SAVINGS OR CREDITS—WHICH CHANELL OF FINANCIAL INTERMEDIATION WORKS BETTER FOR GROWTH AND POVERTY ALLEVIATION? — AN EMPIRICAL STUDY USING PANEL DATA

Selim Akhter[1]

ABSTRACT

Using panel data from 54 developing countries for the period 1993-2004, this study provides evidence that beyond the indirect effect that transmitted through economic growth, financial development has a direct effect on poverty alleviation. But the direct effect can be identified when financial development is measured by the ratio of aggregate money balance (currency plus deposits) to GDP rather than the ratio of private credits to GDP. Our analysis also reveals that financial development and financial instability are positively correlated and that while financial development is good, financial instability is detrimental to the poor.

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University of Western Sydney

[1]A faculty in the Department of Finance and Banking, University of Rajshahi, Bangladesh. Now on study leave, a PhD candidate in the School of Economics and Finance at the University of Western Sydney, Australia.
Email: s.akhter@uws.edu.au

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> Tara, owner of a tiny grocery on the platform of Rajshahi (a town in the northern areas of Bangladesh) railway station, was speaking loudly with a passenger waiting for a down train. "I was so happy when the bank issued me the credit card; now, see, it is taking every penny out of my cash box. I had a small savings with the bank. The bank officer asked me if I was interested to apply for a credit card. I got excited, why not? Since then started spending from the card and was paying regularly the fees and minimum payments. The manager said: your payment record is good, why don't you increase the limit? Again I said, well. Now look, whatever I earn goes into the card, what a burden it is; neither can I vomit, nor can I digest. The card is a curse on me brother….
> Maybe it is not the card, the curse is how, when and where you spend it - the passenger responds before boarding in the train.

I. INTRODUCTION

Financial intermediaries provide savings and credit opportunities. Which of these financial services is pro-poor? More precisely, are the poor benefited when the aggregate money balances (currency plus deposits) with banks or credits provided by them to the private sectors are increased in an economy? The primary objective of this paper is to seek answer to this question.

Some authors (e.g. Beck et al 2004 and 2007) argue that financial development is not only pro-growth (enhances economic growth) but also pro-poor (enhances poverty alleviation). By pro-poor, they mean a direct link between financial development and poverty alleviation. Using aggregate credit as a measure of financial development, they have shown that beyond the indirect effect that goes to the poor through economic growth, financial development (or more precisely credits) has a direct effect on the poor since the income of the poor grows at a faster rate than the growth in the average income of the economy as a result of financial development. But access of the poor to bank credits is limited due to the high unit cost of small loans as Greenwood and Jovanovic (1990) rightly argued. This

contradicts the idea that credit is pro-poor. Then, how might one claim that financial development has a direct link with poverty? One branch of thought (for example Rajan and Zinales 2004) suggests that as the financial system becomes healthier and more competitive, banks offer more flexible loans and at the same time firms and households attain the ability to afford higher cost of capital.

There is yet another argument in the literature to support the view that financial development helps the poor both indirectly through growth and directly by inducing them in self-financed economic initiatives. This argument is due largely to McKinnon (1973) who hypothesized that money and capital are complements and that in absence of deep financial markets money balances should be accumulated first before indivisible investment can be undertaken. In essence, McKinnon (1973) argued that even if they do not provide credit to the poor, financial institutions are still useful because they offer profitable financial opportunities for savings. Thus, from McKinnon's point of view, financial sector reform measures, especially in developing countries should be directed towards encouraging savings and eliminating financial repression by liberalizing interest rates prior to reforms directed to easing access to credit. The present study is motivated by these propositions. We believe that even though there is no doubt about the role of financial development in growth and poverty alleviation, alternative measures aiming at improving the quality of financial intermediation in developing counties should be critically evaluated.

Accordingly, the present study investigates which channel of financial intermediation: savings or credit is more conducive to the poor. As the indicator of development of these two channels of financial intermediation, we use the ratio aggregate money balances (currency

plus deposits) to GDP (M3/GDP) and private credits to GDP (CGDP) respectively. We use these indicators in poverty models which look for an effect of these indicators on poverty beyond the effect that trickles down to poor though growth. In other words, our model tries to recognize a direct link between financial development and poverty alleviation after controlling for the indirect effect that transmitted to the poor through growth. We justify using M3/GDP and CGDP in a poverty model by the theoretical arguments presented by McKinnon (1973) and Beck et al (2004; 2007) respectively. Financial development and financial instability are like the two sides of a coin; while financial development is believe to help poverty alleviation, financial instability is supposed to be detrimental to the poor. We therefore, consider an indicator of financial instability in our model to see its effect on the poor.

Using data from 54 developing countries for the period 1993-2004 in a panel data model, we find evidence that financial development has both a direct and indirect effect but the direct effect is identified only when the balance (M3/GDP) is used as the indicator of financial intermediaries' development. This reveals the predominance of McKinnon's arguments regarding the finance-poverty nexus. The failure of CGDP to exert a direct effect indicates that access to credit for the poor still remains a challenge in the developing countries. We have also found that the marginal impact of financial development on poverty alleviation is reduced (the coefficient of M3/GDP increases in absolute terms) when the instability indicator is added to the model. This indicates a positive correlation between financial instability and financial development.

This paper proceeds as follows: section 2 presents a description of the research issue and a review of literature. Section 3 describes the research design. Section 4 presents results and interpretations while section 5 concludes the paper.

II. THE RESEARCH ISSUE AND REVIEW OF LITERATURE

2.1. The Link between Finance and Poverty

Undeniably, institutional finance can help the poor to invest in physical capital or human resources and insulate their spending against external shocks. But the question is whether the poor can access the formal sources of finance. A survey report is worth quoting in this context:

> "For many people, the only source of credit is a pawnshop or money lender who may charge staggeringly high interest and beat up clients who fail to pay on time. In the Philippines, lenders who zip from town to town on motorcycles expect six pesos back for every five they lend. That translates into an annual interest rate of over 1,000% on a loan for a month."(Easton 2005, 3)

This provides evidence that financial services are costly which the poor may not be able to afford. Banerjee and Newman (1993) and Aghion and Bolton (1997) claim that credit constraints are particularly binding on the poor and that these credit constraints represents a particularly high barrier to the ability of the poor to exploit investment opportunities. The idea is more formally presented by Greenwood and Jovanovic (1990). They argue that because access of the poor households to bank credit may be impeded by the high unit cost of small loans, financial development, especially at the early stage, may be regressive for the poor. According to Greenwood and Jovanovic (1990) benefiting from institutional finance or

subscribing to such financial services as screening and risk pooling requires an initial set-up cost which the poor cannot afford. However, Greenwood and Jovanovic also point out that over time it becomes easier for the poor to access credit, which may result in an inverted U-shape curve of income inequality and financial development. In essence, the Greenwood and Jovanovic (1990) model suggests that while at an early stage of financial development, it is only the rich who have access to financial markets and thus the opportunity to invest in high-risk, high-return projects, over time, the access expands to poorer segments of the population. The distribution effect of financial development is thus adverse for the poor at early stages, but positive after a turning point.

Building partially on this proposition, Rajan and Zingales (2003) argue that it is only half-truth that the poor are not profitable customers for financial services. They have shown that as the financial system becomes healthier, powerful and more competitive, financial strength of firms and households enhances; as a result, they can bear with even higher cost of capital. Moreover, the development of informal credit, which is often the only source of borrowing for poor people, is made easier by the growth of a formal financial market which offers opportunities for profitable investments. In another work, (Rajan and Zingales 2004) they present strong theoretical arguments why banks should consider the poor as profitable clients for credits. They observe that the poor may not be able to provide the so-called collateral in the form of an asset such as a piece of land, a precious antique item, or something else, but they still qualify for bank credit should they possess creativity and have the vision of a better future. Rajan and Zingales consider the creativity of the poor as their hidden wealth. They argue that banks refusing credit to the poor are short-sighted as they fail

to explore this hidden wealth of the poor. They contend that the reason poor people in developing countries cannot get finance at a reasonable rate is that these countries are deficient in institutions; ownership rights are neither well demarcated nor well enforced; there are no agencies collecting, storing, and disseminating information on the creditworthiness of potential borrowers; there is little competition between moneylenders; the laws governing credit are outdated; contracts are not enforced because the judiciary is all too often either asleep or corrupt. Thus, according to Rajan and Zingales the idea that people who have little money do not make suitable clients for financial services is at most a half-truth. Perhaps, the message has conveyed to the financial institutions. There are instances that financial services are now being redirected from the vicinity of the rich to the unexplored wealth of the poor. In Latin America commercial banks have begun to make pooled loans available to the poor, as microcredit institutions have been doing (Mosley 1999). The world's largest banks are discovering the market for poor customers (Easton 2005). Are these developments really changing the living condition of poor? If so then, what is the theoretical link between financial development and poverty that justifies the view that financial development helps the poor?

