



# **Financial Development and Inequality: Brazil 1985-1994**

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## Abstract

We examine the impact of financial development on earnings inequality in Brazil in the 1980s and first half of the 1990s. The evidence—based on panel time-series data and analysis—shows that financial development had a significant and robust effect in reducing inequality during the period. We suggest that this is not only because the poorer can invest the acquired credit in either short or long-term productive activities, but also because those with access to financial markets can insulate themselves, via a process of financial adaptation, against recurrent poor macroeconomic performance, which is exemplified in Brazil by high rates of inflation. The main implication of the results is that a deeper and more active financial sector alleviates the high inequality seen in Brazil without the need for distortionary taxation.

**Keywords:** Financial development, inequality, Brazil.

**JEL Classification:** D31, E44, O11, O54.

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# 1 Introduction and Motivation

We investigate the role of financial development on inequality in Brazil in the 1980s and 1990s. The evidence—based on panel time-series data and analysis—shows that financial development had a significant effect in reducing inequality in Brazil at the time. The main implication emerging from the results is that not only deeper financial sectors, but also more active financial intermediaries present the advantage of alleviating inequality without the need for distortionary redistributive policies.

What distinguishes this paper from the previous empirical studies is that firstly, as suggested by Besley and Burgess (2003), we carry out a much needed national and sub-national study on the subject. We construct and explore the variation of a sub-national panel time-series data set that covers six major regions of Brazil over the period of poor macroeconomic performance seen between 1985 and 1994. This can be regarded as a step forward from the previous international cross-sectional and panel studies for the ability of the national and sub-national data in better pinpointing the effects of financial development on inequality at a more disaggregated level<sup>1</sup>. Moreover, studying the Brazilian context of the 1980s and the first half of the 1990s is particularly interesting for the importance and topicality of better understanding the consequences of extended periods of high inflation on particular variables—e.g. financial development contracted during the bursts of hyperinflation and inequality was particularly high at the time.

Secondly, we use the usual measures of financial development, and also extra measures that we believe capture more appropriately the Brazilian economic reality at the time. Furthermore, we take into consideration the importance of having access to financial markets for the additional insulation provided, via a process of financial adaptation, in times of poor macroeconomic performance.

The importance of financial development in such an economic environment is twofold: firstly, access to credit benefits the poor and the middle classes via the investment in productive activities channel. Loosely speaking, with more credit the poorer can invest in, e.g. short-term activities such as self-employment, and also in longer-term projects such as education. However—as well argued by Loury (1981), Galor and Zeira (1993), and Banerjee and Newman (1993)—the initial assumption is that the poorer lack initial wealth, and therefore moral hazard arises. Thus, credit markets are imperfectly accessed by those at the bottom and middle of the income distribution. The main prediction is that these imperfections determine the occupational outcomes of those in such an economy, with the poorer becoming wage earners and the rich becoming entrepreneurs. This social

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<sup>1</sup>Moreover, panel time-series does not suffer from the usual criticism applied to cross-sectional analysis, i.e. that periods of high inflation are usually followed by short periods of low inflation, which would cancel each other out, see Bruno and Easterly (1998).

immobility, of those at the bottom and middle with respect to those at the top of the distribution, tends to widen the distribution of income.

On a different—but related strand—Greenwood and Jovanovic (1990) develop a model that predicts a Kuznets curve, Kuznets (1955), i.e. an economy in its initial stages of financial development would present increasing inequality and only in a second or even third stage of development would inequality actually decrease<sup>2</sup>. Finally, Piketty (1997) argues that imperfectly-accessed credit markets lead to high interest rates, and consequently low credit market intermediation. With that, the economic mobility of the poorer is reduced, when compared to the rich, and inequality increases.

Secondly, in an economy in which the Fisher relationship holds, and that presents and requires either cash-in-advance constraints or different shopping-time allocations for the consumption of a particular bundle of goods—e.g. Lucas and Stokey (1987), Sturzenegger (1992), Erosa and Ventura (2002), and Cysne et al. (2005)—the presence of higher inflation and hyperinflation act as a tax on consumption of goods requiring cash, therefore leading people to substitute consumption of cash for goods requiring credit. All the same, with this process of financial adaptation between cash and credit, the velocity of money increases and the rich are able to hold assets that are not *so* affected by the inflation tax. On the other hand, the poorer are credit-goods constrained and therefore end up holding the highly-taxed cash<sup>3</sup>. Loosely speaking, the rich would get their wages in period  $t$ , consume a bundle of goods in period  $t$ , however with, e.g. post-dated cheques and credit cards—instruments of deferring payment not always available to the poorer—they would pay for those goods only in period  $t + 1$ . In a country that presented high rates of inflation for a considerable period of time, this monthly difference in prices paid between periods  $t$  and  $t + 1$  would be considerable<sup>4</sup>.

Moreover, Acemoglu, D., S. Johnson, et al. (2003) argue that distortionary macroeconomic policies, e.g. that cause high inflation, is a symptom of weak institutions and it is therefore nothing less than a redistributive device used by the ‘elite’ to enrich themselves at the expense of another group

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<sup>2</sup>In addition, Aghion and Bolton (1997) argue that more access to credit is not a sufficient condition to reduce inequality for the trickle-down mechanism occurs only at very high rates of capital accumulation. Because of that they advocate some redistribution, which would improve efficiency and welfare in the early stages of development.

