015)
Government expenditure	-0.064*	-0.087*	0.105*	0.071	-0.015	-0.012*	0.104*	0.014*
	(0.039)	(0.049)	(0.67)	(0.158)	(0.013)	(0.007)	(0.055)	(0.008)
Inflation	0.005**	0.018	0.008	0.055	0.003*	0.011	0.011*	0.004
	(0.002)	(0.032)	(0.036)	(0.053)	(0.002)	(0.008)	(0.006)	(0.012)
Population growth	-0.197*	-0.197	-5.214	-3.172	-0.111*	-0.120*	-0.102	-0.107*
	(0.105)	(0.385)	(0.774)	(0.705)	(0.065)	(0.067)	(0.123)	(0.060)
Constant	43.074	37.327*	131.346	92.131	12.543	45.198*	56.103**	43.105*
	(33.956)	(22.312)	(82.730)	(63.123)	(10.102)	(33.302)	(22.423)	(22.506)
Observations	318	114	75	129	318	114	75	129
R-squared	0.133	0.203	0.190	0.200	0.213	0.198	0.202	0.204
Number of id.	106	38	25	43	106	38	25	43

Notes: Standard errors are given in parentheses, */**/*** indicate the 10%/5%/1% significance levels. Like in Hansen (1999), each regime has to contain at least 5% of all observations. 1000 bootstrap replications were used to obtain the p-values to test for the number of thresholds. By construction, the confidence intervals for the threshold estimates can be highly asymmetric.

References

Aslan, G., Deléchat, C., Newiak, M. M., Yang, M. F., 2017. Inequality in financial inclusion and income inequality. International Monetary Fund Working Paper Series 17/236.

Dabla-Norris, M. E., Ji, Y., Townsend, R., Unsal, D. F., 2020. Distinguishing constraints on financial inclusion and their impact on GDP, TFP, and the distribution of income. Journal of Monetary Economics, forthcoming.

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., Hess, J., 2018. The Global Findex database 2017: Measuring financial inclusion and the FinTech revolution. Washington, DC: The World Bank.

Galor, O., Zeira, J., 1993. Income distribution and macroeconomics. The Review of Economic Studies. 60, 35-52.

Greenwood, J., Jovanovic, B., 1990. Financial development, growth, and the distribution of income. Journal of Political Economy. 98, 1076-1107.

Hansen, B. E., 1999. Threshold effects in non-dynamic panels: Estimation, testing, and inference. Journal of Econometrics. 93, 345-368.

Honohan, P., 2007. Cross-country variation in household access to financial services. Paper Presented at the Conference "Access to Finance", Washington DC, 15-16 March.

Mookerjee, R., Kalipioni, P., 2010. Availability of financial services and income inequality: The evidence from many countries." Emerging Markets Review. 11 (4), 404-408.

Park, C-Y., Mercado, R., 2018. Financial inclusion, poverty, and income inequality. The Singapore Economic Review. 63, 185–206.