The literature recognizes an indirect link between financial development and poverty. The idea is that the effect of financial development is transmitted to the poor through economic growth. It is well documented in the literature that financial development enhances economic growth (e.g. Levine et al 2000, Levine 1997, Easterly 1993), and growth is good for the poor (e.g. Sylla 2006 and 2008, Rousseau and Sylla 2004, Dollar and Kraay 2002, and

Jalilian and Kirkpatrick 2002)[2]. For instance, Dollar and Kraay (2002) have shown that average per capita income of the poorest population is largely explained by the growth in real GDP per capita. Whilst the indirect effect is well established in the literature, researchers are now raising yet another question: is there any other distinguishable effect of financial development beyond the effect that transmits through growth?

Beck et al (2004 and 2007) make seminal attempts to addressing the issue. Given that there is already significant evidence that financial development is pro-growth, they seek to determine whether financial development is also pro-poor. By pro-poor they mean a direct link between financial intermediary development and poverty alleviation. They have shown that financial intermediary development reduces income inequality by disproportionately boosting the income of the poor and, therefore, reduces poverty. But their results may be criticized on the ground that they do not necessarily establish a causal link from financial development to poverty. They use the ratio of private credit to GDP as the indicator of financial intermediary development. The credit to GDP ratio is an aggregate measure that captures the amount of savings intermediated to private borrowers relative to GDP. It does not, however, indicate the degree to which the population in general or the poor in particular access financial services. The authors themselves admit this limitation and contend that they consider their analysis as a first step before better data on access of the poor to financial services is constructed. From our point of view, although Beck et al (2007) results do not provide a causal link, they do provide an initial prediction which has significant policy implications, and therefore, needs further investigation. For example, they emphasize credit

[2] See Haber (2008) for a latest review of literature on the finance-growth nexus.

as the principle channel through which the benefit of financial intermediation reaches the poor. They ignore savings or deposits — the other channel of financial intermediation, which according to McKinnon (1973) is a crucial input to growth and poverty alleviation. Moreover, they do not consider financial instability that may follow the growth of credits. More specifically, they ignore the issue that credit growth is a predictor of banking and currency crises (Loayza and Ranciere 2006). There is another limitation in Beck et al (2004) which relates to estimation technique. They use cross-sectional method which suffers from omitted variable bias by disregarding heterogeneity across the panel units (countries). In the present study, we use panel data which not only takes into account such heterogeneities, but also allows us to estimate our model with more degrees of freedom.

The growth-finance literature reviewed above emphasizes credit as the principal channel of financial intermediaries that passes growth-enhancing and thereby poverty reducing effects on the economy. Can aggregate money (currency plus deposits) with a banking system be considered another growth-enhancing and poverty reducing channel? The answer can be found in the 'finance motive' for money demand suggested by Keynes (1937) and rehabilitated by McKinnon (1973) when he presented the concept of 'conduit effect'. The idea of the conduit effect is embedded in his well-known complementary hypothesis which states that money and real capital assets are complements in developing economies because in the absence of deep financial markets and extensive financial intermediation, money balances have to be accumulated before relatively costly and indivisible investment projects can be undertaken. He argued that when economic units are confined to self-finance so that there is no useful distinction between savers (households) and investors (firms),

indivisibilities in investment are of considerable importance. Here, money and capital become complementary:

> If the real return on holding money increases, so will self-financed investment over a significant range of investment opportunities. The increased desirability of holding cash balances (for the poor) reduces the opportunity cost of saving internally for the eventual purchase of capital goods from outside the firm-household. The financial 'conduit' for capital accumulation is thereby enlarged (McKinnon, 1973, p. 60).

Based on the idea of the conduit effect of real money balances, in the early 1970s, McKinnon advocated freeing the financial systems of developing countries from constraints that impede their development, such as ceilings on interest rates, high reserve requirements, administrative credit allocation, and other government-induced distortions.

A number of studies (e.g. Fry 1978, Khan and Hasan, 1998; Kar and Pentecost, 2001) have empirically investigated McKinnon's complementary hypothesis and found that the demand for real money balances depends positively on real income, the real rate of interest on bank deposits, and the real return on capital; and that at the same time the ratio of aggregate investment to real income is positively related to the real return on money balances. Li et al (1997) find that financial depth enters strongly and significantly as a contributor of lowering income inequality (Gini index) and raising the average income of the lower 80% of the population. They conclude that financial development removes credit constraints for poor households and thereby feeds their desire to spend money on activities such schooling and healthcare for children. Recently Guillaumont and Kpodar (2008) take into account McKinnon's complementary hypothesis to justify using deposit as the channel through which financial intermediation work on growth and poverty. They find this channel

(deposit) to perform better compared to credit in transmitting the effect of financial intermediation on poverty alleviation. More specifically, their results suggest that the direct effect of financial development on poverty alleviation is stronger when M3/GDP is the response variable. However, their results regarding the relative importance of deposit versus credit leave rooms for doubt as they contradict earlier evidence (e.g. Beck et al 2004 and 2007). The difference in results may be due to the composition of data or estimation techniques. We believe that the issue of relative importance of these channels needs further investigation because it provides crucial reform directions for improving financial systems, especially in developing countries. For example, the dominance of McKinnon conduit effect (role of savings or deposits) would suggest reforms to eliminate financial repression by liberalizing interest rates prior to reforms to improve access to affordable finance by improving the institutional lending mechanism. In other words, savings mobilization would seem to be more effective for poverty alleviation than making credit available for the poor. By contrast, if credit is recognized as the principal channel for financial intermediation, reform policies would emphasize lending which in the long run may hurt peoples' motivation in undertaking enthusiastic self-reliant economic initiatives. Furthermore, we believe that further studies of the direct and indirect effect have critical importance because the magnitude of these effects would suggest active financial sector reforms. For example, if the direct effect of the ratio of private credits to GDP (one of the measures of financial development in this study) is found to be insignificant, this would mean that private credit does not benefit the poor directly. Therefore, a micro-lending based financial architecture might be more useful for the poor people in developing countries. Keeping these serious

issues in mind, we undertake this study and believe that the empirical evidence from this study will not only help decide the policy direction but also contribute to the existing body of literature on the finance-poverty nexus.

2.2. Financial Instability and Poverty

Thus far we have highlighted only the positive aspects of financial development. But there are many theoretical and practical justifications suggesting that as the financial systems developed, it is more likely to experience instability particularly in developing countries. The literature has pointed out various factors responsible for such instability. To mention a few from those, for example, are inadequate legal system and poor macro-economic policies (Guillaumont and Kpodar 2006), and multiple equilibrium states- that is, a shift from non-crisis to crisis equilibrium (Loayza and Ranciere 2006). However, we are not going to elaborate on the financial development and instability link because it is beyond the purview of this study. We rather seek answer to the question whether financial instability hurts the poor. Again, there are many reasons to believe that financial instability is detrimental to the poor. Guillaumont and Kpodar (2008) observe that the poor are more vulnerable to financial crises than the rich. They argue that the poor people are particularly hurt by disruptions of the payment system and unwarranted bank closures. For instance when deposits are frozen, lower and middle income people cannot diversify their assets say, by investing their savings in foreign banks. Therefore, in countries where some banks are periodically unable to ensure the liquidity of their deposits, the McKinnon conduit effect is probably dampened or even cancelled out by the doubt surrounding the health of the banking system. Moreover, when

banks are in difficulty, they begin to ration small loans because these borrowers are less profitable for them and also because the poor have little negotiating power.

Beside the direct effect, an indirect effect may result from the instability of growth and inflation induced by an unstable financial system. Ramey and Ramey (1995) argue that growth volatility induced by financial instability impedes economic growth. Because economic growth is a necessary condition for durably reducing poverty, financial instability thus hurts the poor. Moreover, because investment is closely linked to credit availability, financial instability is likely to exacerbate fluctuations in the investment rate, thereby destabilizing growth. We consider a study of the finance-poverty link is incomplete if it does not take into account the possible effect of financial instability. Therefore, we design a poverty model that includes both financial development and financial instability. The model and estimation techniques are described in the following section.

III. RESEARCH DESIGN

3.1. The Analytical Framework, the Model and Estimation Techniques

Based on the arguments presented in section 2, we proceed to analyze the impact of financial development on poverty alleviation within the following framework. First we recognize the indirect effect of financial development: that is, financial development enhances growth and growth is good for the poor. Then we hypothesize that beside this indirect effect, financial development has a direct impact on poverty. We consider two channels of financial intermediation: one is savings or deposits, and the other is credit. Building on the McKinnon conduit effect and Beck et al (2004 and 2007) argument that financial development is pro-

poor, we hypothesize that both channels have distinguishable direct and indirect effects on poverty alleviation. Finally, we assume that there is a positive correlation between financial development and financial instability and that the latter exerts a negative impact on poverty alleviation.