<sup>3</sup>Dollarisation was widely used in some Latin American countries, e.g. Argentina, Uruguay and Peru, as an instrument of protection against high inflation. However, in Brazil dollarisation was never fully implemented, and therefore it did not play such a crucial role against high inflation, see Singh (2006). Furthermore, an IDB (2005) report argues that private credit in Latin America is at 28% of the GDP, and in developed countries the same measure is at 84% of the GDP, which illustrates how restrictive the financial sector is in Latin America in general.

<sup>4</sup>For more on the direct impact of high inflation on inequality in Brazil, see Cardoso, Barros, et al. (1995), Barros, Corseuil, et al. (2000), Ferreira and Litchfield (2001), and Bittencourt (2007).

in society. Furthermore, Crowe (2006) suggests that inflation is only brought under control when the ‘elite bias’ is reduced, and Albanesi (2007) argues that the poor are the ones to lose more with high inflation for the fact that they have less political weight. Coincidentally enough, Brazil implemented sounder macroeconomic policies only in July 1994, well after democracy was fully implemented in 1989, or alternatively, when political polarisation diminished<sup>5</sup>. Considering the contractionary nature of financial development seen during the hyperinflationary bursts, it can be primarily suggested that good macroeconomic performance is a *necessary* condition for financial development.

Previous empirical studies include, e.g. Beck, Demirgüç-Kunt, et al. (2007). They use a cross-section of countries, with legal origins as instruments, and find that financial development alleviates inequality. Moreover, Li, Squire, et al. (1998), Dollar and Kraay (2002), and Clark, Xu, et al. (2003), use panels of countries instead, and their results confirm the theoretical prediction that more access to financial and credit markets help either to reduce inequality or to improve the incomes of the poor. Somehow more distantly related, Bonfiglioli (2005) finds some evidence, also using cross-sections and panels of countries, that stock market development can have a progressive impact on inequality.

All in all, we highlight the importance of not only financial development, but also of better institutions that are conducive to improved macroeconomic performance and consequently financial development, for inequality. Furthermore, in times of generalised higher inflation and even hyperinflation, e.g. in Zimbabwe, it is redundant to overemphasize the importance of studying a period of poor macroeconomic performance and its direct and indirect effects on crucial variables that are related to economic welfare in general.

The remainder of this paper has the following structure: the next Section describes the data set, presents the descriptive statistics and correlations amongst the main variables, and shows how financial development and inequality behaved over the period. Section 3 explains the empirical strategy used, and presents and discusses the main results. Section 4 concludes the paper; it summarises the main findings, discusses the significance of the results and also their limitations, examines the policy implications and advantages of financial development for inequality, and suggests some future work.

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<sup>5</sup>Alesina and Drazen (1991) also argue that stabilisations were severely delayed in more polarised societies like Brazil in the 1980s and early 1990s.

## 2 The Data

The data set used covers the period between 1985 and 1994 ( $T = 120$ ), and six major regions of Brazil ( $N = 6$ ). The set comes from the Brazilian Institute of Geography and Statistics (IBGE), which is the Brazilian Census Bureau, the Brazilian Central Bank (BACEN) and the Institute of Applied Economic Research (IPEA) files. The IPEA is an agency of the Brazilian government that, among other things, compiles primary and provides secondary data coming from the IBGE and BACEN themselves.

Firstly, the data on labour earnings come from the Monthly Employment Survey (PME) files compiled by the IBGE, which is a monthly rotative survey that follows ILO recommendations for international comparability, and that covers six regions over time and approximately 38,500 households. The six regions are, from North to South: Pernambuco (PE), Bahia (BA), Minas Gerais (MG), Rio de Janeiro (RJ), São Paulo (SP) and Rio Grande do Sul (RS).

The concept of before tax earnings adopted by the PME includes wages, monetary bonuses and fringe benefits earned by those at work, profits made by those who are self employed and employers, and the monetary value of goods for those earning in kind. Therefore, this concept is broader and less restrictive than what usually is understood by more conservative definitions of earnings. Moreover, given the nature of the macroeconomic environment at the time, e.g. Atkinson and Bourguignon (2000) argue that monthly data provide less inaccurate information on earnings.

Furthermore, in a country which presented high rates of inflation for such a long period of time the way the data are deflated is important. The earnings data are deflated by the IBGE's National Index of Consumer Prices (INPC). One important prior adjustment is the use of a converter to express all data in Real (R\$) mainly because Brazil had many monetary reforms with several different currencies being implemented during the period—as an instrument to curb high inflation—especially between 1986 and 1994. Some adjustments in the INPC itself are also implemented. These include a correction of 22.25 percent for the inflation incurred in June 1994, a month before the full implementation of the R\$. The reason is that the INPC calculated inflation using the price variations of a virtual, but not fully implemented R\$, which was lower than the price variation incurred by the still widely used Cruzeiro (CR\$)<sup>6</sup>.

