

Responses to the Referee Report 2

Manuscript No. 2019-11

Manuscript title: The effects of income and inflation on financial development: Evidence from heterogeneous panels.

Dear Editor,

Thank you for the opportunity given to us to revise our paper. We appreciate the insightful comments of the referee, which are fundamental to improving the quality of the manuscript. We have addressed the comments, point-by-point as follows:

Referee Report 2

This paper studies the long-run relationship between finance and growth in a large sample of countries. It accounts for the impact of inflation and allows for non-linearities and finds, as most previous research, significant heterogeneities in the relationship across countries, levels of development and inflation rates. While the paper is rich in results, it does not integrate them in a meaningful way, which makes it hard to grasp its contribution to the large literature that has looked at this issue. Below I offer some comments and suggestions that might help the authors as they further improve their work.

1. There is a large literature assessing the finance-growth nexus. Central to this debate has been the endogeneity of financial development (see Beck, 2008; Ang, 2008; Valickova, Havranek and Horvath, 2014). Financial sectors perform many functions that can spur economic growth, but finance can also follow the development of the real economy, as the latter creates the need for different financial services. This two-way causality has been addressed in several ways, including IV and GMM estimations (Beck, Levine and Loayza, 2000; Beck and Levine, 2004; Arcand, Berkes and Panizza, 2015) or cointegration techniques (Arestis, Demetriades and Luintel, 2001; Christopoulos and Tsionas, 2004; Luintel, Khan, Arestis and Theodoridis, 2008; Peia and Roszbach, 2015). The authors opt to investigate the demand-leading hypothesis and use GDP as their main independent variable. Yet, most of the literature employing GMM estimations looks at the opposite relationship, and regresses GDP growth rates on financial development (Beck et al., 2000; Beck and Levine, 2004; Rioja and Valev, 2004; Arcand et al., 2015; ROUSSEAU and WACHTEL, 2011). The authors need to address this two-way causal relationship or carefully interpret their results as simple correlations and not causal relationships. They follow the empirical specification in Baltagi, Demetriades and Law (2009), yet this paper is concerned with the impact of openness on financial development and not GDP growth. A more thorough motivation for the empirical strategy employed and how this relates to previous literature is needed.

Response:

We have added footnote No. 5 on page 7 as follows:

“We thank an anonymous referee for this comment. The purpose of our paper is to examine the determinants of financial development (with an emphasis on GDP and inflation) in heterogeneous panels. We did not investigate the two-way causal relationship between financial development and economic growth since it has already been examined in several studies (e.g. Christopoulos & Tsionas, 2004; Gozgor, 2015; Peia & Roszbach, 2015). Our econometric model is, however, consistent with the finance literature, where financial development is specified as a function of GDP, inflation and other control variables (e.g. Boyd et al., 2001; Kim & Lin, 2010; Odhiambo 2012). Theoretical economic literature posits that an increase in GDP has the capacity to enhance financial development since it enables households and firms to increase their demands for financial products, services, intermediaries and institutions. To meet these increased demands, the financial sector embarks on innovations and technology that facilitate the development of the sector (Gozgor, 2015; Huang & Lin, 2009; Peia & Roszbach, 2015). Similarly, the theoretical literature asserts that high and volatile long-term inflation is detrimental to financial development, while low and stable inflation enhances financial deepening. Hence, countries that have higher inflation rates are likely to have less efficient financial markets due to the higher interest rates that accompany higher inflation (Boyd & Smith, 1998; Huybens & Smith, 1999)”.

2. The non-linear relationship between GDP and private credit is explored in other papers, which the authors fail to mention. Notably, Rioja and Valev (2004) and Arcand et al. (2015) are important contributions. Again, how does the empirical strategy employed in this paper compare to previous research? Rioja and Valev (2004) split a panel of 72 countries into three regions and show that there is no statistically significant relationship between finance and growth at low levels of financial depth, there is a strong and positive relationship at intermediate levels of financial depth, and that there is a weaker but still positive and statistically significant effect of finance at higher levels of financial depth. Arcand et al. (2015) argue that there can be too much" finance and find that the marginal effect of financial depth on output growth becomes negative when credit to the private sector reaches 80-100% of GDP. What is the theoretical argument for the non-linear relationship the authors investigate, i.e. that “too much" GDP growth can have a negative effect on the development of the financial sector?