Thus, our poverty model identifies both the direct and the indirect effects of financial development. We use the logarithm of mean per capita income measured in the same years as poverty to take into account the indirect effect, that is, the impact of growth on poverty. Following Guillaumont and Kpodar (2008) we favor average income rather than per capita GDP growth rate because the former already captures information on past growth episodes over a relatively long period, which is relevant when assessing the impact of long-term growth on poverty reduction. Moreover, average income takes into account the initial level of income, thus allowing us to control for the initial level of poverty. To measure financial development, we use two popular indicators namely the ratio of aggregate money balances (M3) to the gross domestic product (M3/GDP) and the ratio of private credits to GDP (CGDP). Private credits include those provided by banks and non-bank financial institutions to the private sector. These indicators have been used in many empirical studies (e.g. Guillaumont and Kpodar 2008 Beck et al 2007, Honohan, 2004) since they capture different aspects of financial development. More specifically, M3/GDP is related to the ability of financial systems to provide transaction services and saving opportunities, so it is relevant for testing the McKinnon conduit effect. While the ratio of credits to GDP, by excluding credit to the public sector, has the advantage of measuring more accurately the role of financial intermediaries in channeling funds to productive agents and possibly to the poor. However,

one may criticize using these indicators in poverty model on the ground that they are aggregate measures and do not represent the share of the poor in the financial intermediation. We admit this limitation but, at the same time, want to make the point clear that we do not intend to test causality; our aim is to examine the probable dependence of a poverty indicator on these indicators of financial development which is predicted by existing theories and arguments.

To estimate the impact of financial instability on poverty, we use an indicator of instability which is generated from the respective series of financial development indicators. The existing literature identifies quite a large set of poverty determining factors. For instance, it is alleged that inflation hurts the poor disproportionately (Easterly and Fischer 2001), while high and rising corruption increases income inequality and poverty (Gupta et al 1998). Moreover, Beck et al (2007) have suggested incorporating variables such as trade openness, government expenditure, school attainment, regional identity, and legal origin. However, we could not include the whole set of poverty determining factors in our model. Depending on the availability of data, theoretical justification and empirical evidence, we consider some of these factors namely inflation, trade openness, government expenditure, instability of growth (measured by the standard deviation of GDP per capita), corruption and political stability in order to extract their effects from the poverty-finance relationship. Our base model is specified as follows.

$$hci_{i,t} = \beta_i + \beta_1 \log(pci_{i,t}) + \beta_2 FD_{i,t} + \beta_3 FI_{i,t} + u_i + e_{i,t} \qquad (1)$$

The last part of equation (1) $u_i + e_{i,t}$ is the sum of the error components: where u_i represents county specific heterogeneity and $e_{i,t}$ the time variant error. We assume u_i to be correlated

with the regressor. This makes OLS estimator inconsistent and biased (see Wooldridge 2006). The second component $e_{i,t}$ is the time-variant (or idiosyncratic) disturbance to which the classical OLS assumptions e.g. orthogonal to the regressor and serial independence apply. But in panel data, the idiosyncratic disturbance (those apart from the fixed effects) may have individual specific patterns of heteroskedasticity and serial correlation, which again makes OLS estimates unreliable. A widely used technique to handle these issues is the system generalized method of moments (GMM) proposed by Arellano and Bover (1995) and Blundell and Bond (1998). We use this technique to estimate parameters of our model.

However, each panel unit in our data set has irregular gaps which limit generating instruments from immediate lags. Moreover, the within variance of most of the variables is very small (table A1 presents the panel data summary in the appendix), which is likely to cause identification problem. Recently, Plümper and Troeger (2007) propose a technique called fixed effect vector decomposition (FEVD) which can efficiently estimate coefficients of rarely changing or time-invariant variables. We use this technique together with system GMM to estimate our models. The FEVD estimator decomposes the unobserved unit fixed effect into two segments: an unexplained part and a part explained by the time invariant and/or rarely changing variables. The estimation process under this technique involves the following three steps: in the first step, the procedure estimates the unit FE by running a FE estimate of the base model. In the second step, the procedure splits the unit effects into an explained and an unexplained part by regressing the unit effects on the time-invariant and/or rarely changing explanatory variables of the original model. Finally, the third stage performs a pooled-OLS estimation of the base model by including all explanatory time-variant

variables, the time-invariant variables, the rarely changing variables, and the unexplained part of the FE vector. This third stage allows computing correct SEs for the coefficients of the (almost) invariant variables. In addition, one can conveniently use this stage to adjust for serial correlation of errors.

3.2. Description of Variables and Data

The dependent variable—poverty in our model is represented by the head count index (*hci*) which is defined as the percentage of population under a dollar daily income. On the explanatory side we include natural log of average per capita income (*pci*) to capture the effect of growth. Data on *hci* and *pci* are obtained from the World Bank poverty database called *PovcalNet*[3]. *FD* in the model represents the indicator of financial development. As mentioned earlier, we use two measures of financial development namely the Credit-GDP ratio and the M3-GDP ratio. Credits include those extended to the private sector by the bank and non-bank financial institutions whereas M3 includes currencies and deposits. One cannot expect financial development to have immediate impact on poverty. A policy measure is likely to take few years to exert an influence on peoples' living condition. Moreover, poverty index is observed at irregular intervals. For these reasons, we take mean values of *FD* over five years. Therefore, each observation of *FD* at time *t* is an average taken over the year of poverty index and preceding four years. Following Guillaumont and Kpodar (2006), *FI*, the indicator of financial instability in our model is defined as a five-year average of the absolute value of residuals of the trend line: $FD_\tau = a + bFD_{\tau-1} + c\tau + \varphi_\tau$ where *FD* is the indicator of

[3] *PovcalNet* is an interactive computational tool that allows researchers to replicate the calculations made by the World Bank's researchers in estimating the extent of absolute poverty in the world, including the $1 a day poverty measures. For more details, visit http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp

financial development, τ is an indicator of time, φ is the residual, and *a, b,* and *c* are the parameters of the trend line. Thus, a given observation of financial instability is defined as: $FI_{i,t} = \frac{1}{5}[|\varphi_t| + |\varphi_{t-1}| + |\varphi_{t-2}| + |\varphi_{t-3}| + |\varphi_{t-4}|]$ where (t) is the year for which the poverty observation is available. An alternative to this indicator of financial instability could be the standard deviation of the variable *FD*. But the residual approach has the advantage over the standard deviation approach of not assuming a stochastic or deterministic trend; while the standard deviation approach implicitly assumes that the trend is stochastic. Moreover, the residual approach corresponds to the assumption that absolute variations in the indicators of financial development (*FD*) measure the level of instability more precisely than relative variations. In other words, by defining financial instability in terms of the absolute value of the residuals, we can assume that if, for example, the overall financial instability rises from 10% to 12% and then falls to 8%, the effect poverty will be the same as a rise from 20% to 22%, followed by a fall to 18%. *FI* is generated from the time series of respective financial development indicators (M3/GDP or CGDP) available at the World Development Indicators (WDI) 2006 online. The time period covered to generate *FI* is 1960 to 2004 in most cases. Countries with less than 15 observations are not considered.

Among the control variables, inflation is defined as the natural logarithm of 1 plus the rate of inflation $[\ln(1 + \text{rate of inflation})]$ where the rate of inflation is measured as the annual rate of change in consumer price index (CPI). Trade openness is defined as the sum of exports and imports. Data on the CPI, trade openness and government expenditure are taken from WDI 2006. Again, a given observation of these control variables represents an average

taken over the year for which the poverty index is available and preceding four years. Likewise, instability of growth at a given point of time *t*, represents the standard deviation of GDP per capita over time *t* and preceding four years. For corruption, we use the corruption perception index prepared by the Berlin based Transparency International (TI)[4]. Scores on this index relate to perceptions of the degree of corruption as seen by a large sample of business people and country analysts, and range between 10 and 0. A high value indicates less corruption, while a low score represents more corruption. For political stability, we use data from the World Bank's Worldwide Governance Indicators (WGIs) constructed by Daniel Kaufmann and associates[5]. The index of political stability represents the perceptions of the likelihood that a government will be destabilized or overthrown by unconstitutional or violent means, including political violence and terrorism. Its value ranges between -2.5 to 2.5; with a high value indicates more stability while a low score represents less stability of the government. Hence, we expect negative coefficients for both corruption and political stability in the estimated model. In addition to these variables, while using FEVD technique, we control our model for regional identity and legal origin to see heterogeneity of poverty across these indicators. Data for these indicators are obtained from the CIA World Factbook[6]. Furthermore, within the GMM framework, we use dummies for time. The autocorrelation test and the robust estimates of the coefficient standard errors under the GMM framework assume no correlation across individuals in the idiosyncratic disturbances. Time dummies make this assumption more likely to hold (Roodman 2006).