Another adjustment is the need to centre the INPC as if it was measuring inflation starting on the first day of each month, which is the date that most people get their paycheques. Finally, taking into consideration that the information on earnings reported in the questionnaires of the PME is related to the first day of a particular reference month  $t$ , the data on earnings are

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<sup>6</sup>For more about the the Real Plan, see Agénor and Montiel (1999).

corrected by the deflator of month  $t + 1$  to allow the inflation incurred in  $t$  to be accounted for. Therefore, it is believed that the above procedure improves the overall quality of the data and consequently enhances the precision of the estimates reported<sup>7</sup>.

We can then use the information on individual earnings from people between fifteen and sixty five years of age to obtain the Gini coefficient (*GINI*) of the earnings distribution by regions. This measure of inequality is used for having attractive properties since it is Lorenz consistent<sup>8</sup>.

Secondly, the data used to construct the measures of financial development come from the BACEN and IBGE files. The national monetary aggregates, *m2*, *m3*, credit to the private sector (*credit*) and personal credit (*personal*) are originally from the BACEN's Monthly Bulletin. The first monetary aggregate, *m2*, is defined as money in circulation in the economy, and current account and savings deposits in the financial sector, or the liquid liabilities for short. The second monetary aggregate, *m3*, is defined as *m2* plus other deposits that do not present the same sort of high liquidity that the ones contained in *m2* do, but that present higher nominal and real returns. Credit to the private sector and personal credit are defined as credit provided by financial institutions to the private sector, and individuals only respectively. These monetary aggregates are deflated by the IBGE's INPC.

The data on the financial domestic product (FDP)—which accounts for the gross domestic product of the financial sector in each region, and the regional gross domestic products (GDPs)—are from the IBGE's National Accounts System. All these macroeconomic aggregates are calculated at market prices by the IBGE and deflated by the GDP implicit price deflator.

We are then able to calculate the ratios  $m2/GDP$ ,  $m3/GDP$ ,  $credit/GDP$  and  $personal/GDP$ , by region to obtain *M2*, *M3*, *CREDIT* and *PERSONAL*. On one hand, it can be said that *M2* and *M3* measure the overall size of the financial sector or financial depth of an economy. On the other hand, *CREDIT* and *PERSONAL* measure how active the financial intermediaries are in actually channeling credit from savers to borrowers<sup>9</sup>.

However, to construct these regional proxies for financial development we have also to take into account the fact that the information on monetary aggregates is national in scope. We therefore use the available national monetary aggregates over the regional GDPs, but multiplied by the percentage participation of each region in the total FDP to construct these proxies. The reason for doing so is that otherwise the most developed regions of the South would not appear as financially developed as they actually are. The weight used re-captures the importance of the most financially developed

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<sup>7</sup>See Corseuil and Foguel (2002) for more details on how to best deflate earnings and income data from Brazil.

<sup>8</sup>For more on inequality measures and their properties, see Sen and Foster (1997).

<sup>9</sup>See Beck, Demirgüç-Kunt and Levine (2001) for more on measures of financial development.

regions and hence provides a more accurate picture of the regional variation of financial development in Brazil, e.g. São Paulo, Rio de Janeiro and Rio Grande do Sul regain their places as the most financially developed regions with the weighting. Definition 1 illustrates the regional ( $FD_{it}$ ) proxies for financial development.

$$FD_{it} = (mon.aggregates_t/GDP_{it})FDP_{it}, \quad (1)$$

in which  $FDP_{it} = FDP_i / FDP_t$ .

Furthermore, the reason for using  $M3$  in addition to the usual  $M2$  is because of the financial repression problem seen in Brazil in the 1980s and first half of the 1990s. Although the rates of inflation were notoriously high—the government kept the nominal interest rates on basic deposits and savings artificially low—and consequently generated negative real interest rates and a low  $m2/GDP$  ratio. Hence, it can be argued that  $M3$ —for including financial assets with more nominal indexation attached, higher rates of returns and less restrictions—would not be as severely affected by financial repression as  $M2$ <sup>10</sup>. Moreover, the importance of the narrower  $PERSONAL$  is because, unlike the usual  $CREDIT$ , it captures the financial resources being allocated only to individuals, who might well lack the initial wealth and collateral usually available to private firms. Hence, these two extra measures are believed to give a broader ( $M3$ ) and more accurate ( $PERSONAL$ ) view of the importance of financial development for inequality.

Thirdly, regarding the first macroeconomic control variable used, the rates of inflation ( $INFL$ ), we use the variation on the IBGE's regional Consumer Price Indexes (IPCs). These IPCs cover ten regions—including the six regions covered here—which are then aggregated and weighted by the resident population in each region, to form the INPC itself.

Fourthly, we also use the regional unemployment rates ( $UNEMP$ ) as an extra macroeconomic control variable. This information is compiled by the IBGE using information from the PME, and it is defined as people who are unemployed and currently looking for employment over the labour force who are at least fifteen years old.