Response:

We have rephrased the paragraph on page 3 as follows:

“A second but related issue is whether the relationship between GDP and financial development could be non-linear. Some studies have shown a non-linear relationship between financial development and economic growth (e.g. Arcand et al., 2015; Law & Singh, 2014; Law et al., 2018). They indicated that a low level of financial development may not enhance economic growth (e.g. Rioja & Valev, 2004; Henderson et al., 2013), while “too much finance” may

undermine economic growth (e.g. Arcand et al., 2015; Law et al., 2018; Law & Singh, 2014). This implies the existence of an optimum level of financial development that accelerates growth¹. Our study applies a similar principle in examining the non-linear relationship between GDP and financial development. Theoretical literature suggest that a low GDP may have a negligible effect on financial development because economic activities may be too low to stimulate adequate demands for financial services, products, intermediaries and institutions that are necessary to enhance the development of the financial system (see Deidda & Fattouh, 2002; Huang & Lin, 2009). But as the economy expands, there may be an expansion in the demand for financial intermediaries which may stimulate financial sector development. Huang and Lin (2009) noted that financial intermediation develops at a certain critical level of economic development either because of the minimum size requirements or due to the difficulty of building and maintaining a costly financial superstructure. In their theoretical model, Deidda and Fattouh (2002) showed that the income level determines the relationship between finance and growth. As the real economy grows and provides more investment opportunities, more savings are likely to enter the financial system which enables it to extend new loans for investment. Firms are likely to borrow more money from the financial system for new investment or for the expansion of existing ones if there is good economic performance. However, the impact of GDP on financial development may be non-monotonic. At a high level of GDP, further expansions in economic activity may exert only a minimal effect on the financial system either because the latter has reached a higher level of development or because firms' demands for financial services and products are not increasing due to the expectations of the profitability of future investment opportunities (see Deidda & Fattouh, 2002; Huang & Lin, 2009). Huang and Lin (2009) added that developing economies could offer more investment opportunities and generate greater demands for financial services relative to advanced economies. Hence, beyond a certain threshold level, a further increase in GDP may not have the desirable effect on financial development. This then raises the question: is higher income really "better" for financial sector development?"

3. Similar to the previous comment, the empirical relationship between inflation and financial development is not very thoroughly motivated. As the authors acknowledge on page 2, higher inflation rates might be a signal of other things such as high interest rates, which might impede the functioning of the financial sector. In general, one would expect that very high inflation rates reflect other institutional characteristics such as low central bank independence, all of which might also affect financial sector development. As such, I am having a hard time interpreting the interaction term between inflation and GDP in equation (2). I would expect that less developed countries are also the ones associated with high inflation rates. At the same time the fact that the authors only find an effect in middle income countries is equally puzzling. The average inflation rate of 57% in middle income countries, reported on page 10, is most likely due to some large outliers. Are results consistent after these are eliminated? I am more sympathetic to the second empirical strategy (in Table 3) that splits countries into groups based on their level of inflation. Yet how do the authors address the fact that there has been a world-wide trend towards lower inflation rates over the sample period considered?

¹. We thank the referee for suggesting this point.

Response:

We have rephrased the paragraph on the relationship between inflation and financial development on page 4 as follows:

"Third, the theoretical literature suggests that persistent increases in the inflation rate interferes with the capacity of the financial system to allocate resources efficiently and effectively (Boyd et al., 2001). The importance of information asymmetries in the credit markets has been stressed to show that a continuous rise in inflation rate has an adverse effect on credit market friction, and negatively influences financial sector performance (Huybens & Smith, 1998). Moreover, a rise in the inflation rate reduces the real rate of return on money (and assets in general), which aggravate credit market frictions. The latter causes credit rationing, fewer loans from the financial sector, less efficient resource allocation, and diminishing intermediary activity (Boyd et al., 2001). However, the impact of inflation on financial development depends on the level of the inflation rate. While high and volatile long-term inflation can retard financial development, low and stable inflation aid the deepening of the financial sector. High and persistent inflation reduces the returns on savings thereby decreasing savings and savers, and causing credit scarcity in the economy (Bittencourt, 2011). Countries with higher inflation rates are also likely to have less efficient financial markets due to the higher interest rates that accompany higher inflation (Boyd & Smith, 1998; Huybens & Smith, 1999). The detrimental effect of inflation on financial development has been sufficiently documented (Bittencourt, 2011; Boyd et al., 2001; Odhiambo, 2012). English (1999a), on the other hand, argued that inflation aids financial development. Higher inflation causes households to substitute purchased transactions services for money balances which increases the provision of financial services and enhances the size of the financial sector. However, Kim and Lin (2010) found that inflation only has a short-run positive effect which turned negative in the long-run. In contrast, Cherif and Dreger (2016) documented that the long-run effect of inflation on financial development is insignificant. Yet other empirical studies showed that the impact of inflation on financial development depends on the threshold level of inflation (Boyd et al., 2001; Khan et al., 2006). Boyd et al. (2001) argued that inflation has a negative effect on financial development when the rate exceeds a threshold level of 15% percent. Khan et al. (2006) corroborated the hypothesis but found the detrimental effect of inflation when it exceeds a lower threshold level of 3%-6%. The absence of consensus throws open the question of whether the effect of inflation on financial development varies with the level of inflation.

Regarding the empirical results of the middle-income panel, we have added footnote No. 6 on page 14 as follows:

“The negative and significant effect of the interaction term between GDP and inflation rate found in the middle-income panel is not puzzling since this panel has the highest average inflation rate of 56.6%. The coefficient of the interaction term is also negative in the low-income panel (albeit statistically insignificant) with an average inflation rate of 51.5%. Conversely, in the high-income panel with an average inflation rate of 6.4%, the coefficient of the interaction term is positive (albeit statistically insignificant). This implies that the indirect effect of inflation rate on financial development (through GDP) would depend on the level of inflation. This finding is

consistent with some theoretical and empirical literature (e.g. Boyd et al., 2001; Kim & Lin, 2010) who revealed that a high inflation rate will adversely affect the financial sector development while a low inflation rate will not. However, to ascertain the robustness of our estimation results and check for the potential effect of outliers in the middle income panel, we followed the procedure employed in Boyd et al. (2001) and removed the very high inflation countries (i.e. countries with average inflation rate above 100%) from the panel and redo the analysis. These countries include Argentina, Bolivia, Brazil, Nicaragua and Peru. The estimation results are consistent with the results reported in Table 2 in terms of the sign and significance. Another way we controlled for potential outliers was the categorization of the countries into different panels based on the level of inflation rates. The worldwide trend towards lower inflation rates in recent years do not affect the splitting of the countries into different groups since we employ the average inflation rate of each country during the 1981-2015 period. Countries with average inflation rates of below 6% during the period were classified as low-inflation countries, those with 6%-15% average inflation rates were categorized as medium-inflation countries while those countries with over 15% inflation rates were categorized as high-inflation countries. This procedure has been used in some previous studies (e.g. Kim & Lin, 2010). The empirical outcomes indicated that inflation has a direct adverse effect on financial development in high-inflation and medium-inflation panels, while the effect is insignificant in the low-inflation panel. Besides, the coefficient of the interaction term is negative in the high inflation panel but positive in the low-inflation panel (albeit statistically insignificant). Hence, the level of inflation rate matters in the link between financial development and inflation."

We have explained the interpretation of the interaction term between GDP and inflation rate as presented in Equation 2 on Page 9.

4. Many results found are hard to justify and appear as econometric artifacts. For example, on page 12, the findings suggest that "higher GDP could be beneficial to financial development in high inflation countries". Why is that?