[4] The TI's scores on corruption are available at: http://www.transparency.org/policy_research/surveys_indices/cpi
[5] The WGIs dataset and background paper e.g. Kaufmann et al (2005) describing methodologies are available at: http://info.worldbank.org/governance/wgi2007/resources.htm
[6] Available at: https://www.cia.gov/library/publications/the-world-factbook/geos/af.html

We consider time period from 1993 to 2004 with at least three observations of the poverty index for each country[7]. This gives us a panel of 54 developing countries. The reason we use a smaller time period is that the poverty indices (percentage of population under a dollar income per day) before 1993 appear to be suspicious for many countries. Moreover, for some countries, poverty indices before 1993 are not comparable with the indices after 1993. The reason is that the poverty index is constructed on the basis of an internationally comparable concept of income, that is, income is measured in terms of a currency unit which is comparable across countries. This is done by converting a local currency unit to a currency unit of international purchasing power parity (PPP). But consistent information about PPP before 1993 is not available for many countries, especially the developing ones. This makes poverty index before and after 1993 inconsistent for a number of countries. We therefore, decide to drop data before 1993[8].

IV. RESULTS AND INTERPRETATIONS

Table 1 provides the estimates of our model where the channel of financial intermediation is savings or deposits (measured by the ratio of M3 to GDP). As we can see in table 1, the log of average per capita income (LPCI) appears with a significant negative coefficient across all specifications. We assume this variable to capture the effect of growth. Thus, the significant negative coefficient of LPCI indicates the effect of financial development which is transmitted to the poor through growth. The coefficient of the variable of our interest

[7] At the time of taking up the research, data up to the 2004 were available.
[8] In an initial attempt (Daly and Akhter 2007), we use date for the period 1980-2004 in a panel data model and found similar results regarding the relationship between the financial development indicators and the indicator of poverty. A summary of these results is provided in table A6 in the appendix.

—M3/GDP also emerges with significant negative coefficient. Moreover, the relationship is robust across all specifications. This implies that on average, an increase in the level of financial development will result in a decrease in the percentage of population under a dollar income per day, given the other variables are constant. We therefore, cannot reject the hypothesis that beside the indirect effect, financial development, represented by aggregate currency and deposit, has a direct effect on poverty alleviation. In other words, this provides evidence of McKinnon conduit effect across our sample. Moreover, the estimated positive coefficient of the interaction term (M3/GDP*LPCI) suggest that the McKinnon conduit effect works more in countries with low level of average per capita income (GMM model 2 in Table 1).

Table 1
OLS and GMM Estimates of Poverty Model:
Indicator of Financial Development: M3/GDP

Dependent variable: Percentage of population under $1 income a day						
	OLS			System GMM		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Log of per capita income (LPCI)	-0.4604***	-0.4593***	-0.4536***	-0.3511*	-1.2279***	-0.8859***
	(0.0310)	(0.0306)	(0.0302)	(0.1629)	(0.2297)	(0.2031)
M3/GDP	-0.0725*	-0.1165**	-0.1189**	-0.1675+	-7.3591***	-4.9650*
	(0.0363)	(0.0397)	(0.0391)	(0.0861)	(1.7673)	(1.8851)
Instability of M3/GDP		0.8883*	0.7474*	0.9355	-0.0919	0.3068
		(0.3437)	(0.3414)	(1.2257)	(0.6745)	(6.1607)
Instability of growth			-0.8397**		0.0390	-0.3018
			(0.2779)		(0.5563)	(0.4164)
Inflation	-0.0191	-0.0349*	-0.0194	-0.0165	-0.0341	-0.0075
	(0.0127)	(0.0139)	(0.0146)	(0.0214)	(0.0296)	(0.0258)
Corruption	0.0788	0.0468	0.0273	0.6146+	-0.1822	-0.1873
	(0.0790)	(0.0791)	(0.0781)	(0.3347)	(0.1521)	(0.1351)
Government Expenditure	0.1438	0.1019	0.1488	-1.5423	0.0299	-0.1126
	(0.1694)	(0.1683)	(0.1663)	(1.0097)	(0.5441)	(0.4077)
Trade openness	-0.0691**	-0.0631**	-0.0533*	-0.0017	-0.1468	-0.1158
	(0.0214)	(0.0213)	(0.0212)	(0.0799)	(0.0878)	(0.0836)
M3/GDP*LPCI					2.2136***	1.5056*
					(0.5183)	(0.5738)
LPCI* Instability						-0.0605
						(1.8280)
Constant	1.6640***	1.6829***	1.6734***	1.3376**	4.3508***	3.1842***
	(0.0936)	(0.0928)	(0.0914)	(0.4378)	(0.7755)	(0.6675)
R^2	0.54	0.55	0.57			
Number of observations	258	258	258	258	258	258
Number of countries	54	54	54	54	54	54
Number of instruments used				35	43	47
Hansen test statistic (H_0: Over-identified restrictions are valid)				8.1675	22.2150	21.8244
P-value				0.9944	0.7264)	0.8604
Arellano-Bond test for no auto-correlation in first differenced errors (H_0 = no auto-correlation)						
AR (1)				-0.3477	-1.3672	-1.4301
P-value				0.7281	0.1716	0.1527
AR (2)				0.7294	1.3188	1.2280
P-value				0.4658	0.1872	0.2195
F statistic for overall fit (H_0 :all coefficients except the constant are zero)	49.265	44.137	41.014	3.051	6.718	6.529
P-value	0.00	0.00	0.00	0.00	0.00	0.00

Notes: + p<0.1, * p<.05, ** p<.01, *** p<.001 (represents 90, 95, 99 and 99.99 percent level of significance respectively). Absolute values of the standard error (SE) are in parenthesis. System GMM estimates present one-step robust results.

The results in Table 1 reveal that when the effect of financial instability on the poverty indicator is controlled, the magnitude of the coefficient of M3/GDP increases (compare the OLS models 1 and 2). The coefficient of M3-GDP increases from 0.0725 to

0.1165 in absolute term when the indicator of financial instability is added in the model. This suggests a positive correlation between financial development and financial instability. The instability of economic growth (measured by the standard deviation of GDP per capita) appears to be negatively correlated with the poverty index in the OLS model. Comparing OLS model 2 and model 3 reveals that introduction of this variable (instability of growth) reduces the marginal impact of M3/GDP instability. The coefficient of M3/GDP instability reduces from 0.89 (OLS model 2) to 0.75 (OLS model 3) when the variable instability of growth is included, implying that the instability of economic growth is probably one of the channel through with the detrimental impact of financial instability transmitted to the poor. However, the GMM estimator cannot identify indicators of instability and other control variables in the model. As we can see, the estimated coefficients of all these variables appear insignificant in all GMM models (though corruption appears significant in GMM model 1, it does not come up with the expected negative sign). Although the Hansen test statistic and autocorrelation test results are satisfactory, implying no evidence of over identification and no autocorrelation in the first difference of errors respectively, the small F statistics for the GMM models may raise question about the overall fit of the specified model. But as long as the hypothesis of no statistical significance of all coefficients except the constant is rejected (p value of F indicates strong rejection of this hypothesis), and more importantly, as the coefficients of the variables indicating direct and indirect effects of financial development are significant in all specifications, we can claim that GMM results largely satisfy our objective. Nonetheless, we use an alternative technique, fixed effect vector decomposition (FEVD), to

double check our results. Table 2 presents results from this estimator for the model where M3/GDP is used as the financial development indicator.

Table 2
FEVD Estimates of Poverty Model:
Indicator of Financial Development: M3/GDP

Dependent variable: Percentage of population under $1 income a day					
	Model 1	Model 2	Model 3	Model 4	Model 5
Log of per capita income (LPCI)	-0.4222***	-0.4281***	-0.7369***	-0.4403***	-0.5818***
	(0.0127)	(0.0126)	(0.0262)	(0.0130)	(0.0336)
M3/GDP	-0.0448**	-0.0363**	-3.1306***	-0.3031***	-0.2642***
	(0.0140)	(0.0135)	(0.2266)	(0.0414)	(0.0420)
Instability of M3/GDP	0.2787*		0.0842	0.2247*	0.2169+
	(0.1108)		(0.1106)	(0.1113)	(0.1104)
Inflation	0.0131**	0.0100*	0.0125**	0.0132**	0.0117*
	(0.0047)	(0.0041)	(0.0047)	(0.0047)	(0.0047)
Corruption	-0.0074*	-0.0057*	-0.0166***	-0.0406***	-0.1868***
	(0.0029)	(0.0028)	(0.0029)	(0.0058)	(0.0326)
Political stability	-0.0082+	-0.0082+	-0.0094*	-0.0073+	-0.0095*
	(0.0043)	(0.0043)	(0.0043)	(0.0043)	(0.0043)
Trade openness	-0.0099	-0.0138+	-0.0583***	-0.0234**	-0.0239**
	(0.0081)	(0.0081)	(0.0088)	(0.0084)	(0.0083)
Instability of growth	-0.2957***	-0.2596**	-0.2835**	-0.3013***	-0.2943***
	(0.0876)	(0.0873)	(0.0867)	(0.0879)	(0.0870)
M3/GDP * LPCI			0.9551***		
			(0.0700)		
M3/GDP * Corruption				0.0833***	0.0684***
				(0.0125)	(0.0129)
LPCI * Corruption					0.0455***
					(0.0100)
Constant	1.5548***	1.5725***	2.5801***	1.5698***	2.3171***
	(0.0417)	(0.0417)	(0.0857)	(0.0485)	(0.1138)
R^2	0.971	0.971	0.972	0.971	0.972
Number of observations	258	258	258	258	258
Number of countries	54	54	54	54	54

Notes: + p<0.1, * p<.05, ** p<.01, *** p<.001 (represents 90, 95, 99 and 99.99 percent level of significance respectively). Standard errors (SE) are in parenthesis.

