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Overview

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Proposals of Special Issues should be submitted to at jbfe@wz.uw.edu.pl. All proposals are being reviewed by the Editorial Team on the basis of certain criteria that include e.g.: the novelty, importance and topicality of the theme; whether the papers will form an integrated whole; and the overall 'added value' of a Special Issue.

CONTENTS

Sovereign Debt Restructurings in Belize: Debt Sustainability and Financial Stability Aspects

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ABSTRACT

This paper examines the causes, processes, and outcomes of the two Belize sovereign debt restructurings in 2006–07 and in 2012–13, which occurred outside an IMF-supported program. It finds that the motivation for the two debt restructurings differed, as the former was driven by external liquidity concerns while the latter was motivated by a substantial increase in the coupon rates and future fiscal solvency concerns. Despite differential treatment between residents and non-residents, both 2006–07 and 2012–13 debt exchanges were executed through collaborative engagement, due in part to the existence of a broad-based creditor committee and the authorities' effective communication strategy. However, while providing temporary liquidity relief, neither of the debt restructurings properly addressed long-term debt sustainability concerns. Going

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forward, the success of the 2012–13 debt restructuring will still depend on the country's ability to strengthen fiscal efforts and the public debt management framework.

JEL Classification: F34, G15, H63

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1. INTRODUCTION

Typical determinants of restructurings, as well as defaults, are over-indebtedness (debt/GDP ratio) and illiquidity (rollover risks). Further, factors such as political instability and external shocks, in particular commodity price shocks and interest rate hikes, can exacerbate the adverse effects of these determinants. Market risk indicators, such as bond spreads, credit default swap prices and rating changes can generally be viewed as predictors of the risk of default and debt restructurings. Restructurings are rarely isolated events. They often follow or precede banking and currency crises and are associated with a decline in output, trade, and capital inflows.

Debt Sustainability Analyses (DSAs) are an important tool to assess the potential need and scope of a sovereign debt restructuring. In essence, DSAs analyze the conditions under which a government's primary balance (the budget balance excluding interest payments) is sufficiently high to stabilize or reduce the debt-to-GDP ratio (or, the debt-to-export ratio). The most basic DSA model can be reduced to two key variables: real interest rates (borrowing costs) and real growth. The larger the differential between interest rates and growth, the higher the primary budget balance that is needed just to stabilize the debt-to-GDP ratio.

The scope of haircuts (creditor losses) in bond restructurings has varied substantially, ranging from under 10 percent present value reduction (e.g., Uruguay, 2003, Dominican Republic, 2005) to over 80 percent (e.g., Dominica, 2004, Ecuador, 2009, Seychelles, 2010, Cote D' Ivoire, 2010, Greece, 2012). High participation rates, of more than 90 percent, have been the rule in recent sovereign bond exchanges. Evidence has shown that the size of the haircut in a restructuring is correlated with years of exclusion from capital markets and post-restructuring borrowing costs. In particular, higher haircuts (lower recovery values) are associated with longer periods of market exclusion and higher spreads after a crisis (Das et al., 2012).

The past international experience with sovereign crises and debt restructuring episodes provides us with several important insights for the case of Belize, which undertook two sovereign debt restructurings within a relatively short-time span and announced in Nov. 9 2016 that it intends to start restructuring discussions with holders on the 2038 sovereign bond. In 2006–07, facing an acute external liquidity shortage due to high debt service burden, Belize exchanged its various external debt instruments, including both loans and bonds, into one single U.S. dollar denominated bond ("super-bond") with face value of US$547 million (34 percent of GDP in 2013).[2] The exchange lengthened maturity and lowered coupon rates.[3] Six years later, the Belizean authorities, this time driven mainly by a substantial increase in the coupon rates and future fiscal solvency concern, launched a second external debt restructuring, with a modest face value haircut as well as cash-flow relief through changes in both coupon and maturity structures.

[2] Throughout the paper, external debt is defined as debt issued in foreign currencies and under the jurisdiction of a foreign court. It can be noted that the share of external public debt to the total public debt is around 84 percent of GDP.

[3] Though maturity extension and lowering coupon rates over the short term without any face value reductions made it easier for both creditors and sovereigns to reach agreement on a deal, debt repayment burden became prominent over the medium and long term.

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This paper applies the case study method and analyzes several pertinent issues to Belize's sovereign debt restructurings, such as the evolution of the debtor-creditor relationship, including the role of the International Monetary Fund (hereafter IMF). We examine the case of Belize as it is unique in conducting its two debt restructurings outside of an IMF-supported program. Furthermore, it assesses the debt exchanges with regard to what has worked well and what has not, as the country's debt level still remains elevated even after the repeated debt exchanges.[4,5] Specifically, the paper focuses on three key aspects:

- *Cause* – why did the country restructure its debt? This question will crystallize what macroeconomic indicators signaled the vulnerability of policies that ultimately led to debt restructurings.
- *Process* – how did the debtor-creditor relationship develop? It includes an analysis of the modalities and length of negotiation and communication with private, official bilateral and multilateral creditors. Are there any legal and operational characteristics that might have influenced the renegotiation process?
- *Outcomes* – did the restructuring fully address debt sustainability concerns? What was the impact on the liquidity and solvency conditions after each restructuring? What is the creditor loss along with the prospects for future market reaccess?

Even though Belize's two debt restructurings ultimately achieved preemptive, smooth, and broadly transparent processes, debt sustainability concerns remain. Differential treatment of residents and non-residents did not hamper the collaboration between the government and creditors. Also, although the investor base remained the same over time, the experience gained in the first debt restructuring helped to conclude the second debt restructuring in a relatively expedite way.[6] However, while both restructurings were undertaken in a collaborative manner, the debt level remains high with potential risks of large contingent liabilities, implying that a substantial fiscal adjustment is still warranted to put the debt level on a sustainable path.

The rest of the paper is organized as follows. Sections 2 provides a brief review of the relevant literature. Section 3 and 4 investigate the causes, processes, and outcomes of the debt exchanges in 2006–07 and 2012–13, respectively. Analysis of the results of the first restructuring includes the question on what led the country to a subsequent debt exchange. Finally, conclusions are presented in Section 5.

2. BRIEF LITERATURE REVIEW

This paper relates to the empirical literature on case studies of sovereign debt restructurings (e.g., Reinhart and Rogoff, 2009; Sturzenegger and Zettelmeyer, 2006; Finger and Mecagni, 2007; Diaz-Cassou et al., 2008; Panizza et al., 2009; Das et al., 2012; Duggar 2013; Erce, 2013; Tomz and Wright, 2013; Asonuma and Trebesch 2016, Asonuma et al. 2017b). Among these

[4] Reinhart, Rogoff, and Savastano (2003) argue that debt "intolerance" is highly linked to the phenomenon of serial default due to a vicious cycle in which default weakens a country's institutions in turn making subsequent default more likely. Asonuma (2016) theoretically explains that outcomes of previous renegotiation influence the borrowing costs of subsequent bond issuances, making repeated restructuring or default more likely.

[5] IMF (2013a) provides a preliminary review of IMF policies and practices in light of recent experience in sovereign debt restructuring including Belize (2006–07 and 2012–13), the Dominican Republic (2004–05), Grenada (2004–05), Jamaica (2010, 2013) and St. Kitts and Nevis (2011–12). Jahan (2013) discusses some common features and asymmetries in three prominent debt restructurings in the Caribbean: Belize (2006–07), the Dominican Republic (2004–05) and Jamaica (2010). Diaz-Cassou et al. (2008) also provide detailed case studies on two restructuring episodes in the region: Belize (2006–07) and the Dominican Republic (2004–05) and Erce (2013) examines the role played by the IMF during sovereign debt restructurings in the region: the Dominican Republic (2004–05), Dominica (2004), Grenada (2004–05) and Jamaica (2010). Furthermore, Das et al. (2012) overview restructuring cases in the region: Belize (2006–07), Dominica (2004), the Dominican Republic (2004–05), Grenada (2004–05), and Jamaica (2010).

[6] Several new legal terms included in the 2012–13 debt exchange offer attempted to improve transparency between the committee and the authorities in the event of a future debt distress.

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studies, Sturzenegger and Zettelmeyer, 2006, present detailed histories of default and debt crisis in seven emerging market (EM) during 1998–2005, while Diaz-Cassou et al., 2008, and Finger and Mecagni, 2007, review recent sovereign debt restructurings and IMF-supported programs in late-1990s and 2000s. Based on a large sample of debt restructurings over 1950–2010, Das et al., 2012, present new stylized facts on the outcome and process of debt restructurings, including on the size of net present value (NPV) haircuts, creditor participations and legal aspects. The current paper fills a gap in the literature of sovereign debt restructurings focusing specifically on "unique" case studies of the sovereign opting to restructure the debt outside the IMF-supported programs.

Another strand of literature discusses serial sovereign debt restructurings (e.g., Reinhart et al., 2003; Reinhart and Rogoff, 2005; Eichengreen et al., 2005; Catao et al., 2005; and Asonuma, 2016). Reinhart et al., 2003, and Reinhart and Rogoff, 2005, emphasize the role of past credit history in debt intolerance, while Eichengreen et al., 2003, stress that countries that have experienced "original sin," i.e., inability to issue bonds in their domestic currencies, must pay an additional risk premium when they borrow externally, thus increasing their solvency risks, as financial markets know that their inability is a source of financial fragility. Catao et al., 2009, point out that vicious cycles in sovereign credit histories arise due to output persistence – inertia of output dynamics which continues to stay at the previous level – combined with asymmetric information about output shocks. In contrast, Asonuma, 2016, shows theoretically and empirically that outcomes of previous debt restructurings influence the credit worthiness of sovereigns though increased borrowing costs. The paper contributes to the literature on serial sovereign debt restructurings by exploring in depth causes, processes, and outcomes of two serial debt restructurings in Belize in the case study analysis.[7]

3. 2006–07 DEBT RESTRUCTURING

The 2006–07 debt restructuring achieved liquidity relief in a preemptive, collaborative, broadly transparent manner, but left solvency concerns unresolved.[8] Prior to the debt exchange, Belize embarked on fiscal adjustment effort to address its vulnerabilities in fiscal and external positions. While this policy reduced new financing requirements in the following years, large financing gaps were still projected to remain in 2007 and beyond due to debt service of external commercial debt. In this light, the country undertook the debt restructuring and consolidated various instruments into one single benchmark bond. The deal was concluded in a collaborative manner with high creditor participation and introduced a single external bond with longer maturity than those of the original instruments, thus providing liquidity relief. The restructuring closed with strong creditor support based on the country's ability and willingness to put in place a strong fiscal consolidation effort.

3.1. Background

Highly expansionary macroeconomic policies in the late 1990s and early 2000s resulted in serious imbalances in the fiscal and external accounts (Annex 1). In the aftermath of the hurricanes and tropical storms in 2000–02, the government undertook aggressive efforts to stimulate economic growth through higher capital spending and lower taxes. This expansionary policy mix led to a soaring public debt level, high debt service costs, and widening of the external

[7] Asonuma et al. (2017a) discuss two consecutive debt restructurings in Grenada. Moreover, Asonuma and Papaioannou (2016) explore domestic sovereign debt restructurings over decades.

[8] Asonuma and Trebesch (2016) define Belize's 2006–07 restructuring as "weakly preemptive" as some payments were missed, but only temporarily and after the start of formal or informal negotiations with creditor representatives (no unilateral default).

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current account deficit. The overall deficit of the central government rose from an average of 3 percent of GDP in 1996–98 to about 9 percent of GDP in 2000–04. In addition, certain external financial transactions by a number of quasi-fiscal institutions contributed to the buildup of foreign liabilities.[9] To secure financing, the government extensively borrowed from external commercial sources, including loans and bonds, which resulted in public debt surging from US$ 599 million (72 percent of GDP) in 2000 to over US$ 990 million (100 percent of GDP) by 2003, with 95 percent of the total public debt outstanding held by external creditors. Against this backdrop, IMF staff urged the authorities to implement immediately forceful measures to reduce the fiscal deficit.[10]

At the same time, Belize's external condition became more challenging owing in part to high world oil prices, declining export prices, and rising external debt service costs. Trade imbalances, coupled with surging debt service burden, led to significant current account deficits, which averaged 17.3 percent of GDP during the period 2001 through 2005. The large current account deficits were principally financed through a build-up of external public debt, which almost tripled from less than US$400 million in 1998 to US$1.1 billion in 2005. As debt service obligations rose and market financing became increasingly difficult to secure, the government resorted to financing from the central bank, whose international reserves fell below one month of import coverage by end-2005. This erosion of reserves left the Belizean economy highly vulnerable to both endogenous and exogenous shocks.

In addition, as a result of repeated refinancing operations the liquidity position deteriorated leading to a consistent rise in borrowing costs. The maturity structure of the external public debt at end-June 2006 exhibited a large share of short and medium-term debt, with 13 percent of liabilities falling due within a year and 25 percent of debt maturing in 1–5 years, forcing frequent refinancing. Since the refinancing was done by borrowing from external commercial markets at high interest rates, the cost of refinancing the external debt rose substantially, with the average effective interest rate at 11.25 percent.[11]

In face of the persistent high fiscal and current account deficits, in 2005 the government embarked on a forceful adjustment strategy. As a result of tax revenue measures and primary spending cuts, the overall deficit of the central government fell sharply from 8.6 percent of GDP in FY2004/05[12] to 3.3 percent in FY2005/06, while the primary balance shifted from a small deficit to a surplus of 3 percent of GDP. Partly in response to the tighter policy stance, the external current account deficit narrowed from 18 percent of GDP in 2005 to 14 percent in 2006. Subsequently, net international reserves position improved from 0.6 to 1.4 months of imports.

However, even with the adjustment effort, as well as prospective additional official financing, large financing gaps would remain in 2007 and beyond.[13] Debt sustainability was also a major concern in the consultations between the government and IMF staff prior to the 2006–07 debt exchange, which indicated that without sustained primary surpluses the public debt would not

[9] The Government of Belize assumed directly over 20 percent of GDP in external liabilities associated with a government guarantee on failed mortgage securitization scheme, and failed privatizations (IMF, 2006a).

[10] IMF (2002a).

[11] The rise in external commercial borrowing cost was partly a result of the downgrade of Belize's sovereign credit rating by Standard and Poor's and twice by Moody's in June 2005 (with refinancing interest rates, equivalent to nominal external interest rates increasing to 7.8 percent from 7.0 percent before the downgrade). S&P's downgrades and negative outlook reflected mounting liquidity pressures that had been exacerbated by Belize's impaired market access (both official and commercial) and the government's worsening debt trajectory. The public sector's dire liquidity position in 2005 was weakened by massive amortization needs (as compared to available assets) and limited ability to access external financing which continued to suffer due to the unstable political situation. The government debt's deteriorating profile had been difficult to reverse due to persistent fiscal slippages and the government's assumption of Development Finance Corporation's debt as a result of the bank's financial distress (Standard and Poor's, 2013). Similarly, Moody's rating downgrades incorporated an assessment of Belize's increased external vulnerability and macroeconomic conditions that had not been consistent with fiscal and debt sustainability, as well as indications by the government of its intention to engage creditors in order to explore alternatives to improve Belize's external debt profile. Moody's believed that debt restructuring represented a credit event that was increasingly likely to materialize.

[12] Belize fiscal year runs from April to March.

[13] IMF (2006a).

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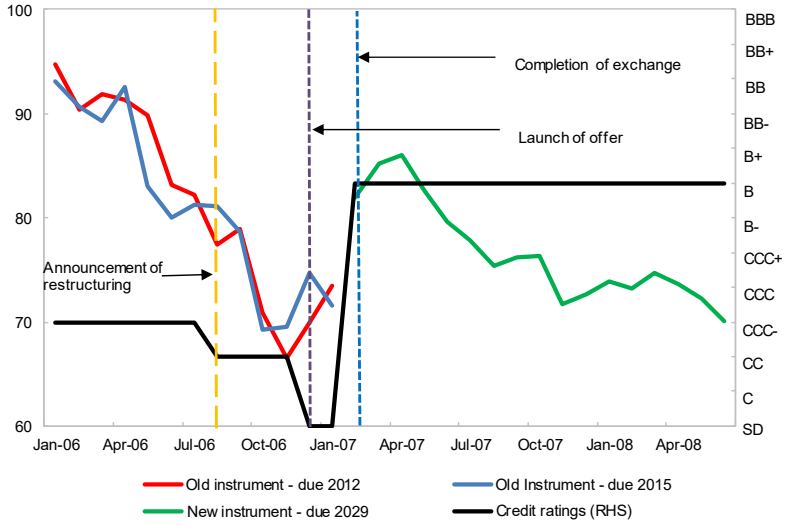
stabilize in the medium run. While the debt-to-GDP ratio would initially fall from 98½ percent at end-2005 to 84½ percent in 2012, it would shift back to an upward trend thereafter due to a rising interest bill. It was in this context that Belize sought to restructure its debt.[14]

3.2. PROCESS

The government announced the intention to restructure the country's sovereign debt in August 2006 (IMF 2006a).[15] In the announcement, the authorities expressed willingness to recognize and work with a formal creditor committee representing holders of at least 51 percent of the affected debt (Buchheit, 2009).[16] Bond prices, which had been declining since January 2006, slumped further after the authorities' announcement (Figure 1).

Figure 1
Belize Debt Restructuring, 2006–07: Price of New and Old Instruments (In percent of face value)



Sources: Bloomberg; Central Bank of Belize, Standard and Poor's.

The restructuring was undertaken preemptively, with subsequent arrears occurring due to missed coupon payments during the negotiation stage. The authorities had remained current on their debt obligations until its announcement of restructuring in August 2006, but in mid-September they announced that debt service payments to two special purpose vehicles, which formed part of an issuance of insured loans, had not been made.[17] The government explained that this action was driven by the country's acute liquidity difficulties and the need to conserve the very limited pool of usable reserves. At the same time, the authorities reiterated their intention to use their best efforts to continue servicing debt, pending an orderly restructuring of the debt.

The authorities targeted only external commercial debt, discriminating those creditors from domestic creditors and external official creditors. The authorities initially sought to restructure all of the government's bond indebtedness, external commercial loans, and insured loans. However,

[14] IMF (2006b).

[15] The Belize authorities appointed Houlihan Lokey, Howard & Zukin as financial advisors in fall 2005 (Robinson, 2010). At the same time, BroadSpan Securities LLC was acting as a financial advisor to the Committee (Buchheit, 2009) and Cleary Gottlieb Steen & Hamilton LLP was acting as a legal advisor to the government (Buchheit, 2009 and Belize Ministry of Finance, 2006).

[16] Committee members included AIC Finance Limited, British-American Insurance Company, Caribbean Money Market Brokers Limited, First Citizens Asset Management Limited, First Global Financial Service Limited, Guardian Asset Management, Jamaica Money Market Broker Limited, National Commercial Bank (SVG), RBTT Merchant Bank Limited, RBTT Trust Limited, Republic Bank Limited, Sagicor Life Inc, Trinidad & Tobago Unit Trust Corporation (Buchheit, 2009).

[17] The structure of these two insured loan facilities was such that at inception, the government had to prepay six months of debt service into reserve accounts. The government's failure to make the scheduled coupon payments triggered the use of these reserve accounts to make the payments to bondholders.

DOI: 10.7172/2353-6845.jbfe.2017.2.1

T-bills, domestic loans, and bilateral and multilateral claims were not eligible in the offer.[18,19] This may be because (i) the authorities primarily aimed at addressing external vulnerabilities, as argued by Erce and Diaz-Cassou (2010); (ii) T-bills and domestic loans were difficult to restructure since the banks would need to be recapitalized; and (iii) the size of official credits was not large to help mitigate liquidity pressure. Such creditor discrimination did not seem to raise any apparent inter-creditor equity concerns.

The existence of a broad-based creditor committee and the authorities' effective and broadly transparent communication strategy facilitated the smooth debt renegotiation (Buchheit and Karpinski, 2007, Buchheit, 2009). The creation of the creditor committee differs from those formed in the 1980s and 1990s in certain aspects: establishing certain criteria for formation of committee and its procedural rules and incorporating elements that enhanced dialogue and participation among creditors in past restructurings cases (Buchheit, 2009, Li et al., 2010). The creditor committee was engaged through an open dialogue with the authorities, which attempted to keep transparency in dissemination of all relevant macroeconomic data.[20] The focus of discussion centered on projections of growth, fiscal consolidation, and debt dynamics which were important inputs to assess Belize's repayment capacity and financing gaps. Details of the government's indicative scenarios presented to creditors in October 2006 are shown in Table 1 below.

Table 1
Belize Debt Restructuring, 2006–07: Indicative Scenarios

	Indicative Scenarios		
Option	Discount	Discount	Par
Face value haircut	20%	20%	0%
Grace period (years)	8	13	12
Final maturity (years)	18	13	22
Coupon	2.5% until 2010 4.5% until 2012 9% until 2025	2.5% until 2010 4.5% until 2012 9% until 2020	2% until 2010 3.5% until 2013 7% until 2029
Repayment Style	Amortizing	Bullet	Amortizing

Source: Belize authorities.

On December 18, 2006, after intensive dialogue with the creditors, the government launched the debt offer. Commercial debt eligible for exchange comprised (i) US$348 million (29 percent of GDP) global bonds (including notes); (ii) bank notes for US$53 million (4 percent of GDP); and (iii) two insured loans valued at US$115 million (9 percent of GDP). The restructuring was executed through an exchange, with a single instrument dubbed as "super-bond". The "super-bond" was a par-bond (i.e., no principal haircut) with a final maturity in 2029, amortization starting in 2019, and a step-up coupon structure (Table 2). With hindsight, this step-up coupon structure played a role in the authorities' decision to seek the second restructuring, as the government was anticipating increases in debt service by 0.6 and 1.2 percent of GDP in 2012 and 2013, respectively.

[18] Belize Ministry of Finance (2006, p. 58).

[19] Multilateral claims are often considered to be senior relative to other claims and are excluded from the exchange.

[20] In particular, the authorities maintained close contact with over 40 creditors who held more than 80 percent of the face value of the total restructured debt.

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The details of financial terms at the exchange were the following (Table 2):

- ***No principal haircut***. Approximately US$546 million (45 percent of GDP) of new 2029 bonds were issued without face value reduction.
- ***Coupon rate reduction***. Due to a step-up coupon structure, coupon rates of the new bond over maturity are lower by 2.1 percent than those of the old instruments on average.
- ***Maturity extension and change in repayment structure***. Maturity was extended by 16 years on average. Contrary to payments due at maturity for a majority of old instruments (85 percent of total outstanding), the new bond is an amortizing bond commencing in August 2019.
- ***NPV and market haircuts***.[21] Using a discount rate of 9.2 percent, the NPV haircut was 24 percent, while the market haircut was 21 percent. NPV haircuts differ across creditors; NPV losses for holders of insured loans were 50 percent higher than those of global bonds and notes due to lower exchange ratio.[22]

Table 2
Belize Debt Restructuring, 2006–07: Deal Structure

	Old Instruments			New Instrument
Instruments	Global bonds/notes	Bank loans	Insured loans	Super-bond
Face value (US$ mil.)	348	53	115	547
Face value haircut[1)]	0%	0%	0%	-
Maturity	2007-15	2008-12	2010-15	2029
Grace period (years)[2)]	N/A	N/A	N/A	12
Remaining maturity (years)	6.2	4.4	5.8	22
Coupon	Fixed 8.95–9.95%	Fixed 9.25–10%	Fixed 10%	4.25% until 2010, 6% until 2012, 8.5% until maturity
Repayment style	Amortizing/Bullet	Bullet	Bullet	Amortizing
Present value on 2/2007[3) 4)]	104%	103%	105%	79%
NPV haircut[5) 6)]	21%	26%	32%	-
Market haircut[6) 7)]	18%	23%	29%	

1) Each instrument was exchanged based on "conversion factor" that varies from 0.85 to 1.1 with cash payments, without face value haircut. If the face values of the existing instruments were multiplied by the respective conversion factor, they match with the face value of the super-bond.
2) Grace period affects only capital requirements and not interest payments.
3) Discount rate of 9.2 percent was the exit yield at completion of the exchange (March 28, 2013 was the first transaction day when the yield was recorded after completion of the exchange).
4) Weighted average of all instruments following in the category based on outstanding as of 2/2007.
5) NVP haircut is defined as 1 - Present value of new debt/Present value of old debt as in Sturzenegger and Zettelmeyer (2006, 2008). Present value of new debt and old debt is computed with the same discount rate.
6) Weighted average of all instruments following in the category based on outstanding as of 2/2007.
7) Market haircut is defined as 1 - Present value of new debt/Face value of old debt.

Sources: Belize authorities, Bloomberg, and authors' calculations.

21 NVP haircut is defined as 1 - Present value of new debt/Present value of old debt as in Sturzenegger and Zettelmeyer (2006, 2008). Present value of new debt and old debt is computed with the same discount rate. On the contrary, market haircut is defined as 1 – Present value of new debt/Face value of old debt.

22 Exchange ratios define the principal amount of new bonds "Superbonds" to be exchanged for each of the eligible claims identified in Table 2.

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The debt exchange achieved 98-percent participation rate after the exercise of the collective action clause (CAC) (Annex 2). The CAC was triggered on the 9.75-percent note due 2015 (85-percent threshold of outstanding principal under New York law) on February 5, 2007 after the offer was closed. This raised the percentage of total eligible claims subject to exchange from 87 to 98 percent and facilitated the exchange.[23] To this date, the remaining 2 percent of bondholders were not identified and did not take a significant legal litigation even without receiving debt service payments. Further, despite a large variety of restructured instruments with variations in NPV haircuts, the consolidation to one single bond did not seem to raise any significant inter-creditor equity issues.

Creditors accepted the offer despite concerns about future debt distress. The offer memorandum for the 2006–07 debt exchange acknowledged the possibility of future debt exchanges in light of vulnerabilities and risks.[24] However, creditors accepted the offer in the end, likely because (i) they thought the return profile was rewarding enough based on risk-adjusted assessment given the global environment; (ii) it was more economically sensible to accept the offer rather than take legal actions that may entail significant costs; and (iii) the original bonds were illiquid and thus the outright sales were not easy.

The IMF played its role as an independent party to provide debt sustainability assessment and cash flow analysis. It maintained close contact with both authorities and financial advisors, but not with creditors during the restructuring process. The 2006 Article IV consultation highlighting projected large financing gaps over the medium term provided essential inputs into an adjustment scenario that the authorities were preparing with their financial advisors (IMF, 2006a). At the request from the authorities of Belize, the IMF issued an assessment letter to the international financial community on December 20, 2006, right after the launch of the deal (IMF, 2006b). The letter noted that a high participation by private creditors would help support the authorities' "orderly macroeconomic adjustment, restore fiscal and external sustainability, and establish the conditions for strong economic growth."

The Belizean authorities also engaged with official multilateral and bilateral creditors to lend additional support to Belize. Although the official sector loans were not restructured, the authorities received substantial new concessional financing from the regional development banks, such as the Inter-American Development Bank (US$25 million) and the Caribbean Development Bank (US$25 million), as well as from official bilateral creditors, particularly Taiwan (US$30 million) and Venezuela (US$50 million).

3.3. Outcomes

The debt restructuring provided a significant liquidity relief, but solvency concerns remained unresolved. The average maturity of public external debt was extended from 5.7 years before the exchange to 22 years, which resulted in a substantial decline in debt service in the short run (Figure 2).[25,26] Debt service relief amounted to US$12 million (including the missed interest payments) in 2007 (1 percent of GDP) and about US$38 million (2.6 percent of GDP) per year from 2008 to 2012. However, with no nominal haircut, the outstanding debt remained high at 86 percent of GDP in 2007, declining only gradually to 77 percent of GDP by 2012.

[23] Buchheit and Karpinski (2007).

[24] Belize Ministry of Finance (2006, p. 16).

[25] Cash payments at the closing of the transaction were equal to the unpaid interest on tendered claims accrued up to the closing date.

[26] Projected debt service schedule was similar to that of Argentina 2005 global debt restructuring: small debt service over the short term and substantial increase in debt payments over the medium and long terms due to amortization and step-up coupon structures.

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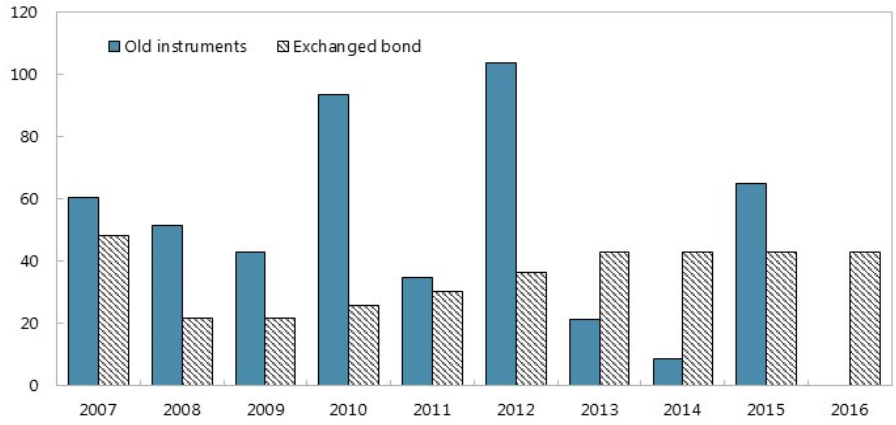
Figure 2
Belize Debt Restructuring, 2006–07: Debt Service of Old Instruments and Exchanged Bond[1)]
(In millions of U.S. dollars)



[1)] Debt service to the exchanged bond in 2007 includes cash payments at the closing of the transaction.

Sources: Belize authorities; and authors.

Belize enjoyed an immediate improvement in its credit ratings. Standard and Poor's raised Belize's credit rating on both its long- and short-term debt from CCC- to B immediately after the exchange. Moody's subsequently followed with an upgrade of Belize's sovereign debt to B3. By completion of exchange on February 15, 2007, the bond price recovered from 70 to 80 percent of the face value, close to the pre-announcement level (Figure 1).

After the completion of debt exchange, Belize did not access international capital markets. Although its emerging market bond index (EMBI) remained fairly low after the debt exchange (below 400 basis points for the next four months), Belize continued to rely on official project financing from both bilateral and multilateral creditors. In addition, the global financial crisis that occurred right after the debt exchange raised the risk sensitivity of creditors, preventing new external commercial debt issuances.[27]

No formal debt management and investor relations program was established after the restructuring. The debt restructuring in 2006–07 consolidated different debt instruments into one single bond, which would have facilitated regular interaction with foreign creditors. However, the government did not launch a formal debt management program and thus a regular and rigorous communication channel was not maintained after the completion of the first restructuring until start of negotiation on the second debt restructuring. Moreover, it should be noted that market participants were not convinced that the first restructuring would be sufficient to adequately address the debt sustainability concerns that led to this restructuring.