Having said that, Table One below presents the descriptive statistics of the pooled variation in the sub-national data, and also the correlations between the measures of inequality and financial development during the period. Initially, it is worth mentioning the high mean of the Gini (54.69), which illustrates the high inequality in Brazil. With regards to the measures of financial development, it is important to mention at this point that  $PERSONAL$  presents the smallest ratios of all, which illustrates low activity of the financial intermediaries at a more individual level. Inflation was on average at 21.38 percent *per month* during the period and it also

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<sup>10</sup>For more on the problem of financial repression in developing countries, see Agénor and Montiel (1999) or Easterly (2002).

presents a sizeable standard deviation, which shows its extreme behaviour at the time.

About the correlations on the second panel of the Table, first the measures of financial development present positive correlations among themselves, as expected. Second, the main control variable, inflation, presents a positive correlation with the Gini, and negative ones with all measures of financial development. More significantly, it is important to highlight the negative correlation between the Gini and all measures of financial development, which gives an initial insight of the importance of financial development for inequality. All correlations are statistically significant at the five percent level.

Table One: Descriptive Statistics and the Correlation Matrix, 1985-1994.

Variables	Obs	Mean	Std. Dev.	Min	Max	
GINI	648	54.69	3.03	49.17	61.50	
M2	648	1.09	.60	.34	3.01	
M3	648	1.63	.94	.54	4.32	
CREDIT	648	1.70	.86	.70	4.38	
PERSONAL	648	.09	.07	.02	.40	
INFL	648	21.38	9.92	3.49	43.87	
UNEMP	648	4.68	1.30	2.45	9.05	
Correlations	GINI	M2	M3	CREDIT	PERSONAL	INFL
GINI	1					
M2	-.34*	1				
M3	-.31*	.99*	1			
CREDIT	-.39*	.95*	.94*	1		
PERSONAL	-.29*	.78*	.76*	.75*	1	
INFL	.21*	-.17*	-.18*	-.19*	-.46*	1

Source: IBGE, BACEN, IPEA, and author's own calculations. \* significant at the 5 percent level.

In addition, earnings and income inequality in Brazil have historically been among the highest in the world. In Figure 1 below we plot the average of the Gini Coefficient seen between 1985 and 1994. We can see, e.g. how the Gini behaved during the hyperinflationary bursts of 1989-1990 and in 1994; it saw a considerable increase during both hyperinflationary peaks. For instance, the Gini reached its maximum value in January 1989. That reinforces the suggestion that the poor macroeconomic performance seen in Brazil at the time presented a regressive impact on inequality.

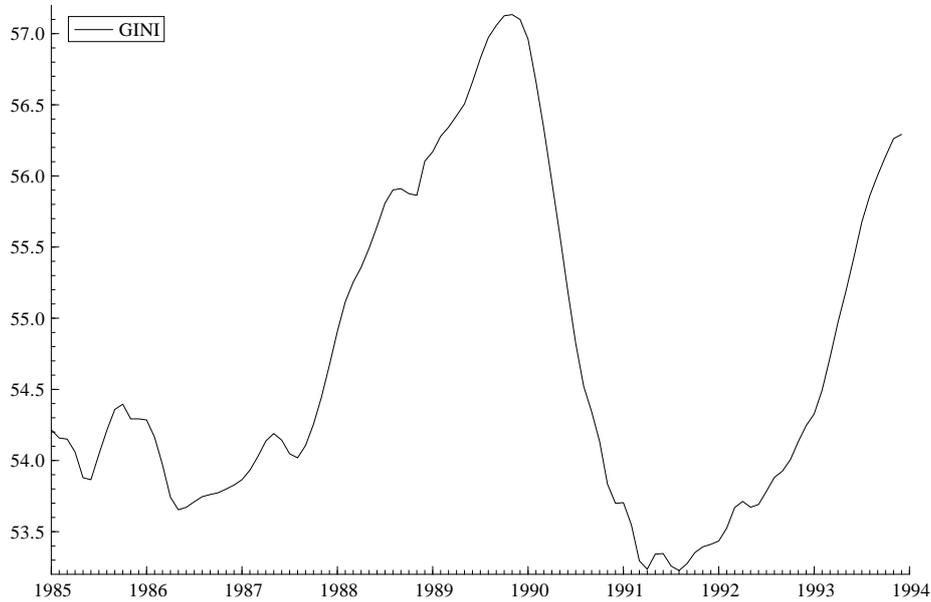


Figure 1: Earnings Inequality, 1985-1994. Source: PME, IBGE, and author's own calculations. The measure of inequality is the Gini coefficient (*GINI*).

With respect to the measures of financial development, in the first panel of Figure 2 we put together the averages of *M2* and *M3*. Both measures, which are believed to be more related to the process of financial adaptation— for containing assets which would allow individuals to postpone the payment of their consumption in  $t$  until  $t + 1$  during the hyperinflationary periods— presented sharp falls in 1989-1990. For example, they both reached their lowest values in February 1991. Additionally, in the second panel of the Figure we graph the averages of the two other measures which are more related to how active the financial intermediaries are, *CREDIT* and *PERSONAL*. Similarly to how the previous two measures behaved, they both reached rock bottom during and right after the hyperinflation of 1989-1990.