In the FEVD model, we consider time-invariant control variables such as regional identity and legal origin (their coefficients are not reported in table 2 but can be found in table A3 in the appendix). Moreover, the variable government expenditure is replaced in the FEVD model by the political stability indicator (though keeping both in the model does not cause any variation in results). With regard to the direct and indirect effects of financial

development, the FEVD and GMM provide the same results. As we can see the coefficients of both LPCI and M3/GDP are negative and significant across all specifications. However, the FEVD estimator provides evidence that financial instability is detrimental to poverty alleviation. The statistically significant positive coefficient on the indicator of financial instability implies that on average, the higher the instability the higher is the percentage of population under a dollar income per day, given the effects of other variables are constant.

The FEVD estimates of the coefficients of the control variables are statistically significant. Moreover, all of them, except inflation, emerge with logically expected signs. For example, trade openness, corruption, political stability and growth instability have negative coefficients, whereas inflation appears with a significant positive sign. The negative coefficient on trade openness indicates the percentage of population under a dollar income per day falls as trade increases. The relationship between poverty and inflation appears to be confusing as the positive sign of inflation contradicts the idea that increases in economic activity (hence, average income) lead to higher prices. So, as inflation increases, the percentage of population under a dollar income is supposed to decrease. However, a possible explanation for the positive sign of inflation is that inflation especially in developing countries may just escalate uncertainty and threaten sustainability of income of the poor. Consider the case of small business owners or self-employed people in developing countries who base their tiny business on fund borrowed at a higher rate. Return from their businesses remains more or less flat over time compared to the rate of inflation. As a result, when inflation goes up and up, their business becomes vulnerable; it becomes difficult for them to come back to the same level of business as they start with. Some may even have to dispose

their small business for a nominal price and wander in the unskilled labour market for survival. Furthermore, because their access to insurance is very limited, and they do not have sufficient trade independent security (the ability to survive loss with own funds), their business could not survive unexpected galloping prices and eventually their income falls back again in the poverty fence. There are few more arguments in the literature which justify the positive correlation between inflation and the percentage of population under the poverty line. For instance, Chowdhury (undated) identifies two channels through inflation is likely to harm the poor. First, since wage adjustments typically fall behind price rises, inflation reduces the real wages. As a result, the share of the income of the poor in the national income declines vis-à-vis that of profit earners since most of the poor people are wages earners. Second, if there are any savings, the poor mostly hold it in money. Inflation reduces the real value of money holdings. If inflation is unanticipated, the poor will be harmed even more disproportionately as they have a weaker bargaining power and are generally unable to hedge against inflation.

The negative signs of corruption and political stability indicators indicate that on average, increases in the scores on these indicators (less corruption and more stability) will result in lower percentage of percentage of population under one dollar income a day, given the other variables remain unchanged. Moreover, the positive coefficients of the interaction terms M3/GDP*Corruption and LPCI*Corruption indicate that corruption hurts poverty alleviation through financial development by reducing both the direct and indirect impacts. Our result also shows considerable heterogeneity in the intercepts of the poverty model across the indicator variables namely regional indentity and legal origin (see table A3 in the

appendix). For instance, region identities 1, 2 and 3 (stand for America, Asia and Europe respectively) appears significantly negative. Thus, the intercept terms for these regions are smaller compared to the intercept of the base region (Africa). This implies that given all covariates are zero, the mean poverty level of Africa is higher compared with the other regions under consideration.

Table 3 presents estimated parameters of poverty models where the ratio of credit to GDP is used as the indicator of financial development. As we can see in the table, the coefficient on the credit to GDP ratio (CGDP) is insignificant both in OLS and GMM models except in the OLS estimate where the instability indicator is included. Even though the coefficient becomes significant in the OLS estimates when the instability variables are added, its size is smaller compared to that in the other models where M3/GDP is used as the indicator of financial development. This clearly indicates no or very weak, if at all, relationship between the credit/GDP ratio and the index of poverty. However, the coefficient of the log of average per capita income (LPCI) is negative and statistically significant across in all specification. By our assumption LPCI reflects the effect of growth. Therefore, the strong coefficient of LPCI and the absence of direct relationship suggest that the benefit of private credit provided by banks and non-bank financial institutions only trickles down to the poor. The absence of direct relationship implies that access to credit for the poor in developing countries still remains a challenge.

The results in Table 3 also indicate a positive correlation between the level of the credit-GDP ratio and the indicator of instability obtained from the time series of that ratio, as we can see the magnitude of credit/GDP increases as the instability indicator is incorporated

in the model. The relationship between poverty and the other control variables appears more or less the same as in the models where M3/GDP measures financial development.

Table 3
OLS and GMM Estimates of Poverty Model
Indicator of Financial Development: Credit/GDP

Dependent variable: Percentage of population under $1 income a day					
	OLS			System GMM	
	Model 1	Model 1	Model 1	Model 1	Model 2
Log of per capita income (LPCI)	-0.4633***	-0.4394***	-0.4353***	-0.4827*	-0.3502**
	(0.0326)	(0.0328)	(0.0324)	(0.2371)	(0.1233)
Credit to GDP (CGDP)	-0.0122	-0.0573+	-0.0601*	-0.2722	0.0811
	(0.0283)	(0.0308)	(0.0304)	(0.2141)	(0.1084)
Instability of CGDP		0.3366***	0.2819**	0.1833	0.0581
		(0.0994)	(0.1006)	(0.2131)	(0.2237)
Standard deviation of growth			-0.7331*		-0.5843
			(0.2842)		(0.5343)
Inflation	-0.0155	-0.0350*	-0.0200	-0.0252	-0.0771
	(0.0126)	(0.0137)	(0.0147)	(0.0325)	(0.049)
Corruption	0.0554	0.0287	0.0121	0.3035	-0.4007+
	(0.0790)	(0.0778)	(0.0772)	(0.3098)	(0.2218)
Government expenditure	0.2060	0.1027	0.1575	0.0732	0.3744
	(0.1677)	(0.1671)	(0.1666)	(1.1508)	(0.3727)
Trade openness	-0.0746***	-0.0685**	-0.0606**	-0.166	-0.1438
	(0.0214)	(0.0210)	(0.0210)	(0.1322)	(0.0896)
Constant	1.6499***	1.6140***	1.6050***	1.8294**	1.5330**
	(0.0974)	(0.096)	(0.0950)	(0.6605)	(0.4499)
R^2	0.534	0.554	0.566		
Number of observations	258	258	258	258	258
Number of countries	54	54	54	54	54
Number of instruments used				35	39
Hansen test statistic				7.8358	19.5553
P-value				0.9958	0.7218
Arellano-Bond test for no auto-correlation in first differenced Errors (H_0 = no auto-correlation)					
AR (1)				-0.5436	-0.7433
P-value				0.5867	0.5867
AR (2)				1.8222	1.5214
P-value				0.0684	0.1282

Notes: + p<0.1, * p<.05, ** p<.01, *** p<.001 (represents 90, 95, 99 and 99.99 percent level of significance respectively). Absolute values of the standard error (SE) are in parenthesis. System GMM estimates present one-step robust results.

V. CONCLUSION

The main conclusion of this paper is that other than the indirect effect that trickles down to the poor through growth, an increase in private credit to GDP ratio does not directly translate into improved well being of the poor. Our results provide evidence that if financial development has any direct effect on the poor at all, that realizes through McKinnon's conduit effect captured by the ratio of M3/GDP. Since physical and human capital investments by the poor are subject to liquidity constraints, improvement in financial intermediation is beneficial to the poor because it offers them a higher return on their savings. Our analysis also predicts a positive correlation between the level of financial development and instability, implying that the latter may seriously downsize the potential conduit effect. Furthermore, in our analysis, corruption appears as a threat to both the direct and the indirect effect of financial development (table 2).