4. 2012–13 DEBT RESTRUCTURING

The second debt restructuring followed a similar path to the previous one – preemptive and orderly process that achieved only a temporal liquidity relief.[28] Notwithstanding the improvement in Belize's fiscal and external positions after the 2006–07 debt exchange, the country embarked on a new debt restructuring mainly driven by both a prospective increase in the debt service and medium-term debt sustainability concern – largely associated with potential compensation to the former shareholders of two nationalized companies. While negotiations did not proceed smoothly at the beginning, direct communication between high level officials and the head of the creditor

[27] Excluding T-bills, Belize had not issued any domestic bonds at the local market.

[28] Asonuma and Trebesch (2016) define Belize's 2012–13 restructuring as "weakly preemptive" as some payments were missed, but only temporarily and after the start of formal or informal negotiations with creditor representatives (no unilateral default).

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committee accelerated the process and eventually both parties reached an agreement. However, similar to the 2006–07 episode, the exchange provided only a substantial cash-flow relief over the near and medium terms, while debt sustainability concerns remain unaddressed.

4.1. Background

Following the 2006–07 restructuring, Belize's debt service burden and external position improved, liquidity pressures also softened relative to the financing needs (Annex 1). Debt servicing costs significantly tapered off as the central government interest payments dropped to about 16 percent of current revenues on average in 2007–11 compared to the average 25 percent in the preceding 5-year period. Gross financing needs declined to about 7½ percent of GDP in 2007–12, compared with 25 percent of GDP in 2002–06.

The discovery of oil in mid-2005 provided temporary headroom for fiscal maneuver to service external debt and rein in the fiscal deficit. Oil-related revenues increased from 0.2 percent of GDP in 2006 to 2.9 percent in 2011, boosted by peaks in production at the main commercial well-elevated world crude prices, and an additional tax. Rising oil exports also bolstered Belize's external position, as the current account deficit narrowed to 4.7 percent of GDP on average in 2007–11 compared to the average 13.3 percent in 2002–06. Combined with steadily-increasing substantial FDI inflows, gross international reserves went from 2.1 months of imports in 2008 to 3.2 months on average in 2009–11.

Meanwhile, Belize's growth performance was lackluster, due mainly to structural vulnerabilities and exogenous weather shocks. Real growth declined in the period between the two debt exchanges – averaging 1.9 percent in 2007–11 compared with 5.4 percent on average in 2002–06 – when growth was spurred by expansionary fiscal policies. While oil production boosted output growth, traditional sectors of the economy decelerated, reflecting structural weaknesses and the impact of severe weather-related shocks, which contributed to output losses, mostly in agriculture, and damaged infrastructure. In 2008, two tropical storms caused direct economic losses estimated at about US$75 million (5.4 percent of GDP), with a negative balance of payments impact of US$46 million.

The authorities continued to face spending pressures, including those associated with the "super-bond" step-up coupon. According to the authorities, the economic slowdown, increased poverty, a surge in crime, and the associated need for increased citizen security constrained their efforts to engage in a more aggressive fiscal consolidation. Moreover, while Belize faced lower interest payments over the period 2008–12 than anticipated after the 2006–07 restructuring (2.8 percent of GDP vs. 4.6 percent of GDP, respectively), the authorities started to be concerned about the step-up coupon structure, as it was due to rise to 8.5 percent in 2012 (from 4.25 percent in 2007 and 6 percent in 2010), implying about 0.6 percent of GDP in additional interest payments in 2012 and 1.2 percent in 2013.

In addition, Belize faces significant additional claims associated with the nationalization of two public utility companies and the enforcement of several arbitration awards. The government nationalized the Belize Telemedia Limited (BTL) in 2009 and Belize Electricity Limited (BEL) in 2011.[29] While the government is required to pay the compensations to former owners of these companies, no agreement has been reached as of end-December 2016 between the government and the former owners on the amount of compensation. The valuation of the companies ranges from 6 percent of GDP (government valuation) to 30 percent of GDP (former owners' valuation), and depending on the court's ruling regarding the compensation amount, would amplify the

[29] In 2009, the government started to negotiate with BTL on how to address a series of allegedly illegal agreements between the BTL and the previous administration. Following failure of such efforts, it enacted legislation to acquire the shareholding in BTL. In 2011, the government nationalized the BEL to ensure continuous electricity supply to the public, following the company's proclamation that it would execute rolling blackouts in the country in response to its financial difficulties.

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debt-to-GDP ratio, which at end-2012 stood at 79 percent. In addition to these claims, several arbitral awards related to land acquisition, overpayment of taxes, and non-observance of tax agreement have been delivered against the government and are pending enforcement.[30] While IMF's Debt Sustainability Analysis in 2011 did not explicitly raise debt sustainability concerns over the medium term, it alerted that the debt ratio would be elevated by 17 percent of GDP if fiscal contingent liabilities materialize.[31]

Prime Minister Barrow made the restructuring of the "super-bond" an electoral issue in the March 2012 general election. Similar to the 2006–07 debt exchange, the authorities targeted only external commercial debt, while the creditors did not raise inter-creditor equity issues. Some market participants viewed that the debt restructuring was driven by lack of the "willingness" to service external liabilities, not the lack of "ability", given no expected immediate liquidity shortage.[32] The bond price plunged to 40 percent of the face value, while no immediate outright sales occurred likely owing to the lack of liquidity in the secondary market.

4.2. Process

After securing his re-election in March 2012, Mr. Barrow announced the appointment of a debt review team to conduct a comprehensive review of external public debt and contingent liabilities.[33] At the same time, the authorities also engaged the financial advisors for restructuring.[34] The Belizean authorities explicitly identified the additional liabilities associated with the nationalization as one of the driving forces of debt restructuring, along with the onerous step-up coupon. However, as negotiations with previous owners of nationalized companies stalled, the government focused on debt burden stemming from high coupon rate, effectively de-linking the debt restructuring and the additional liabilities issues. On June 20, 2012, the authorities published an economic and financial update, showing that despite active engagement with multilateral partners, Belize was facing sizeable financing gaps from 2013 onwards.[35]

The reaction by investor community was swift and well-organized, while the authorities' initial approach was not viewed as collaborative. Prior to the authorities' economic and financial update, a group of bondholders announced the creation of a creditor committee representing US$200 million of the "super-bond".[36,37] This swift reaction by the bondholders stemmed from growing 'readiness' for sovereign debt restructuring and debt negotiation, owing to their accumulated experiences from a series of smooth debt negotiations in the Caribbean region, including the first Belize's debt restructuring. However, the authorities and the creditors were pursuing different strategies in negotiating the terms of the debt exchange. While the authorities aimed to reduce debt service via substantial face value reduction, the creditors targeted a long-term coupon reduction with no steep step-up. Due to this difference in restructuring strategies, the creditor committee rejected the authorities' first indicative scenarios published in August

30 Central Bank of Belize (2012) extensively discusses the additional liabilities.

31 IMF (2011).

32 In February 2012, S&P downgraded twice Belize's long-term foreign-currency rating to CCC- (three notches in total) noting, first, the lower political willingness to service the country's external commercial debt and, second, the increasing likelihood that Belize would seek to restructure its sovereign external debt.

33 Belize Press Office, Government of Belize Initiates External Public Sector Debt Review, March 19, 2012, https://www.centralbank.org.bz/news/details?newsid=23.

34 BroadSpan Capital LLC and Blitzer Consulting acted as the Committee's financial advisers, while Arnold & Porter LLP was retained as the Committee's legal advisor. White Oak Advisory LPP was the financial advisor for the Government of Belize, and Cleary Gottlieb Steen & Hamilton LLP, Houlihan Lokey Howard & Zukin was acting as the government's legal advisor (Belize Ministry of Finance, 2013b and Coordinating Committee of Belize, 2013).

35 https://www.centralbank.org.bz/news/details?newsid=29.

36 Belize Coordinating Committee Announces Formation, Press Release, June 13, 2012.

37 The Coordinating Committee and an ad-hoc group of bondholders which consists of 20 additional institutional members represented over US$338 million, i.e. about 62 percent of the US$547 million of bonds outstanding.

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2012 that implied substantive face value and NPV haircuts with coupon reduction and maturity extension (Table 3).

A partial coupon payment opened ground for extending debt exchange negotiations. On August 21, 2012, the Government of Belize missed a US$23 million coupon payment on the "super-bond" resulting in S&P's downgrading the country to a default rating. Then, on September 20, 2012 – one day after the expiration of the 30-day grace period of missed payment – the authorities made a partial coupon payment of US$11.7 million and the creditor committee agreed to give Belize 60 more days to conclude debt restructuring negotiations.

Negotiations between the government and the creditor committee started in earnest in early October 2012.[38] The focus of the negotiations included growth projection, potential amount of the additional liabilities associated with the nationalization of the two utility companies, and availability of external official financing.[39] These three elements were essential ingredients to determine the financing gaps and the associated creditor loss to be agreed. Subsequently, on November 21, 2012, the creditor committee made a counter proposal, which included par bonds with more modest creditor loss in NPV terms than the authorities' original indicative scenarios. This proposal was followed by the authorities' revised indicative scenarios that entailed lighter face value haircut and higher coupon rate than the original proposal. These revised scenarios were, however, also rejected by the creditor committee. Details of the government's indicative scenarios are presented in Table 3 below.

Table 3
Belize Debt Restructuring, 2012–13: Initial and Revised Indicative Scenarios

	Initial Indicative Scenarios (Aug 9)			Revised Indicative Scenarios (Nov 29)	
Option	Par	Discount	Discount	Par	Discount
Face value haircut	0%	45%	45%	0%	33%
Grace period (years)	15	0	5	10	5
Final maturity (years)	50	30	30	40	30
Coupon	2%	1% until 2019 2% until 2026 4% until 2042	3.50%	2.75% until 2018 4.5% until 2053	4.5% until 2018 6.75% until 2043
Repayment Style	Amortizing	Amortizing	Mortgage	Mortgage	Mortgage

Source: Belize authorities.

The high-level intensive discussion after the rejection of the revised indicative scenarios helped both parties to reach an agreement on the terms of the exchange offer. After refusing the revised indicative scenarios, the committee expressed its view that both sides would be missing the window for a timely resolution of the impasse. Right after the rejection, the direct communication between the authorities and the creditor committee, including direct dialogue between Mr. Barrow and the co-chair of the committee, started, leading to a framework agreement between both parties. However, the underlying considerations of the participants in assessing the offer cannot be readily ascertained.[40] The anticipated execution of the bond exchange pushed up the bond price to the pre-exchange announcement level. The exchange offer was launched on

[38] https://www.centralbank.org.bz/news/details?newsid=51.

[39] Belize Ministry of Finance (2012).

[40] http://edition.channel5belize.com/archives/79952.

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February 15, 2013 and the CAC (75-percent threshold under New York law) was executed to raise the participation rate from 86 percent to a full participation. The debt exchange operation was closed on March 20, 2013.

The restructuring financial terms were the following (Table 4):

- ***Principal haircut***. Approximately US$530 million of new 2038 bonds were issued. The original "super-bond" was subject to a 10 percent face value haircut, but overdue interest was added to the face value of the new bond (approximately 7 percent of the original principal).[41] As a result, the "net" face value haircut was about 3 percent.
- ***Coupon rate reduction***. The new bond will pay a step-up coupon of 5 percent without grace period through 2017 (for 4.5 years) and 6.767 percent thereafter, compared with the original 8.5 percent through maturity.
- ***Maturity extension***. The final maturity will be February 2038 (instead of 2029 under the original "super-bond" terms), with the first amortization falling due in August 2019, while the grace period remained unchanged.
- ***NPV and market haircuts***. Using a discount rate of 9.2 percent, the NPV haircut was 29 percent, while the market haircut was 33 percent.

Table 4
Belize Debt Restructuring, 2012–13: Deal Structure

	Old Instrument	New Instrument
Instruments	2029 US bond ("super-bond")	2038 US bond
Face value (US$ mil.)	547	530
Face value haircut	10% (3%)[1)]	-
Maturity	2029	2038
Remaining maturity (years)	16	25
Coupon	4.25% until 2010, 6% until 2012, 8.5% until maturity	5% until 2017, 6.767% until maturity
Repayment profile	2019–29	2019–38
Present value on 3/2013[2)]	94%	67%
NPV haircut[3)]	29%	-
Market haircut[4)]	33%	-

1) Face value haircut was 10 percent. Adding the missed coupon payments to the face value, the net face value haircut is 3 percent.
2) Discount rate at 9.2 percent which was exit yield at completion of exchange (on 3/28/2013 – the first transaction day when yields were recorded after completion of exchange).
3) NVP is defined as 1 – Present value of new debt/Present value of old debt as in Sturzenegger and Zettelmeyer (2008). Present value of new debt and old debt is computed with the same discount rate.
4) Market haircut is defined as 1 – Present value of new debt/Face value of old debt.

Sources: Belize authorities; and authors.

The debt exchange offer included several new legal terms, most notably a committee engagement provision (Annex 3). In contrast to recent sovereign debt restructurings, the government of Belize and the creditors' committee agreed to a more extensive bondholders'

41 The missed coupon payments (August 2012 and February 2013) amounted to about US$35 million.

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committee engagement provision to augment, among others, contract enforceability.[42] Given the circumstance where no IMF-supported program is in place, both parties agreed to maintain a close engagement if the government experiences difficulties to service its debt obligations.

Other new terms included a contingency account for trustee indemnification, principal reinstatement in the event of a future default, and a most favored creditor provision. In addition, Belize clarified the *pari passu* clause to mean equal ranking in the legislation authorizing the exchange together with the exchange offer.[43] Also, the government has committed to improve data transparency, through its "best effort" to begin to subscribe to the Special Data Dissemination Standard (SDDS).

As in the 2006–07 restructuring, the IMF did not participate directly in the restructuring process through an adjustment program. However, while maintaining neutrality during the debt exchange process, IMF staff was in close contact with both the authorities and the financial advisors. An IMF mission visited Belize from November 1–15, 2012 to conduct the yearly review of the country's economy, in the context of the IMF's Article IV consultations. However, in light of ongoing negotiations with bondholders on the restructuring of the "super-bond", further discussions with the authorities were required to complete the consultations. Discussions resumed in April 2013 and were completed in June 2013. In parallel with the Article IV consultations, a technical assistance mission assessed the current framework for debt management and helped the authorities build relevant institutional capacity.

While no credit enhancements were formally offered to bondholders, the authorities initially considered an operation with the IDB to fund a partial guarantee.[44] Similar guarantees were used for recent debt restructuring cases: guarantees of US$10 million were provided to Seychelles in 2010 by the African Development Bank and of US$12 million to St. Kitts and Nevis in 2012 by the Caribbean Development Bank. In both cases, guarantees not only complemented part of interest payments of new discount bonds, but also played a catalytic role in assuring confidence in the country's macroeconomic adjustment program. In Belize's case, the authorities approached the IDB at the early stage of the debt exchange negotiations and discussed the possibility of provision of a partial guarantee by the IDB. However, as negotiations between bondholders and the government intensified toward the end of 2012, the IDB and the Belizean authorities began discussion on alternative ways to support the country.[45]

4.3. Outcomes

The deal provided substantial cash-flow relief over the near term (Figure 3). The reduced coupon, along with the modest face value haircut, would result in debt service relief of US$47 million (including the missed interest payments) in 2013 (2.9 percent of GDP) and about US$20 million (1.1 percent of GDP) per year from 2014 to 2017. Over the remaining 16-year life of the original "super-bond", total cash-flow relief will be US$384 million. On the contrary, Belize will face continuous liquidity needs over the long term until 2038, indicating the need for frontloaded macroeconomic adjustment policies.

[42] The most notable examples of creditor engagements were those of Hungary in its late 2004 and early 2005 offerings. The 2004 English law offering document disclosed the usual industry-model engagement clause; however, less than a year later, Hungary's New York law issue included an engagement clause without an undertaking to pay the committee's expenses.

[43] Rather than modifying the terms of instruments, the authorities used a new technique to clarify the meaning of the clause in disclosure documents.

[44] Central Bank of Belize, 2012 Annual Report and Statement of Accounts, pp. 44–45.

[45] http://www.reporter.bz/front-page/no-idb-guarantee-but-negotiations-will-go-on/.

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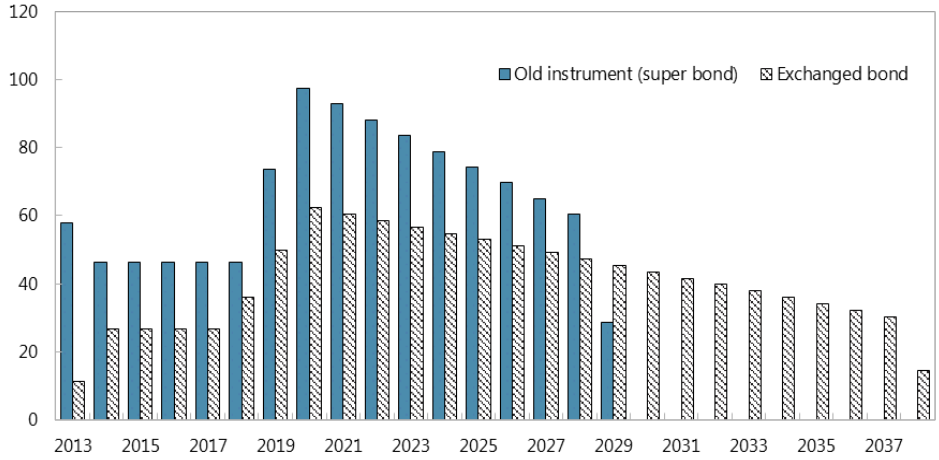
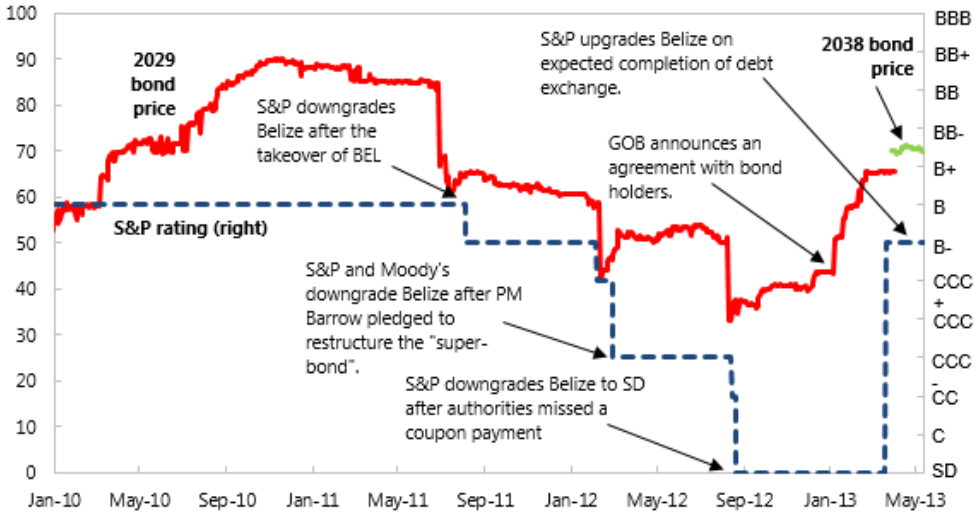
Figure 3
Belize Debt Restructuring, 2012–13: Debt Service of Old Instruments and Exchanged Bond[1)]
(In millions of U.S. dollars)



Sources: Belize authorities; and authors.

The credit ratings were upgraded immediately after the debt restructuring, with a significant drop in EMBI spread. S&P upgraded Belize to non-default rating (B-) on March 20 given expected completion of the debt exchange, followed by an upgrade by Moody's from Ca to Caa2 on April 15, reflecting an improvement in the government's liquidity position.[46] Further, the bond price recovered from 60 to 65 percent of the face value (Figure 4).

Figure 4
Belize: External Bond Price and Credit Rating Development, 2010–13



Sources: Bloomberg; Standard and Poor's; and authors.

Despite the cash-flow relief, concerns over public debt sustainability and external stability remain mostly due to liquidity needs over the long term, necessitating strong fiscal policy efforts. Our calculations suggest that the debt exchange would reduce the debt-to-GDP ratio by around 8 percent in 2018. Although the debt path would be *ceteris paribus* more favorable after the restructuring, there still remains uncertainty about the size, modality, and timing of the possible compensation payments to the former owners of the two nationalized companies.

[46] Standard and Poor's (2013) explains that credit ratings on Belize are constrained by its weak political institutions, weak medium-term growth prospects which are weaker than those of peers rated in the B category, limited financing options reflecting shallow domestic capital market, and potential risk of contingent liabilities to the government's ability to service its newly issued debt.

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The compensation payments could increase the debt level by 17 percent of GDP at end-2015 and push up the financing needs to above 6½ percent of GDP in 2016, and to more than 7 percent of GDP after 2018.[47] Unless the authorities adhere to an active fiscal adjustment policy that will help contain growing financing needs and achieve a faster downward debt trajectory, the debt level will remain elevated.[48]

The government of Belize is committed to revamp the public debt management framework, and the reform is underway. The current administration announced its intention to "modernize" the debt management framework after the debt restructuring.[49] Robust debt management scheme with solid medium-term debt management strategy will help the authorities monitor various risks that are inherent in the public debt portfolio. However, even the second restructuring was not able to persuade market participants and analysts that debt sustainability had been restored and no further restructurings would be needed.

5. CONCLUSION

In this paper, we analyzed the causes, processes, and outcomes of Belize's two consecutive sovereign debt restructurings, as unique cases of not involving the IMF-supported (adjustments) programs. Also it was indicated that the underlying motivation for the sovereign debt restructurings of 2006–07 and 2012–13 was different. The former was driven by external liquidity concerns while the latter was motivated by a substantial increase in the coupon rates and future fiscal solvency concerns. Some market participants had a different take, particularly with respect to the second restructuring. They recognized that the 2006–07 debt exchange was largely motivated by liquidity concern, but they viewed the 2012–13 debt exchange as driven by a lack of "willingness" to pay. A difference in understanding of the underlying motivation of the second restructuring negatively affected the smoothness of the negotiation process, at least at its initial stage.

Both debt restructurings were undertaken in a preemptive and broadly transparent manner despite explicit discrimination between residents and non-residents. A successful collaboration between the government and creditors in the first restructuring paved the way for the second restructuring through shared experience of renegotiation. Further, the representation of the creditor committee was also high in particular in the second debt restructuring — 62 percent of the US$547 million of bonds outstanding — which helped contain potential holdouts.

Belize introduced a number of new legal provisions to facilitate engagement with creditors. Examining the implications of the new legal provisions for future sovereign restructurings goes beyond this paper. In the 2006–07 restructuring, the exercise of CAC smoothed negotiations to yield high participation of creditors. In the 2012–13 restructuring, a more extensive bondholders' committee engagement provision was included to augment contract enforceability in the future. Other new terms included a contingency account for trustee indemnification, principal reinstatement in the event of a future default, and a most favored creditor provision.

However, debt sustainability has not been effectively restored following the two restructurings, thus calling for more robust macroeconomic policy adjustments (Annex 1). Smooth debt renegotiation *process* did not necessarily guarantee successful *outcomes*. Even after the repeated debt exchanges, Belize still remains vulnerable both to external shocks (including weather) and domestic shocks, with debt sustainability overshadowed by the looming additional fiscal contingent liabilities. Despite plans to revamp the public debt management framework, further

[47] Due to high uncertainty surrounding the nationalization compensation, the calculations are based on the assumptions, and are for illustration purpose. For further details, see IMF (2013b).

[48] IMF (2013b) suggests that raising gradually the primary surplus to 3 percent of GDP over the medium term – 1 percent of GDP above the average over the last 10 years – would help reduce the debt-to-GDP ratio to less than 60 percent of GDP a decade from now and to below the long-term value of 50 percent of GDP by mid-2020s.

[49] Belize, Ministry of Finance, "Achieving debt sustainability, Stimulating economic expansion", Budget Presentation for Fiscal Year 2013/2014.

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fiscal consolidation to achieve debt sustainability and reduce future financing needs have not been attained, leading to the authorities' announcement on November 9, 2016 to start new restructuring discussions with bond holders. In light of the recent developments, further research is warranted focusing on appropriate measures on fiscal consolidations that could address future debt sustainability concerns.

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References

Asonuma, T. (2016) Serial Sovereign Defaults and Debt Restructurings. IMF Working Paper WP/16/66.

Asonuma, T., Papaioannou, M.G., (2016), Domestic Sovereign Debt Restructurings: Process, Outcomes and Challenges. manuscript, IMF.

Asonuma, T., Li, M.X., Papaioannou, M.G., Thomas, S., and Togo, E., (2017a), Sovereign Debt Restructurings in Grenada: Causes, Processes, Outcomes and Lessons Learned, forthcoming as IMF Working Paper.

Asonuma, T., Niepelt, D., and Ranciere R., (2017b), Sovereign Bond Prices, Haircuts and Maturity, IMF Working Paper WP/17/119.

Asonuma, T., and Trebesch, C. (2016) Sovereign Debt Restructurings: Preemptive or Post-Default. *Journal of the European Economic Association*, Vol. 14 (1), pp. 175–214.

Belize, Ministry of Finance. (2006) *Offering Memorandum*, December 18, 2006.

———. (2012) *Memorandum,* November 29, 2012.

———. (2013a) *Offering Memorandum,* February 15, 2013.

———. (2013b) *Press Release*, March 20, 2013.

———. (2013c). Achieving Debt Sustainability, Stimulating Economic Expansion. Budget Presentation for Fiscal Year 2013/2014.

Buchheit, L.C. (2009) Use of Creditor Committees in Sovereign Debt Workouts. *Business Law International*, Vol. 10, pp. 205–217.

Buchheit, L.C. and Karpinski, E. (2007) Belize's Innovations. Journal of International Banking and Financial Law. May 2007: pp. 278–280.

Buchheit, L.C. and Pam, J.S. (2004) The *Pari Passu* Clause in Sovereign Debt Instruments. *Emory Law Journal*, Vol. 53, pp. 870–922.

Catao, L.A.V., Fostel, A., and Kapur, S. (2009) Persistent Gaps and Default Traps. *Journal of Development Economics*, Vol. 89 (2). pp. 271–284.

Central Bank of Belize. (2012) *Economic and Financial Updates,* June.

———. 2013, 2012 Annual Report and Statement of Accounts.

Coordinating Committee of Belize. (2013) *Press Release*. February 19, 2013.

Das, U., Papaioannou, M., and Trebesch, C. (2012). Sovereign Debt Restructurings 1950–2010: Literature Survey, Data and Stylized Facts," IMF Working Paper, WP/12/203.

Diaz-Cassou, J., Erce-Dominguez, A., and Vazquez-Zamora, J.J. (2008) Recent Episodes of Sovereign Debt Restructurings. A Case-Study Approach. Bank of Spain Working Paper, No. 0804.

Duggar, E. (2013) The Role of Holdout Creditors and CACs in Sovereign Debt Restructurings. Moody's Sovereign Default Series Compendium, October 7, 2013.

Eichengreen, B., Hausmann, R., and Panizza, U. (2003) The Mystery of Original Sin. eds. by B. Eichengreen and R. Hausmann in *Other People's Money – Debt Denomination and Financial Instability in Emerging Market Economies*, University of Chicago Press.

DOI: 10.7172/2353-6845.jbfe.2017.2.1

Erce-Dominguez, A. (2013) Sovereign Debt Restructurings and the IMF: Implications for Future Official Interventions. Federal Reserve Bank of Dallas Globalization and Monetary Policy Institute Working Paper No. 143.

———. and Diaz-Cassou, J. (2010) Creditor Discrimination during Sovereign Debt Restructurings. Bank of Spain Working Paper, No. 1027.

Finger, H., and Macagni, M. (2007) Sovereign Debt Restructurings and Debt Sustainability – An Analysis of Recent Cross-Country Experience. IMF Occasional Paper No.255.

International Monetary Fund. (2002a) Belize: Staff Report for the 2002 Article IV Consultation. IMF Country Report No. 02/255.

———. (2002b) The Design and Effectiveness of Collective Action Clauses. International Monetary Fund, Washington, DC.

———. (2006a) Belize: Staff Report for the 2006 Article IV Consultation. IMF Country Report No. 06/360.

———. (2006b) Belize-Assessment Letter for the International Financial Community.

———. (2011) Belize: Staff Report for the 2011 Article IV Consultation. IMF Country Report No. 11/340.

———. (2013a) Sovereign Debt Restructuring: Recent Developments and Implications for the Fund's Legal and Policy Framework. IMF Board Paper, April.

———. (2013b) Belize: Staff Report for the 2013 Article IV Consultation. IMF Country Report No. 13/227.

Jahan, S. (2013) Experiences with Sovereign Debt Restructuring: Case Studies from the OECS/ECCU and Beyond. in Schipke, A., Cebotari, A., and N. Thacker, eds. "The Eastern Caribbean Economic and Currency Union: Macroeconomic and Financial System," International Monetary Fund (Washington, DC).

Panizza, U., Sturzenegger, F., and Zettelmeyer, J. (2009) The Economics and Law of Sovereign Debt and Default. *Journal of Economic Literature*, Vol. 47, pp. 651–698.

Reinhart, C., Rogoff, K., and Savastano, M. (2003) Debt Intolerance. *Brookings Papers on Economic Activity*, Vol. 1, Spring 2003, pp. 1–74.

Reinhart, C.M., and Rogoff, K.S. (2005) Serial Default and the "Paradox" of Rich-to-Poor Capital Flows. *The American Economic Review*, Vol. 94 (2), pp. 53–58.

———. (2009) *This Time is Different – Eight Centuries of Folly*, Princeton University Press.

Robinson, M. (2010) Debt Restructuring Initiatives Paper. paper prepared for the Commonwealth Secretariat.

Standard & Poor's. (2005) Research Update: Belize Long-term Ratings Lowered, Outlook Negative. *Ratings Direct*. April 2005.

———. (2013). Ratings on Belize Raised to 'B-/B' on Expected Completion of Debt Exchange; Outlook Stable; Bonds Due in 2038 Rated 'B-'", *RatingsDirect*. March 2013.

Sturzenegger, F., and Zettelmeyer, J. (2006) *Debt Defaults and Lessons from a Decade of Crises*, Cambridge, MA: MIT Press.