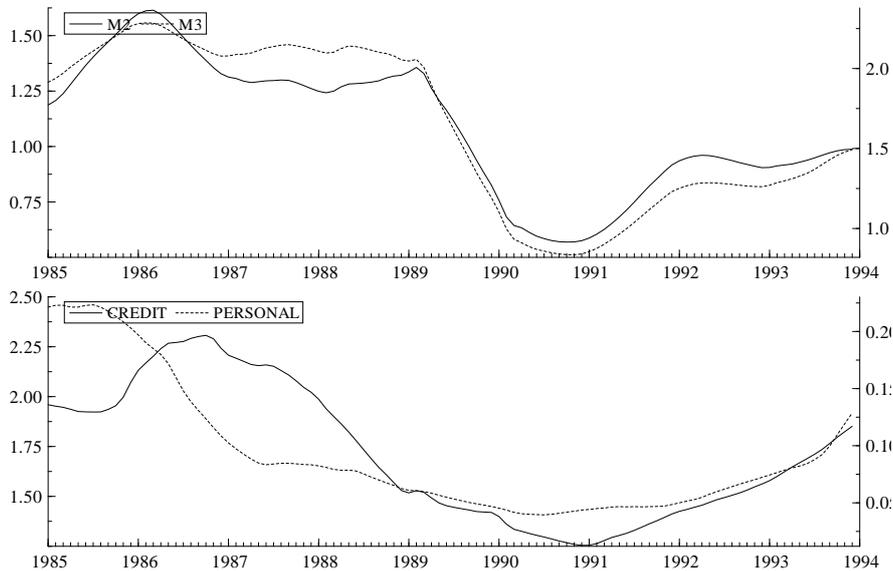


Figure 2: Financial Development, 1985-1994. Source: BACEN, IBGE, IPEA, and author's own calculations. The measures of financial development are  $M2$ ,  $M3$ , private credit ( $CREDIT$ ) and personal credit ( $PERSONAL$ ).

All in all, particularly during and right after the hyperinflation of 1989-1990, there was a significant reduction in importance of all measures of financial development. This indicates that, because of the macroeconomic instability seen at the time—only those better-endowed at the upper-middle and top of the earnings distribution managed to keep themselves in the financial and credit markets, and hence insulated against the poor macroeconomic performance via the process of financial adaptation provided mainly by  $M2$  and  $M3$ —and with enough credit to be invested in productive activities via the credit provided by  $CREDIT$  and  $PERSONAL$ . Coincidentally enough, inequality increased considerably during the same period.

Hence, what can be said about the above preliminary descriptive evidence is that financial development and inequality, and financial development and inflation, moved in opposing directions in Brazil at the time. This suggests, firstly, the importance of macroeconomic stability for financial development, and secondly and more importantly, the prospective progressive role of financial development on inequality.

### 3 Empirical Strategy and Results

#### 3.1 Strategy

When further exploring the regional variation present in the sub-national panel time-series  $T \succ N$  data, we firstly take the centred twelve-point moving averages to deal with any seasonality and to smooth the irregular component in the series. We then check all series for non-stationarity using the Im, Pesaran and Shin, IPS (2003), test for unit roots—which for sufficiently large  $T$  converge in probability to a standard normal distribution. The advantage of this test over other competing alternatives is that it considers the existence of heterogeneous parameters and serial correlation in the data<sup>11</sup>. The IPS (2003) consists of an Augmented Dickey-Fuller (ADF) regression for each region of each variable, which are then averaged. Equations 2 and 3 illustrate the regional ADF equations of a particular variable  $y$  and the IPS test respectively.

$$\Delta y_{it} = \alpha_i + \beta_i y_{it-1} + \sum_{j=1}^{k_i} \gamma_{ij} \Delta y_{i,t-j} + u_{it}, \quad (2)$$

and

$$IPS = \frac{\sqrt{N}(\bar{t} - E(\bar{t}))}{\sqrt{var(\bar{t})}}, \quad (3)$$

in which  $\alpha_i$  and  $\beta_i$  represent the heterogeneous intercepts and slopes,  $u_{it}$  the residuals,  $N$  is the number of regions ( $N = 6$ ), and  $E$  and  $var$  are the mean and the variance of the average  $\bar{t}$ , which are then plugged into the IPS test. The  $E$  1.504 and  $var$  .683 information is taken from IPS (2003).

Secondly, we estimate equations using the baseline Pooled Ordinary Least Squares (POLS), and then the one-way Fixed Effects (FE) estimators. The FE estimator—which when  $T \rightarrow \infty$  and  $N$  small—provides unbiased and consistent estimates of the expected values of the coefficients in dynamic models. More intuitively, the Nickell bias is severely reduced as  $T \rightarrow \infty$ <sup>12</sup>.

Thirdly, we understand that the financial development measures, as originally set—present a measurement error for the absence of regional information on monetary aggregates that although corrected and minimised by the factor  $FDP_{it}$ —can cause a statistical endogeneity problem. Hence, we use the First Differences with Instrumental Variables (FD-IV) estimator with robust standard errors, which is asymptotically consistent and efficient

<sup>11</sup>An alternative is the test by Levin, Lee and Chu (2002), however this test ignores the possibility of heterogeneity in panels, and is therefore somewhat restrictive.