The dominance of McKinnon conduit effect (role of savings or deposits over credits) in the finance-poverty nexus conveys the policy implication that measures to reform financial intermediation should be directed to eliminating financial repression by liberalizing interest rates prior to reforms to ease access of the poor to affordable finance by improving the institutional lending mechanism. Savings mobilization should emphasized than efforts towards making credit cheaply available since the latter may squeeze motivation of the poor in undertaking self-reliant economic initiatives. Moreover, as the evidence (absence of direct effect of credit/GDP on the poverty index) suggests that commercial banks credit are not yet reaching the poor in the developing countries, micro-lending based financial architecture is likely to be more useful for the poor in these countries. Furthermore, any reform measure in

the financial sector must take into account the risk of instability as the benefits of financial development is likely to be dampened by instability.

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APPENDIX

A 1. DESCRIPTION OF THE ESTIMATION METHODS USED IN THE STUDY

The Generalized Methods of Moment (GMM)[9]:

The difference and system GMM estimators are designed for panel analysis, and embody the following assumptions about the data-generating process:

1. There may be arbitrarily distributed fixed individual effects. This argues against cross-section regressions, which must essentially assume fixed effects away, and in favor of a panel set-up, where variation over time can be used to identify parameters.
2. The process may be dynamic, with current realizations of the dependent variable influenced by past ones.
3. Some regressors may be endogenous.
4. The idiosyncratic disturbances (those apart from the fixed effects) may have individual-specific patterns of heteroskedasticity and serial correlation.
5. The idiosyncratic disturbances are uncorrelated across individuals.
6. Some regressors may be predetermined or weak-exogenous: even if independent of current disturbances, still influenced by past ones. The lagged dependent variable is an example.
7. The number of time periods of available data, *T*, may be small compared to the number of individuals in the panel, that is, the panel is "small T, large N."
8. Finally, since the estimators are designed for general use, they do not assume that good instruments are available outside the immediate data set. In effect, it is assumed that the only available instruments are "internal"—based on lags of the instrumented variables. However, the estimators do allow inclusion of external instruments.

GMM formulates a set of moment conditions (orthogonality restrictions) related to an econometric model and finds parameter estimates that come as close to achieving these

[9] This section largely draws on Beck (2002), Baum (2006) and Roodman (2006). Roodman (2006) presents a very useful description of how GMM can be implemented on Stata. Roodman writes a program for GMM implementation which is known as xtabond2. The program is available for registered Stata users from Stata's Statistical Software Collection (SSC) archive. We use this program in the study on a number of occasions.

orthogonality properties in the sample. Arellano and Bond (1991) argue that the Anderson and Hsiao estimator (2SLS on first differenced data) mentioned above, although consistent, fails to take all the potential orthogonality conditions into account. They propose an estimator based on moment conditions derived from the differenced data. The estimator begins by specifying the DPD models as a system of equations, one per period, and allows the instruments applicable to each equation to differ. The instruments include suitable lags of the levels of endogenous variables which enter the equation in differenced form, as well as the strictly exogenous regressors and any others that may be specified. This method is known as *differenced GMM*. Symbolically, the Arellano and Bond (1991) difference equation for a given observation in a panel data looks like the following equation:

$$(y_{i,t} - y_{i,t-1}) - (y_{i,t-1} - y_{i,t-2}) = \beta_1(y_{i,t-1} - y_{i,t-2}) + \beta_2(x_{i,t} - x_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \qquad \text{(A1.1)}$$

Given that the error term, $\varepsilon's$ are not serially correlated and that the explanatory variables $x's$ are weakly exogenous[10] (i.e., the explanatory variables are assumed to be uncorrelated with future realizations of the error term), Arellano and Bond (1991) propose the following moment conditions:

$$\begin{aligned} &E[y_{i,t-s}, (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for } s \geq 2;\ t = 3, \ldots T \\ &E[x_{i,t-s}, (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for } s \geq 2;\ t = 3, \ldots T \end{aligned} \qquad \text{(A1.2)}$$

[10] A variable x_{it} is said to be strictly exogenous if $E[x_{it}, \varepsilon_{is}] = 0$ for all *t* and *s*. If $E[x_{it}, \varepsilon_{is}] \neq 0$ for $s < t$ but $E[x_{it}, \varepsilon_{is}] = 0$ for all $s \geq t$, the variable is said to be weakly exogenous or predetermined. This implies that unforecastable errors ($\varepsilon's$) today might affect future changes in $x's$.

Using these moment conditions, Arellano and Bond (1991) propose a two-step GMM estimator. In the one-step, the error terms are assumed to be independent and homoskedastic across countries and over time. Whereas, in the two-step, the residuals obtained in the one-step are used to construct a consistent estimate of the variance-covariance matrix, thus relaxing the assumptions of independence and homoskedasticity. The two-step estimator is thus asymptotically more efficient relative to the one-step estimator.

A weakness in Arellano-Bond difference estimator has been revealed in later work by Arellano and Bover (1995) and Blundell and Bond (1998). They observe that lagged levels are often poor instruments (because they have correlation with the error term) for first-differenced variables, especially if the variables are close to random-walk.

This influences the asymptotic and small-sample performance of difference estimators. In addition to this statistical weakness, the difference estimators are not conceptually feasible for investigating cross-country relationship since the differencing eliminates information within the panel units. Arellano and Bover (1995) and Blundell and Bond (1998) propose a modification which combines in a system the regression in differences with the regression in levels. This modified estimator is known as the *system GMM*. The system GMM includes lagged levels (for equations in first difference) as well as lagged differences (for equations in levels) as instruments. These are appropriate instruments under the following additional assumption: although there may be correlation between the levels of the right-hand side variables and the country-specific effect, there is no correlation between the differences of these variables and the country-specific effect. Given that lagged levels are used as instruments in the regression in differences, only the most recent difference

is used as an instrument in the regression in levels. Using additional lagged differences would result in redundant moment conditions (Arellano and Bover 1995). Thus, additional moment conditions for the second part of the system (the regression in levels) are:

$$E[(y_{i,t-s} - y_{i,t-s-1}),(u_i + \varepsilon_{i,t})] = 0 \quad \text{for } s = 1$$
$$E[(x_{i,t-s} - x_{i,t-s-1}),(u_i + \varepsilon_{i,t})] = 0 \quad \text{for } s = 1 \qquad \text{(A1.3)}$$

Thus, in the present study, we use the moment conditions presented in A1.2 and A1.3. Although the system GMM better fits our data compared to difference GMM, for robustness, we report results from both estimators.

Fixed Effect Vector Decomposition (FEVD) [11]:

The most significant advantage of FE estimators is their ability to deal with unobserved heterogeneity across units. But this advantage does not come free of cost. The first drawback, which has widely been recognized, is the problem of estimating time-invariant variables in panel data (see for instance Baltagi, 2001; Wooldridge, 2002; Hsiao, 2003). Since the FE estimators use only the within variance (variation over time in a given unit) for the estimation and disregards the between variance (variation across different units in the panel), they do not allow the estimation of time-invariant variables. A second drawback of the FE models, which is by far the less recognized in the literature, results from their inefficiency in estimating the effect of variables that have very small within variance. These variables may more appropriately be called rarely changing variables. Typical examples of these variable

[11] This section largely draws on Plümper and Troeger (2007). I would like to thank Mr. Vera E. Troeger, Director, Essex Summer School in Social Science Data Analysis for his comment on my initial attempt to implement FEVD on Stata and making me familiar with their program xtfevd.

are those representing institutional and political characteristics of a country such as regulatory quality, level of corruption, level of democracy and so else. Many other variables such as per capita income, government spending, and pollution level etc. may also be characterized as rarely changing or even time invariant in context of a set of panel data by restricting the number of time periods or selecting specific units in the panel. Thus, a small change in the sample can turn these type of time-invariant variables into variables with very low within variation—an almost time-invariant or rarely changing variable. Under a FE framework, effects of these variables cannot be estimated efficiently because the fixed unit effect soaks up most of the explanatory power of these slowly changing variables. Thus, if a variable changes over time, but slowly, the fixed effect makes it hard for such variables to appear either substantively or statistically significant (Beck, 2001). More importantly, inefficiency does not just imply low levels of significance (due to large standard errors); point estimates are also unreliable since the influence of the error on the estimated coefficients becomes larger as the inefficiency of the estimator increases.

Probable alternatives that can estimate time-invariant and slowly changing variables are RE and IV estimators. But RE estimates are biased and inconsistence when regressors are correlated with the unobservable unit effects. In presence of the correlation between the regressors and the unit effects, one may use IV estimators. But IV methods work well only if the instruments are uncorrelated with the errors and the unit effects and highly correlated with the endogenous. Unfortunately, identifying those instruments is complicated by the fact that the unit effects are unobserved.