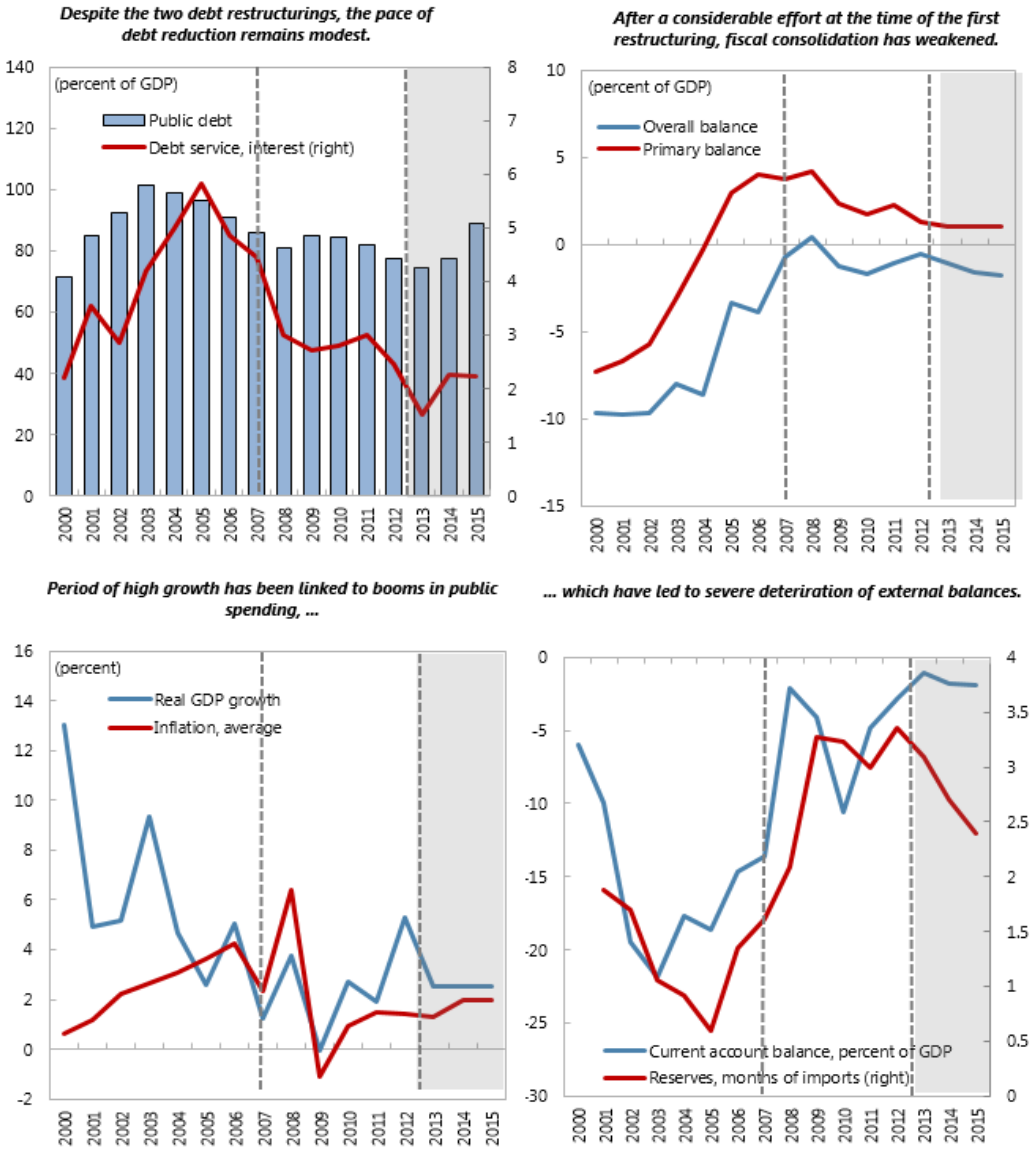
Sturzenegger, F., and Zettelmeyer, J. (2008) Haircuts: Estimating Investor Losses in Sovereign Debt Restructurings, 1998–2005. *Journal of International Money and Finance*, Vol. 27 (5), pp. 780–805.

Tomz, M., and Wright, M.L.J. (2013). Empirical Research on Sovereign Debt and Default. *Annual Review of Economics*, Vol. 5, pp. 247–272.

DOI: 10.7172/2353-6845.jbfe.2017.2.1

ANNEX 1.

Figure
Belize: Selected Economic Indicators, 2000–15[1)]



[1)] Dotted vertical lines represent debt restructurings in 2007 and 2013. Shaded area represents projection years.

Sources: Belizean authorities; and IMF staff estimates and projections.

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ANNEX 2.
Collective Action Clause in Belize 2006–07 Restructuring

Belize employed collective action clause (CAC). This Annex illustrates key characteristics of these instruments.

CACs

CACs can be classified into two broad categories (see IMF, 2002b):

- "Majority restructuring" provisions, which allow a qualified majority of bondholders of an issuance to change the bonds' financial terms (principal, interest, and maturity) and to bind in all other holders of that issuance, either before or after default. For most recently issued bonds with CACs, a supermajority is reached when bondholders holding a certain percentage of total outstanding debt agree (e.g., 75 percent).
- "Majority enforcement" provisions, which can limit the ability of minority bond holders to enforce their rights following a default. In practice, this means that a qualified majority can prevent individual bondholders from (i) declaring the full amount of bond due and payable ("acceleration"), and (ii) commencing litigation against the sovereign.

In the Belize's case, the authorities issued a 9.75 percent bond with face value of US$100 million due 2015 under New York law in the 1st half of 2003 that included "majority restructuring" provision with a written consent of holders owning at least 85 percent of the notes. Holders of 87.3 percent of the bond accepted Belize's exchange offer, thereby consenting to the amendments, which included matching the terms of the old bonds with those of the new bonds.

Two key features of CAC used in Belize 2006–07 restructuring (Buchheit and Karpinski, 2007) include:

- While in most countries the required threshold to amend the terms of the bonds containing majority restructuring clauses has been 75 percent of the aggregate principal amount of the outstanding bonds, Belize is the only country that has required 85 percent.
- Belize was the first sovereign in more than 70 years to use a CAC to amend the payment terms of bonds in sovereign debt restructuring.

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ANNEX 3.
Legal Terms in 2012–13 Exchange Offer[1]

The 2012–13 exchange offer includes various legal terms, in addition to the CACs that were used in the 2006–07 debt exchange.[2] Among others, the committee engagement provision was newly introduced and unique to Belize case.

- ***Committee engagement provision.*** It represents commitment from the sovereign debtor "to recognize and to engage with a Creditor Committee" (i) in the event of a future default, (ii) any event or circumstance which would, with the giving of notice, lapse of time, the issuing of a certificate and/or fulfillment of any other requirement, constitute an event of default, or (iii) any public announcement by the debtor to the effect that the debtor is seeking or intends to seek a restructuring of the securities (whether by amendments, exchange offer or otherwise).
- ***Minimum participation threshold.*** It ensures that a high number of bondholders agree on exchange offer. Sovereigns reserve the right, in its sole discretion, to cancel the proposed offer in the event that the level of participation in the proposed offer would not exceed the threshold. These clauses have been used to reassure tending bondholders that they would not be left out holding a smaller and illiquid claim in the event that most bondholders chose not to accept the offer. In Belize's case, this minimum threshold was set at 75 percent of the aggregate principal amount of the eligible claims.
- ***The Most-Favored-Creditor provision.*** It lets creditors know that the sovereign debtor will not settle, by negotiation, any other outstanding claim on better terms that it has offered holders of the old bonds.
- ***Principal reinstatement provision***. It states an automatic upward adjustment in principal in the event of a future default. Specifically, upon a default, the authorities shall issue to each holder of the exchanged bond within 5 business days after the principal reinstatement date an amount of additional exchange bond equal to 11.11 percent of the outstanding principal amount of exchange bond as of the date of original issuance of the new bonds.
- ***Pre-funding of a Trustee Contingency Account***. It specifies that a sovereign debtor pays the funding of Contingency Account which is available for reimbursement of expenses of the Trustee of New Bonds.
- ***The Pari Passu clause***. It ensures that the borrower does not have, nor will it subsequently create, a class of creditors whose claims against the borrower will rank legally senior to the indebtedness represented by the loan agreement (Buchheit and Pam, 2004).

[1] Belize Ministry of Finance (2013a).

[2] Although CACs can play an important role in facilitating debt restructurings, their presence is no guarantee for a quick exchange with high participation. Other legal vehicles and exchange characteristics, in particular exit consents, aggregation clauses and minimum participation thresholds can play a role as well (Das et al., 2012).

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Does persistence in idiosyncratic risk proxy return-reversals?

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ABSTRACT

Understanding the return-reversal phenomenon observed to generate large abnormal profits under some stock market trading strategies is of considerable interest in finance. There is also much debate over the use of idiosyncratic risk as a predictor in asset pricing models when it is persistent. This paper, using the Australian data, presents new empirical evidence of return-reversals at the firm level and the existence of an equilibrium state based on robust econometric methodology of panel error-correction model. The method exploits the persistence in idiosyncratic risk and builds on its cointegration with the returns series. Our results reveal the tendency of long-run returns to restore equilibrium, reversals in short-run returns, a slower recovery to equilibrium by small stocks, and while the short-run responses of returns to changes in log book-to-market ratios are positive, their reaction to persistence in idiosyncratic volatility causes the reversal process. The pattern in quantile dependent coefficients of short-run idiosyncratic risk-return relationship suggests that (i) the changes in idiosyncratic volatility risk adversely affects the short-run returns of low performing stocks but investments in high performing stocks benefit from such changes; (ii) the increasing trend in the coefficients implies a quadratic relationship in the levels of the two series. The significant marginal effects of changes in idiosyncratic volatility and its one period lagged values on changes in returns at many quantiles support the impact being due to persistence in idiosyncratic risk, and their reversing signs provide an evidence of reversion in short-run returns.

JEL classification: C21; C23; C33; C58; G12

Keywords: Return reversals, idiosyncratic risk, panel cointegration, panel ECM, quantile regression

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1. INTRODUCTION

The phenomenon of return-reversals observed to generate large abnormal returns under some stock-market trading strategies has attracted much attention in empirical finance. Understanding its generating process can help investors develop trading strategies for harvesting sizable returns. In this paper, utilising the Australian data, we present a new explanation of the incidence of short-run return-reversals at the firm level and the existence of an equilibrium state via empirical evidence based on robust econometric methodology of panel error-correction model (ECM) – a methodology that has not been applied or considered in past studies. The model exploits the persistence in idiosyncratic volatility risk and other explanatory variables, and builds on their cointegration with the returns series. It allows for the existence of an underlying long-run relationship between the returns and the explanatory variables, incorporates short-run adjustments in variables to correct persistence imbalance due to the nonstationary predictors within the panel data structure.

This paper links to two strands of literature: (i) 'devoted to understanding the return-reversal phenomenon (e.g., Avramov et al. 2006, Campbell, Grossman and Wang (henceforth CGW) 1993; Chordia et al. 2005; Jegadeesh 1990; Jegadeesh and Titman 1993; Lehmann 1990)'; (ii) 'related to asset pricing where the interest is to explore the behaviour of idiosyncratic volatility risk in explaining future stock returns (e.g., Ang et al. 2006, 2009; Fu 2009; Levy 1978; Malkiel and Xu 2004; Merton 1987)'. While Jegadeesh (1990) and Lehmann (1990) observe the return-reversal phenomenon from employing the contrarian trading strategy (buying past losers and selling past winners), Jegadeesh and Titman (1993) find its presence – the momentum reversals, when applying the relative strength or the momentum trading strategy (buy past winners and sell past losers). CGW (1993) explain this phenomenon via the rational equilibrium paradigm. In the asset pricing literature, the theoretical work of Levy (1978) shows that idiosyncratic risk affects equilibrium asset prices if investors do not hold a fully diversified portfolio of assets. The theory of Merton (1987) infers a positive relation between idiosyncratic risk and expected returns in under-diversified portfolios. Fu (2009), and Malkiel and Xu (2004) present empirical evidence to suggest that higher idiosyncratic risk produces higher expected returns in the cross section. However, the empirical studies of Ang et al. (2006, 2009) reporting a negative relationship in predictive models built on daily data over monthly frequencies have caused much debate over the form of the relationship. Fu (2009) and Huang et al. (2010) attribute the negative relationship observed in Ang et al. (2006, 2009) to return-reversals in stocks that have high idiosyncratic volatilities.

Following on the remarks of Jegadeesh and Titman (1993), who utilising the momentum strategy report observing initially positive and later negative returns, that the returns may have links to delayed price reactions to firm-specific information, we examine the return-reversal process by employing idiosyncratic volatility risk, book-to-market ratios and market capitalization of stocks as the firm-specific information factors, as opposed to liquidity and/ or volume used in earlier studies. Observing persistence in idiosyncratic volatility series is not uncommon. For the US data, Ang et al. (2009) and Jiang and Lee (2006) report idiosyncratic volatility series to be persistent over time, while Hur (2010) and Nath and Brooks (2015) observe persistence in idiosyncratic risk series based on the Australian data. There is much debate (e.g., Campbell and Yogo 2006; Jiang and Lee 2006) over the use of idiosyncratic risk as a predictor in asset pricing models when it is persistent.

The investigation in this paper finds the idiosyncratic volatility series possessing a unit root. We apply the ADF (Augmented Dickey Fuller) and the KPSS (Kwiatkowski, Phillips, Schmidt and Shin) tests for checking various time series for unit roots (i.e., random walks). Both tests reveal that the time series of idiosyncratic volatility risk, *lnsize* (log of market capitalization) and *lnbm* (log of book-to-market) for the majority of the stocks considered follow nonstationary $I(1)$

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(i.e., integration of order one) processes, but the proportion of realized future excess returns series following an *I*(1) process is small. The application of error-correction panel cointegration tests of Westerlund (2007) confirms panel cointegration between the time series of expected excess returns and the time series of idiosyncratic volatility (*IVol*) and *lnbm*, and allows the use of a panel ECM. This panel ECM involves all stationary variables and can be estimated using any of the classical estimation methods. We make use of the ordinary least squares (OLS) estimation for bench marking and the quantile regression method for obtaining a detailed assessment of the relationships in variables.

The model estimation reveals the tendency of returns to restore equilibrium via the error-correction mechanism. The model also shows reversals in short-run returns, and a slower recovery rate to equilibrium by the returns of small stocks. A significant negative (positive) impact of changes in *IVol* risk on short-run returns at the lower (upper) quantiles of its conditional distribution indicates that while the changes in *IVol* risk create buying and selling opportunities among the low performing stocks, investments in high performing stocks benefit from such changes. An increasing trend in the quantile dependent marginal effect of changes in *IVol* risk on short-run returns implies a quadratic relationship in the levels of the two series. The significant marginal effects of changes in idiosyncratic volatility and its one period lagged values on short-run returns at many quantiles support persistence in idiosyncratic risk, and their reversing signs provide an evidence of reversion in short-run returns. While the short-run responses of returns to changes in *lnbm* are positive, their reaction to persistence in changes in *IVol* cause the reversal process – a pattern that could be interpreted as the effect of risk-averse investors' efforts to adjust their investment moves to take advantage of value-growth opportunities and reduce exposure to idiosyncratic risk. The quantile regression estimation within the size-sorted portfolios reveals that the quadratic form of the long-run idiosyncratic risk-return relationship is sensitive to the market capitalization of firms, and highlights the importance of the role played by the market capitalization of stocks in the stock market.

In summary, the findings in this paper enhance our understanding of the return-reversal process and the rational equilibrium paradigm of CGW (1993) via explanations based on an econometric model of panel error-correction, and the role played by persistence in idiosyncratic risk. The applicability of the quantile regression methodology within the modelling framework of this paper facilitates the unfolding of several new relationship patterns, while confirming some known results.

The remainder of the paper is organised as follows: In Section 2 we provide detailed literature review covering the two strands of literature flagged in the introduction. Section 3 describes the data and the modelling framework. Section 4 reports the findings of the analysis and implications of the results, and the paper concludes by summarising the main results in Section 5.

2. LITERATURE REVIEW

In this section, we limit our discussion to papers that are closely related to our work and belong to the two strands of literature this paper connects to. The generating mechanism of the return-reversals that produces large abnormal profits under some stock market trading strategies has intrigued researchers. According to the literature (e.g. Sims, 1984) the stock prices should display a martingale behaviour over short time intervals, since systematic changes in fundamental valuations should not occur over short time horizons to impact prices. However, empirical studies report evidence of predictability in stock returns. Lehmann (1990), following the contrarian trading strategy, finds the existence of return-reversals at the weekly horizons; portfolios of stocks that had positive (negative) returns in one week typically had negative (positive) returns in the next week. He describes this phenomenon as a result of an imbalance in the market for

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short-run liquidity. Jegadeesh (1990) reports the presence of significantly negative first-order serial correlation in monthly returns as an evidence of return-reversals at the monthly frequencies. Some researchers (DeBondt and Thaler, 1985; Fama and French, 1988) observed such variation patterns over three-to-ten year intervals.

Following the relative strength trading strategy for forming portfolios, Jegadeesh and Titman (1993) observe significant positive returns[2] (the momentum continuation) over 3 to 12 month holding periods followed by momentum reversals. They offer two possible interpretations of their results: (i) 'the relative strength trading strategy moves the prices away from their long-run values temporarily and thereby cause prices to overreact'; (ii) 'it is possible that the market underreacts to information about the short-term prospects of firms but overreacts to information about their long-term prospects'. They explain that this profitability can neither be attributed to the systematic risk, nor to the lead-lag effects that result from delayed stock price reactions to common factors. They add that it is more likely linked to delayed price reactions to firm-specific information, and that a more sophisticated model of investor behaviour is needed for understanding this observed pattern in returns. For the US data, Arena et al. (2008) report observing high idiosyncratic volatility stocks yielding higher momentum returns and displaying quicker and larger reversals.

CGW (1993) describe the return-reversal process and the associated high abnormal returns resulting from the short-run contrarian strategies via the rational equilibrium paradigm. They explain that shifts in demand by non-informational (i.e., liquidity) traders that accompany high trading volume cause price deviations from the fundamentals. This offers profit opportunities to risk-averse liquidity suppliers – the market makers, and the absorption of liquidity demand by market makers causes the prices to revert. Thus, the lack of liquidity moves stock prices away from the fundamentals and the supply of liquidity induces return reversals. CGW (1993) offer the above explanation based on observing a large trading volume (using turnover as its proxy) associated with a relatively large first order negative autocorrelation in returns, and a significant interaction between the trading volume and the first order autocorrelation in returns. They add that the risk-aversion of the market plays a very influential role in the return-reversal phenomenon; the relationship between volume and autocorrelation of returns weakens as the persistence in risk-aversion increases.

Chordia et al. (2005) assert that the level of correction in liquidity determines the speed of the process integrating information into the stock prices. If stock prices move away from the fundamentals, liquidity will influence how much and how fast the prices revert. Applying the concept of illiquidity, Averamon et al. (2006) report observing reversals in weekly and monthly stock returns that are mainly confined to the loser stocks – the stocks with negative returns in the past week or month. Controlling for volume, they find that the return reversals are more dominant in less liquid stocks. At the weekly (monthly) frequency, they observe high (low) turnover stocks exhibiting higher negative serial correlation and therefore, more reversals than low (high) turnover stocks, and thus confirming the existence of rational equilibrium paradigm of CGW (1993).

Lu-Andrews and Glascock (2014) study the price reversal behaviour around the strong market events using stock portfolios sorted by liquidity and/ or size. They find that large liquid stocks have a stronger reaction to market shocks and experience a faster price reversal following the shocks than do small illiquid stocks. Their study also reveals that larger firms with larger betas as well as high liquidity seem to experience a stronger reversal when associated with market events, and that small illiquid stocks have higher idiosyncratic volatility risk than larger liquid stocks.

[2] The attractiveness of positive returns over short to medium time horizons from following the momentum strategy in the US motivated many researchers to evaluate the performance of this strategy in markets outside US. Rouwenhorst (1998) apply the momentum strategy to 12 European markets, and observe results similar to Jagedeesh and Titman (1993). Connolly and Stivers (2003) study momentum reversals observed in individual stocks in the US, Japan and the UK stock markets, and find that the reversals are associated with low turnovers. Drew et al. (2007) find the existence of momentum continuation followed by reversals in the Australian stock market; Hameed and Kusnadi (2002) apply this strategy to six stock markets in the Pacific Basin and do not find its prevalence.

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It follows from the discussion in the preceding paragraphs that underlying the price movements, there exists a long-run equilibrium process around the fundamental valuations of stocks. Prices deviate from the fundamentals temporarily and then move back towards the fundamentals causing return reversals and creating buying-selling opportunities. It should be noted that all of the above quoted studies, which were devoted to the understanding of the short-run return-reversal phenomenon within the existence of a rational equilibrium paradigm, utilized US data. To the best of our knowledge, our study is the first one outside the US to show the short-run return-reversal process linked to the existence of an equilibrium state based on novel evidence backed by robust econometric methodology. We, using the Australian data and keeping in view the findings of Levy (1978), build on the remarks of Jegadeesh and Titman (1993) and employ idiosyncratic volatility risk, book-to-market ratios and market capitalization of stocks as the firm-specific information factors, as opposed to liquidity and/ or volume used in earlier studies. While the idiosyncratic volatility contains fundamental factors as well as the non-fundamentals (Jiang and Lee, 2006), the book-to-market ratios represent valuations of stock prices by informed and ill-informed traders at a given point in time. The importance of the effect of market capitalization of stocks on returns and its relationship with idiosyncratic volatility risk is well known in the finance literature.

This paper also links to a large literature on asset pricing, where the interest is to explore the form of the idiosyncratic risk-return relationship. Given that the theoretical work of Levy (1978) shows that idiosyncratic risk affects equilibrium asset prices if investors do not hold a fully diversified portfolio of assets, we expect idiosyncratic risk to play a dominant role in our investigation. Campbell et al. (2001) and Goyal and Santa-Clara (2003) identify the idiosyncratic risk as constituting a major portion of the total risk. Some studies (e.g., Fu, 2009; Malkiel and Xu, 1997) find a positive relationship between the idiosyncratic volatility risk and the expected returns in the cross section, and thus provide an empirical support to the theory proposed by Merton (1987). However, the empirical studies of Ang et al. (2006, 2009) report a negative relationship in predictive models built on daily data over monthly frequencies.

Fu (2009) argues that idiosyncratic risk-return relationship is contemporaneous and attributes the anomalous negative idiosyncratic risk-return relation in Ang et al. (2006) to the use of a predictive model linking realized idiosyncratic risk from the previous month to the next month's returns. He asserts that Ang et al. (2006) implicitly assume that the idiosyncratic volatility time series can be approximated by a random walk process for setting up a predictive model. Ang et al. (2009), p.2, para 5, defend their stance by stating that 'they observe persistence in the idiosyncratic volatility series, and expect their lagged measure of idiosyncratic volatility risk to be correlated with the future idiosyncratic volatility risk that agents might assess in determining expected returns'. Many other studies (e.g., Hur, 2010; Jiang and Lee, 2006; Nath and Brooks, 2015) report observing persistence in idiosyncratic volatility series.

Campbell et al. (2001) observe a positive deterministic trend in idiosyncratic firm-level volatility based on US data for the period 1964–1997. Bekaert et al. (2008, Table 2) dispute this assertion, and show that the trend tests are quite sensitive to the sample period used (e.g., 1964–1997 v/s 1964–2005). They further add that if a time series exhibits time trend over a part of its sample path, it is likely characterised by near non-stationary behaviour. As per Jiang and Lee (2006), the power of the one-step predictive regressions methodology used for studying the relationship between future returns and volatility is compromised if the explanatory variable is persistent. They state that if idiosyncratic risk is persistent, then instead of using the raw idiosyncratic measure values, serially uncorrelated innovations in idiosyncratic volatility must be added in the model as regressors. Campbell and Yogo (2006) explain that 'Conventional tests of the predictability of stock returns could be invalid, that is reject the null too frequently, when the predictor variable is persistent and its innovations are highly correlated with returns'. It follows from the above discussion that it is likely for an idiosyncratic volatility series to be persistent or

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non-stationary in some sampling periods or study samples[3], and if it does it is important that the modelling process accommodates such data features.

Fu (2009) explains that the negative relation in Ang et al. (2006) study is due to a subset of small stocks with high idiosyncratic volatility that earn high returns in the month of high idiosyncratic volatility. The high returns reverse in the next month causing negative abnormal returns. Huang et al. (2010) attribute the negative relation in Ang et al. (2006) to the 'omission of the previous month's stock returns as a regressor in the cross-sectional regressions involving daily data. It results in a negatively biased coefficient on idiosyncratic risk, especially if one uses realized idiosyncratic volatility in the previous month as a proxy for idiosyncratic risk. This bias is largely attributed to the negative serial correlation in monthly returns and the positive contemporaneous relation between realized idiosyncratic volatility and stock returns'. Fu (2009) and Huang et al. (2010) studies also assert that using a more accurate estimate of idiosyncratic risk, e.g., an EGARCH estimate based on monthly data, produces a positive relationship.

The motivation in the investigations of Fu (2009) and Huang et al. (2010) is the assumption that the relationship between idiosyncratic risk and stock returns ought to be contemporaneous and positive, or else the model used (e.g., the predictive models of Ang et al. 2006, 2009) for linking the variables is either not correct, or the estimate of idiosyncratic risk is inferior. Recently, Nath and Brooks (2015) resolved the issue of inferior estimate flagged in Fu (2009) and Huang et al. (2010) papers by building predictive models on daily data and showing the emergence of identical results from employing the idiosyncratic risk estimates used in Ang et al. (2006) and Fu (2009) studies.

According to the literature on return-reversals cited above, the return-reversal process if it exists is not bad as it creates buying-selling and profit opportunities for investors. The interest is to understand what causes return-reversals, and if there exists an equilibrium state governed by fundamentals maintaining balance via reversions. This paper supports the notion of predictive models[4], where explanatory variables are estimated or recorded in a period prior to the period of realizing stock returns. From a decision or a policy maker's perspective, models with predictive element have a lot more appeal than a static single or same period models depicting contemporaneous relationships. A model that does not offer opportunity to investors to weigh their investment strategy in short to medium term time frame is of limited use. The time between buying and selling of stock (s) to realize returns on an investment is never zero, and therefore a model representing contemporaneous relation cannot serve well. Moreover, like Ang et al. (2006), we find the idiosyncratic volatility risk to be highly persistent that justifies the use of lagged idiosyncratic risk for predicting future stock returns. Jegadeesh (1990), Lehmann (1990) and many others form portfolios of stocks on past information – the so called predictive portfolios, and observe the returns on these stocks at a future date.

Against this background, we build our modelling frame work to assess if persistence in idiosyncratic volatility risk is a proxy for short-run return-reversals in stock market trading.

[3] Moreover, the persistence patterns observed from using daily and monthly values are likely to be different from the annualized values due to smoothing.

[4] All tests of the Fama and MacBeth (1973) model are predictive in nature in the sense that estimates of the beta and non-beta risks, used as explanatory variables to explain expected returns, are computed from data for a period prior to the time of the stock returns. Referring to the 'Normative Theory' of Markowitz (1959) they add that " As a normative theory the model only has content if there is some relationship between future returns and estimate of risk that can be made on the basis of current information". In the context of introducing the intertemporal capital asset pricing model, Merton (1973) comments that although the CAPM (capital asset pricing model) is a static single-period model, it has been treated to hold inter-temporally. He adds that as per Merton (1971) work, "the portfolio behavior for an intertemporal maximizer will be significantly different when he faces a changing investment opportunity set instead of a constant one". Thus, if a model is to be based on reasonable assumptions, it must be intertemporal to capture the effects that would not show up in a static single-period model.

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3. DATA AND EMPIRICAL FRAMEWORK

Data for the period from January 2001 to August 2010 are downloaded from Datastream. It consists of the end of the day prices of stocks trading on the Australian Securities Exchange (ASX), All Ordinaries Index as a representative of a general market portfolio, market capitalization (firm size), book-to-market value of each stock, and 30-day Cash rate as set by Reserve Bank of Australia Board at each monthly meetings as a proxy for the daily risk free rate of return. Stocks that did not trade for 20% or more days during the sampling period, had missing data on one or more important variables or did not trade for 100 consecutive days are excluded from our study sample. Due to the global financial crisis in 2007–2008 some companies merged or failed to exist and did not meet our selection criteria. The sample ends up with 207 stocks representing all 12 sectors of S & P GICS (Global Industry Classification System) adopted by the ASX in 2002. These stocks traded over the entire length of the study period, and experienced expansion and contraction periods of the Australian economy.

3.1. Measuring idiosyncratic risk and setting up panel data structure

The idiosyncratic volatility risk is measured relative to the Fama and French (1993) three-factor (FF-3) model as in Ang et al. (2006, 2009) using forward rolling windows of 20 days. In empirical finance it is a common practice to use forward rolling windows and daily data within a calendar month for estimating time varying parameters over monthly horizons (e.g., 1/0/1 strategy in Ang et al., 2006, 2009). Many studies (e.g., Fu, 2009) require a stock to trade for a minimum of 15 days within a month for inclusion in the sample; the maximum number of days a stock can trade in a calendar month is 23. In this instance, the estimation sample size within a month can vary between 15 and 23. We depart from this practice and instead use 20-day trading-blocks for fitting the FF-3 model to estimate the idiosyncratic volatility. The logic here is that traders following the technical analysis rules may not want to confine to calendar months framework[5]; they use moving averages based on daily data for gauging the price movements in stocks, and may wish to know the idiosyncratic risk estimate over the same time horizon. The 20 day trading regime roughly corresponds to a month's trading and allows an easy comparison with studies that employ calendar months based time horizons. Moreover, this design can accommodate estimation and holding window sizes of any desired length in days (cf., Nath and Brooks, 2015[6]). While, the use of rolling windows in estimation allows the parameters of the process to evolve over time placing little constraint on the evolutionary structure, the choice of a larger estimation sample versus a smaller sample in rolling windows depends on the desire to balance the bias and variance likely to result from a stationary versus a nonstationary process. Fama and MacBeth (1973) explain the choice between a larger and a smaller estimation sample as 'a desire to balance the statistical power obtained with a large sample from a stationary process against the potential problems caused by any non-consistency of β_i'. As a number of time series employed in this paper display nonstationary behaviour, it is reasonable to use 20 days as the estimation window size.

We follow the two-stage procedure of Fama and MacBeth (1973) for setting up a panel data structure using predictive models that allows a stock to have time varying betas, idiosyncratic risk and other important stock specific characteristics. In the first stage, we compute the idiosyncratic risk applying the least squares estimation[7] of FF-3 factor model specified in Eq. (1) for each stock using a time series of 20 days' excess returns, excess market returns and Fama and French (1993)

[5] Referring to the reported abnormal profits generated from following the contrarian as well as the relative strength trading strategies, Jegadeesh and Titman (1993) explain that one possible reason for this occurrence could be due to the differences between the time horizons used in the trading rules examined in academic papers and those used in practice.

[6] Nath and Brooks (2015) use estimation and holding windows of different sizes in days for assessing the robustness of their models.

[7] Nath and Brooks (2015) show that identical results emerge from using the least squares and the GARCH based measures of idiosyncratic volatility estimated using daily data.