Response:

We have created a new section entitled "Discussion and Policy Implication" on page 17 where we justify our estimation results within theoretical and empirical literature (as presented in the responses to comments #7 below). We have also rephrased the earlier statement on page 12.

5. The empirical strategy in Table 7 is not very clear. Do the authors still employ 5-year non-overlapping periods? If so, what is the statistical power of this econometric exercise?

Response:

We have added footnote No. 7 on page 16 to clarify the data used for the DCCE estimation results presented in Tables 7 and 8 as follows:

"We use the panel data (annual) for the 1981-2015 period for the Dynamic Common Correlated Effects (DCCE) estimation technique which reveals the estimation results for the individual-

specific country as well as controls for cross-sectional dependence. This is consistent with previous studies (e.g. Durusu-Ciftci, et al., 2017; Chidik & Pesaran, 2015) since the DCCE estimator requires long span panel data”

6. Overall, the country-specific results in Tables 7 and 8 are hard to interpret. Is there a way to integrate the results and show some consistent patterns across groups of countries, in particular in the light of the panel estimations in previous sections?

Response:

We have added more discussion regarding the pattern of our results on page 18 as follows:

“Fourth, although there is no robust evidence of a non-linear relationship between GDP and financial development in the panels, the study reveals a U-shaped relationship between GDP and financial development in 37 countries, implying that higher income could enhance financial development in these countries. Majority of these countries are low income or middle income countries (e.g. Bangladesh, Burkina Faso, China, Costa Rica, Dominican Republic, El Salvador, Gabon, Honduras, Kenya, Madagascar, Malawi, Malaysia, Mali, Mauritania, Nicaragua, Pakistan, Panama, Rwanda, Senegal, South Africa, Suriname, Thailand, Tunisia, Venezuela, etc). On the other hand, we find an inverted U-shaped relationship between GDP and financial development in 34 countries, suggesting that a further increase in GDP will not accelerate financial development. Most of these countries are high income countries (e.g. Algeria, Australia, Austria, Bahrain, Bulgaria, Colombia, Dominica, Hong Kong, Hungary, Iran, Israel, Japan, Kuwait, Malta, Mauritius, Morocco, Netherlands, Singapore, Switzerland, Trinidad and Tobago, Turkey, United Kingdom, etc). Finally, there is no significant evidence of a non-linear relationship between GDP and financial development in the remaining 54 countries.

The pattern of our findings also shows that inflation adversely moderates the effect of GDP on financial development in 40 countries. This finding is consistent with the panel data results since most of these countries are mainly middle income countries with probably medium to high inflation rates (e.g. Bangladesh, Belize, Botswana, Bulgaria, Burkina Faso, Central African Republic, China, Dominica, Ecuador, Egypt, Guatemala, Jamaica, Jordan, Malawi, Mauritania, Mauritius, Mozambique, Nepal, Nicaragua, Niger, Panama, Peru, South Africa, Sudan, Suriname, Uganda, Uruguay, etc). Conversely, inflation favorably moderates the effect of GDP on financial development in 48 countries. Majority of these countries are mainly high income countries with probably low inflation rate (e.g. Antigua and Barbuda, Australia, Bahrain, Belgium, Canada, Chile, Finland, Germany, Greece, Hong Kong, Iceland, Korea Republic, Netherlands, New Zealand, Oman, Portugal, Saudi Arabia, Sweden, Switzerland, Trinidad and Tobago, etc). Lastly, inflation has no significant moderating role on the impact of GDP on financial development in the remaining 37 countries. Most of these countries are low income countries with probably low inflation rates (e.g. Benin, Burundi, Comoros, Congo DR., Congo Republic Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Haiti, Lebanon, Madagascar, Mali, Nigeria, Rwanda, Sierra Leone, Sri Lanka, etc).”

7. The authors need to better articulate their results and how these relate to previous literature. Claims such as “high inflation moderates the effect of GDP on financial development in over 70% of the countries” or “We also show the countries where higher GDP is better for financial

development and where it is not" are difficult to grasp. Is inflation "high" in 70% of countries? Which are the countries where GDP growth hinders financial development and why? A better reflection on the theoretical channels behind the results uncovered is needed.