Plümper and Troeger (2007) propose a technique that can efficiently estimate time-invariant and rarely changing variables from limited sample panel data. They label this technique as the ‘‘fixed effects vector decomposition’’ (FEVD) model. As the label suggests, the FEVD estimator decomposes the unobserved unit fixed effects into two segments: an unexplained part and a part explained by the time invariant or the rarely changing variables. By Monte Carlo simulations, Plümper and Troeger (2007) have demonstrated that the FEVD model has better finite sample properties in estimating models that include either time invariant or almost time-invariant variables correlated with unit effects than competing estimators. In the analyses dealing with the estimation of time-invariant variables, they compare the vector decomposition model to the FE model, the random effects (RE) model, pooled OLS and the Hausman-Taylor procedure. They find that the vector decomposition model performs better than pooled OLS, RE, and the Hausman-Taylor procedure if both time invariant and time-varying variables are correlated with the unit effects. The analysis of the rarely changing variables takes these results one step further. Again based on Monte Carlo simulations, they have shown that the vector decomposition method is more efficient than the FE model and thus gives more reliable estimates than the FE model under a wide variety of constellations. Specifically, they find that the vector decomposition model performs better than the FE model when the ratio between the between variance and the within variance is large, when the overall R^2 is low, and when the correlation between the time-invariant or rarely changing variable and the unit effects is low.

The FEVD technique involves the following three stages. Given a data generating process (DGP) as follows:

$$y_{it} = \alpha + \sum_{k=1}^{K} \beta_k x_{kit} + \sum_{m=1}^{M} \gamma_m z_{mi} + u_i + \varepsilon_{it} \qquad \text{(A1.4)}$$

where the *x* variables are time-varying and the *z* variables are time invariant (and/or rarely changing), u_i denotes the $(N - 1)$ unit-specific fixed effects (FE) of the DGP, ε_{it} is the independent and identically distributed error term, α is the intercept of the base unit, and β and γ are the parameters to be estimated. The first stage of the FEVD procedure runs a standard FE estimator on (A1.4) and obtains the fixed unit effect $\hat{u}_i$ defined as:

$$\hat{u}_i = \overline{y}_i - \sum_{K=1}^{K} \hat{\beta}_k^{FE} \overline{x}_{ki} - \overline{e}_i \qquad \text{(A1.5)}$$

The second stage splits the unit effects into an explained and an unexplained part by regressing the estimated unit effects ($\hat{u}_i$) on the time-invariant and/or rarely changing explanatory variables of the original model. That is, the second stage runs the OLS on the following model and obtains it residuals (h_i) as under:

$$\hat{u}_i = \sum_{m=1}^{M} \gamma_m z_{mi} + h_i \qquad \text{(A1.6)}$$

$$h_i = \hat{u}_i - \sum_{m=1}^{M} \gamma_m z_{mi} \qquad \text{(A1.7)}$$

Thus, this stage decomposes the unit effects into an unexplained part and a part explained by the time-invariant variables. We are interested in the unexplained part h_i. Finally, the third stage runs the following regression:

$$y_{it} = \alpha + \sum_{k=1}^{K} \beta_k x_{kit} + \sum_{m=1}^{M} \gamma_m z_{mi} + \delta h_i + \varepsilon_{it} \qquad \text{(A1.7)}$$

By design, h_i is no longer correlated with *z*. If the time invariant variables are assumed to be orthogonal to the unobserved unit effects, the estimator is consistent. If this assumption is violated, the estimated coefficients for the time-invariant variables are biased[12], but this bias is of course just the normal omitted variable bias. Yet, given that the estimated unit effects $\hat{u}_i$ consist of much more than the real unit effect u_i and since we cannot disentangle the true elements of u_i from the between variation of the observed and included variables, researchers necessarily face a choice between using as much information as possible and using an unbiased estimator. The FEVD procedure thus gives as much power as possible to the available variables unless the within variation is sufficiently large to guarantee efficient estimation.

The estimation of stage 3 proves necessary for various reasons. First of all, only the third stage allows obtaining the correct standard errors (SE's). Not correcting the degrees of freedom leads to a potentially serious underestimation of SE's and overconfidence in the results. Second, the third stage also allows us to explicitly deal with the dynamics of the

[12] Note that the estimated coefficients of the time-varying variables remain unbiased even in the presence of correlated unit effects. However, the assumptions underlying a FE model must be satisfied (no correlated time-varying variables may exist).

time-invariant variables. This is important since estimating the model requires that heteroscedasticity and serial correlation must be eliminated. Keeping this in mind we present estimates which are robust to heteroscedasticity. Moreover, to handle the potential serial correlation, we consider Prais-Winsten[13] version of feasible generalized least square (FGLS) estimation.

[13] See Baum (2006, pp 159-160) for description.

A 2. PANEL DATA SUMMARY AND RESULTS

Table A1
Summary of Panel Data
Period 1993-2004

Variable		Mean	Std. Dev.	Min	Max	Observations	
Poverty Indicator: Percentage of Population under $1 Income a Day	Overall	0.1181	0.1699	0.0002	0.8794	Number of observations (N)	258
	Between		0.1918	0.0012	0.8505	Number of Countries (n)	54
	Within		0.0344	-0.0118	0.2893		
Logarithm of Mean Per Capita Income (LPCI)	Overall	3.2397	0.2638	2.5115	3.7079	N	258
	Between		0.2723	2.5708	3.6388	n	54
	Within		0.0553	3.0608	3.3953		
M3/GDP	Overall	0.3680	0.2155	0.0712	1.3121	N	258
	Between		0.2053	0.0804	1.0666	n	54
	Within		0.0642	0.0992	0.6134		
Instability of M3/GDP	Overall	0.0279	0.0256	0.0000	0.1893	N	258
	Between		0.0183	0.0077	0.1016	n	54
	Within		0.0182	-0.0416	0.1156		
Private credit to GDP (CGDP)	Overall	0.3843	0.2828	0.0428	1.4615	N	258
	Between		0.2640	0.0522	1.2372	n	54
	Within		0.1054	-0.2046	0.8499		
Instability of CGDP	Overall	0.0537	0.0905	0.0044	1.1142	N	258
	Between		0.0694	0.0068	0.4544	n	54
	Within		0.0632	-0.2906	0.7134		
Standard Deviation of Growth	Overall	0.0361	0.0282	0.0032	0.2123	N	258
	Between		0.0186	0.0064	0.0755	n	54
	Within		0.0213	-0.0174	0.1808	T-bar	4.8
Inflation = Log (1+ rate of inflation)	Overall	1.2173	0.5985	0.0100	3.3217	N	258
	Between		0.4149	0.3178	2.0543	n	54
	Within		0.4271	0.0793	3.0640		
Government Expenditure	Overall	0.1395	0.0475	0.0479	0.2769	N	258
	Between		0.0452	0.0597	0.2691	n	54
	Within		0.0172	0.0822	0.2400		
Trade Openness	Overall	0.7219	0.3569	0.1677	1.9383	N	258
	Between		0.3374	0.2034	1.6913	n	54
	Within		0.0930	0.2773	1.0121		
Index of Political Stability	Overall	-0.2905	0.7322	-2.1230	1.1050	N	258
	Between		0.6891	-1.7527	0.9178	n	54
	Within		0.2731	-1.6750	0.4252		
Index of Corruption	Overall	3.2222	1.0695	1.4000	7.5000	N	258
	Between		1.0043	1.6333	5.6333	n	54
	Within		0.3447	2.1055	5.3055		

Table A2
System GMM Model 3
(Part of these results appears in column 7 of table 1 in the text)

Number of observation: 258 F(16, 53) = 6.53
Number of countries: 54 Prob > F = 0.000
Number of instruments = 47
Observation per country: Min :3; Avg: 4.78; Max: 10

Dependent variable: Percentage of population under $1 income a day

	Coefficient	Robust Std. Error	t	|P>|t|	95% Confid. Interval	
LPCI	-0.8859	0.2031	-4.3600	0.0000	-1.2259	-0.5460
M3/GDP	-4.9650	1.8851	-2.6300	0.0110	-8.1209	-1.8091
Instability of M3/GDP	0.3068	6.1607	0.0500	0.9600	-10.0069	10.6204
Inflation	-0.0075	0.0258	-0.2900	0.7740	-0.0507	0.0357
Standard deviation of growth	-0.3018	0.4164	-0.7200	0.4720	-0.9988	0.3953
Government expenditure	-0.1126	0.4077	-0.2800	0.7830	-0.7952	0.5700
Trade openness	-0.1158	0.0836	-1.3800	0.1720	-0.2558	0.0242
Corruption	-0.1873	0.1351	-1.3900	0.1710	-0.4134	0.0389
M3/GDP*LPCI	1.5056	0.5738	2.6200	0.0110	0.5451	2.4662
Instability of M3/GDP* LPCI	-0.0605	1.8280	-0.0300	0.9740	-3.1207	2.9997
Year 1998	0.0101	0.0157	0.6400	0.5220	-0.0161	0.0364
Year 1999	0.0021	0.0202	0.1000	0.9180	-0.0318	0.0360
Year 2000	0.0030	0.0222	0.1300	0.8930	-0.0341	0.0401
Year 2001	-0.0118	0.0221	-0.5300	0.5970	-0.0488	0.0252
Year 2002	-0.0176	0.0272	-0.6500	0.5210	-0.0632	0.0280
Year 2003	-0.0114	0.0270	-0.4200	0.6730	-0.0566	0.0337
Constant	3.1842	0.6675	4.7700	0.0000	2.0668	4.3016