<sup>12</sup>Furthermore, the reason for not using a GMM-type estimator is because under  $T \succ N$  we would incur overfitting. Also important to mention is that GMM estimators break down when the variables are believed to be I(1). See Smith and Furtés (2008) or Bond (2002).

when  $N$  or  $T \rightarrow \infty$ , and deals not only with the possible statistical endogeneity caused by the measurement error, but also with the possibility of reverse economic causality. This sort of estimator—which removes the unobserved individual effect, is based on the assumption of sequential exogeneity  $E(FD_{it-1}\Delta u_{it}) = 0$  or  $E(\Delta FD_{it-1}\Delta u_{it}) = 0$ —i.e. the first lag or the lagged first difference of the endogenous explanatory variable are valid identifying instruments<sup>13</sup>. Therefore, since we estimate dynamic models, we choose to use the second lag  $FD_{it-2}$  of the measure of financial development being estimated, as our identifying instrument.

Fourthly, given the descriptive evidence from the previous section, some would justly argue that financial development is being endogenously determined by the poor macroeconomic performance seen at the time, which is exemplified by high rates of inflation<sup>14</sup>. We therefore use the Fixed Effects with Instrumental Variables (FE-IV) estimator, with the second lag of inflation as the identifying instrument for the lagged measure of financial development being estimated. As in the previous case, the dynamic estimates provided by the FE-IV estimator are asymptotically consistent and efficient as  $T \rightarrow \infty$ .

Equations 4 and 5 illustrate the dynamic equations estimated by the baseline POLS and by the FD-IV estimators respectively.

$$GINI_{it} = \alpha + \beta FD_{it-1} + \gamma INFL_{it-1} + \delta UNEMP_{it} + u_{it}, \quad (4)$$

$$\Delta GINI_{it} = \beta \Delta FD_{it-1} + \gamma \Delta INFL_{it-1} + \delta \Delta UNEMP_{it} + \Delta u_{it}, \quad (5)$$

in which  $\alpha$  is the homogeneous intercept of the POLS estimator,  $GINI_{it}$  is the measure of inequality,  $FD_{it-1}$  is the particular lagged measure of financial development being estimated,  $INFL_{it-1}$  the lagged inflation rates,  $UNEMP_{it}$  the unemployment rates and  $u_{it}$  the residuals.

### 3.2 Results

Initially, in Table Two we report the IPS statistics for non-stationarity in the regional series of all variables used for estimation, and they suggest that we can accept the alternative that at least *one* region of each variable is, in fact, stationary<sup>15</sup>.

<sup>13</sup>See Chamberlain (1992), or Anderson and Hsiao (1981 and 1982).

<sup>14</sup>For example, Boyd, J., R. Levine, et al. (2001) argue that inflation presented detrimental effects to financial development in a panel of countries between 1960 and 1995.

<sup>15</sup>Additionally, Phillips and Moon (1999) argue that a spurious regression under  $T \succ N$  is less of a problem. This is because the pooled estimators are averaging over the regions, and therefore the noise is attenuated and the estimates consistent.

Table Two: Panel Unit-Root Tests, 1985-1994.

Variables	IPS Statistics
GINI	-2.89
M2	-2.26
M3	-2.00
CREDIT	-2.07
PERSONAL	-2.26
INFL	-3.08
UNEMP	-2.01

The moment of the mean  $E$  and variance  $var$  of the average  $\bar{t}$  are respectively: -1.504 and .683. Source: Im, Pesaran and Shin (2003), and author's own calculations.

Given that no cointegration analysis might be pursued nor further data transformations needed, we report in Table Three the dynamic estimates obtained by using the POLS and FE estimators respectively.

The first panel of the Table presents the POLS estimates, and all lagged financial development measures present progressive effects on inequality and all estimates are statistically significant. For instance, the effect of a point increase in  $M2$  on inequality would be a reduction of .15 points per year, and  $CREDIT$  would reduce inequality in .13 points per year. The first macroeconomic control variable estimated, the rates of inflation, presents regressive and significant effects on inequality, as expected during this period of high inflation for the process of financial adaptation is imperfect<sup>16</sup>. The other macroeconomic control variable, the unemployment rates, is regressive, which validates the theoretical prediction that in the very short run the poor present lower turnover costs, and therefore lose their jobs and earnings first during periods of macroeconomic instability.

In the second panel of the Table the FE estimator delivers a similar story regarding the impact of financial development for inequality, i.e. all measures present progressive and significant effects on the Gini. For example, a point increase in  $M3$  would reduce inequality in .11 points per year, and a point increase in  $CREDIT$  would reduce inequality in .12 points per year. Unemployment remains significant and regressive on inequality, however the other control, inflation, does not present significant effects this time. The Likelihood Ratio (LR) test suggests that we can not accept the null of homogeneous intercepts, therefore it indicates the presence of fixed effects in all equations, which reinforces the use of the FE estimator to estimate these dynamic equations.