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factors. Specifically, the idiosyncratic risk (*IVol*) for stock *i* over a 20-day estimation period is computed as the standard deviation of the regression residuals (ε_{id}) in the FF-3 factor model

$$y_{id} = \alpha_i + \beta_{MKT,i} r_{md} + \beta_{SBM,i} SBM_d + \beta_{HML,i} HML_d + \varepsilon_{id} \tag{1}$$

In Eq (1), y_{id} is the excess return for stock *i*, r_{md} the *excess* market return, and SMB_d and HML_d the Fama and French (1993) daily factors for the Australian data on day *d*. Since each stock traded for 20 days in the estimation phase, an adjustment of multiplying the standard deviation of residuals by the square root of the number of days a stock traded, as implemented in some past studies (e.g., Fu (2009) is not required. This estimation phase produces estimates of a stock's beta-risk, Fama and French factor loadings as well as idiosyncratic risk. A stock's median market capitalization, expressed in natural log (*lnsize*), and the natural log of the median book-to-market (*lnbm*) values are also recorded over this 20-day time-block. This information forms values of the explanatory variables. Next a stock's average excess return over the next 20 days is computed and used as the response variable value. The process is repeated for each of the 207 stocks; this forms one panel. The estimation window is moved forward by 20 days, and the process is repeated over the entire data of 2503 trading days which creates 118 panels comprising information on the dependent and the independent variables for each of the 207 stocks. This completes the first stage of the procedure.

Estimates from the first stage are used in the second stage for testing and establishing relationships between the realized excess stock returns and the right-hand-side variables, which include *IVol*, FF-3 factor loadings, *lnsize* and *lnbm* as firm characteristics. We use subscripts *i*, *k* and *t* to represent the stock, the 20-day block and the panel numbers, respectively. For forming *T* panels, (*T* + 1) 20-day blocks are required; thus $k = t + 1$, for t = 1, 2,…, *T*. The cross-sectional relationship between the realized excess stock returns in period (*t* + 1) and the realized idiosyncratic risk and other explanatory variable values observed in period *t* is evaluated in each panel using equation (2).

$$\begin{aligned} \boldsymbol{\mathcal{R}}_{i,k,t} &= \gamma_{0t} + \gamma_{1t}\beta_{MKT,i,k-1,t} + \gamma_{2t}\beta_{SBM,i,k-1,t} + \gamma_{3t}\beta_{HML,i,k-1,t} + \\ &+ \gamma_{4t} IVol_{i,k-1,t} + \sum_{l=5}^{L} \gamma_{lt} X_{l,i,k-1,t} + u_{i,k,t}, \\ &i = 1,2,\ldots,N,\ k = t+1,\ t = 1,\ldots,T. \end{aligned} \tag{2}$$

In Eq. (2), $\boldsymbol{\mathcal{R}}_{i,k,t}$ is the average excess return for stock *i* in panel *t* realized in time block *k*. All right-hand-side variables for panel *t* are observed in time block (*k* – 1); betas represent the FF-3 factor loadings for stock *i*, *IVol* – the idiosyncratic risk proxy, $X_{i,k-1,t}$ – the explanatory variables *lnsize* and *lnbm*, and $u_{i,k,t}$ – the error term. The use of subscript *k* in relation (2) was to stress the point that the returns are observed in a time-period (20-day block) later than the right-hand-side variables values. But once the panels are formed we drop subscript *k* from the subsequent equations. Thus, equation (2) is an equivalent of stage-two predictive relationship model in Ang et al. (2009, Eq. 4) and Fu (2009, Eq. 6), which also include *lnsize* and *lnbm* as explanatory variables alongside the FF-3 factor loadings. The logic here is that if FF-3 factor betas are able to explain the cross section of expected returns, then the coefficients of *lnsize* and *lnbm* would not be significantly different from zero. Thus, the inclusion of *lnsize* and *lnbm* as explanatory variables in model alongside FF-3 factors serves as a test of mis-specification of the model. The time series of estimates for each coefficient from equation (2) are pooled and the *t*-test statistics are formed using the Fama-MacBeth (1973) procedure as,

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$$t_{\gamma(t)} = \widetilde{\gamma}_l / \widetilde{\sigma}_l, \text{ where}$$

$$\widetilde{\gamma}_l = \sum_{t=1}^{T} \hat{\gamma}_{lt} / T \tag{3}$$

$$\text{and } \widetilde{\sigma}_l^2 = \frac{1}{T(T-1)} \sum_{t=1}^{T} (\hat{\gamma}_{lt} - \widetilde{\gamma}_l)^2 \tag{4}$$

These *t-statistics* follow Student's *t*-distribution with $(T - 1)$ degrees of freedom. These second stage estimates represent the long-run relationship coefficients between the levels of the expected returns and the explanatory variables series, and serve as the benchmark for checking the subsequent results.

Before executing the second stage of estimation we check all series for persistence and unit roots. The time series plots (not provided in paper) and the autocorrelations in time series of *IVol*, *lnsize* and *lnbm* show high persistence. Table 1 displays summary statistics of autocorrelations observed in *IVol* series of 207 stocks. To conserve space summary of autocorrelations in others series is not reported.

Table 1

Persistence in idiosyncratic volatility: This table presents summary statistics of autocorrelations in idiosyncratic volatility time series of stocks. The reported figures are obtained by first calculating the autocorrelations up to lag 10 for each stock, and then compiling the summary measures. An absolute value greater than or equal to 0.180433 is significant at 5% level of significance. The **bolded** values represent **nonsignificant** autocorrelations. Q1 represents the first quartile and Q3 the 3rd quartile.

	Lag length									
	1	2	3	4	5	6	7	8	9	10
Mean	0.459	0.393	0.365	0.342	0.308	0.277	0.240	0.205	0.191	0.162
Median	0.451	0.395	0.354	0.345	0.297	0.283	0.242	0.204	0.189	0.168
Max	0.907	0.839	0.797	0.757	0.727	0.663	0.581	0.511	0.504	0.452
Q3	0.593	0.523	0.491	0.479	0.426	0.381	0.338	0.306	0.287	0.242
Q1	0.367	0.270	0.230	0.213	0.193	**0.151**	**0.124**	**0.091**	**0.085**	**0.058**
10th percentile	0.228	**0.151**	**0.147**	**0.117**	**0.110**	**0.070**	**0.054**	**0.012**	**0.013**	**-0.014**

It follows from Table 1 that the idiosyncratic volatility series for the majority of the stocks show persistence up to many lags. Of particular interest are the first quartile and the 10th percentile values of the autocorrelations. While the first quartile values imply that at least 75% of the stocks have persistent idiosyncratic volatility series that show dependence up to 5 lags, the 10th percentile values indicate that at least 90% of the idiosyncratic volatility series possess the first order lag dependence. It is, thus, of interest to further investigate the nature of this dependence.

3.2. Testing idiosyncratic volatility and other series for random walks and panel cointegration

It is well known in the econometrics literature (e.g., Engle and Granger 1987) that meaningful long-run relations cannot be formed using nonstationary $I(p)$ series, where $I(p)$ stands for integration of order p, unless the series are cointegrated. A nonstationary $I(1)$ series can be made stationary by differencing once. Moreover, if a relatively less persistent return series is

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regressed on the first lag of some highly persistent predictors, the predictability could often be missed due to the persistence imbalance (Ren et al., 2015). We, therefore, start by testing the time series of idiosyncratic volatility (*IVol*), squared idiosyncratic volatility ($IVol^2$)[8], *lnsize*, *lnbm* and the realized excess returns $\mathcal{R}$ for unit roots. The commonly used ADF (Augmented Dickey Fuller) tests of unit root have unit root as the null. These tests are known to suffer from lack of power and size distortion. It is, therefore, a common practice to use the KPSS (Kwiatkowski, Phillips, Schmidt, and Shin) family of tests, which have 'No unit root' as the null, in conjunction with the ADF tests for confirmatory analysis to make sure that the conclusion is not a consequence of a test that lacks power. Two ADF tests (a test of pure random walk (RW), and RW with a drift) and two KPSS tests (involving constant only, and constant and linear trend as exogenous variables) are employed for this purpose. Table 2 reports a summary statistics of slope estimates from performing the ADF and the KPSS tests on the time series of *IVol*, $IVol^2$, *lnsize*, *lnbm* and $\mathcal{R}$ for each of the 207 stocks. In this reporting, the use of average slope and average test-statistic value is avoided as averaging masks pattern. The listed Dickey-Fuller and KPSS critical values are taken from Greene (2012); the starred critical values for the ADF tests are generated by Eviews software for our time series of length 118. The last column in Table 2 lists the percentage of stocks for which the hypothesis of unit root is accepted. The ADF and the KPSS tests confirm that the time series of *IVol*, $IVol^2$, *lnsize* and *lnbm* for the majority of the stocks have unit roots (i.e., follow random walks) and that the first order differencing makes them stationary. However, the percentage of excess returns series possessing a unit root is very small.

Table 2

Tests of unit root: Table parts (a) and (b) present two ADF tests, the test of a pure Random Walk and a test of Random Walk with a drift. The reported figures are the summary statistic values of the slope estimates and their associated test statistic values (in parentheses) from applying the ADF tests to time series of *IVol*, $IVol^2$, *lnsize*, *lnbm* and $\mathcal{R}$ for each of the 207 stocks. The bottom panel of table part (a) displays the results of applying a pure Random Walk test to first differences of series. The last column shows the percentage of stocks for which the tests confirmed unit root presence. Table parts (c) and (d) report the summary statistic values from applying the two KPSS tests of stationarity to time series of *IVol*, $IVol^2$, lnsize, lnbm and $\mathcal{R}$ for each of the 207 stocks.

(a) ADF test of a pure Random Walk

Series	Min	25th smallest	50th smallest	Mid-value	50th largest	25th largest	Max	Percent accepted unit root
Test result for levels								
IVol	-0.09855 (-3.2206)	-0.04347 (-1.5398)	-0.03713 (-1.1806)	-0.03818 (-0.8903)	-0.02393 (-0.7147)	-0.01949 (-0.5916)	-0.00637 (-0.1872)	98.55
$IVol^2$	-0.46557 (-7.2201)	-0.40192 (-2.8807)	-0.15434 (-2.3082)	-0.15619 (-1.8249)	-0.09881 (-1.4928)	-0.08569 (-1.2920)	-0.08084 (-0.7962)	84.54
lnsize	-0.05758 (-3.1446)	-0.01466 (-1.6118)	-0.00596 (-1.1194)	-0.00069 (-0.2712)	0.00082 (0.6664)	0.00359 (1.0691)	0.00154 (2.7287)	99.03
lnbm	-0.49544 (-10.2110)	-0.09650 (-2.4940)	-0.05441 (-2.0449)	-0.02706 (-1.3127)	-0.00924 (-0.7543)	-0.00260 (-0.2765)	0.00553 (0.6186)	88.89
$\mathcal{R}$	-1.24810 (-7.8574)	-0.82655 (-5.1858)	-1.12151 (-4.8526)	-1.04496 (-4.4244)	-0.69176 (-3.8975)	-0.74229 (-3.6121)	-0.40310 (-2.0991)	0.48

[8] Nath and Brooks (2015) provide lead for building models using $IVol^2$ by showing that the inclusion of predictor $IVol^2$ does not change the forms of relationships between expected excess returns and each of the explanatory variables, but improves Adj-R^2, and hence we test $IVol^2$ series for unit root. However, if *IVol* is nonstationary, $IVol^2$ will be nonstationary as well. The test results are displayed for the sake of completeness.

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Test result for first differences								
IVol	-3.65730 (-10.8320)	-3.45304 (-8.0852)	-2.90054 (-7.6847)	-2.67854 (-6.9771)	-2.41699 (-6.2978)	-2.02900 (-5.9368)	-1.09786 (-4.0604)	0
$IVol^2$	-3.63600 (-13.7332)	-3.32084 (-8.3569)	-3.20600 (-7.9434)	-3.07784 (-7.0847)	-2.58764 (-6.3069)	-2.11705 (-5.8134)	-1.14775 (-4.1277)	0
lnsize	-0.76640 (-6.2384)	-0.90603 (-5.1218)	-1.01609 (-4.8919)	-0.87647 (-4.6288)	-0.87488 (-4.2769)	-0.73619 (-4.0391)	-0.39510 (-3.0325)	0
lnbm	-1.43999 (-6.8551)	-1.12459 (-5.5746)	-1.10602 (-5.2987)	-0.84986 (-4.8390)	-0.77201 (-4.4695)	-0.89744 (-4.2051)	-0.58998 (-3.5448)	0
$\mathcal{R}$	-3.80863 (-11.2024)	-3.56077 (-8.9827)	-3.84020 (-8.4502)	-3.42604 (-7.7993)	-3.48375 (-7.1798)	-2.94288 (-6.8773)	-2.19731 (-5.6106)	0

Critical values (at 1%) of ADF test of pure Random Walk

(Source: *Econometrics Analysis, 2012, William H. Greene*)

n	25	50	100	infinity	118*
Cr. value	-2.66	-2.62	-2.6	-2.58	-2.5847

(b) ADF test of Random Walk with a drift

Series	Min	25th smallest	50th smallest	Mid-value	50th largest	25th largest	Max	Percent accepted unit root
Test result for levels								
IVol	-0.88540 (-8.2734)	-0.49583 (-3.8371)	-0.47851 (-3.5026)	-0.27218 (-2.8485)	-0.20580 (-2.2993)	-0.12333 (-2.0161)	-0.14599 (-1.5793)	75.85
IVol2	-0.96665 (-11.6337)	-0.73038 (-4.2634)	-0.51431 (-3.7264)	-0.52036 (-3.1114)	-0.23401 (-2.5683)	-0.28877 (-2.2982)	-0.11557 (-1.5765)	69.08
lnsize	-0.93986 (-53.9693)	-0.42579 (-8.6191)	-0.30217 (-5.8075)	-0.04622 (-3.4471)	-0.05065 (-1.7862)	-0.03243 (-1.3002)	-0.00098 (-0.0678)	51.21
lnbm	-0.56851 (-12.9391)	-0.26997 (-4.8957)	-0.10497 (-3.3259)	-0.08669 (-2.4912)	-0.04665 (-1.8429)	-0.03949 (-1.4233)	0.01560 (0.6427)	78.26
$\mathcal{R}$	-1.24041 (-7.7577)	-1.02665 (-5.3794)	-1.10111 (-4.9292)	-0.73556 (-4.4775)	-0.71136 (-3.9095)	-0.85219 (-3.6642)	-0.56740 (-2.8874)	6.3

Critical values (at 1%) of ADF test of Random Walk with drift

(Source: *Econometrics Analysis, 2012, William H. Greene*)

n	25	50	100	infinity	118*
Cr. Value	-3.75	-3.59	-3.5	-3.42	-3.4891

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(c) KPSS test of stationarity with intercept only

Series	Min	25th smallest	50th smallest	Mid-value	50th largest	25th largest	Max	Percent accepted unit root at 5%
LM Test statistic values for levels;								
IVol	0.06375	0.17526	0.24229	0.38158	0.57568	0.66234	1.05578	37
$IVol^2$	0.05584	0.16260	0.23799	0.37422	0.52259	0.62323	1.01429	33
lnsize	0.08326	0.27649	0.47311	0.86411	1.12038	1.17700	1.27435	78
lnbm	0.06955	0.23261	0.30736	0.53183	0.76950	0.90269	1.19078	56
$\mathcal{R}$	0.034189	0.067414	0.089421	0.144724	0.234217	0.300814	0.907681	4
Critical values of KPSS test of stationarity; using intercept only (Source: *Econometrics Analysis, 2012, William H. Greene*)								
Cr. Values:	0.739 (at 1%)		0.463 (at 5%)		0.347 (at 10%)			

(d) KPSS test of stationarity with intercept and linear trend

Series	Min	25th smallest	50th smallest	Mid-value	50th largest	25th largest	Max	Percent accepted unit root at 5%
LM Test statistic values for levels; exogenous constant & linear trend								
IVol	0.05855	0.08957	0.11114	0.15069	0.19424	0.21883	0.35275	55
$IVol^2$	0.05468	0.08332	0.09741	0.13054	0.17524	0.20089	0.36815	41
lnsize	0.05390	0.11269	0.13685	0.17880	0.23604	0.25706	0.31017	69
lnbm	0.04701	0.09598	0.12807	0.17328	0.21680	0.25046	0.29758	66
$\mathcal{R}$	0.02279	0.04393	0.05296	0.06727	0.09513	0.12789	0.21219	6
Critical values of KPSS test of stationarity; using intercept & linear trend (Source: *Econometrics Analysis, 2012, William H. Greene*)								
Cr. Values:	0.216 (at 1%)		0.146 (at 5%)		0.119 (at 10%)			

We next test the time series of realised excess returns and the explanatory variables for panel cointegration. Westerlund (2007) developed four error-correction based panel cointegration tests, which assume the response variable to possess a deterministic and a stochastic component but allow the explanatory variables to follow random walks. Each test has 'no cointegration' as the null hypothesis. He argues that if the null of no error-correction is rejected, then the null of no cointegration is also rejected. The proposed panel tests exploit the structural rather than the residual dynamics. The tests follow limiting normal distributions and are more powerful than the residual based panel cointegration tests (e.g., Pedroni 2004). Moreover, the Westerlund (2007) tests require only one-step in estimation compared to the residual based tests that need two steps. The general form of the equation for the error correction panel cointegration tests of Westerlund (2007) is,

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$$d(z_{it}) = \delta' d_t + \alpha\left[z_{i,t-1} - \gamma' x_{i,t-1}\right] + \sum_{j=1}^{p_i} \zeta_j d(z_{i,t-1}) + \sum_{j=0}^{p_i} \eta'_{ij}\, d(x_{i,t-1}) + e_{it} \quad (5)$$

In Eq (5), $i = 1,\ldots N$ and $t = 2,\ldots T$ index the cross-sectional units and the time-series, respectively. In equation (5), z_{it} is the response variable; x_{it} represents a vector of explanatory variables; γ' the parameter vector of long-run relationship; the symbol $d(\cdot)$ stands for the first order differencing; $d_t = (1, t)'$ takes care of the deterministic component in the response variable and δ' is its coefficient vector; α is the error-correction parameter, and p_i denotes the number of lagged terms required for removing serial correlation. The lagged terms on the first differences of z and x help capture the short-run dynamics in the system, but do not affect α – the error-correction (EC) parameter. The expression in the square brackets is the error-correction term. Thus, the panel cointegration test involves checking whether α is negative and significant.

Equation (5) can be re-parameterized as

$$d(z_{it}) = \delta' d_t + \alpha z_{i,t-1} + \lambda' x_{i,t-1} + \sum_{j=1}^{p_i} \zeta_j d(z_{i,t-1}) + \sum_{j=0}^{p_i} \eta'_{ij}\, d(x_{i,t-1}) + e_{it} \quad (6)$$

where $\lambda' = -\alpha\gamma'$. In equation (6), the EC parameter α is unaffected by this rearrangement, which means the least squares estimate of α can be used for performing the tests. Westerlund's tests G_τ and G_α are based on the group-mean statistics, while the tests P_τ and P_α on the panel statistics; each of the four test statistics follows a normal distribution. The two panel tests are designed to test the alternative that the panel is cointegrated as a whole, while the other two tests assess the alternative that there is at least one cross-section that is cointegrated. The results of the four error-correction panel cointegration tests using vector x of explanatory variables as (*lnbm*, *IVol*) are presented in Table 3. The results of error-correction panel cointegration tests for x = (*IVol*) and (*lnbm*, *IVol*, $IVol^2$) are not reported to conserve space, but are available on request. All four tests for each x vector are highly significant, and confirm that there is a panel cointegration between the time series of returns and the explanatory variables.

Table 3

Error-Correction Cointegration Tests: The values in this table are the results of applying the four error-correction cointegration tests of Westerlund (2007) for vector x = (*lnbm*, *IVol*). (Results from using x = (*IVol*) and (*lnbm*, *IVol*, $IVol^2$) are not reported to conserve space, but are available on request.) All tests have *p-values* of 0, and imply that there is a panel cointegration between $\mathcal{R}$ and the vector x of explanatory variables.

Deterministic component	Statistics	Value	Z-value	p-value
None	G_τ	-4.9419	-3.3975	0
	G_α	-125.4941	-21.8846	0
	P_τ	-68.0478	-50.5050	0
	P_α	-111.1051	-22.1589	0
Constant only	G_τ	-5.1318	-3.3629	0
	G_α	-133.0625	-19.7592	0
	P_τ	-69.5290	-65.6738	0
	P_α	-115.3664	-19.5839	0
Constant & linear trend	G_τ	-5.3302	-3.3321	0
	G_α	-140.5096	-17.3071	0
	P_τ	-71.9373	-77.2124	0
	P_α	-121.3302	-16.3984	0

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3.3. Idiosyncratic risk-return relationship and the panel Error-Correction Model

A panel error-correction model (ECM) linking the short-run and the long-run dynamics between the expected excess returns and the explanatory variables is specified as

$$d(\mathcal{R}_{it}) = \alpha\left[\mathcal{R}_{i,t-1} - \gamma' x_{i,t-1}\right] + \sum_{j=1}^{p_i} \zeta_j d(\mathcal{R}_{i,t-1}) + \sum_{j=0}^{p_i} \eta'_{ij}\, d(x_{i,t-1}) + u_{it}$$
$$i = 1,\ldots,N;\ t = 2,\ldots,T. \tag{7}$$

In relation (7), x represents a vector of explanatory variables, and the expression in square brackets is the error correction term. The error correction term is $I(0)$ when the variables are cointegrated. The other terms involve $I(0)$ variables since they are expressed in differences. Kumar and Rao (2012) state that an equation involving all $I(0)$ variables can be estimated using any of the classical estimation methods. We use the OLS and the quantile regression methods for estimation. A re-parameterization of equation (7) results in equation (8), which allows one-step estimation.

$$d(\mathcal{R}_{it}) = \alpha\mathcal{R}_{i,t-1} + \lambda' x_{i,t-1} + \sum_{j=1}^{p_i} \zeta_j d(\mathcal{R}_{i,t-1}) + \sum_{j=0}^{p_i} \eta'_{ij}\, d(x_{i,t-1}) + u_{it}$$
$$i = 1,\ldots,N;\ t = 2,\ldots,T. \tag{8}$$

4. RESULTS

4.1. The long-run idiosyncratic risk-return relationship and the panel error-correction models

Before discussing the main results, we inspect inter-correlations in variables utilized in building various models.

Table 4
Inter-correlations in variables: The reported values are the Pearson correlations. Each coefficient value is based on 24426 paired observations. An absolute value ≥ 0.0128 is significant at 5% level and ≥ 0.0165 at 1%. Significant correlation values are displayed in bold.

	$\mathcal{R}$	*lnsize*	*lnbm*	β_{MKT}	β_{SMB}	β_{HML}
lnsize	**-0.02469**					
lnbm	**0.07172**	**-0.25769**				
β_{MKT}	0.00851	**0.01896**	-0.00255			
β_{SMB}	0.01085	**-0.29972**	**0.02477**	**0.38396**		
β_{HML}	**0.03471**	**-0.03161**	**0.22979**	**0.17418**	-0.00848	
IVol	-0.00160	**-0.56852**	**0.16007**	**0.13541**	**0.38845**	**0.02986**

Table 4 reports Pearson's correlation coefficients, r. Each coefficient is based on 24426 paired observations, and, with the exception of a few, are highly significant (an absolute value ≥ 0.0128 is significant at 5%, and an absolute value ≥ 0.0165 at 1%). For example, the estimated values of coefficients β_{MKT}, β_{SMB}, and β_{HML}, obtained in the first stage of the Fama-MacBeth method from

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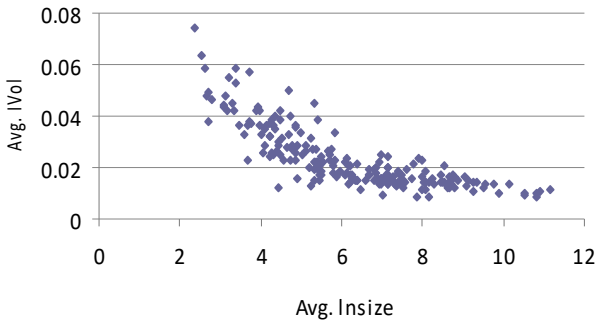
equation (1) that are traditionally used as explanatory variables in equation (2) for the second stage estimation, are highly correlated with *lnsize* and *lnbm*. Of the others, *lnsize* has highly significant negative correlation with *lnbm* (r = -0.2578) and *IVol* (r = -0.5685), meaning smaller stocks possess higher *IVol* and *lnbm* ratios. The use of highly correlated explanatory variables is likely to create a collinearity problem. Moreover, Figure 1 shows that *IVol* has a non-linear declining relationship with *lnsize*. Nonetheless, for benchmarking we start by fitting and reporting the long-run relationship model based on equation (2) utilizing all explanatory variables.

Figure 1
Idiosyncratic volatility and *lnsize* relationship in the cross-section: The scatter plot shows average idiosyncratic volatility in an individual stock against its average *lnsize* over the 10-year study period.



4.1.1. The OLS estimation evidence

Model 1 in Table 5 part (a) reports the OLS estimation of model using all explanatory variables. The adjusted R^2 (Adj-R^2) value of this model is only 0.06741, implying that the fitted model is not able to capture the relationship dynamics well, but it is at least comparable to the reported values of the best fitting models in Ang et al. (2009, Tables 2 and 8) for the US data. The best fitting model in Hur (2010, Table 7, Panel 8) has R^2 value of 0.0091 for the Australian data. Huang et al. (2010, Table 1, Models 2 and 3), do not report R^2 or the Adj-R^2 values, so one does not know how well their models performed.

Table 5
(a) Ordinary least squares estimation of Long-run idiosyncratic risk-return relationship models: The reported values are the Fama-MacBeth (1973) pooled estimates and the associated *t-statistic* values (in parentheses) from fitting Models 1–4. The response variable is $\mathcal{R}$, and the predictors are listed in the first column along with the average coefficient of determination and the average adjusted coefficient of determination values.

	Model 1	Model 2	Model 3	Model 4
intercept	7.64E-05 (0.1917)	0.00073 (1.7254)	0.00033 (1.5495)	0.00059 **(2.6171)**
lnsize	1.92E-05 (0.5184)	-1.98E-05 (-0.5257)		
lnbm	**0.00050 (6.3434)**	**0.00050 (6.4527)**	**0.00055 (6.7143)**	0.00054 **(6.6771)**
β_{MKT}	-1.96E-05 (-0.2440)	-1.36E-05 (-0.1780)		
β_{SMB}	-0.00020 (-0.1212)	-0.00141 (-0.7839)		
β_{HML}	0.00325 (1.9737)	0.00176 (1.0286)		
IVol	0.00167 (0.2517)	**-0.02994 (-2.0405)**	-0.00214 (-0.3229)	-0.02378 (-1.5881)
$IVol^2$		**0.38300 (2.0156)**		0.30473 (1.7228)
R^2	0.09458	0.10974	0.04803	0.06471
Adj-R^2	0.06741	0.07842	0.03869	0.05089

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(b) Ordinary least squares estimation of Panel Error-Correction Models: This table reports ordinary least squares estimation of two panel error-correction models ECM 1 and ECM 2 encompassing explanatory variables *lnbm* and *IVol*, and *lnbm*, *IVol* and $IVol^2$, respectively. The response variable is $d(\Re)$. The first column displays variables in the model and the implied long-run relationship parameters estimates γ_k^*, k = 0, 1, 2, 3, (denoting the intercept and the coefficients of *lnbm*, *IVol* and $IVol^2$, respectively) obtained using the relation, $\lambda' = -\alpha\gamma'$. The average values of coefficient of determination and adjusted coefficient of determination for the models are also reported. Notation $Z(-1)$ stands for 'lag one' value of variable Z, and $d(Z)$, the first differences. The reported values are the Fama-MacBeth (1973) pooled estimates and in parentheses, the associated *t-statistic* values. Significant coefficient estimates of important variables are displayed in bold.

	ECM 1	ECM 2
Intercept	0.00043 (3.5756)	0.00046 (3.5211)
γ_0^*	**0.00082 (3.5921)**	**0.00086 (3.5516)**
$\Re(-1)$	**-0.62519 (-52.5573)**	**-0.62692 (-52.4746)**
lnbm(-1)	0.00050 (5.6542)	0.00052 (5.8682)
γ_1^*	**0.00086 (5.6283)**	**0.00090 (5.8773)**
IVol(-1)	-0.00533 (-1.1427)	-0.00476 (-1.0150)
γ_2^*	-0.01209 (-1.4352)	-0.01151 (-1.3512)
$IVol^2(-1)$		-0.03181 (-0.5781)
γ_3^*		-0.04080 (-0.4754)
$d(\Re(-1))$	**-0.18915 (-20.1382)**	**-0.18918 (-19.8554)**
d(*lnbm*)	**0.00066 (9.5844)**	**0.00065 (9.4901)**
d(*lnbm*(-1))	0.00006 (1.0382)	0.00005 (0.7540)
d(*IVol*)	-0.00327 (-0.7517)	-0.00292 (-0.6697)
d(*IVol*(-1))	0.00393 (1.2012)	0.00367 (1.1091)
$d(IVol^2)$		-0.01444 (-0.4151)
$d(IVol^2(-1))$		0.05634 (1.2247)
R^2	0.44509	0.45335
Adj-R^2	0.42267	0.42251

The weakest correlation value (-0.0016) in Table 4 is the correlation between *IVol* and the realized future returns, which is negative and not significant. This near zero correlation value could mean a lack of linearity in the relationship. Using a quadratic term in *IVol* along with all other explanatory variables employed in Model 1 of Table 5 part (a) is reported as Model 2. This produces a slight improvement in the Adj-R^2 value. Moreover, this makes the coefficient of *IVol* negative and significant, while producing the coefficient of $IVol^2$ as positive and significant. Viewing the coefficients of *IVol* and $IVol^2$ across Models 2, 3 and 4 in Table 5, and observing the *IVol* and *lnsize* relationship pattern in Figure 1, one wonders whether the observed quadratic effect of *IVol* a consequence of the non-linear relationship between *IVol* and *lnsize*.