Response:

We create a new section entitled "Discussion and Policy Implications" where we articulate our results and how they relate to previous literature on page 17 as follows:

Discussion and Policy Implications

"The findings of this study are summarized as follows: First, GDP enhances financial development in high income and middle-income countries while the effect is insignificant in low-income countries. This finding is consistent with some previous studies (e.g. Baltagi et al., 2009; Bittencourt, 2011; Kim & Lin, 2010; Law & Habibullah, 2009) who reported a significant positive impact of GDP on financial development. Robinson (1952) also posited that GDP growth facilitates the development of the financial sector because "where enterprises go finance follows. However, this current study has advanced the extant literature by showing that the level of income is important in determining the impact of GDP on financial development. For instance, the average GDP in low-income countries during the 1981-2015 period was only USD572.38 compared to USD3970.20 and USD30323.22 in middle income and high-income countries, respectively. This suggests that the expansion of the economy probably causes firms and households to demand more financial services, products, instruments, and institutions, which prompts the financial system to respond positively through expansion to satisfy this higher demand. Hence, at the early stage of economic development, GDP has a negligible impact on financial development probably because of the low demand for financial products and services. But as the economy achieves a higher income level, the impact of GDP on financial development becomes more apparent.

Second, inflation has a detrimental effect on financial development in middle income and low-income countries, while the effect is insignificant in high-income countries. Also, inflation has a negative effect on financial development in high and medium inflation countries but an insignificant effect in low inflation countries. This result could be due to the high level of inflation rate in middle income and low-income countries compared to high income countries during the period. For instance, the average inflation rates were 56.66% and 51.59% in middle income and low income countries, respectively compared to 6.49% in high income countries. This finding is consistent with some studies (e.g. Bittencourt, 2011; Boyd et al., 2001; Kim & Lin, 2010) who documented a negative impact of inflation on financial development. Theoretical literature opines that high and volatile long-term inflation is repugnant to financial development, whereas low and stable inflation aids the deepening of the financial sector. High and persistent inflation reduces the returns on savings thereby decreasing savings and savers, and causing credit scarcity in the economy (Bittencourt, 2011). Countries with higher inflation rates are also likely to have less efficient financial markets due to the higher interest rates that accompany higher inflation (Boyd & Smith, 1998; Huybens & Smith, 1999). Hence, we conclude from the above results that inflation is only detrimental to financial development when the inflation rate is high.

Third, apart from the direct detrimental effects, the inflation rate also has an indirect adverse effect on financial development via GDP in middle income countries. In other words, inflation

negatively influences the effect of GDP on financial development, as the marginal effect of GDP on financial development declines as the inflation rate rises. This implies that GDP has a higher impact on financial development at a lower level of inflation compared to a higher level of inflation. This is consistent with some empirical studies which showed that the impact of inflation on financial development depends on the threshold level of inflation (Boyd et al., 2001; Khan et al., 2006). For instance, Boyd et al. (2001) argued that inflation has a negative effect on financial development when the rate exceeds a threshold level of 15% percent. In our study, the average inflation rates during the 1980-2015 period were 56.66% and 51.59% in middle income and low-income countries, respectively.

Fourth, although there is no robust evidence of a non-linear relationship between GDP and financial development in the panels, the study reveals a U-shaped relationship between GDP and financial development in 37 countries, implying that higher income could enhance financial development in these countries. Majority of these countries are low income or middle income countries (e.g. Bangladesh, Burkina Faso, China, Costa Rica, Dominican Republic, El Salvador, Gabon, Honduras, Kenya, Madagascar, Malawi, Malaysia, Mali, Mauritania, Nicaragua, Pakistan, Panama, Rwanda, Senegal, South Africa, Suriname, Thailand, Tunisia, Venezuela, etc). On the other hand, we find an inverted U-shaped relationship between GDP and financial development in 34 countries, suggesting that a further increase in GDP will not accelerate financial development. Most of these countries are high income countries (e.g. Algeria, Australia, Austria, Bahrain, Bulgaria, Colombia, Dominica, Hong Kong, Hungary, Iran, Israel, Japan, Kuwait, Malta, Mauritius, Morocco, Netherlands, Singapore, Switzerland, Trinidad and Tobago, Turkey, United Kingdom, etc). Finally, there is no significant evidence of a non-linear relationship between GDP and financial development in the remaining 54 countries.