<sup>16</sup>In addition, the imperfect wage indexation due to the lower bargaining power by the poor is believed to have played a role in compressing lower wages. See Dornbusch and Simonsen (1983).

Table Three: Dynamic Estimates of Financial Development on Inequality, 1985-1994.

POLS (GINI)				
M2 <sub>t-1</sub>	-1.291 (-6.19)			
M3 <sub>t-1</sub>		-0.704 (-5.21)		
CREDIT <sub>t-1</sub>			-1.126 (-8.12)	
PERSONAL <sub>t-1</sub>				-7.803 (-4.46)
INFL <sub>t-1</sub>	.052 (4.60)	.052 (4.61)	.046 (4.19)	.034 (2.71)
UNEMP	.240 (2.49)	.271 (2.76)	.227 (2.49)	.402 (4.45)
Constant	53.86 (83.76)	53.45 (82.06)	54.55 (88.02)	52.88 (87.31)
LR test	194.05	199.70	169.32	199.95
F test	38.07	33.90	48.31	31.24
R <sup>2</sup>	.15	.13	.18	.12
FE (GINI)				
M2 <sub>t-1</sub>	-1.585 (-7.37)			
M3 <sub>t-1</sub>		-0.987 (-7.05)		
CREDIT <sub>t-1</sub>			-1.052 (-7.43)	
PERSONAL <sub>t-1</sub>				-14.817 (-6.60)
INFL <sub>t-1</sub>	-.323 (-1.03)	-.325 (-1.04)	-.253 (-.81)	-.419 (-1.33)
UNEMP	.862 (7.94)	.881 (8.10)	.866 (8.00)	.930 (8.65)
F test	2.87	2.81	2.88	2.73
R <sup>2</sup>	.37	.36	.37	.36

T-ratios in parentheses, number of observations:  $NT=648$ . The estimated equation is:  $GINI_{it} = \alpha + \beta FD_{it-1} + \gamma INFL_{it-1} + UNEMP_{it} + u_{it}$ , where  $GINI$  is the measure of inequality,  $FD$  is the measure of financial development being used,  $INFL$  is the inflation, and  $UNEMP$  the unemployment rates. Source: author's own calculations.

When we take into consideration the measurement error and the reverse causality issues, the FD-IV and FE-IV estimators deliver similar pictures. The first panel of Table Four reports the FD-IV estimates in which most financial development measures present significant and progressive effects on the Gini. For instance, a point increase in  $M3$  would reduce inequality in .57 points per year, and a point increase in  $PERSONAL$  would reduce the Gini in .98 points per year. The dynamic estimates of inflation present regressive effects on inequality and the dynamic estimates of unemployment are not entirely significant, which probably illustrates the presence of dual labour markets in the medium run. Furthermore—in the first-stage FD-IV regressions the identifying instruments are statistically significant, and the regression-based Hausman test for endogeneity suggests that we can actually reject the null of no endogeneity, which justifies the use of an instrumental variable estimator.

The estimates reported in the second panel of the Table—using the FE-IV estimator and inflation as the identifying instrument—confirm that all

measures of financial development have the ability of reducing the Gini. For example, a point increase in  $M3$  would reduce inequality in .71 points per year, and a point increase in  $CREDIT$  would reduce the Gini in .62 points per year. The dynamic estimates of unemployment are negative and significant, suggesting that the underground economy played a role in the medium run in attenuating the regressive effect of higher short-run unemployment in the formal sector<sup>17</sup>. Moreover, in the first-stage regressions the identifying instrument, i.e. inflation, is significant and negative, which suggests that the poor macroeconomic performance at the time was detrimental to financial development. Finally, the Hausman test rejects the null of endogeneity.

Table Four: Dynamic Estimates of Financial Development on Inequality, 1985-1994.

FD-IV (GINI)				
$M2_{t-1}$	-6.97 (-4.36)			
$M3_{t-1}$		-4.78 (-3.97)		
$CREDIT_{t-1}$			-9.03 (-.82)	
$PERSONAL_{t-1}$				-8.24 (-2.25)
$INFL_{t-1}$	.046 (2.44)	.048 (2.70)	.028 (1.39)	.031 (2.89)
$UNEMP_{t-1}$	-.669 (-1.96)	-.517 (-1.64)	-.213 (-.52)	.003 (.02)
Hausman test	2.44	2.47	2.87	3.11
F test	158.95	104.56	8.96	11.05
FE-IV (GINI)				
$M2_{t-1}$	-9.38 (-6.03)			
$M3_{t-1}$		-5.92 (-5.87)		
$CREDIT_{t-1}$			-5.22 (-8.43)	
$PERSONAL_{t-1}$				-25.48 (-11.39)
$UNEMP_{t-1}$	-1.65 (-6.12)	-1.87 (-6.05)	-.84 (-6.75)	-.54 (-6.64)
Hausman test	5.04	5.08	4.71	3.42
F test	20.13	19.06	39.26	71.78

T-ratios in parentheses, number of observations:  $NT=648$ . The estimated equation is:  $\Delta GINI_{it} = \beta \Delta FD_{it-1} + \gamma \Delta INFL_{it-1} + \delta \Delta UNEMP_{it} + \Delta u_{it}$ , where  $GINI$  is the differenced measure of inequality,  $FD$  is the differenced measure of financial development being used,  $INFL$  is the differenced inflation rate, and  $UNEMP$  the differenced unemployment rates. The identifying instruments are the second lag of the measure of financial development being estimated, and the second lag of inflation respectively. Source: author's own calculations.