It is well documented in the literature that firms with smaller market capitalization yield higher returns (Banz, 1981; Beedles *et al*., 1988; Fama and French, 1992; O'Brien *et al*., 2012 and references therein) and carry higher idiosyncratic risk (e.g. Ang *et al*., 2006, 2009; Hur, 2010; Jiang *et al*., 2006; Lu-Andrews and Glascock, 2014). Thus, it follows by the law of association that high idiosyncratic risk may lead to high returns. To avoid making this presumption and a collinearity problem due to inter-correlations, and especially because of the non-linear relationship between *IVol* and *lnsize* (Figure 1) impacting the returns behaviour endogenously, we

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drop variable *lnsize* from the model. We find the OLS estimates of the slope coefficients of β_{MKT}, β_{SMB} and β_{HML} are not significant, so drop them as predictors from further models. As the interest is to find out if *IVol* has any explanatory power, and the form of its relationship with the returns of the next period, the only regressors we consider are *lnbm*, *IVol and IVol*^{2}. Model 3 in Table 5 part (a) utilizes *lnbm* and *IVol* as the regressors, while Model 4 employs *lnbm*, *IVol* and *IVol*^{2}. Models 3 and 4 will be referred to as the reduced variables linear *IVol* and the quadratic *IVol* models, respectively. In Models 3 and 4, *lnbm* has positive significant marginal effect on returns, and agrees with the reported findings in the literature (e.g., Ang et al., 2009; Fama and French, 1992; Fu, 2009, for the US markets, and O'Brien et al., 2012; Hur, 2010, for the Australian market). The coefficients of *IVol* in Models 3 and 4 are negative but not significant; Model 4 shows *IVol*^{2} has a nonsignificant positive impact on expected returns.

Having identified a panel cointegration between the time series of returns and the series of *lnbm* and *IVol*, we next estimate models within the panel error-correction framework using explanatory variables employed in Models 3 and 4 in Table 5, part (a). These model fittings are reported as ECM 1 and ECM 2 in Table 5 part (b). Notation $Z(-1)$ denotes 'lag one' value of variable Z. Coefficients γ_k^*, $k = 0, 1, 2, 3$, are the implied parameters of long-run relationship derived using $\lambda' = -\alpha\gamma''$. Specifically, γ_k^*, $k = 0, 1, 2, 3$, represent the implied estimates of intercept and slope coefficients of *lnbm*, *IVol*, and *IVol*^{2}, respectively. The reported coefficient estimates and the *t-statistic* values are obtained using the Fama-MacBeth pooling method. The improvement in Adj-R^2 value from using the panel ECMs is huge; the Adj-R^2 value of 4% for Model 3 jumps to 42% and 5% for Model 4 to 42.25%. This additional power comes from the error-correction structure. Moreover, α – the average coefficient of $\mathcal{R}(-1)$, which is also the error-correction parameter, is negative (-0.625) and highly significant[9]. This implies that each 20-day observation period, the response $\boldsymbol{\mathcal{R}}$ reacts to restore the long-run equilibrium at a speed of 62.5%. This error-correction mechanism, which at the mean level is dominated by *lnbm* ratios, is possibly due to investors overvaluing or undervaluing stocks while seeking opportunities to buy or sell stocks. The long-run *IVol* risk-return relationship at the mean level is still negative but not significant.

The coefficients of $d(lnbm)$ and $d(\mathcal{R}(-1))$ are highly significant in both ECM 1 and ECM 2 and suggest that the short-run adjustments in $\boldsymbol{\mathcal{R}}$ in a period are linked to changes in *lnbm* and changes in returns in the previous period. While the short-run adjustments in $\boldsymbol{\mathcal{R}}$ (i.e., $d(\mathcal{R})$) have positive significant dependence on $d(lnbm)$, the relationship between $d(\mathcal{R})$ and $d(\mathcal{R}(-1))$ is negative and significant. This negative relation may be interpreted as the return-reversal process in the short-run returns[10]. Thus, the use of a panel ECM is able to capture and explain a finer dynamics in realized future excess stock returns.

The signs and significance of the implied long-run relationship parameters are the same as the ones reported for Models 3 and 4 in Table 5, part (a). The implied long-run relationship intercept, γ_0^*, is positive and significant in both ECM 1 and ECM 2; the implied long-run marginal effect γ_1^* of *lnbm* is also positive and significant. In ECM 1 and ECM 2, the implicated long-run marginal effect γ_2^* of *IVol* at the mean level is negative but not significant. As the coefficients of $d(IVol)$ estimated using OLS are not significant in ECM 1 and ECM 2, there seems to be no short-run dependence of $\mathcal{R}$, at least on average, on changes in *IVol*. However, the quantile regression estimation (see next section) support the short-run dependence of $\mathcal{R}$ on changes in *IVol*.

4.1.2. The quantile regression estimation evidence

The relationship in the tails of the conditional returns distribution is of particular interest to investors as it signifies large gains and losses. Moreover, the distribution of returns may not be symmetric, and therefore, the OLS estimation results, which apply at the mean level, may not

[9] We also observed α_i to be highly significant in each panel.

[10] CGW (1993), Fu (2009), Huang et al. (2010), Jegadeesh (1990), Jegadeesh and Titman (1993) and Lehmann (1990) report observing return-reversal process in the levels of returns for the US data.

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serve well. Barnes and Hughes (2002) remark that 'the ordinary least squares based conclusions can be very narrowly focussed and may not reflect the true form of the relationship·····. A fortunate by-product of the quantile regression approach is that it alleviates the statistical problems like errors-in-variables, omitted variables bias, sensitivity to outliers and non-normal errors distributions which affect the empirical investigations in asset pricing models'. Also, if the OLS results approximately match the quantile regression based estimates around the median level, it is a confirmation of the observed pattern. The use of quantile regression is not new in empirical economics, finance and many business areas. Barnes & Hughes (2002) use quantile regression for examining the beta risk and the returns relationship in one-factor capital asset pricing model; Engle & Manganelli (2004) apply it to study the problem of Value at Risk; Wan (2008) estimates idiosyncratic volatility using this method. Kuan et al. (2012) employ the quantile regression to study the relationship between excess control rights and cash holdings. Some further applications and details of the methodology can be found in Bassett and Chen (2001), Buchinsky (1997, 1998), Koenker and Bassett (1978) and Koenker and Hallock (2001). We now estimate models reported in Table 5 parts (a) and (b) using quantile regression. However, to conserve space we report only Models 2, 4 and panel ECM 1. While Model 2 involves all variables, Model 4 and ECM 1 have reduced number of explanatory variables.

Table 6
Nonlinearity in long-run idiosyncratic risk-returns relationship models

(a) The fitted model is $\mathcal{R} = fn[intercept, lnsize, lnbm, \beta_{MKT}, \beta_{SMB}, \beta_{HML}, IVol, IVol^2]$. Notation $fn[.]$ stands for 'function of'. The table reports the Fama-MacBeth (1973) pooled estimates of coefficients of the fitted model obtained using the quantile regression and the OLS methods. The associated *t-statistic* values are in parentheses. The OLS estimates are the Model 2 values replicated from Table 5 part (a) to facilitate comparison. Significant coefficient estimates are displayed in bold.

	Quantile									
Variable	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	OLS
intercept	**-0.0037** **(-6.420)**	**-0.0019** **(-4.863)**	**-0.0012** **(-3.249)**	-0.0005 (-1.524)	1.1E-04 (0.351)	**0.0009** **(2.434)**	**0.0015** **(3.959)**	**0.0030** **(7.058)**	**0.0054** **(8.658)**	0.0007 (1.725)
lnsize	**3.0E-04** **(6.183)**	**1.9E-04** **(4.936)**	**1.3E-04** **(3.812)**	**8.7E-05** **(2.866)**	4.6E-05 (1.572)	-3.0E-05 (-0.902)	**-8.5E-05** **(-2.327)**	**-2.3E-04** **(-5.936)**	**-4.3E-04** **(-7.880)**	-2.0E-05 (-0.526)
lnbm	**6.4E-04** **(5.865)**	**5.1E-04** **(5.840)**	**3.7E-04** **(4.491)**	**3.1E-04** **(4.553)**	**2.4E-04** **(3.988)**	**1.9E-04** **(3.150)**	**1.9E-04** **(2.829)**	1.4E-04 (1.860)	3.6E-05 (0.401)	**5.0E-04** **(6.453)**
β_{MKT}	-2.3E-04 (-1.744)	-1.1E-04 (-1.263)	-1.6E-04 (-1.624)	-6.3E-05 (-0.773)	-5.1E-05 (-0.644)	8.6E-05 (1.201)	1.2E-04 (1.534)	**2.2E-04** **(2.606)**	**3.5E-04** **(3.416)**	-1.4E-05 (-0.178)
β_{SMB}	-0.0020 (-0.772)	**-0.0042** **(-2.092)**	-0.0019 (-1.149)	-0.0026 (-1.636)	-0.0014 (-0.957)	-0.0018 (-1.375)	-0.0011 (-0.708)	-0.0017 (-0.916)	-0.0007 (-0.253)	-0.0014 (-0.784)
β_{HML}	0.0025 (1.156)	0.0014 (0.778)	**0.0033** **(2.022)**	0.0028 (1.855)	0.0026 (1.530)	0.0019 (1.073)	0.0017 (0.890)	0.0007 (0.344)	-0.0012 (-0.482)	0.0018 (1.029)
IVol	**-0.1999** **(-10.625)**	**-0.1460** **(-10.165)**	**-0.0975** **(-7.560)**	**-0.0636** **(-5.312)**	**-0.0255** **(-2.229)**	0.0128 (1.183)	**0.0533** **(4.349)**	**0.1031** **(7.089)**	**0.1549** **(6.974)**	**-0.0299** **(-2.041)**
$IVol^2$	**1.3483** **(5.929)**	**0.9438** **(4.907)**	**0.6023** **(3.479)**	**0.4244** **(2.624)**	0.1793 (1.147)	-0.0799 (-0.539)	-0.2290 (-1.331)	**-0.5747** **(-2.693)**	**-0.5362** **(-1.981)**	**0.3830** **(2.016)**
R^2	0.1626	0.1137	0.0838	0.0647	0.0571	0.0589	0.0708	0.0994	0.1645	0.1097
Adj-R^2	0.1332	0.0825	0.0515	0.0318	0.0239	0.0258	0.0381	0.0677	0.1351	0.0784

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(b) The quantile and the OLS regressions of nonlinear model in *IVol* using reduced number of predictors. The reported values are obtained using the Fama-MacBeth (1973) pooling method; the associated *t-statistic* values are in parentheses.

	Quantile									
Variable	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	OLS
intercept	**-7.3E-04** **(-2.333)**	-2.2E-04 (-0.944)	4.7E-05 (0.211)	2.6E-04 (1.380)	**5.0E-04** **(2.939)**	**6.3E-04** **(3.606)**	**8.1E-04** **(4.174)**	**1.0E-03** **(4.669)**	**1.5E-03** **(5.495)**	**5.9E-04** **(2.617)**
lnbm	**5.6E-04** **(5.155)**	**3.8E-04** **(4.954)**	**3.5E-04** **(4.838)**	**3.1E-04** **(4.325)**	**2.7E-04** **(4.375)**	**2.5E-04** **(3.901)**	**2.2E-04** **(3.071)**	**2.3E-04** **(2.963)**	**3.0E-04** **(3.067)**	**5.4E-04** **(6.677)**
IVol	**-0.2637** **(-14.691)**	**-0.1800** **(-12.340)**	**-0.1213** **(-9.076)**	**-0.0676** **(-5.819)**	**-0.0248** **(-2.121)**	0.0235 (1.912)	**0.0722** **(5.159)**	**0.1423** **(8.800)**	**0.2442** **(11.437)**	-0.0238 (-1.588)
$IVol^2$	**1.6200** **(7.424)**	**1.0460** **(5.942)**	**0.6913** **(4.149)**	**0.2897** **(2.008)**	0.0476 (0.336)	-0.1921 (-1.349)	**-0.3421** **(-1.970)**	**-0.6844** **(-3.380)**	**-1.0066** **(-2.917)**	0.3047 (1.723)
R^2	0.1200	0.0801	0.0542	0.0389	0.0321	0.0337	0.0435	0.0661	0.1179	0.0647
Adj-R^2	0.1070	0.0665	0.0403	0.0247	0.0178	0.0194	0.0293	0.0523	0.1049	0.0509

Table 6 parts (a) and (b) display quantile regression estimation of Table 5 part (a) Models 2 and 4, respectively, and provide benchmark for assessing panel ECM results. The reported values are the pooled estimated coefficients and the test-statistic values obtained by applying equations (3) and (4). The last column in Table 6, labelled OLS, reproduces information from Table 5 to facilitate comparison. It can be observed from the quantile regression estimation of intercept that large negative (positive) abnormal returns are associated with the lower (upper) quantiles of the returns distribution. The *t-statistic values* for *lnsize* are highly significant at the extreme quantiles, and the marginal effect of *lnsize* on expected excess returns decreases from being positive at the lower quantiles to negative at the upper quantiles.

The quantile regression estimates of slope coefficient of *lnbm* are positive and significant at all quantiles with the exception of the 80th and the 90th quantiles where they are positive but not significant. In the reduced variables model (Table 6 part (b)), *lnbm* shows positive and significant effect at all quantiles, and implies the dominance of *lnbm* in explaining expected excess returns. The quantile regression estimates of the slope coefficients β_{MKT}, β_{SMB} and β_{HML} are significant only at an occasional quantile suggesting that they do not have a significant effect over and above the effect of *lnsize*, *lnbm*, and *IVol*, and are not included in the reduced variables model in Table 6 part (b).

It is clear from Table 6 parts (a) and (b) that the marginal linear effect of idiosyncratic risk is highly significant in the tails of the conditional distribution of excess returns; the relationship form is not impacted by the removal of *lnsize* as a predictor. The relationship impact changes from being negative and significant at the lower quantiles to positive and significant at the upper quantiles, but is not significant around the median. The slope coefficients of $IVol^2$ are positive (negative) and significant at the lower (upper) quantiles. The significant *t-statistic* values of the marginal effects of $IVol^2$ at many lower and upper quantiles indicate the presence of a quadratic relation between the *IVol* and the future excess returns, a finding reported in Nath and Brooks (2015). The reduced variables model in Table 6 part (b) mirrors this pattern; the overall idiosyncratic risk-return relationship form is not impacted by the use of reduced number of variables. Comparing the OLS and the quantile regression based *IVol* slope coefficient estimates in the full model (Table 6 part (a)) and the reduced variables model (Table 6 part (b)), it follows that the relationship pattern around the median[11] is similar to the pattern at the average level captured by the OLS estimation, but the quantile regression provides a much richer dynamics of the relationship.

[11] The return distribution is possibly not symmetric (Nath and Brooks (2015), therefore, the 50th quantile may not reflect the average level.

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Table 7 reports quantile regression estimation of panel ECM 1 reported in Table 5 part (b). For conserving space, results for panel ECM 2 are not reported, but are available on request. We can make the following observations from this table.

Table 7

Estimation of Panel Error-Correction Models using quantile regression: This table reports fitting of panel ECM encompassing explanatory variables *lnbm* and *IVol*, an equivalent of ECM 1 in Table 5 part (b), which is replicated in the last column to facilitate comparison. The response variable is $d(\mathcal{R})$. The first column displays the explanatory variables in the model and the implied parameters γ_k^*, k = 0, 1, 2, (denoting the intercept and the coefficients of *lnbm* and *IVol*, respectively) obtained using relation, $\lambda^* = -\alpha\gamma'$. Notation $Z(-1)$ stands for 'lag one' value of variable Z, and $d(Z)$, the first differences. The reported values are the pooled estimates and the associated *t-statistic* values (in parentheses) obtained using Fama-MacBeth (1973) method. Significant coefficient estimates of important variables are displayed in bold.

	Quantile									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	OLS
Intercept	-0.0016 (-9.357)	-6.3E-04 (-5.448)	-1.8E-04 (-2.055)	1.4E-04 (1.639)	3.9E-04 (5.139)	7.6E-04 (9.648)	0.0011 (11.818)	0.0013 (11.908)	0.0020 (12.090)	4.3E-04 (3.576)
γ_0^*	**-0.0027** **(-8.865)**	**-0.0010** **(-4.968)**	**-3.0E-04** **(-2.122)**	**1.5E-04** **(1.250)**	**5.7E-04** **(5.008)**	**0.0011** **(9.528)**	**0.0015** **(11.487)**	**0.0019** **(11.026)**	**0.0030** **(11.296)**	**8.2E-04** **(3.592)**
$\mathcal{R}(-1)$	**-0.5996** **(-44.143)**	**-0.6509** **(-59.412)**	**-0.6769** **(-65.544)**	**-0.6868** **(-71.867)**	**-0.7032** **(-76.835)**	**-0.7125** **(-87.320)**	**-0.7068** **(-77.681)**	**-0.7026** **(-62.441)**	**-0.6931** **(-45.697)**	**-0.6252** **(-52.557)**
lnbm(-1)	6.8E-04 (5.112)	5.1E-04 (5.418)	4.2E-04 (5.527)	4.2E-04 (6.511)	2.9E-04 (4.387)	1.9E-04 (2.774)	1.7E-04 (2.293)	7.3E-05 (0.830)	-1.1E-04 (-0.867)	5.0E-04 (5.654)
γ_1^*	**0.0012** **(4.705)**	**7.8E-04** **(4.943)**	**6.2E-04** **(5.431)**	**6.1E-04** **(6.287)**	**4.2E-04** **(4.350)**	**2.9E-04** **(2.890)**	**2.4E-04** **(2.255)**	7.6E-05 (0.587)	-1.6E-04 (-0.782)	**8.6E-04** **(5.628)**
IVol(-1)	-0.1932 (-29.783)	-0.1305 (-28.322)	-0.0848 (-21.833)	-0.0445 (-12.529)	-0.0108 (-3.203)	0.0179 (5.083)	0.0586 (14.032)	0.1190 (21.991)	0.1955 (27.152)	-0.0053 (-1.143)
γ_2^*	**-0.3526** **(-20.767)**	**-0.2099** **(-22.864)**	**-0.1288** **(-19.913)**	**-0.0655** **(-12.242)**	**-0.0161** **(-3.155)**	**0.0258** **(5.085)**	**0.0851** **(13.486)**	**0.1785** **(16.566)**	**0.3112** **(17.894)**	-0.0121 (-1.435)
$d(\mathcal{R}(-1))$	**-0.1912** **(-17.763)**	**-0.1746** **(-20.829)**	**-0.1618** **(-20.337)**	**-0.1576** **(-20.968)**	**-0.1520** **(-20.662)**	**-0.1437** **(-19.594)**	**-0.1433** **(-18.336)**	**-0.1469** **(-16.025)**	**-0.1523** **(-12.732)**	**-0.1891** **(-20.138)**
d(*lnbm*)	**5.7E-04** **(5.702)**	**5.0E-04** **(6.493)**	**4.1E-04** **(6.901)**	**3.9E-04** **(7.415)**	**3.7E-04** **(6.995)**	**3.1E-04** **(5.831)**	**3.4E-04** **(6.228)**	**3.4E-04** **(4.825)**	**3.9E-04** **(4.963)**	**6.6E-04** **(9.584)**
d(*lnbm*(-1))	-4.1E-05 (-0.416)	-2.9E-05 (-0.452)	-8.3E-05 (-1.525)	-9.6E-05 (-1.800)	-5.0E-05 (-1.001)	-2.1E-05 (-0.417)	-1.9E-05 (-0.319)	-2.8E-06 (-0.041)	1.4E-04 (1.609)	6.5E-05 (1.038)
d(*IVol*)	**-0.1553** **(-23.811)**	**-0.1068** **(-22.921)**	**-0.0691** **(-16.520)**	**-0.0396** **(-10.134)**	**-0.0153** **(-4.201)**	**0.0106** **(2.905)**	**0.0422** **(9.525)**	**0.0911** **(16.602)**	**0.1561** **(22.379)**	-0.0033 (-0.752)
d(*IVol*(-1))	**0.0235** **(4.585)**	**0.0135** **(3.903)**	**0.0109** **(3.957)**	0.0028 (1.001)	-0.0022 (-0.838)	-0.0025 (-0.972)	**-0.0063** **(-2.119)**	**-0.0117** **(-3.251)**	**-0.0167** **(-3.296)**	0.00393 1.20122
R^2	0.3504	0.3174	0.2991	0.2874	0.2821	0.2838	0.2921	0.3119	0.3564	0.4451
Adj-R^2	0.3242	0.2898	0.2708	0.2587	0.2531	0.2549	0.2635	0.2841	0.3304	0.4227

The coefficient α representing the speed of restoration to equilibrium by short-run adjustments in $\boldsymbol{\mathcal{R}}$ is negative and significant at all quantiles, and implies that the error-correction mechanism is at play throughout the conditional distribution of returns. However, the speed of adjustment in the recovery to equilibrium by the short-run adjustments in $\mathcal{R}$ is slower at the lower quantiles compared to the upper quantiles. This means that the underperforming stocks take longer to reach

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the equilibrium state after a displacement. The long-run implied coefficients values γ_k^*, k = 0, 1, 2, in Table 7 mimic the long-run relationship pattern observed in Table 6 part (b) for intercept, *lnbm* and *IVol*, respectively.

The coefficient of *d*(*lnbm*) is positive and significant at all quantiles, and implies that changes in *lnbm* ratios impact the short-run adjustments in returns. We observe that the coefficient of *d*(*IVol*) is also significant at all quantiles, but negative (positive) at the lower (upper) quantiles. This pattern allows us to draw two inferences. (i) The changes in *IVol* affects adversely the short-run returns of the low performing stocks, but investments in high performing stocks benefit from such changes, and could be interpreted as the short-run momentum effect at play as observed in past studies (e.g., Jagedeesh and Titman 1993). (ii) The increasing trend in marginal effect of *d*(*IVol*) on changes in returns suggests that the idiosyncratic risk-return relationship in the levels of the variables (i.e., the long-run relationship) is quadratic. This second inference confirms the pattern observed in Table 6 part (a) and agrees with the Nath and Brooks (2015) finding that the relationship in the levels of expected excess returns and the lagged *IVol* is parabolic[12]. A significant impact of *d*(*IVol*(-1)) is also observed at the extreme quantiles of the short-run returns, which supports the presence of persistence in *d*(*IVol*) and, therefore, the persistence in *IVol*. While the impact of *d*(*IVol*) on *d*($\mathcal{R}$) is negative (positive) at the lower (upper) quantiles, the effect *d*(*IVol*(-1)) is positive (negative) at lower (upper) quantiles. These reversing signs of the effects of *d*(*IVol*) and *d*(*IVol*(-1)) at the same quantile level for a number of extreme quantiles of the distribution of *d*($\mathcal{R}$) provide an evidence that the reversion in short-run returns is due to the persistence in *IVol*. Thus, the short-run dynamics of expected returns is linked to the error-correction term, the changes in *IVol* and its first lag and changes in *lnbm*.

Our panel ECM also shows the coefficients of *d*($\mathcal{R}$(-1)) as negative and significant at all quantiles, suggesting the existence of a pervasive return-reversal process that spans the entire distribution of short-run adjustments in $\boldsymbol{\mathcal{R}}$ in the Australian stock market. Thus, using the panel ECM and the quantile regression, we are able to establish: (i) the existence of an underlying long-run equilibrium relationship between the returns and the time series of *IVol* and *lnbm*; (ii) while the short-run responses of returns to changes in *lnbm* are positive, their reaction to persistence in changes in *IVol* and, therefore, in *IVol* cause the reversal process; the system keeps correcting itself to maintain an equilibrium. These patterns could be interpreted as the effect of risk-adverse investors' efforts to adjust their investment moves to take advantage of value-growth opportunities and reduce exposure to idiosyncratic risk.

4.2. Idiosyncratic risk-return relationship and panel Error Correction Models in size-sorted portfolios

It is widely documented in the finance literature that firms with smaller market capitalization yield higher returns than larger market capitalization firms (e.g., Banz, 1981; Beedles *et al*., 1988; Fama and French, 1992; Malkiel and Xu, 1997; O'Brien *et al*., 2012). Angelidis and Tessaromatis (2008) assert that it is the volatility of small capitalization stocks that matters for asset pricing, and that idiosyncratic volatility of small stocks predicts the small capitalization premium component of the market returns. We observe from the scatter plot of idiosyncratic risk against *lnsize* in Figure 1 that the larger stocks possess the least amount of idiosyncratic volatility, and agrees with the findings in the literature. Figure 1 also suggests that the relationship is not linear. Thus, it is of interest to explore the impact of size on the return-reversal process and the existence of an equilibrium state resulting from a cointegrated relationship. We expect the idiosyncratic risk-return relationship in portfolios formed on size to reveal some degree of variation in form and strength.

[12] Nath and Brooks (2015) show that the parabolic relation between idiosyncratic risk and stock returns is quantile dependent; it is U-shaped (inverted U-shaped) at the lower (upper) quantiles, flipping curvature around the median. The changing curvature may be due to the risk-aversion of traders trying to balance the risk and the returns.

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Size-sorted portfolios are formed using 20-day blocks. At the end of each 20-day period, stocks are sorted on *lnsize* and divided into three equal size groups to form portfolios of small, medium and large stocks. Once again we have a panel data structure, where each panel consists of average excess returns realized from holding a stock for a 20-day period, *lnsize, lnbm*, beta-risk estimates, coefficients of Fama-French factors SMB and HML, and idiosyncratic risk for each stock. This allows evaluation of all models considered earlier within the size-sorted portfolios, however we report only the reduced variables models. Table 8 (a) reports summary statistics on *lnsize* of stocks in three size-sorted portfolios. It is clear that the *lnsize* characteristics of stocks in the three portfolios are quite different. The mean and median *lnsize* for the three portfolios are not the same; the variation in the portfolio of medium size stocks is smaller than the other two. The distribution of *lnsize* in the small and medium size stocks portfolios is very close to being symmetric but is positively skewed in large stocks portfolio. The *lnsize* distribution in small stocks portfolio is more peaked compared to the other two.

The long-run relationships in size-sorted portfolios are first evaluated using the OLS and the quantile regression methods for benchmarking. Table 8 (b) lists the estimated coefficients and the associated test statistic values from fitting the reduced variables models. The OLS estimate of the intercept of the long-run relationship is positive and significant only in the portfolio of small stocks; it is virtually zero in the other two. The quantile regression estimates of intercept are negative (positive) at the lower (upper) quantiles in each portfolio, but the estimates are significant mostly in the small stocks portfolio.

Table 8
Long-run idiosyncratic risk-return relationship in size-sorted portfolios

(a) Summary statistics of variable *lnsize* in size-sorted portfolios

	Mean	Median	Mode	StDev	Kurtosis	Skewness	N
Small	3.94142	3.96765	3.05447	1.12219	1.34617	0.09623	8143
Medium	6.18900	6.18948	5.94201	0.75735	0.41665	-0.09908	8143
Large	8.48466	8.37071	7.02252	1.11750	0.39748	0.45473	8143

(b) The quantile regression and OLS estimation of idiosyncratic risk-return relationship in size-sorted portfolios using reduced number of explanatory variables. The response variable is $\mathcal{R}$. The reported values are obtained using the Fama-MacBeth (1973) pooling method; the associated *t-statistic* values are in parentheses. Significant coefficient estimates are displayed in bold.

Small stocks

	Quantile									
Variable	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	OLS
intercept	**-0.0023** **(-3.923)**	**-9.0E-04** **(-2.005)**	-7.6E-05 (-0.213)	5.2E-04 (1.475)	**0.0012** **(3.539)**	**0.0017** **(4.781)**	**0.0023** **(5.561)**	**0.0031** **(6.094)**	**0.0045** **(6.444)**	**0.0011** **(2.713)**
lnbm	**0.0010** **(4.516)**	**7.0E-04** **(4.445)**	**6.3E-04** **(4.421)**	**5.7E-04** **(4.173)**	**6.9E-04** **(4.953)**	**6.8E-04** **(4.756)**	**8.0E-04** **(4.926)**	**0.0010** **(5.335)**	**9.0E-04** **(3.071)**	**0.0010** **(6.663)**
IVol	**-0.2167** **(-7.972)**	**-0.1740** **(-7.988)**	**-0.1328** **(-7.733)**	**-0.0957** **(-5.470)**	**-0.0581** **(-3.406)**	-0.0235 (-1.223)	0.0249 (1.127)	**0.0921** **(3.543)**	**0.1592** **(3.963)**	-0.0359 (-1.751)
$IVol^2$	**1.4051** **(4.454)**	**1.2460** **(4.706)**	**0.9235** **(4.310)**	**0.6630** **(3.162)**	**0.3949** **(1.995)**	0.2700 (1.155)	0.0948 (0.351)	-0.3780 (-1.171)	-0.3035 (-0.563)	0.4162 (1.647)
R^2	0.1100	0.0771	0.0616	0.0522	0.0466	0.0465	0.0526	0.0728	0.1144	0.0799
Adj-R^2	0.0690	0.0345	0.0183	0.0085	0.0026	0.0025	0.0088	0.0300	0.0735	0.0374

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Medium stocks

intercept	**-0.0022**	**-0.0013**	-6.0E-04	-6.2E-04	-1.8E-04	2.9E-04	6.2E-04	**0.0011**	**0.0011**	-1.1E-04
	(-2.861)	**(-2.825)**	(-1.743)	(-1.923)	(-0.563)	(0.870)	(1.588)	**(2.531)**	**(1.948)**	(-0.263)
lnbm	**6.8E-04**	**4.9E-04**	**4.8E-04**	**4.2E-04**	**3.5E-04**	**2.7E-04**	**3.1E-04**	1.5E-04	8.3E-05	**4.2E-04**
	(3.255)	**(3.164)**	**(3.942)**	**(4.354)**	**(3.814)**	**(2.816)**	**(3.121)**	(1.506)	(0.605)	**(4.237)**
IVol	**-0.1792**	**-0.0862**	-0.0426	0.0268	0.0466	**0.0626**	**0.1006**	**0.1404**	**0.2995**	0.0306
	(-3.691)	**(-2.281)**	(-1.413)	(0.982)	(1.783)	**(2.341)**	**(3.432)**	**(4.003)**	**(6.624)**	(1.023)
$IVol^2$	0.8024	-0.3670	-1.0305	**-1.7493**	-1.3039	-1.0607	-1.0546	-0.9525	**-3.4396**	-0.9235
	(0.691)	(-0.402)	(-1.315)	**(-2.431)**	(-1.907)	(-1.567)	(-1.564)	(-1.102)	**(-3.122)**	(-1.476)
R^2	0.1279	0.0886	0.0673	0.0537	0.0485	0.0524	0.0607	0.0767	0.1153	0.0930
Adj-R^2	0.0876	0.0465	0.0243	0.0101	0.0046	0.0087	0.0173	0.0341	0.0745	0.0512

Large stocks

intercept	-8.0E-04	-4.6E-04	-1.7E-04	8.8E-05	1.7E-04	3.5E-04	**6.2E-04**	**0.0010**	**0.0012**	8.9E-05
	(-1.739)	(-1.456)	(-0.615)	(0.299)	(0.613)	(1.490)	**(2.015)**	**(2.718)**	**(3.061)**	(0.325)
lnbm	**5.1E-04**	**2.5E-04**	1.8E-04	1.5E-04	2.0E-05	1.4E-05	-4.7E-05	-1.2E-04	-1.6E-04	1.1E-04
	(3.695)	**(2.025)**	(1.707)	(1.508)	(0.231)	(0.172)	(-0.547)	(-1.330)	(-1.457)	(1.326)
IVol	**-0.2305**	**-0.1613**	**-0.1030**	-0.0638	-0.0092	0.0287	0.0666	**0.1110**	**0.2260**	0.0047
	(-4.386)	**(-4.295)**	**(-2.948)**	(-1.736)	(-0.255)	(0.889)	(1.632)	**(2.344)**	**(4.429)**	(0.137)
$IVol^2$	**3.2552**	2.1043	1.0309	0.7803	-0.2528	-0.3582	-0.6227	-1.0528	**-3.5563**	-0.5057
	(1.958)	(1.779)	(0.920)	(0.637)	(-0.201)	(-0.289)	(-0.435)	(-0.653)	**(-2.119)**	(-0.428)
R^2	0.1152	0.0843	0.0687	0.0616	0.0583	0.0612	0.0669	0.0805	0.1181	0.0966
Adj-R^2	0.0743	0.0421	0.0257	0.0183	0.0148	0.0179	0.0238	0.0381	0.0774	0.0549

The positive marginal effect of *lnbm* on returns is most prominent in portfolios of small and medium size stocks. The OLS estimate of *lnbm* effect, although positive in all portfolios, is significant only in the portfolios of small and medium size stocks. The quantile regression estimates show positive and significant effect of *lnbm* throughout the distribution of returns in small stocks portfolio, up to quantile 0.7 for the medium size stocks, and at quantiles 0.1 and 0.2 of the large stocks. Thus, it follows that only the small capitalization stocks benefit from the value-growth opportunities.