Finally, the pattern of our findings shows that inflation adversely moderates the effect of GDP on financial development in 40 countries. This finding is consistent with the panel data results since most of these countries are mainly middle income countries with probably medium to high inflation rates (e.g. Bangladesh, Belize, Botswana, Bulgaria, Burkina Faso, Central African Republic, China, Dominica, Ecuador, Egypt, Guatemala, Jamaica, Jordan, Malawi, Mauritania, Mauritius, Mozambique, Nepal, Nicaragua, Niger, Panama, Peru, South Africa, Sudan, Suriname, Uganda, Uruguay, etc). Conversely, inflation favorably moderates the effect of GDP on financial development in 48 countries. Majority of these countries are mainly high income countries with probably low inflation rate (e.g. Antigua and Barbuda, Australia, Bahrain, Belgium, Canada, Chile, Finland, Germany, Greece, Hong Kong, Iceland, Korea Republic, Netherlands, New Zealand, Oman, Portugal, Saudi Arabia, Sweden, Switzerland, Trinidad and Tobago, etc). Lastly, inflation has no significant moderating role on the impact of GDP on financial development in the remaining 37 countries. Most of these countries are low income countries with probably low inflation rates (e.g. Benin, Burundi, Comoros, Congo DR., Congo Republic Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Haiti, Lebanon, Madagascar, Mali, Nigeria, Rwanda, Sierra Leone, Sri Lanka, etc).

This study has some fundamental policy implications. First, low income countries should formulate policies and programmes that can accelerate real GDP with a view to boosting the development of the financial sector. Such policies should accelerate capital accumulation and productivity growth which are the sources of economic growth. It may be necessary to facilitate the development of physical capital, human capital, infrastructure and institutions which are fundamental for economic growth. These are essential because as countries move from low

income to high income, the beneficial effects of GDP on financial development increases while the adverse effects of inflation rate declines. Second, countries that have high inflation rate (especially low income and middle-income countries) should employ the appropriate policies to reduce the inflation rate in order to enhance financial development. The negative impact of inflation on financial development suggests that policies aimed at reducing inflation will enhance the development of the financial system. In this regard, countries should employ the necessary fiscal policy instruments (e.g. government expenditure and taxation) and monetary policy instruments (e.g. open market operations) to control inflation. These policies can control inflation without harming the financial sector.”

8. Minor comments

(a) The introduction is not fully developed and articulated. For example, the findings and how they relate to previous literature are not discussed.

(b) The choice of some expressions might be reconsidered. Examples include: “engenders”, “households”, “throws open”, “deleterious”.

(c) On page 1, the sentence “there may be a threshold level beyond which further increases in GDP may only have negligible positive effects on GDP” is a typo?

Response:

We have included a brief discussion of our findings and how they relate to previous literature in the introduction section on page 6 as follows:

“Interestingly, our empirical outcomes reveal that GDP enhances financial development in high income and middle income countries while the effect is insignificant in low income countries. Moreover, inflation has both direct and indirect adverse effects on financial development in middle income and low income countries, while the effect is insignificant in high income countries. We also show that inflation has a negative effect on financial development in high and medium inflation countries while the effect is insignificant in low inflation countries. These findings are consistent with some previous studies (e.g. Baltagi et al., 2009; Bittencourt, 2011; Boyd et al., 2001; Kim & Lin, 2010; Law & Habibullah, 2009; Odhiambo 2012). However, there is no robust evidence of a non-linear relationship between GDP and financial development in the panels (albeit we find some evidence in a few individual countries).”

We have rewritten some of the expressions and corrected the typo on page 1.

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Yours truly,

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