Given the above, the estimates of  $PERSONAL$  and  $CREDIT$  fare well against the Gini coefficient, which highlights the potential of these particular

<sup>17</sup>Fiess, Fugazza, et al. (2006) report evidence using Brazilian data covering the period of 1983-1989, which suggests that the underground economy played an important role in absorbing displaced workers from the formal sector at the time.

measures in reducing inequality through investment in productive activities. Furthermore, the estimates of those measures more related to financial adaptation, i.e.  $M2$  and  $M3$ , present the right signs and are statistically significant, indicating the importance of some sort of earnings protection against the high inflation seen in periods of poor macroeconomic performance.

All in all, the results are statistically and economically significant, and robust for a range of financial development measures and estimators which reinforces the importance of these findings for *policy* purposes<sup>18</sup>. More fundamentally, the results suggest that not only the size of the financial sector is important, but also how important is to have active financial intermediaries in an economy, so that the excessive inequality seen in Brazil is reduced.

## 4 Concluding Remarks

We examined the role of financial development in alleviating earnings inequality in Brazil during the 1980s and 1990s using panel time-series data and analysis.

The range of results presented in Sections 2 and 3 confirms the theoretical prediction that financial development, e.g. in the role of a more active financial sector has an impact in reducing inequality through the channel of short and long-run investment in productive activities, even in periods of poor macroeconomic performance. Moreover, financial depth proved to be important also via the process of financial adaptation, that is, access to financial markets and methods of deferring payment actually provided insulation against the poor macroeconomic performance, in the role of high inflation, recurrently seen in Brazil during the 1980s and first half of the 1990s.

The significance of these results is mainly because: firstly, we undertake a needed national and sub-national study on the subject, which pinpoints more accurately, when compared to international cross-sectional and panel studies, the impact of financial development on inequality in a major developing country like Brazil. Secondly, in addition to the usual measures of financial development we use alternative ones,  $M3$  and  $PERSONAL$ , that we believe capture more realistically the Brazilian economic reality at the time. Furthermore, the results are statistically and economically significant, and robust for different measures of financial development, and different specifications and estimators. Last, but not the least, the significance of this sort of historical study on the importance of financial development on inequality during a prolonged period of high inflation in a polarised country like Brazil at the time is not only for the current episode of generalised higher inflation, but also by the hyperinflation seen in particular emerging

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<sup>18</sup>When instead of inflation we make use of the inflation tax, the same sort of results arise. Available upon request.

countries, e.g. Zimbabwe.

The main limitation at this point concerns the data available, though. The information on monetary aggregates used to construct the measures of financial development is still only provided at national level. Although we explore the regional variation of the data, correcting and minimising the possible measurement error present, we understand that the provision of regional information on the monetary aggregates would certainly bring more flexibility than we have at the moment in terms of empirical modelling. On the other hand, this temporal limitation can not act as an impediment to carry out such studies. We do manage to minimise the error caused by the lack of regional information on monetary aggregates and construct regional proxies of financial development that deliver significant and robust results. Moreover, at the moment there are no data on financial assets at an individual level in Brazil, which would disaggregate this sort of information even further. Certainly the availability of these sorts of data would allow us to investigate not only the direct access to credit by the poorer, but also how well or badly they are actually repaying their debts.

The main implication of the evidence is that the policy of making financial and credit markets less clubby and more widely available has the advantage of being a non-distortionary redistributive policy—for it generates negative incentives to invest, and consequently lower employment that affects mostly the poorer and their earnings—that reduces the persistent inequality seen in Brazil. Furthermore, it is also important to stress the importance of a stable macroeconomic environment as a necessary condition for a more active and deeper financial sector.

A natural extension of this paper would be a study of the impact of financial development on inequality after the stabilisation of 1994-1995. In principle, the more stable period would present the right conditions for an increase in financial development, and consequently a reduction on inequality<sup>19</sup>. Furthermore, an investigation of the impact of inflation on financial development itself—i.e. how the poor macroeconomic performance of the 1980s and first half of the 1990s directly affected financial development—and with that indirectly affecting inequality and also other macroeconomic variables such as economic growth. All in all, the research agenda of the importance of financial development, macroeconomic performance and above all better institutions on inequality using national and sub-national data is relevant and has been overlooked so far.

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<sup>19</sup>Singh (2006), Singh and Cerisola (2006) and Santiso (2006) highlight the importance of the much improved macroeconomic performance in Latin America recently to produce better economic outcomes. Furthermore, Carvalho and Chamon (2006) argue that after the reforms of the 1990s the Brazilian income has grown by much more than the official figures suggest, which reinforces the importance of macroeconomic stability on welfare in general.

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