The OLS estimate of the coefficient of *IVol*, is negative (positive) in small (medium and larger) stocks portfolio(s) but not significant. The quantile regression slope coefficients of *IVol* in all size portfolios, representing the linear relationship between *IVol* and $\mathcal{R}$, are negative (positive) at the lower (upper) quantiles − a pattern which has been observed in all reported models thus far. The coefficients of this long-run relationship are significant only at the extreme quantiles in all portfolios, but the significant effect is most prominent among the smaller stocks.

Given that we observe a strong nonlinear relation between average *lnsize* and average *IVol* (Figure 1), it is no surprise that the quadratic effect of *IVol* on $\mathcal{R}$ is dominant only among the small stocks. The OLS estimates of the coefficients of $IVol^2$ are not significant in any of the portfolios, but its effect is positive (negative) in small (medium and large) stocks' portfolio(s). The quantile regression based coefficients of $IVol^2$ are positive (negative) at lower (upper) quantiles, but are significant only at the lower quantiles (0.1 to 0.5) in the small stocks portfolio and at the 90th quantile in the portfolio of medium and large stocks. Viewing pairs of significant quantile regression estimates of coefficients of *IVol* and $IVol^2$ in the three size-sorted portfolios, and following discussions in Nath and Brooks (2015), one can say that a U-shaped quadratic risk-return relationship is prevalent in the left half of the returns distribution in the portfolio of

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small stocks, but an Inverted-U-shaped distribution in the returns of the medium and large stocks at the 90th quantile. It follows then that while investors are comfortable with taking on higher idiosyncratic risk with some underperforming small stocks, they are more cautious when dealing with large capitalization stocks. This conclusion should not be a surprise given that Figure 1 shows a weak and almost flat relationship between idiosyncratic volatility and large capitalization stocks. However, such conclusions cannot be drawn on the basis of pattern observed in the OLS estimates.

Table 9

Ordinary least squares estimation of Panel Error-Correction Models in size-sorted portfolios: This table reports OLS fitting of panel ECM in size-sorted portfolios using explanatory variables *lnbm* and *IVol*, an equivalent of ECM 1 in Table 5 part (b). The response variable is $d(\mathcal{R})$. The first column displays the explanatory variables employed in the model, and the implied parameters γ_k^*, k = 0, 1, 2, (denoting the intercept and the coefficients of *lnbm*, *IVol* and $IVol^2$, respectively) obtained using the relation $\lambda' = -\alpha\gamma'$. Notation *Z*(-1) stands for 'lag one' value of variable *Z*, and *d*(Z), the first differences. The reported values are the Fama-MacBeth (1973) pooled estimates and the associated *t-statistic* values are in parentheses. Significant coefficient estimates of important variables are displayed in bold.

	Small		Medium		Large	
Intercept	6.1E-04	(3.237)	1.6E-04	(0.709)	4.6E-04	(2.300)
γ_0^*	0.0018	(1.905)	-0.0051	(-1.119)	**0.0015**	**(2.627)**
$\mathcal{R}$ (-1)	**-0.5764**	**(-26.979)**	**-0.6425**	**(-31.102)**	**-0.6389**	**(-33.418)**
lnbm(-1)	6.8E-04	(4.193)	3.0E-04	(1.997)	4.7E-04	(2.885)
γ_1^*	**0.0018**	**(2.399)**	-0.0010	(-1.324)	5.0E-04	(1.303)
IVol(-1)	-0.0127	(-1.571)	0.0014	(0.156)	-0.0057	(-0.693)
γ_2^*	-0.0436	(-0.892)	-0.1099	(-0.852)	-0.0582	(-1.678)
d($\mathcal{R}$ (-1))	**-0.2199**	**(-13.035)**	**-0.1744**	**(-10.921)**	**-0.1833**	**(-11.059)**
d(*lnbm*)	**7.0E-04**	**(5.034)**	**6.0E-04**	**(5.036)**	**5.7E-04**	**(5.381)**
d(*lnbm*(-1))	8.0E-05	(0.734)	7.3E-05	(0.725)	-7.5E-05	(-0.681)
d(*IVol*)	-0.0099	(-1.323)	-0.0040	(-0.496)	-2.8E-04	(-0.037)
d(*IVol*(-1))	0.0054	(1.038)	0.0053	(0.857)	-0.0014	(-0.257)
R^2	0.4903		0.5132		0.5114	
Adj-R^2	0.4223		0.4483		0.4462	

Table 9 reports the OLS estimation of panel ECM 1 in size-sorted portfolios. The comments related to the panel error-correction models that are made at the end of Section 4.1.1 can be reiterated for the size-sorted portfolios with a few exceptions. The implied long-run positive dependence between $\mathcal{R}$ and *lnbm* at the mean level is significant only among the smaller stocks. It follows once again that only the small capitalization stocks benefit from the value-growth opportunities. The coefficients of $\mathcal{R}$(-1) are negative and significant in each size portfolio that suggests that error-correction mechanism is at play and that the panel cointegration exists within the size-sorted portfolios. However, α, the speed of convergence to equilibrium by the response of $\mathcal{R}$ is faster among the medium and large stocks compared to small stocks. This means that after a shock, the expected returns from medium and large stocks restore the equilibrium state faster than the small stocks. These findings are in agreement with the ones documented by Chordia et al. (2005) and Lu-Andrews and Glascock (2014), which are based on very different perspectives and methodologies. Further analysis suggests that α for the small stocks is significantly lower than the αs for the medium and large stocks.

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5. CONCLUDING REMARKS

The US based study of CGW (1993) describes the return-reversal process observed to generate large abnormal profits from following some stock market trading strategies via the rational equilibrium paradigm. CGW explain that the phenomenon occurs due to the short-run liquidity imbalance in the market. The shifts in demand by liquidity traders cause price deviations from the fundamentals and offer profit opportunities to risk-averse market makers. The absorption of liquidity demand by market makers causes the prices to revert. Thus, the lack of liquidity moves stock prices away from the fundamentals and the supply of liquidity induces return reversals.

Employing the Australian data, this paper presents a new explanation of the return-reversal process at the firm level and the presence of an equilibrium state via empirical evidence based on econometric methodology of panel error-correction model (ECM). The model exploits the persistence in explanatory variables and builds on their cointegration with the returns series. It allows for the existence of an underlying long-run relationship between the returns and the explanatory variables, incorporates short-run adjustments in variables to correct persistence imbalance due to the nonstationary predictors within the panel data structure. As the panel ECM involves all stationary variables, it can be estimated using any of the classical estimation methods. This paper makes use of the ordinary least squares estimation for bench marking and the quantile regression estimation for deeper understanding of the relationship patterns.

We apply the ADF and the KPSS tests for assessing the time series of idiosyncratic (*IVol*) risk, *lnbm* (log book-to-market), *lnsize* (log of market capitalization) and stock excess returns for unit roots, and the error-correction panel cointegration tests of Westerlund (2007) for establishing a panel cointegration between the realized future excess returns series and variables *IVol* and *lnbm*. The estimated panel error-correction models (Table 5 (b), ECM 1 and ECM 2; Table 7) reveal the tendency of long-run returns to restore equilibrium via the error-correction mechanism, and that the short-run returns dynamics is linked to one-period lagged changes in returns, changes in *lnbm*, changes in *IVol* and the error-correction term. The existence of an underlying long-run equilibrium relationship, although between returns and variables *IVol* and *lnbm*, support the rational equilibrium paradigm of CGW (1993). The patterns suggests that while the short-run responses of returns to changes in *lnbm* are positive, their reaction to persistence in *IVol* causes the reversal process – a pattern that could be interpreted as the effect of risk-averse investors' efforts to adjust their investment moves to take advantage of value-growth opportunities and to reduce exposure to idiosyncratic risk. The dominant role displayed by *IVol* risk in our models is consistent with the strong connection observed between price momentum and the idiosyncratic volatility in Arena et al. (2008) study.

A significant negative (positive) impact of changes in *IVol* risk at the lower (upper) quantiles of the conditional distribution of short-run returns (Table 7) can be inferred in two ways. (i) The changes in *IVol* risk adversely affects the short-run returns of the low performing stocks but investments in high performing stocks benefit from such changes, and could be interpreted as the short-run momentum effect observed in past studies (e.g., Jagedeesh and Titman 1993). (ii) The increasing trend in the coefficients implies a quadratic relationship in the levels of the two series, and could mean that investors' investment strategies change with the level of exposure to *IVol* risk and the stakes involved (see, e.g., Nath and Brooks 2015). The significant marginal effects of changes in *IVol* and its one period lagged values on short-run returns at many quantiles support the persistence in *IVol* risk, and their reversing signs present an evidence of reversion in short-run returns. Further indication of short-run return-reversals is provided by the negative significant coefficients of one-period lagged changes in returns.

The analysis within the size-sorted portfolios highlights the importance of the role played by the market capitalization of stocks. The quantile regression estimation (Table 8 (b)) reveals that the quadratic form of the long-run idiosyncratic risk-return relationship is mainly confined to small stocks. The returns of small stocks bear the most effect of *IVol* risk and *lnbm*, and it is the

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idiosyncratic volatility and value-growth opportunities associated with small stocks that seem to dominate the asset pricing. We also observe (Table 9) that while the reversal in short-run returns is more dominant among the small stocks, the recovery rate to equilibrium by the response of small stocks' returns is slower.

In this study, we have initiated an application of a panel ECM for showing the existence of a short-run return-reversal process and an underlying long-run equilibrium relationship being maintained via a panel cointegration between the time series of returns and variables *IVol* and *lnbm*. The concepts of return-reversals and the existence of an underlying equilibrium are pursued in some US based studies that also seek a more sophisticated model for understanding the return regularities observed in stock market trading. While the current study is based on the Australian data, it would be of interest for the future research to weigh up our modelling framework by applying it to other stock markets using different time horizons, different holding periods to realize profits, and using predictors like liquidity and/ or the trading volume.

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References

Ang, A., Hodrick, R., Xing, Y., Zhang, X. (2006) The cross-Section of volatility and future excess returns, *Journal of Finance* 61, pp. 259–299.

Ang, A., Hodrick, R., Xing, Y., Zhang, X. (2009) High idiosyncratic volatility and low returns: International and further U.S. evidence, *Journal of Financial Economics*,91, pp. 1–23.

Angelidis, T., Tessaromatis, N. (2008) Idiosyncratic volatility and equity returns: UK evidence, *International review of Financial Analysis* 17, pp. 539–556.

Arena, M.P., Haggard, K.S., Yan, X. (2008) Price momentum and idiosyncratic volatility, *The Financial Review* 43, pp. 159–190.

Avramov, D., Chordia, T., Goyal, A. (2006) Liquidity and Autocorrelations in Individual Stock Returns, *Journal of Finance* 61, pp. 2365–2394.

Banz, R. W. (1981) The relationship between return and market value of common stocks, *Journal of Financial Economics* 9, pp. 3–18.

Barnes, M., Hughes, A. (2002) A quantile regression analysis of the cross section of stocks market returns, Working paper (http://ssrn.com/absract=458522).

Bassett Jr, G. W., Chen, H. (2001) Portfolio style: Return-based attribution using quantile regression, *Empirical Economics* 26, pp. 293–305.

Beedles, W. L., Dodd, P., Officer, R. R. (1988) Regularities in Australian Share Returns, *Australian Journal of Management* 13, pp. 1–29.

Buchinsky, M. (1997) The dynamics of changes in the female wage distribution in the USA: A quantile regression approach, *Journal of Applied Econometrics* 13, pp. 1–30.

Buchinsky, M. (1998) Recent advances in quantile regression models: A practical guideline for empirical research, *Journal of Human Resources* 33, pp. 88–126.

Campbell, J. Y., Grossman, S. J., Wang, J. (1993) Trading Volume and Serial Correlation in Stock Returns, *The Quarterly Journal of Economics* 108, pp. 905–939.

Campbell, J. Y., Lettau, M., Malkiel, B. G., Xu, Y. (2001) Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk, *Journal of Finance* 56, pp. 1–43.

Chordia, T., Roll, R., Subrahmanyam, A. (2005) Evidence on the speed of convergence to market efficiency, *Journal of Financial Economics* 76, pp. 271–292.

Connolly, R., Stivers, C. (2003) Momentum and Reversals in Equity-Index Returns During Periods of Abnormal Turnover and Return Dispersion, *The Journal of Finance* 58, pp. 1521–1555.

De Bondt, W. F. M., Thanler, R. (1985) Does the stock market overreact? *Journal of Finance* 40, pp. 793–805.

Drew, M.E., Veeraraghavan, M., Ye, M. (2007) Do momentum strategies work? Australian evidence, *Managerial Finance* 33, pp.772–787.

DOI: 10.7172/2353-6845.jbfe.2017.2.2

Engle, R., Granger, C. (1987) Co-integration and Error Correction: Representation, Estimation, and Testing, *Econometrica* 35, pp. 251–276.
Engle, R. F., Manganelli, S. (2004) CAViaR: Conditional Value at Risk by Regression Quantile, *Journal of Business, Economics and Statistics 22*, pp. 367–381.
Fama, E., MacBeth, J. (1973) Risk, return and equilibrium: Empirical tests, *Journal of Political Economy* 81, pp. 607–636.
Fama, E., French, K. (1988) Permanent and temporary components of stock prices, *Journal of Political Economy* 96, pp. 247–273.
Fama, E., French, K. (1992) The cross-section of future excess returns, *Journal of Finance* 47, pp. 427–465.
Fama, E., French, K. (1993) Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, pp. 3–56.
Fu, F. (2009) Idiosyncratic risk and the cross-section of expected stock returns, *Journal of Financial Economics* 91, pp. 24–37.
Goyal, A., Santa-Clara, P. (2003) Idiosyncratic Risk Matters! *Journal of Finance* 58, pp. 975–1007.
Greene, W. H. (2012) Econometric Analysis, Pearson Education Limited, Essex, England
Huang, W., Liu, Q., Rhee, S., Zhang, L. (2010) Return Reversals, Idiosyncratic Risk, and Expected Returns, *Review of Financial Studies* 23, pp. 147–168.
Hur, T. S. (2010) Idiosyncratic volatility and future excess returns in the Australian market. Master of Business Thesis, Auckland University of Technology, New Zealand.
Jiang, G., Xu, D., Yao, T. (2009) The information content of idiosyncratic volatility, *Journal of Financial and Quantitative Analysis* 44, pp. 1–28.
Jiang, X., Lee, B. S. (2006) On the dynamic relation between returns and idiosyncratic volatility, *Financial Management* 35, pp. 43–65.
Jegadeesh, N. (1990) Evidence of Predictable Behavior of Security Returns, *Journal of Finance* 45, pp. 881–898.
Jegadeesh, N., Titman, S. (1993) Returns to Buying Winners and Selling Losers: Implications for Stock market Efficiency, *Journal of Finance* 48, pp. 65–91.
Koenker, R., Bassett, G. (1978) Regression Quantiles, *Econometrica,* 46, pp. 33–50.
Koenker, R., Hallock, K. (2001) Quantile Regression, *Journal of Economics Perspectives* 15, pp. 143–156.
Kuan, T., Li, C., Liu, C. (2012) Corporate governance and cash holdings: A quantile regression approach, *International Review of Economics and Finance* 24, pp. 303–314.
Kumar, S., Rao, B. (2012) Error-correction based panel estimates of the demand for money of selected Asian countries with the extreme bound analysis, *Economic Modelling* 29, pp. 1181–1188.
Lehmann, B. N. (1990) Fads, Martingales, and Market Efficiency, *The Quarterly Journal of Economics* 105, pp. 1–28.
Lu-Andrews, R., Glascock, J. L. (2014) Liquidity, Price Behavior and Market-related Events, (Unpublished paper), *Available at SSRN 1571512.*
Levy, H. (1978) Equilibrium in an imperfect market: a constraint on the number of securities in the portfolio, *American Economic Review* 68, pp. 643–658.
Malkiel, B., Xu, Y. (2004) Idiosyncratic risk and security returns, (unpublished working paper), *University of Texas at Dallas*.
Markowitz, H., (1959) Portfolio Selection: Efficient Diversification of Investments, New York: Wiley.
Merton, R., (1971) Optimum consumption and portfolio rules in a continuous-time model, *Journal of Economic Theory* 3, pp. 373–413.
Merton, R., (1973) An intertemporal capital asset pricing model, *Econometrica* 41, pp. 876–887.
Merton, R. (1987) A simple model of capital market equilibrium with incomplete information, *The Journal of Finance* 42, pp. 483–510.
Nath, H. B., Brooks, R. D. (2015) Assessing the idiosyncratic risk and stock returns relation in heteroskedasticity corrected predictive models using quantile regression, *International Review of Economics and Finance* 38, pp. 94–111.
O' Brien, M. A., Brailsford, T., Gaunt, C. (2012) Size and Book-to-market Factors in Australia. *Australian Journal of Management* 37, pp. 261–281.
Pedroni, P. (2004) Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis, *Econometric Theory* 3, pp. 579–625.
Ren, Y., Tu, Y., Yi, Y. (2015) Balanced Predictive Regressions, *Monash University and Xiamen University Joint Workshop on Economics, Econometrics and Statistics*, Dec 2015, Melbourne, Australia.
Rouwenhorst, K.G. (1998) International Momentum Strategies, *The Journal of Finance* 53, pp. 267–284.
Sims, C.A. (1984) Martingale-like Behavior of Prices and Interest Rates, *Discussion Paper No*. 205, *Center for Economic Research*, University of Minnesota.
Westerlund, J. (2007) Testing for Error Correction in Panel Data, *Oxford Bulletin of Economics and Statistics* 69, pp. 709–748.
Wan, C. (2008) Idiosyncratic volatility, expected windfall, and the cross-section of stock returns, Sighted at (www.acem.sjtu.edu.cn/upload/publish/img/1091231016500.pdf).

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Mauritius: The Drivers of Growth – Can the Past Be Extended?[1]

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ABSTRACT

Mauritius's economic performance since its independence has been called "the Mauritian miracle" and the "success of Africa" (Romer, 1992; Frankel, 2010; Stiglitz, 2011). However, the future growth potential is more uncertain. In this paper, we use growth accounting to analyze the sources of past growth and project potential ranges of future growth through 2033 under various policies. Growth averaged 4½ percent over the past 20 years. Our baseline suggests future growth rates around 3¼ percent, but growth could reach 4–5 percent with strong pro-active policies including (i) improving investment and savings rates; (ii) improving the efficiency of social spending and public enterprise reforms; (iii) investment in education and education reforms; (iii) labor market reforms; and (iv) further measures to reduce bottlenecks and increase productivity. With policies capable of generating 5 percent growth, Mauritius could reach high-income status in 2021, 4 years earlier than under the baseline.

JEL Classification: F4; O1; O2; O4; O5

Keywords: Growth, Mauritius, Growth accounting.

1. INTRODUCTION

Mauritius' economic performance since independence in 1968 has been invariably labeled "the Mauritian miracle" and the "success of Africa" (Romer, 1992; Frankel, 2010; Stiglitz, 2011). Indeed, the island started out with the disadvantages of a typical African economy: a low-income monocrop exporter with a fully tropical climate, subject to significant terms-of-trade and output shocks, high population growth, and ethnic tensions. Observing the country's adverse inheritance,

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James Mead, a Nobel Prize laureate in economics, who led the economic survey mission to Mauritius in 1960, famously predicted:

> "In the author's opinion, Mauritius faces ultimate catastrophe" (Meade, 1961).

> "Heavy population pressure must inevitably reduce real income per head below what it might otherwise be. That surely is bad enough in a community that is full of political conflict. But if in addition, in the absence of other remedies, it must lead either to unemployment (exacerbating the scramble for jobs between Indians and Creoles) or to even greater inequalities (stocking up still more the envy felt by Indian and Creole underdog for the Franco-Mauritian top dog), the outlook for peaceful development is poor" (Meade et al., 1961).

Despite these initial disadvantages, Mauritius managed to develop into an upper middle-income diversified economy, generating an average real GDP growth of 5.3 percent between 1969 and 2013 compared to 3.8 percent for Sub-Saharan Africa (Figure 1). This is even more impressive in per-capita terms with Mauritius growing at 4.4 percent versus only 1.3 percent for Sub-Saharan Africa. Per-capita income in 2013 was $9,136 dollars at current exchange rates or $16,082 at purchasing power parity, which is about 6 times larger than the average of Sub-Saharan Africa and at a comparable level with Mexico and Turkey.

However, the future growth potential is more uncertain. The long-term trend could be declining (Figure 1), partly as a result of zero population growth and the expiry of trade preferences.[3] A general growth slowdown in Mauritius's main trading partners (United States and Europe) following the financial crisis may limit the potential pickup in growth from traditional sources, at least in the short run while Mauritius diversifies its export markets.

In 2012, the authorities announced an ambitious vision of GDP of one trillion rupees and an income per capita of US$20,000 by the 2020s, which would require real growth of over 6 percent per year. We examine under which circumstances such growth could be achieved, and what policies might increase growth.

This paper uses the standard growth accounting framework to assess the drivers of growth in Mauritius over the past sixty years; to identify the sources of future growth; and to determine potential ranges of growth through 2033 under various policies. It finds that the contribution of labor has systematically declined, although its role picks up if one accounts for improvements in education. Since the 1990s, capital and total factor productivity (TFP) play the dominant role, with TFP permanently higher than before. The results of the growth accounting exercise suggest that a growth rate of 6 percent, as targeted by the authorities, might be somewhat ambitious. The paper estimates that Mauritius' long-run growth rate might be around 3¼ percent, but that pro-active policies could raise growth to perhaps 4–5 percent, which given that population growth is essentially zero, translates into a very respectable 5 percent per-capita growth rate. The policies suggested include (i) improving investment and savings rates; (ii) labor market reforms; (iii) investment in education and education reform; and (iv) further reforms to reduce bottlenecks and increase productivity.

The paper is structured as follows. Section II discusses the previous work on the determinants of Mauritius's success. Section III presents the growth accounting framework and data. Section IV looks at the historical evidence and what we can learn from it. Section V develops the baseline projection scenario and discusses upside and downside risks for the potential growth rate. Section VI concludes with policy implications.

[3] The Multi-Fiber Agreement for textiles expired in 2004 and the EU Sugar Protocol ended in 2009. The price of sugar fell by 36 percent between 2006 and 2010.

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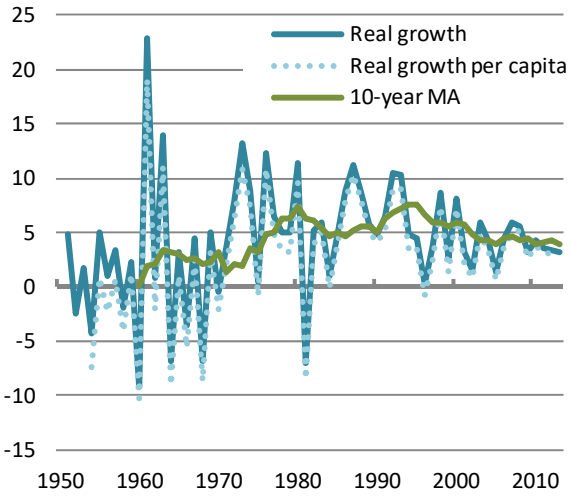
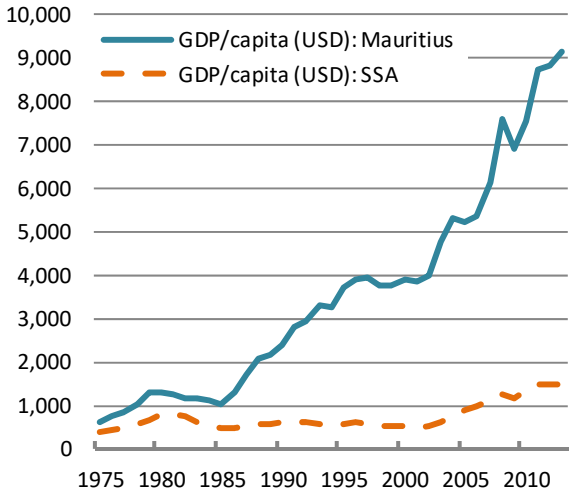
Figure 1
Mauritius: GDP Developments, 1950–2013

Growth averaged 5% over the last 4 decades and averaged 4 percent lately



Per-capita income rose rapidly, putting Mauritius firmly in high middle income status



Sources: CSO; and authors' calculations.

2. LITERATURE REVIEW – MAURITIUS GROWTH MIRACLE

A country's economic performance is mainly determined by three factors: initial conditions, remedial policies, and framing institutions.

There is broad agreement that Mauritius's original inheritance was unfavorable. Meade's prophecy of doom was based on what he saw as the country's impending population explosion, little experience and technical knowledge outside the sugar factories, scarcity of capital and raw materials, a limited domestic market, and the country's remoteness. Furthermore, any reforms would need to be implemented in a society highly fragmented on ethnic, economic, and political lines. As a development strategy, he therefore proposed (i) *population control* with an effective family planning system and emigration of workers to other British colonies; (ii) *diversification* in agriculture and rapid change in industry structure; and (iii) *a system of subsidies* with wage restraint, welfare benefits for the unemployed, and overseas welfare assistance.

Meade's reading of adverse inheritance was later confirmed by the factors identified as important in the growth literature. Geographically, the country was as far from the economic activity centers as the South Pacific islands. On ethnic, linguistic, and religious fragmentation, it was more divided that all the other small African states, and had one of the higher population densities in the world. It started out with distortionary trade barriers and was highly dependent on a single crop, sugar, which suffers from high price volatility. Conditional convergence suggested that Mauritius would have lower growth rates than the rest of the SSA, given its relatively higher per-capita income. The only variable where Mauritius scored positively was life expectancy (Subramanian and Roy, 2001), which at the time further fueled Meade's concerns with overpopulation, but turned out to be a blessing as the country industrialized.

The subsequent success of Mauritius has been attributed to various policies.[4] Part of the growth strategy relied on heterodox trade opening,[5] where the restrictive import policies of the 1970s, 1980s, and 1990s were supplemented by the creation of the export-processing zones (EPZ) with

[4] For previous analysis of Mauritius's performance, see Romer (1992), Subramanian (2001 and 2009), Subramanian and Roy (2007), Frankel (2010), Stiglitz (2011), Zafar (2011).

[5] Subramanian and Roy reject the openness to trade argument offered by Sachs and Warner (1995, 1997).

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duty free access for imported inputs, tax incentives, and a segmented labor market (Subramanian and Roy, 2001; Frankel, 2010). Domestic trade policies were complemented by successful trade diplomacy. Preferential access in textiles and sugar resulted in rents of, respectively, 7 and 4.5 percent of GDP per annum in the 1980s and 1990s, which helped sustain high investment levels. In addition, during those years, it was mostly domestic rather than foreign savings that financed domestic investment (Subramanian and Roy, 2001). Successful recycling of export rents also made possible the heavy investment in human capital, both publically and privately funded. The signing of the Double Taxation Avoidance Treaty with India in 1983 spearheaded the development of the offshore financial sector, and was instrumental in making Mauritius the largest source of FDI inflows into India.

A competing explanation was provided by Romer (1992), who argued that ideas, rather than capital, labor, or other factors of production, were the key ingredient for growth. In the case of Mauritius, he suggested that importing ideas from abroad through inward FDI was an effective alternative to growing them at home. The resounding success of the EPZ experiment in boosting growth in Mauritius accordingly was due to Chinese businessmen bringing textile and apparel manufacturing ideas and jump-starting the country's industrialization.

There were several other ingredients in the growth-targeted policy strategy, such as prudent, proactive fiscal policy (Zafar, 2011) and adaptability to external shocks including through a flexible exchange rate (Frankel, 2011). The government invested heavily in quality schooling, granting free education to all citizens and promoting study abroad. Mauritius had a competitively-valued exchange rate throughout most of its history, when compared with many African and Latin American countries (Iman and Minoiu, 2008). This helped offset some of the anti-trade bias of import tariffs and promoted trade just like the trade preferences.

But why were these successful policies adopted? Considering a horse race of competing hypotheses, Subramanian (2001), Frankel (2011), and Stiglitz (2011) cast their vote for institutions, which were put in place by the officials in charge of the transition to independence and the first prime minister, Ramgoolam. The key institutions were the separation between economic and political power, establishment of the parliamentary system to accommodate diversity, and the decision not to have a standing army. Also, not expropriating or taxing away the Franco-Mauritians' wealth (mainly sugar plantations) facilitated their giving up political power and established and supported secure property rights. The sharing of political power and the development of a vigorous opposition and media ensured that no single elite or ethnic group was in a position to dominate. Not having a standing army generated financial savings and ensured freedom from military coups.

The success of economic policies was made possible by the resulting political stability, rule of law, and strong domestic institutions, with Mauritius topping the World Bank Doing Business rankings in Africa. According to Subramanian and Roy, EPZs failed in most countries because institutions were not able to prevent rent-seeking, corruption, and inefficiency. Mauritius' diversity ended up as a positive factor with business and social networks helping promote trade and investment. For example, Chinese-Mauritians were influential in convincing the government to set up the EPZs (Subramanian, 2001).[6]

Good institutions were established by forward-looking Mauritian leadership but perhaps also because of what Frankel calls "deepest determinants". Few British settlers moved to Mauritius to replace the French, when Great Britain succeeded France as the colonial power. As a result, at independence European settlers were not protected to the same extent as in other countries, and a power-sharing structure was established. In addition, more time was taken to prepare the

[6] The process was supported by various groups. At the individual level, a Sino-Mauritian professor Lim Fat and a Franco-Mauritian economist Jose Poncini promoted the idea of EPZ creation. At the political level, the PMSD under Gaëtan Duval also pushed for the idea. In addition, it was embraced by Ramgoolam and the Labor party establishment. Whilst in opposition, the MMM opposed the EPZ, but embraced it once in power in 1982.