I**nstruments for first differences equation**:
Standard: D.(yr1998 yr1999 yr2000 yr2001 yr2002 yr2003)
GMM-type (missing=0, separate instruments for each period unless collapsed)
L(1/3).(L.logpci m3gdp instabm3gdp inflation corrupt govexp trade m3gdp_lpci stdvgdpgrow lpci_instab) collapsed
Instruments for levels equation:
Standard:
Constant, yr1998 yr1999 yr2000 yr2001 yr2002 yr2003
GMM-type (missing=0, separate instruments for each period unless collapsed)
D.(L.logpci m3gdp instabm3gdp inflation corrupt govexp trade m3gdp_lpci stdvgdpgrow lpci_instab) collapsed

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Arellano-Bond test for AR(1) in first differences: z = -1.43 Pr > z = 0.153
Arellano-Bond test for AR(2) in first differences: z = 1.23 Pr > z = 0.219

Hansen test of overid. restrictions: chi2(30) = 21.82 Prob > chi2 = 0.860
(Robust, but can be weakened by many instruments.)
Wald test:
LPCI = 0 ; M3/GDP = 0 ;Instability M3/GDP = 0
F(3, 53) = 9.53 Prob > F = 0.0000

Table A3
FEVD Model 5
(Part of these results are presented in column 6 of table 2 in the text)

Dependent variable: Percentage of population under $1 income a day						
	Coefficient	FEVD Std. Error	t	P>|t|	95% Confid. Interval	
LPCI	-0.5818	0.0336	-17.3200	0.0000	-0.6481	-0.5155
M3/GDP	-0.2642	0.0420	-6.2900	0.0000	-0.3470	-0.1813
Instability of M3/GDP	0.2169	0.1104	1.9600	0.0510	-0.0009	0.4348
Inflation	0.0117	0.0047	2.5000	0.0130	0.0025	0.0210
Standard deviation of growth	-0.2943	0.0870	-3.3800	0.0010	-0.4660	-0.1226
Corruption	-0.1868	0.0326	-5.7300	0.0000	-0.2512	-0.1225
Trade openness	-0.0239	0.0083	-2.8600	0.0050	-0.0403	-0.0074
Political stability	-0.0095	0.0043	-2.2100	0.0290	-0.0180	-0.0010
Region 1	-0.0597	0.0103	-5.8000	0.0000	-0.0800	-0.0394
Region 2	-0.2298	0.0093	-24.8100	0.0000	-0.2481	-0.2116
Region 3	-0.1771	0.0111	-15.9700	0.0000	-0.1990	-0.1553
Legal origin 1	0.0145	0.0130	1.1200	0.2650	-0.0111	0.0401
Legal origin 2	-0.0432	0.0116	-3.7400	0.0000	-0.0660	-0.0204
Legal origin 3	-0.0182	0.0115	-1.5800	0.1150	-0.0409	0.0045
Government type 1	-0.0207	0.0202	-1.0200	0.3080	-0.0605	0.0192
Government type 2	0.0012	0.0192	0.0600	0.9490	-0.0367	0.0391
Government type 3	-0.1474	0.0251	-5.8700	0.0000	-0.1969	-0.0979
Government type 4	0.0068	0.0204	0.3300	0.7390	-0.0335	0.0472
LPCI*Corruption	0.0455	0.0100	4.5500	0.0000	0.0258	0.0652
M3/GDP*Corruption	0.0684	0.0129	5.3200	0.0000	0.0430	0.0937
Constant	2.3171	0.1138	20.3600	0.0000	2.0925	2.5417

Regional identities: Region 1: America; 2: Asia; 3: Europe; and 4: Africa (the base region in the regression).
Legal origin: Legal origin 1: English; 2: French; 3: German; and 4: Russian (the base)
Government type: Government type 1: Republic; 2: Democracy; 3: Dictatorship; 4: Communist; 5: Constitutional Monarchy (the base).

Table A4
System GMM Model 2
(Part of these results appears in column 6 of table 3 in the text)

Number of observation: 258 F(14, 53) =1.85
Number of countries: 54 Prob > F = 0.055
Number of instruments = 47
Observation per country: Min :3; Avg: 4.78; Max: 10

Dependent variable: Percentage of population under $1 income a day						
	Coefficient	Robust Std. Error	t	|P>|t|	95% Confid. Interval	
LPCI	-0.3502	0.1233	-2.8400	0.0060	-0.5567	-0.1437
CGDP	0.0811	0.1084	0.7500	0.4580	-0.1005	0.2626
Instability of CGDP	0.0581	0.2237	0.2600	0.7960	-0.3165	0.4326
Standard deviation of growth	-0.5843	0.5343	-1.0900	0.2790	-1.4788	0.3101
Inflation	-0.0771	0.0490	-1.5700	0.1210	-0.1592	0.0049
Trade openness	-0.1438	0.0896	-1.6100	0.1140	-0.2937	0.0061
Government expenditure	0.3744	0.3727	1.0000	0.3200	-0.2496	0.9984
Corruption	-0.4007	0.2218	-1.8100	0.0760	-0.7720	-0.0294
Year 1998	-0.0110	0.0212	-0.5200	0.6050	-0.0464	0.0244
Year 1999	-0.0319	0.0306	-1.0400	0.3010	-0.0831	0.0193
Year 2000	-0.0253	0.0323	-0.7800	0.4380	-0.0794	0.0289
Year 2001	-0.0229	0.0347	-0.6600	0.5120	-0.0809	0.0351
Year 2002	-0.0526	0.0403	-1.3100	0.1970	-0.1200	0.0148
Year 2003	-0.0483	0.0446	-1.0800	0.2850	-0.1230	0.0265
Constant	1.5330	0.4499	3.4100	0.0010	0.7797	2.2862

Instruments for first differences equation
Standard
D.(yr1998 yr1999 yr2000 yr2001 yr2002 yr2003)
GMM-type (missing=0, separate instruments for each period unless collapsed)
L(1/3).(L.logpci cgdp instabcgdp inflation corrupt govexp trade stdvgdpgrow) collapsed
Instruments for levels equation
Standard
Constant yr1998 yr1999 yr2000 yr2001 yr2002 yr2003
GMM-type (missing=0, separate instruments for each period unless collapsed)
D.(L.logpci cgdp instabcgdp inflation corrupt govexp trade stdvgdpgrow) collapsed
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Arellano-Bond test for AR(1) in first differences: z = -0.74 Pr > z = 0.457
Arellano-Bond test for AR(2) in first differences: z = 1.52 Pr > z = 0.128

Hansen test of overid. restrictions: chi2(24) = 19.56 Prob > chi2 = 0.722
(Robust, but can be weakened by many instruments.)

Table A5
List of Countries
(in alphabetical order)

Argentina	El Salvador	Lao PDR	Pakistan	Uganda
Armenia	Estonia	Latvia	Panama	Ukraine
Bolivia	Georgia	Lithuania	Paraguay	Uruguay
Brazil	Guatemala	Macedonia, FYR	Peru	Venezuela, RB
Bulgaria	Honduras	Madagascar	Philippines	Vietnam
Burkina Faso	Hungary	Malaysia	Poland	Zambia
China	India	Mauritania	Romania	
Colombia	Indonesia	Mexico	Russia	
Costa Rica	Jamaica	Moldova	South Africa	
Cote d'Ivoire	Kazakhstan	Mongolia	Sri Lanka	
Croatia	Kenya	Nicaragua	Thailand	
Dominican Rep	Kyrgyz Republic	Nigeria	Turkey	

Table A6
Coefficient Estimated by
One-way Fixed Effect Model
For the Period 1980-2004

Dependent variable: Percentage of population under $1 income a day						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
LPCI	-.3812***	-.384***	-.3837***	-.4187***	-.4194***	-.4198***
M3/GDP	-.08537**	-.07884*	-.07852*			
Inflation	0.00418	0.01202	0.01444	0.00298	0.00331	0.00968
Instability of M3/GDP		-0.1745	-0.1754			
Standard deviation of Growth			-0.05885			-0.1197
CGDP				0.00646	0.00675	0.00844
Instability of CGDP					-0.00195	-0.01111
Constant	1.388***	1.398***	1.4***	1.475***	1.477***	1.482***
Sigma_u	0.095	0.095	0.095	0.095	0.095	0.094
Sigma_e	0.057	0.057	0.057	0.058	0.058	0.058

Legend: * p<0.05; ** p<0.01; *** p<0.001