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country for independence, which was not true for most African countries. Mauritius also benefited from being an "immigrant isle" – everyone who was there came from somewhere else and there were no natives to resent the newcomers. Therefore, everyone had a common stake in working together and immigrant initiative could fully develop.

In terms of the analysis of this paper, initial conditions, policies, and institutions affect economic growth to the extent that they determine the rate of factor accumulation and efficiency with which the factors of production are put together. In this respect, our approach adds rigor to the more qualitative assessment of Frankel and Stiglitz. While other papers use growth accounting to look at determinants of growth in the past and policy implications for other countries from Mauritian success, we look at the past to the extent that it gives insight into what can reasonably drive future growth and what policies Mauritius can take to encourage higher growth.

3. MODEL SPECIFICATION – THE GROWTH ACCOUNTING FRAMEWORK

The growth accounting framework is based on the Cobb-Douglas production function, which is commonly used to analyze the sources of historical growth because its constant returns to scale properties make the decomposition relatively easy:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}$$

Here, Y_t represents domestic output in period t, K_t is the physical capital stock, L_t is the employed labor, A_t is the total factor productivity (TFP), and α is the partial elasticity of output with respect to capital.

Total differentiation of the production function allows us to decompose the growth rate of output into the contributions of growth rates of factor inputs and total factor productivity:

$$\frac{dY}{Y} = \frac{dA}{A} + \alpha\frac{dK}{K} + (1-\alpha)\frac{dL}{L}$$

Total factor productivity (TFP), which captures other aspects of production, such as technology, infrastructure, and institutions, is computed as a residual, given that we have data for output, capital, and labor.

In an alternative specification, we augment the labor input with human capital (H) to calculate effective labor (L^*), akin to Bosworth and Collins (2003), which accounts for the role of educational attainment in improving the quality of the labor force:

$$L^* = HL = e^{rs}L$$

Here, s is the average years of schooling of the labor force and r is the return to each year of schooling, estimated to be 10.7 percent for middle-income countries (Psacharopoulos and Patrinos, 2004).

While we present the results for both specifications, we believe that the augmented model is more relevant, because it allows for the fact that labor has different levels of productivity. This is especially relevant in an economy like Mauritius, where per-capita income is increasing and better education and training make people more productive.

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3.1. Capital stock

We estimate the capital stock using the standard perpetual inventory model with geometric depreciation, which gives the accumulation equation:

$$K_t = (1 - \delta)K_{t-1} + I_t$$

Here, δ is the depreciation rate in percent and It is real gross fixed capital formation. Our historical decomposition is based on annual data from 1950 to 2011. Investment data come from the Central Statistical Organization (CSO) for the years 1972 to 2011 and from Nehru and Dhareshwar (1993) for 1950 to 1971.

Since Mauritius never undertook a national wealth survey, the initial capital stock needs to be estimated. We follow the Harberger approach, which allows estimating the mid-point capital stock for a period where the capital-output ratio can be assumed to be constant. In that case, the growth rates of capital and output are equal, and from the accumulation equation it follows:

$$\frac{(K_t - K_{t-1})}{K_{t-1}} = -\delta + \frac{I_t}{K_{t-1}}$$

$$K_{t-1} = \frac{I_t}{y + \delta}$$

where y is the growth rate of output. Since the capital-output ratio is unlikely to vary significantly over short periods of time, we use three-year averages of output growth and investment level and apply the accumulation equation backwards to arrive at the capital stock level in 1950.[7]

The choice of the depreciation rate δ is arguably more important than the initial capital stock, since little initial capital would have survived over 60 years. While errors in estimating the initial capital stock will be dampened over time, errors in the depreciation rate will tend to accumulate. A higher depreciation rate gives a lower estimate of the initial capital stock and therefore more pronounced rates of capital growth. The annual depreciation rate estimated from the capital accumulation equation with CSO data is relatively stable between 7 and 8 percent over the last 4 decades (Figure 2). In constructing its measure of the capital stock, the CSO used the straight-line depreciation method to calculate the consumption of different fixed capital asset types based on mean asset-life assumptions. A recent study by the Mauritius Commercial Bank estimates the depreciation rate at 5 percent over the 1990–2012 period.[8]

We use a range of depreciation rates (5, 7, and 10 percent) to test the sensitivity of the depreciation rate assumption. The resulting growth rates of the capital stock series are similar to the ones of the CSO (7–8 percent) and Nehru and Dhareshwar (4 percent, Figure 3). Given Mauritius specific and international evidence,[9] we think that a depreciation rate between 5 and 10 percent seems most likely for Mauritius.

[7] See Nehru and Dhareshwar (1993) for an overview of other methods of estimating the initial capital stock.

[8] See MCB Focus No. 55 "Mauritius Inc. – The Challenge of Investing in Growth".

[9] Using firm level data, Bu (2006) estimates implied depreciation rates for aggregate physical stock in the range of 10–20 percent for Cote d'Ivoire, Ghana, Kenya, Zimbabwe, Philippines, and South Korea.

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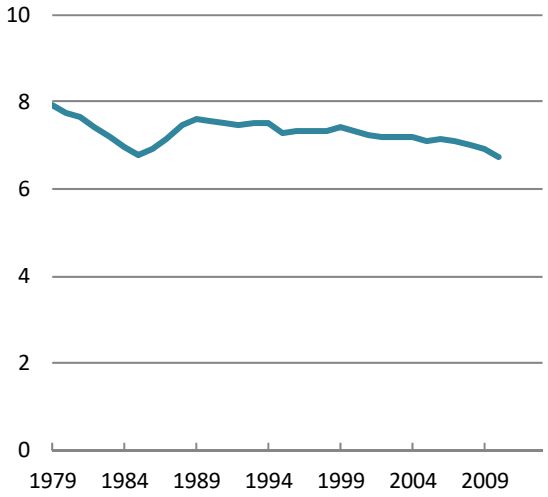
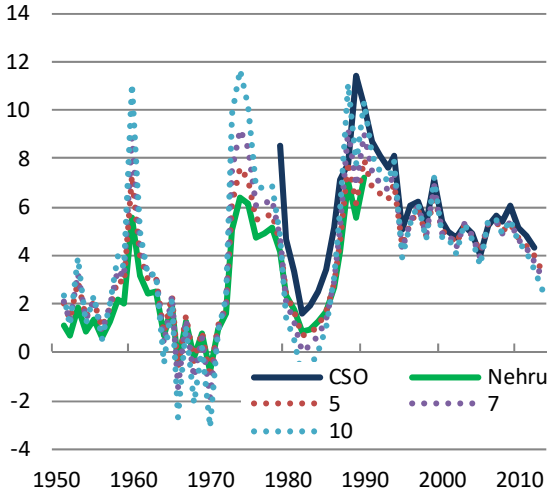
Figure 2
Implied Depreciation Rate, 1979–2013 (in percent)
Estimated depreciation is relatively stable around 7 percent.



Sources: CSO; Nehru and Dhareshwar; and authors' calculations.

Figure 3
Capital Growth, 1950–2013 (in percent)
A higher depreciation rate results in more variable growth rates of capital inputs.



Sources: CSO; Nehru and Dhareshwar; and authors' calculations.

Our approach for calculating capital input is based on using the change in the constructed measure of the capital stock for the growth accounting exercise.

An alternative approach used in the literature (such as Mankiw, Romer and Weil, 1992) is to use investment rate (I/Y) instead of capital growth. They approximate the growth in the capital stock via the following relationship:

$$\frac{(K_t - K_{t-1})}{K_{t-1}} = -\delta + \left(\frac{L_t}{Y_t}\right) / \left(\frac{K_{t-1}}{Y_t}\right)$$

Assuming a steady-state constant level of the capital-output ratio allows the change in capital stock to be measured by the investment rate.

However, given the transformations experienced by the Mauritian economy in this period, the assumption of constant capital-output ratio over the entire period seems not supported by the evident (see discussion below). More importantly, investment rates in Mauritius have been between 20–30 percent, much higher than the -5 to 15 percent growth range estimated for the constructed capital stock (Figure 3). Using investment rates would thus likely lead to an over-estimation of the role of capital for explaining growth.

3.2. Labor force

We use employment data from 1972 onwards from the CSO. The use of employment instead of population implies that our measure reflects, besides population growth, also variations in the participation and employment rates. We reconstruct the data for 1960–1971 using the growth rates of the population aged 15-59 and the total population for 1950–1959 since the other measure is not available for the earlier period. Both series come from the World Development Indicators (WDI) database. This reconstruction assumes that participation and employment rates stay unchanged at the 1972 level during 1950–1971.

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3.3. Shares of capital and labor in output

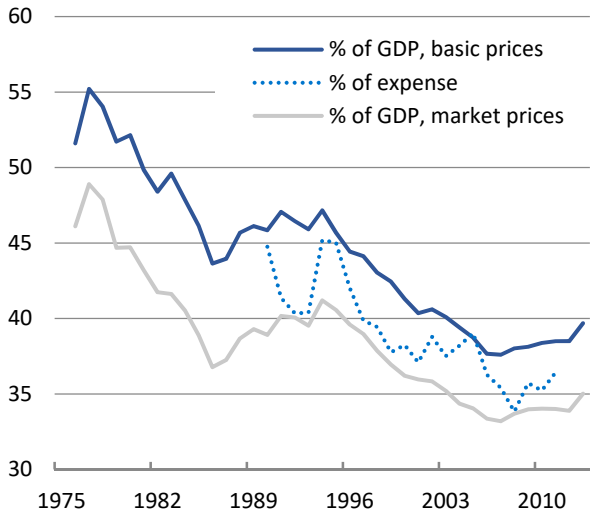
If one assumes constant returns to scale and competitive markets, where each input is paid the amount of its marginal product, then the exponent on each factor input in the production function represents the relative share of total product accruing to that factor:

$$Capital\ share: \frac{(\delta Y/\delta K)K}{Y} = \frac{(A\alpha K^{\alpha-1}L^{1-\alpha})K}{AK^{\alpha}L^{1-\alpha}} = \alpha$$

$$Labor\ share: \frac{(\delta Y/\delta K)L}{Y} = \frac{(A(1-\alpha)K^{\alpha}L^{-\alpha})L}{AK^{\alpha}L^{1-\alpha}} = 1-\alpha$$

One can use the information on the compensation of employees and operating surplus from the national accounts statistics to estimate the factor shares. However, the CSO data exhibit a persistent decline in the share of the employee compensation in the value added over time, from a peak of 55 percent in 1977 to 38 percent in 2011 (Figure 4). This would imply that the capital share has been increasing from 45 percent to 62 percent over time, which goes against the typical assumption of $\alpha = 0.35$ used in cross-country growth studies (see Bosworth and Collins, 2003, and others).

Figure 4
Compensation of Employees, 1975–2013
Labor's share declined, possibly due to structural changes or measurement problems.



Sources: CSO; and authors' calculations.

There are several potential explanations for this phenomenon. Some erosion of the labor share over time is consistent with the structural changes in the Mauritian economy, as the diversification from agriculture into textiles (a relatively more capital-intensive sector) was accompanied by the expansion of the capital stock, reducing the labor share in the distribution of income. Attempts to limit real wage increases to less than productivity increases in order to preserve competitiveness may also have reduced labor's share over time. The experience of Mauritius also matches a broader tendency of developing countries to have lower labor shares compared to industrial countries and to have those shares decline over time, as documented by Diwan (2001) and Harrison (2002). Harrison finds that higher trade and capital account openness tends to reduce the labor share.

DOI: 10.7172/2353-6845.jbfe.2017.2.3

However, according to Gollin (2002), the phenomenon could also be a statistical artifact, because the labor income of the self-employed is often treated incorrectly as capital income in national accounts. Indeed, according to Mauritian labor force surveys,[10] the share of the self-employed workers in Mauritius increased from 13 percent in 1990 to 16 percent in 2000 and to 20 percent in 2010. By comparison, the self-employment rate in the United States in 2009 stood at 11 percent. According to Gollin's adjustments, the labor share estimates in 1990 for Mauritius rise from 39 percent to (i) 49 percent if one imputes self-employed compensation from the overall labor compensation; (ii) 66.8 percent if one reallocates self-employed income into the labor and capital income according to the distribution in the rest of the economy; or (iii) 76.7 percent if one treats all self-employed income as labor income.

The self-employment adjustment argument suggests that the use of constant elasticities could be justifiable. In line with the literature, we chose that standard 35 percent capital share as our baseline. However, in our sensitivity tests we also use a range of the capital share α from 0.25 to 0.35 to 0.5. The results are not very sensitive to the level of the capital share, but if we use a higher capital share, it reduces the historical TFP estimates. For the projection horizon, using a higher capital share increases the contribution of capital, but when combined with lower TFP, it does not materially change the baseline growth projections.

3.4. Human capital

We augment the standard production function with human capital to take into account Mauritius' focus on creating a knowledge-based service economy. We chose this particular functional form – as opposed to, for example, using human capital as an additional factor of production – because we think of human capital as a measure of educational attainment that improves the quality of the workforce. As a result, the overall share of output going to labor input is still $(1-\alpha)$, but workers with more education receive a larger sub-share of this $(1-\alpha)$.

While there are different approaches to measuring the human capital (see Le et al., 2005 for a comprehensive survey), we chose one of the simpler and more transparent ones, with human capital evolving according to:

$$H_t = e^{rs_t}$$

This measure quantifies the accumulated educational investment in the current labor force and assumes that the human capital embodied in the workers is proportional to the average years of schooling (s_t) they have attained, taking account of the return (r) to each year of schooling.[11] Years of schooling are measured according to:

$$s_t = \Sigma_i d_i L_{t,i}$$

where $L_{t,i}$ is the proportion of labor force participants with the ith level of schooling at time t and d_i is the duration in years of the ith level of schooling, which includes six years of primary, seven years of secondary, and three years of tertiary education.

The CSO data show a consistent increase in the average educational attainment of the labor force, from 9.7 years in 1990 to 10.8 years in 2009 (Figure 5).[12] However, even at the end of the period, some 35 percent of the labor force only has primary education as their highest educational attainment level, which suggests that there is room for further improvement. Other measures of

[10] The 2000 Housing and Population Census and the 2010 the Continuous Multi-Purpose Household Survey.

[11] An alternative specification could be $H_t = (1+r)^{s_t}$ if we don't assume continuous compounding.

[12] We use linear interpolation for the years in between the surveys.

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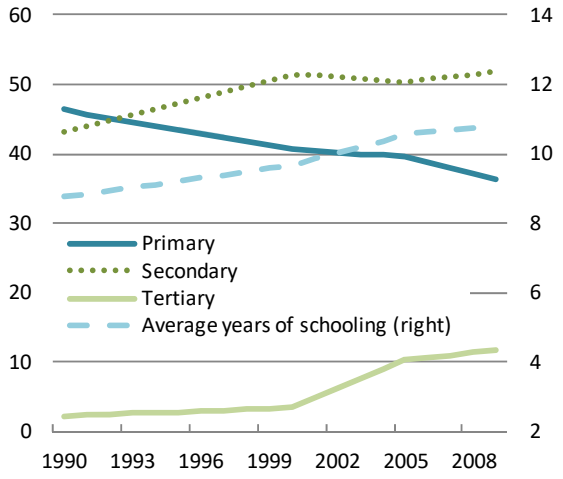
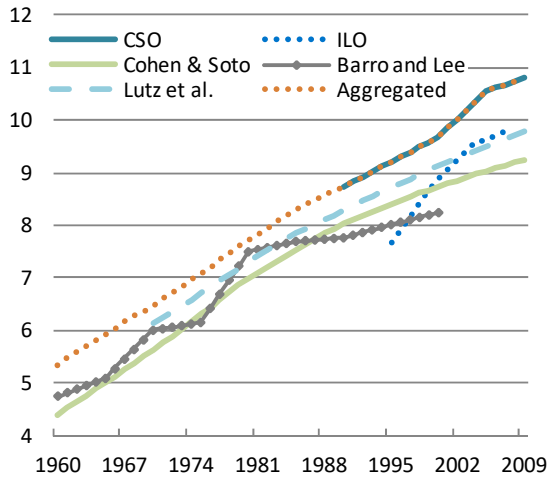
educational attainment in Mauritius (ILO; Cohen and Soto, 2001; Barro and Lee, 2001; Lutz et al., 2007) all show a substantial improvement over time (Figure 6), even though there are some difference in the levels due to methodological reasons.

Figure 5
Education of Labor Force, 1990–2010



Sources: CSO; and authors' calculations.

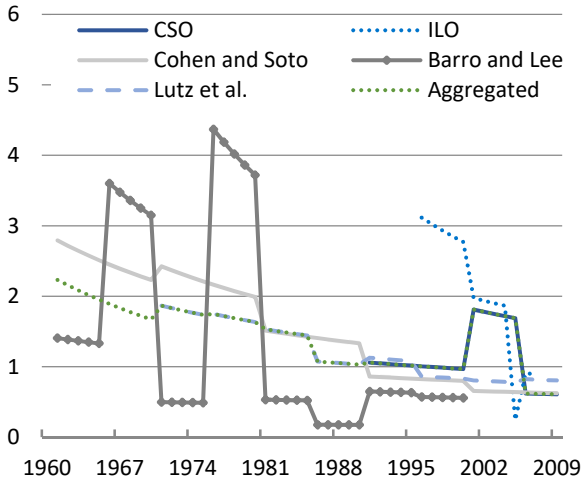
Figure 6
Average years of Education, 1960–2010



Sources: CSO; Cohen and Soto; Barro and Lee; Lutz et al; and authors' calculations.

We extend the CSO data back to 1960 with Lutz et al. and Cohen and Soto, since these measures show the least variable growth rates (Figure 7). High variability in the growth rates could be an indication of inconsistency in survey samples for different survey years and/or in the methodologies used to fill in the missing observations. In the 1960s and 1970s, average years of education grew at 2 percent or more, but growth has declined to about 1 percent per year. An acceleration in the growth rate would require more people to finish secondary and tertiary education.

Figure 7
Average Growth in Education Years of education are still increasing, but at a slower rate



Sources: CSO; ILO Cohen and Soto; Barro and Lee; Lutz et al; and authors' calculations

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4. HISTORICAL DECOMPOSITION OF GROWTH

Mauritius experienced two periods of strong above average growth in the past. In the 1970s, growth was 6 percent on average, driven by the rise in the labor force, which accounted for 2 percentage points, or 3.5 percentage points if labor is adjusted for education levels. In the 1990s, growth was 5.2 percent, led by the capital stock expansion (the labor force contributed 1.1 percentage points). These episodes compare favorably against the already high historical average of 4 percent (Table 1).

Growth accounting suggests that until the 1980s the contribution of labor to growth dominated, driven by the population boom and the entry of women in the labor force (Table 1, Figure 8). After the eradication of malaria in the 1940s, Mauritius went through a dramatic demographic transition. In one year in the 1940s, the mortality rate declined by 30 percent. Population growth reached a peak of 4 percent in mid 1950s, making it one the highest in the world (Greenaway and Dabee, 2001). The population boom led to James Meade's famous doomsayer prediction of Mauritius becoming a "case study in Malthusian economics." However, fertility rates adjusted eventually and fell by 60 percent between 1962 and 1973, following extensive government programs to encourage family planning. Today, population growth is virtually zero.

A parallel demographic development was the entry of women into the labor force, with female participation rates rising by almost 60 percent between 1983 and 1999. The labor force successfully absorbed both the "baby boom" cohort and the additional female workers. This was made possible by the development of export-oriented, labor-intensive manufacturing with lower wages and more flexible labor markets, which was also part of the 3-pronged strategy proposed by Meade. As a result, employment gained so strongly that by the early 1990s unemployment was virtually eliminated (Figure 9) and Mauritius began importing labor. However, since the low in the early nineties, unemployment has increased from about 3 to over 8 percent in 2013, mostly driven by female and youth unemployment, which might reflect a problem of skill mix.[13]

Starting in the 1990s, capital-driven growth took over. Partly, this was driven by the decline in the role of labor, with the slowing population growth and rising unemployment (Figure 9). But mostly this was due to the dramatic boost to capital growth as Mauritius expanded its capital base by diversifying into textiles and later into the higher-end and more capital-intensive brackets of the sugar and textiles market. After an initial textile-driven expansion in the 1970s, capital accumulation slowed in the following decade as unutilized capacity was brought back into production following the 1980-81 crisis. But by the end of 1980s both public and private investment had picked up (Figure 8), with private investment almost doubling from 11.3 percent of GDP in 1982 to 20 percent in 1991. According to Subramanian and Roy (2001), the reinvestment sugar and textile profits played a crucial role in sustaining high levels of investment in Mauritius, with domestic rather than foreign savings financing investment during the growth boom.[14] With the disappearance of the profits in sugar and textile in the 2000s, Mauritius relied increasingly on FDI inflows to finance investment. After having peaked at almost 8 percent in the late 1990s, the growth in the capital stock decline to about 4.5 percent on average at present, which is still above the historical average.

[13] See annex on labor markets in the 2013 Article IV consultation report.

[14] The 1980s were somewhat of a lost decade for Mauritius as the boom in sugar prices in 1973 and 1976 set of a fiscal expansion which was not reversed when the sugar boom turned around. As a result, by the 1980s, the fiscal deficit stood at 10 percent and current account deficit at 20 percent of the GDP respectively, the debt service ratio rose to 10 percent and inflation was 24 percent. A series of three IMF Stand-By Agreements and two World Bank Structural Adjustment Programs contributed to implementing macroeconomic and structural reforms that laid ground for the following strong performance.

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Table 1
Mauritius: Decomposing Historical Growth, 1951–2013
(Elasticity $\alpha = 0.35$, depreciation $\delta = 7\%$)

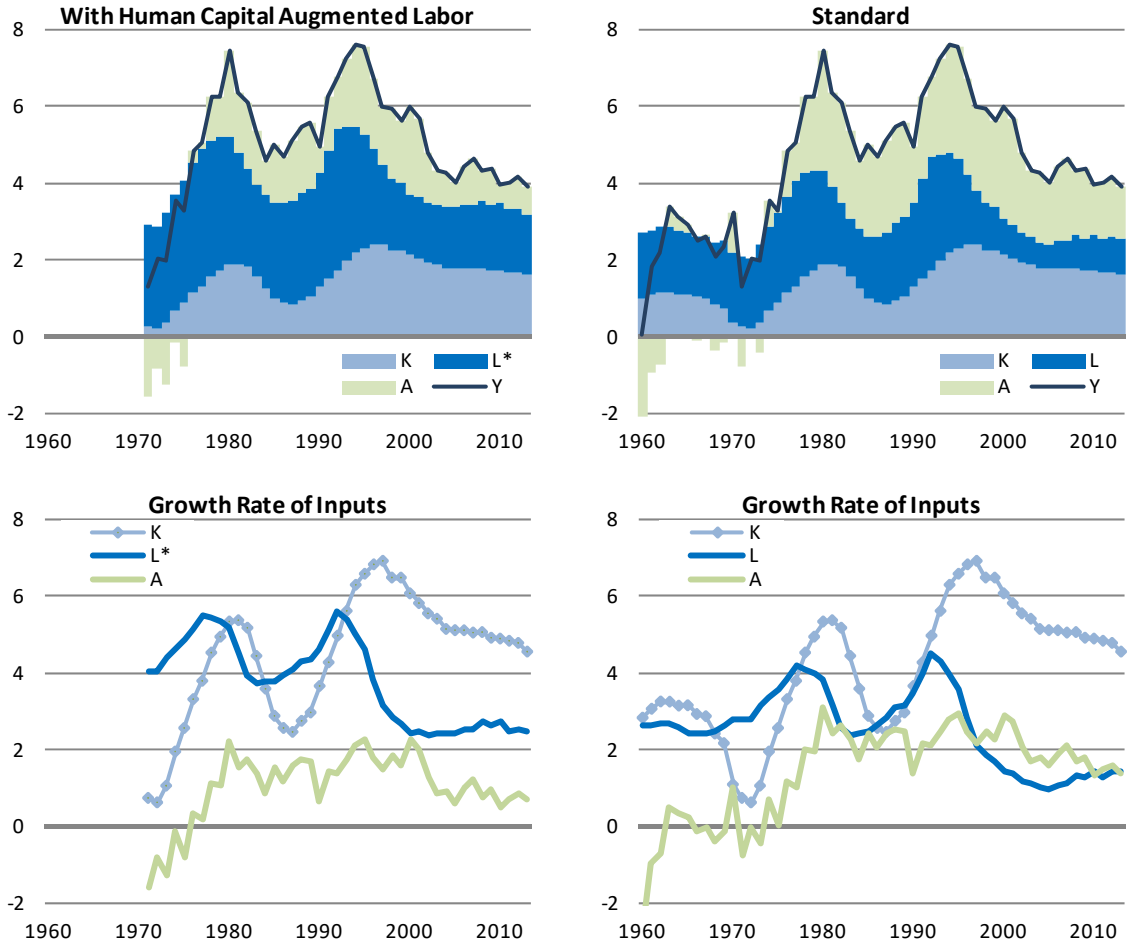
	1950s	1960s[1)]	1970s	1980s	1990s	2000s[2)]	Ave Hist (1950–2013)	Ave Hist (1960–2013)
Real growth, Y	1.1	2.4	6.3	5.6	5.6	4.2	4.2	5.0
Contribution of:								
K	0.8	0.8	1.7	1.0	2.3	1.6	1.4	1.5
L^*		2.6	3.5	2.8	1.8	1.6	…	2.4
A^*		0.5	1.1	1.7	1.6	0.9	…	1.1
L	1.8	1.7	2.6	2.1	1.1	0.9	1.6	1.6
A	-1.5	-0.1	2.0	2.5	2.3	1.7	1.2	1.9

Contribution of $L = (1 - \alpha)dL/L$
Contribution of $K = \alpha\, dK/K$
Contribution of $A = dY/Y - \alpha\, dK/K - (1 - \alpha)dL/L$

1) The average contribution for 1960s does not add to average growth for the augmented model because the human capital data start in 1961.
2) Includes 2000–2013. Data on human capital for 2011–13 is based on baseline projections.

Sources: CSO; and authors' calculations.

Figure 8
Mauritius: Growth Decomposition, 1951–2013
(10-year rolling average of growth rates; elasticity $\alpha = 0.35$, depreciation $\delta = 10\%$)



Sources: CSO; and authors' calculations.

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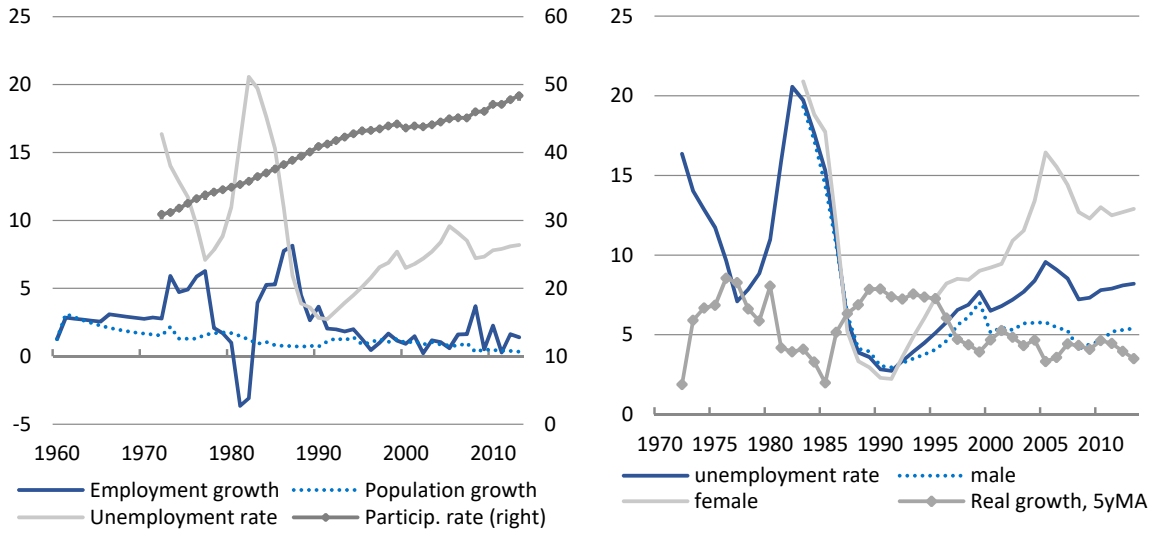
Figure 9
Labor Market Developments, 1960–2013



Sources: CSO; and authors' calculations.

Total factor productivity gained importance over time. Economic growth was primarily led by factor accumulation until the 1990s, which is consistent with Mauritius converging to a higher GDP per capita equilibrium in the standard Solow model. After the 1990s, however, productivity played a role similar to that of capital accumulation. As Figure 8 shows, TFP has become permanently higher than before, and has recently averaged 1 percent in the model with human capital, compared to an average of about a ¼ percent during the 1960s to 1980s.[15] Accounting for human capital (L^*) results in lower productivity estimates since some of the growth is explained a more educated labor force, instead of ending up in the residual TFP calculation, but probably reflects the structure of the Mauritian economy better than the standard Solow model.

Larger capital shares (α) decrease the productivity estimates for the whole period, but not by much (Table 2). This is driven by the fact that overall, capital has been the fastest growing input. Giving capital a larger share in explaining GDP growth reduces the residual. However, the difference is only marginal. The largest difference is only 0.2 percentage points between a capital share of 50 percent versus 25 percent for the case of a 15 percent depreciation rate.[16] Similarly, assuming a lower depreciation rate tends to have the same effect because it increases capital growth and hence reduces the residual.

Historically, growth was mainly driven by private consumption, with a declining contribution from private investment (Figure 10).

[15] The standard growth accounting yields TFP contributions of almost 2 percent for the last two decades. Our estimates for productivity are of similar in magnitude to CSO estimates in its annual Digest of Productivity and Competitiveness Statistics, World Bank estimates in the 2007 Mauritius Country Economic Memorandum (both rely on time-varying factor shares from the national accounts), and Bosworth and Collins (2003).

[16] The largest difference is 0.4 percent in the standard Solow model without a role of human capital, partly because the improvement in human capital is captured by the residual definition of TFP.

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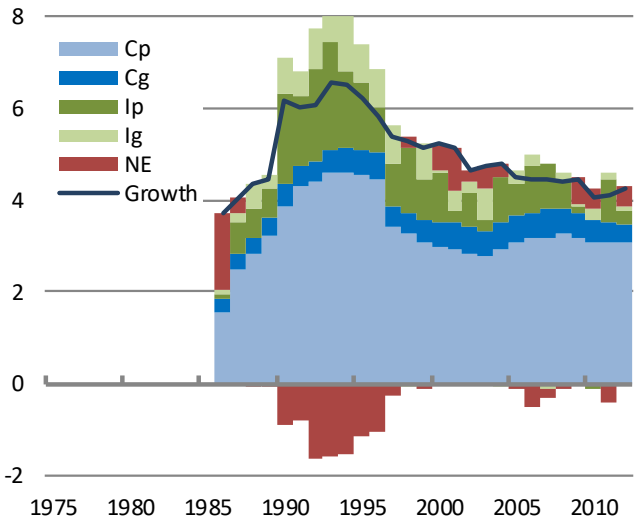
Table 2
Sensitivity, 1961–2013[1]

	Capital Share		
	0.25	0.35	0.50
Real growth, Y	5.0	5.0	5.0
Contribution of:			
L^*	2.8	2.4	1.8
L	1.9	1.6	1.2
		5% depreciation	
K	1.0	1.4	2.0
A^*	1.2	1.2	1.1
A	2.1	2.0	1.7
		7% depreciation	
K	1.0	1.5	2.1
A^*	1.2	1.1	1.1
A	2.1	1.9	1.7
		10% depreciation	
K	1.1	1.5	2.1
A^*	1.2	1.1	1.0
A	2.1	1.9	1.6

[1)] Data on human capital for 2011–13 is based on baseline projections.

Figure 10
Mauritius: Growth Decomposition by Expenditure, 1975–2013
(10-year rolling average)



Sources: CSO; and authors' calculations.

5. BASELINE PROJECTION SCENARIO AND SENSITIVITY ANALYSIS

In our baseline projection, we look at the most likely ranges of growth for Mauritius over the next twenty years given various plausible assumptions regarding the growth of factor inputs and productivity. We explore optimistic and pessimistic scenarios in order to assess the sensitivity of the growth projections to input assumptions. Given the extent of transformation undergone

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and expected for the Mauritian economy, it is difficult to forecast growth with great confidence. Instead, the intent of this section is to explore the implications of a range of capital, labor, and productivity assumptions on the long-term growth trajectories, and to explore policy options to improve future outcomes.

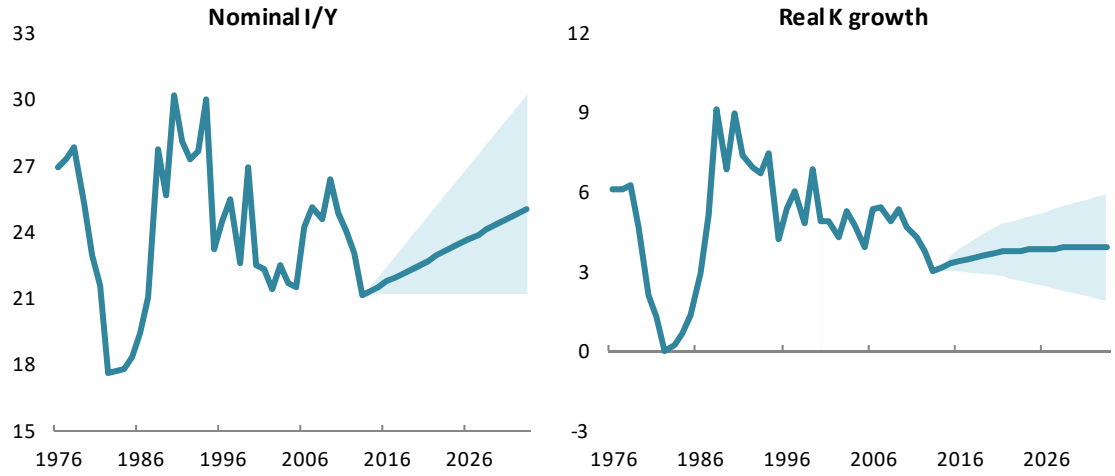
In discussing our projections, we compare Mauritius with the experience of the four Asian Tigers: Hong Kong, Singapore, South Korea, and Taiwan. These were the first newly industrialized countries, noted for maintaining high growth rates between the 1960s and 1990s and graduating into high-income economies by the end of the century. All four countries have a highly educated and skilled workforce and have developed into leading international financial (Hong Kong and Singapore) and/or information technology (South Korea and Taiwan) centers.

5.1. Factor inputs

5.1.1. Capital stock

In our baseline, we assume a gradual increase in the investment ratio from 21 percent in 2013 to 25 percent by the end of 2033, which results in an average capital growth of 3.7 percent (Figure 11). The highest historical investment rate achieved by Mauritius was 30 percent in the 1990s, which is still at the lower bound of the investment rates achieved by the Asian Tigers (Figure 12.A).

Figure 11
Capital Growth Projections, 1975–2033
(Depreciation $\delta = 7\%$)



Sources: CSO; and authors' calculations.

In sensitivity tests, which are given by the upper and lower bounds of the projection cone in the charts, we look at the impact of increasing the investment rate to its historical maximum of 30 percent of GDP for the optimistic scenario and staying at the current level for the pessimistic scenario, which happens to be the most recent historical low of the 1990–2000s. Using the historical highs and lows for Mauritius seems a reasonable assumption. However, the international comparison shows that investment rates in some developing countries peaked around 35–40 percent (Dadush and Stancil, 2010), whereas developed countries invest approximately 20 percent of GDP each year.

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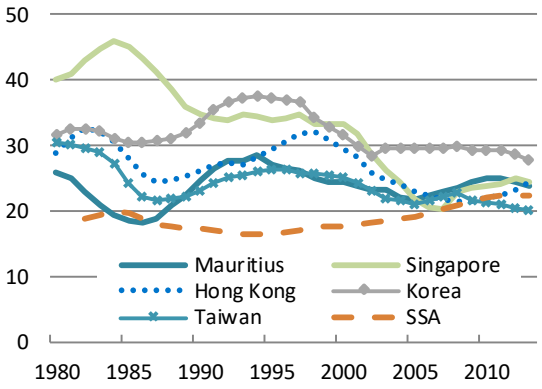
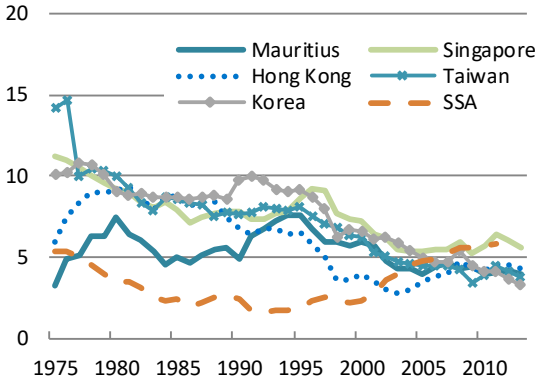
5.1.2. Labor force

Figure 12
Comparison with Asian Tigers (AT) and Sub-Saharan Africa, 1975–2011

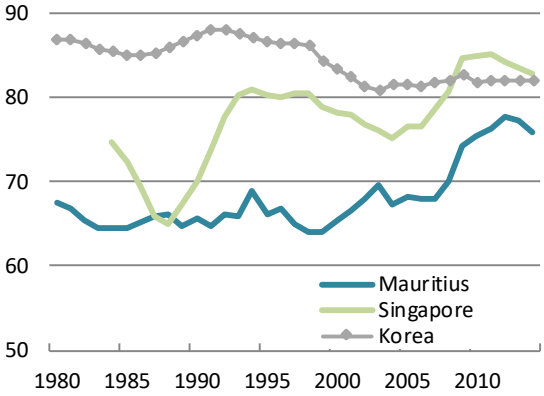
A. Nominal I/Y (5y MA)
Investment rates in Mauritius are lower than during the high growth phases of the AT



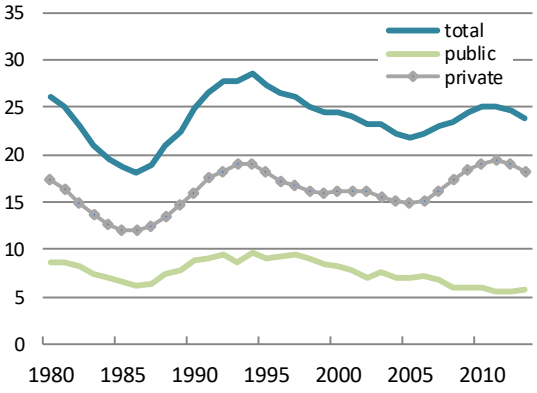
B. GDP growth (5yMA)
Mauritius' growth rates today are comparable to the AT, who grew much faster in the past



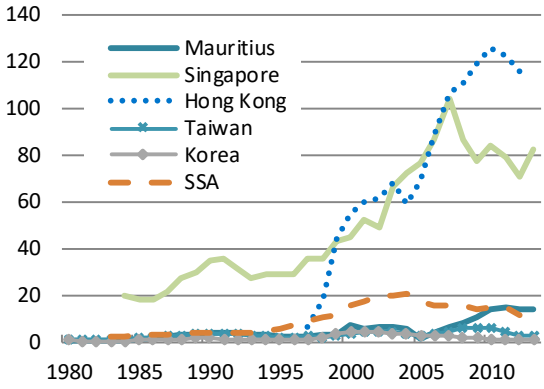
C. Share of public I in total
Mauritius has a lower share of private investment than Korea or Singapore



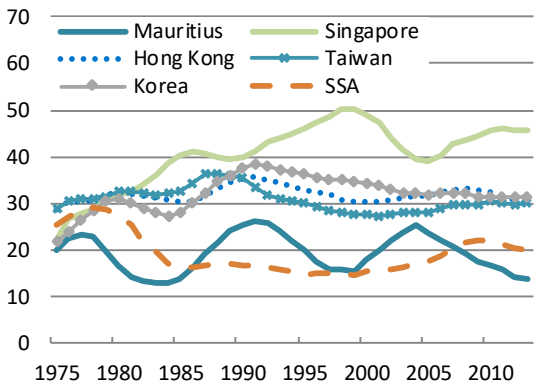
D. Mauritius: Nominal I/Y
Public investment in Mauritius has been more stable than private, but both have been decreasing recently



E. FDI (% of total domestic investment)
FDI constitutes a lower share of investment than Singapore or Hong Kong



F. Savings rate (% of GDP)
Mauritius has low savings rates, which have declined below the SSA average



Sources: IMF World Economic Outlook; CSO.

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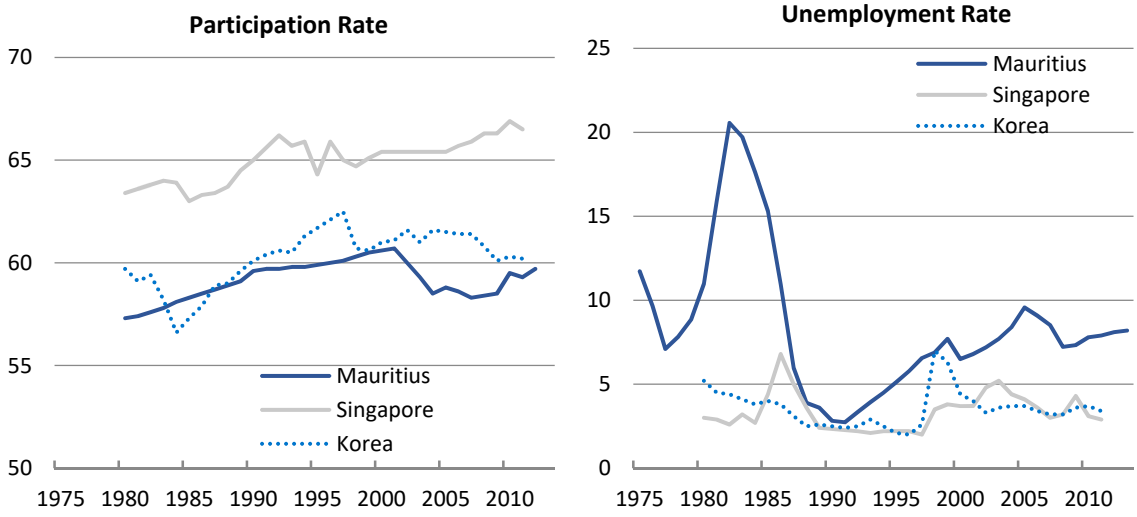
We use the United Nations Population Division forecasts of population growth in Mauritius. For the baseline projection, their median-variant forecast of the average growth of population aged 15–59 during 2014–33 is on average -0.34 percent per year (Figure 13). The 2013 participation rate of 60.6 percent and unemployment rate of 8.2 percent are assumed to improve to 63.6 and 6 percent respectively by 2030. The improvements in the labor markets conditions are assumed to come mainly from female workers. Male participation rate is currently at 77 percent, which is in line with the regional averages for Africa, Asia, Europe, North and Latin America, according to the ILO. Female participation, on the other hand, is 42 percent in Mauritius, which is below the 50 to 60 percent range for the regional averages. The optimistic scenario uses the UN high-variant population forecast (-0.19 percent), and assumes that participation rate reaches by 2033 that of today's Singapore (65 percent) and unemployment rate reaches the structural level of 4.5 percent. The pessimistic scenario uses the low-variant population forecast (-0.49 percent) and no changes in participation and unemployment rates.

Figure 13
Labor Market Comparisons, 1975–2013



Sources: Statistics Mauritius; and World Bank Development Indicators.

5.1.3. Human capital

We use projections of population by the level of educational attainment from the International Institute for Applied Systems Analysis (Samir et al., 2010). For our baseline projection we adopt their global education trend scenario, which assumes that a country's educational expansion will converge on an expansion trajectory based on the historical global trend (Figure 14). The optimistic projection is based on the fast-track scenario, which assumes the achievement of certain milestones, such as Millennium Development and the Education for All goals. If stated targets in educational attainment are not reached by certain years, then an accelerated rate of growth is applied that meets these targets. The pessimistic scenario uses the constant enrollment ratio projection, which demonstrates the implications of extending the status quo into the future by assuming that the proportion of each cohort (by gender) making each educational transition at the appropriate age remains constant over time

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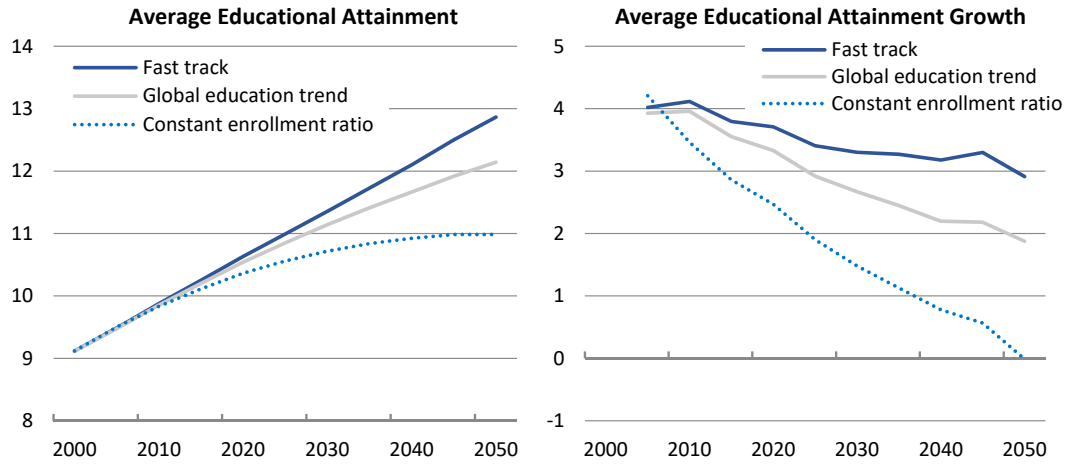
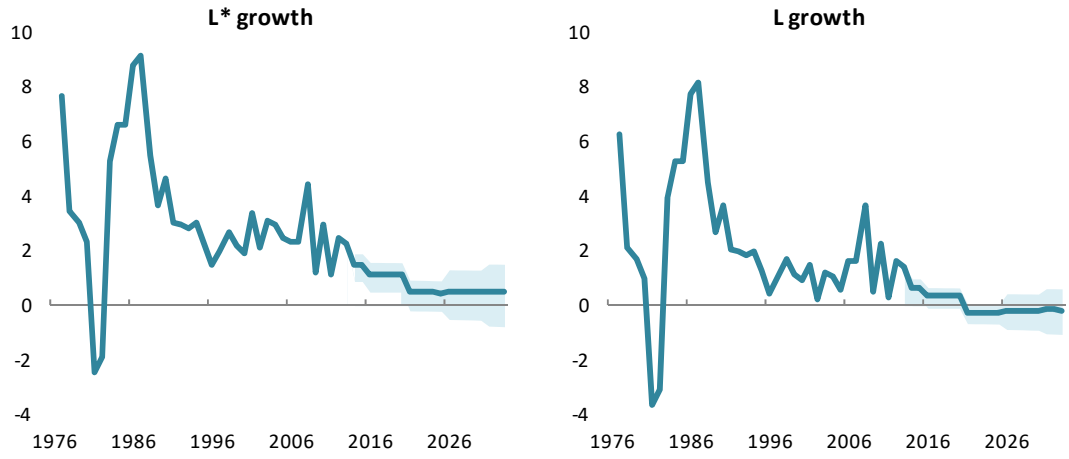
Figure 14
Educational Attainment Projections, 2000–2050



Sources: Statistics Mauritius; and Samir et al., 2010.

Labor inputs are projected to grow at a declining rate over time (Figure 15). Human capital augmented labor growth will decline from an average of about 2 percent per year to less than ½ percent per year by 2033, although with a band of almost +/- 1 percent given the different assumptions about labor force growth and educational attainment. The growth of the labor force itself is projected to become slightly negative by 2033.

Figure 15
Mauritius: Labor Growth Projections, 1975–2033



Sources: Statistics Mauritius; and authors' projections.

5.1.4. Productivity

TFP growth is assumed to be at its 40-year average, which varies depending on the assumed share of labor in output and the modeling of human capital (Figure 16). Going forward, Mauritius would need to rely more heavily on improvements in TFP to sustain growth, especially in the context of the transition towards a high-valued added economy. The optimistic scenario assumes that TFP growth path at the end of the projection period is higher by 75 basis points; while the pessimistic scenario assumes that is it 75 basis points lower. Thus, TFP growth in 2033 would be 2 percent in the optimistic scenario and about zero percent in the pessimistic scenario.[17]

[17] TFP in the standard growth model would start at a higher level of about 1¾ percent per year.

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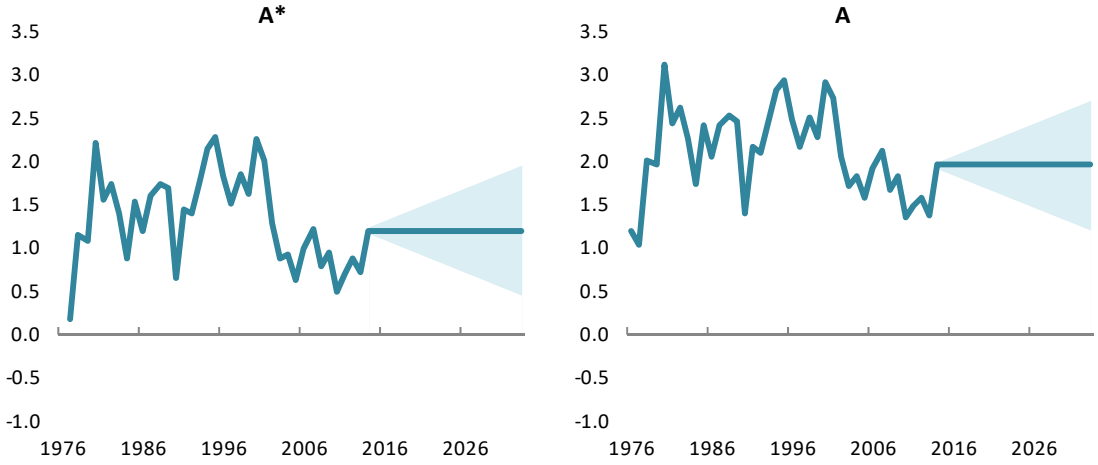
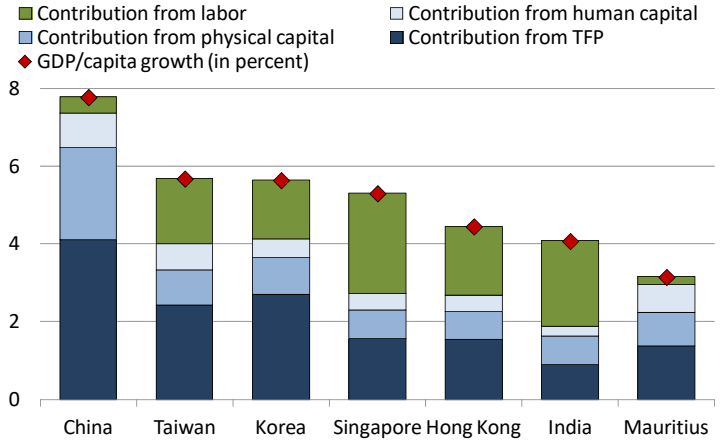
Figure 16
Mauritius: Productivity Projections, 1975–2030



Sources: Statistics Mauritius; and authors' projections.

Estimates for growth success stories in Asia by Aiyar et al. (2013) suggest that there is potential for TFP growth to be higher, even though Mauritius' experience is in line with Singapore and Hong Kong (Figure 17). However, Taiwan and Korea achieved long-run TFP growth of almost 3 percentage points in per capita terms on average over 1970–2009.

Figure 17
Mauritius: International Comparison of TFP as the Driver of Growth
(Growth contribution in per capita terms)



Note: 1970–2013 averages for Mauritius. 1970–2009 averages for Asian countries, where GDP growth is expressed in PPP terms.

Sources: Aiyar at al. (2013); authors' calculations.

5.2. Baseline growth projection

In the baseline, Mauritius' long-run average growth rate is estimated at around 3 percent in the human capital augmented growth model (Table 3). The baseline assumptions result in a high estimate of 3.4 percent (5 percent depreciation and 50 percent capital share) and a low estimate of 2.7 percent (15 percent depreciation and 25 percent capital share).[18] Increasing the share of capital in output, α, tends to increase the growth rate projections because while lowering the historical

[18] In the standard Solow model, the baseline growth rate is 4 percent with a variation from 3.6 to 4.1 percent depending on capital share and depreciation assumptions. However, the human capital augmented growth model seems more appropriate for a knowledge intensive economy like Mauritius.

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average estimate of TFP growth, it assigns a larger role to capital accumulation in explaining past growth rates. In general, higher depreciation rates tend to reduce growth projections by lowering capital stock growth.

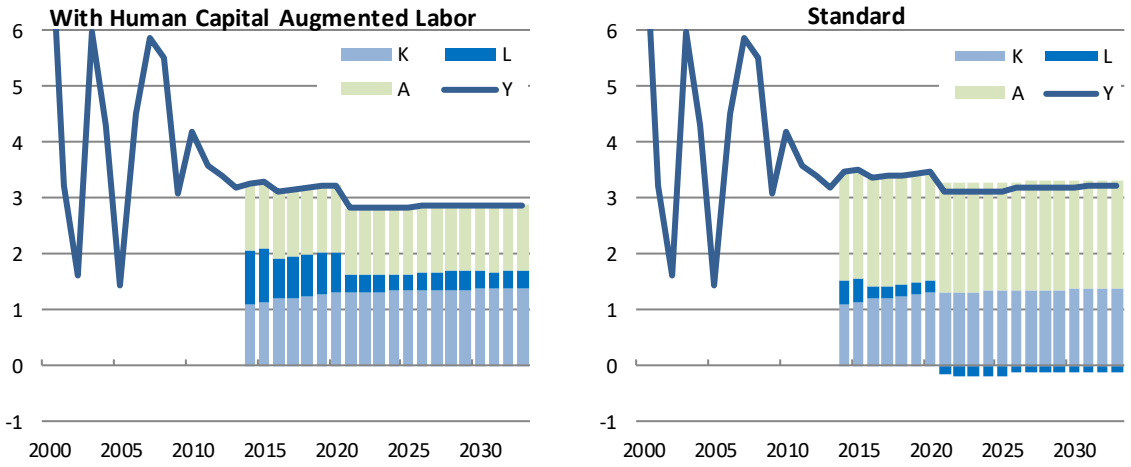
Table 3
Mauritius: Baseline Scenario, 2014–33

Elasticity	With Human Capital 0.25	0.35	0.50	Standard 0.25	0.35	0.50
			5% depreciation			
Real growth, *Y*	**2.92**	**3.10**	**3.36**	**3.25**	**3.38**	**3.58**
Contribution of:						
L	0.56	0.49	0.38	0.01	0.01	0.01
K	0.97	1.36	1.94	0.97	1.36	1.94
A	1.39	1.25	1.05	2.26	2.01	1.64
			7% depreciation			
Real growth, *Y*	**2.84**	**2.99**	**3.21**	**3.17**	**3.27**	**3.43**
Contribution of:						
L	0.56	0.49	0.38	0.01	0.01	0.01
K	0.93	1.31	1.87	0.93	1.31	1.87
A	1.34	1.19	0.96	2.22	1.95	1.55
			10% depreciation			
Real growth, *Y*	**2.76**	**2.88**	**3.05**	**3.09**	**3.16**	**3.27**
Contribution of:						
L	0.56	0.49	0.38	0.01	0.01	0.01
K	0.90	1.26	1.80	0.90	1.26	1.80
A	1.30	1.13	0.88	2.18	1.89	1.46

Source: Authors' projections.

Capital accumulation and total factor productivity improvements are the main drivers of growth in the baseline projections (Figure 18). This seems reasonable since the working age population will peak in 2015 using the UN projection. There would still be a small contribution from labor due to improvements in human capital, but would fall from about 1 percent per year in the mid 2010s to about a ¼ percent by the end of the projection period. Both capital and TFP would account for about 1½ percentage points per year with an increasing role for TFP. Overall growth rates would be stable at around 3 percent.

Figure 18
Mauritius: Growth Decomposition (Baseline Scenario), 2014–33
(Capital share $\alpha = 0.35$, depreciation $\delta = 7\%$)



Source: Authors' projections.

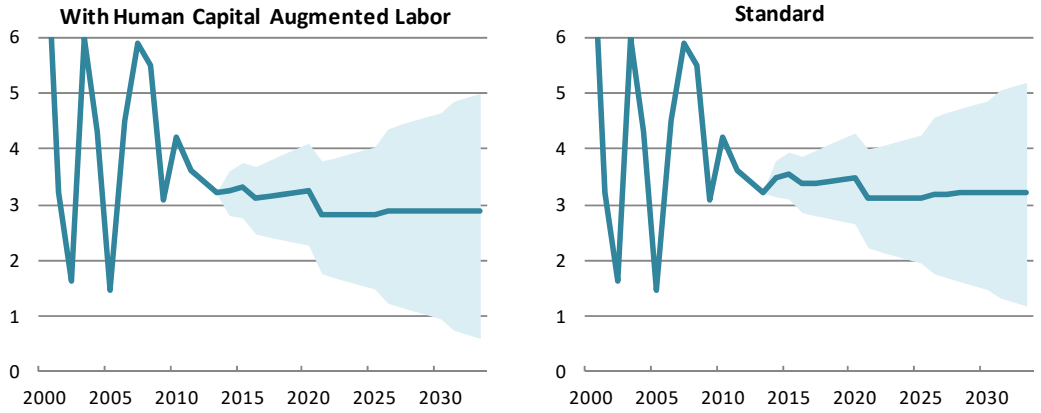
DOI: 10.7172/2353-6845.jbfe.2017.2.3

5.3. Sensitivity analysis

The sensitivity analysis show plausible ranges of long-run growth under the optimistic and the pessimistic scenarios (Figure 19, and Tables 4 and 5). In the human capital augmented growth model, growth rates in 2033 range from 5 percent in the optimistic case to ½ percent in the pessimistic case.

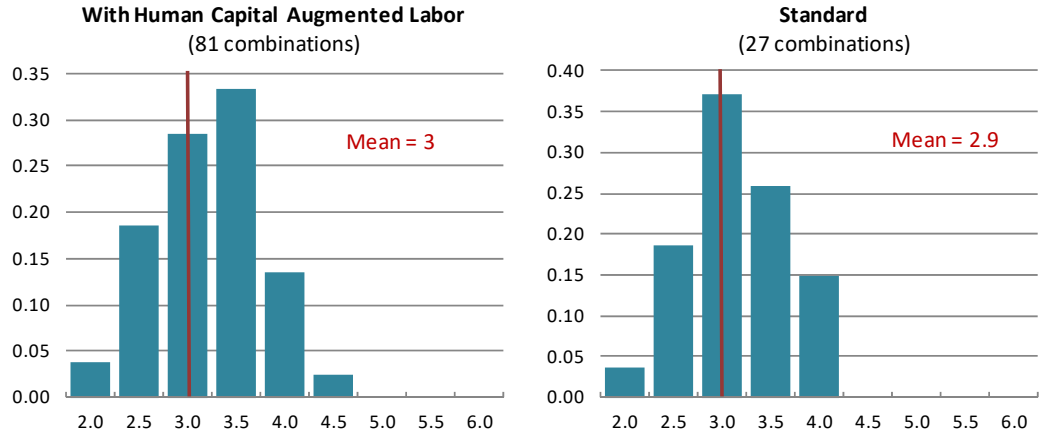
The likelihood of achieving an average growth rate of 6 percent growth is small. Taking the central scenario of capital share $\alpha = 0.35$ and depreciation rate $\delta = 7$ percent, Figure 20 gives the frequency distribution of the likely growth outcomes over all possible combinations of scenarios (baseline, optimistic, and pessimistic) for the factor inputs. There are a total of 81 average growth paths for the human capital augmented model and 27 possible growth paths for the standard growth accounting.[19] The median average growth for the human capital augmented growth model is 3 percent, which is the same as the mean. Both models have their mode (most common value) at 3 percent.

Figure 19
Mauritius: Sensitivity of Growth Projections, 2000–33
(The shaded areas give ranges of growth under optimistic and pessimistic scenarios for capital share $\alpha = 0.35$ and depreciation rate $\delta = 7\%$)



Source: Authors' projections.

Figure 20
Frequency Distribution of Average Growth Rates
(Capital share $\alpha = 0.35$, depreciation $\delta = 7\%$)



Source: Authors' projections.

[19] The total number of possible combinations from n sets each of size k when each set selection is non-empty (no null elements) is n^k. Increasing the possible combinations by also varying the depreciation rate and the capital share rate would increase the variation of estimates, but would not materially change the mode, median, or mean projections.

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Table 4
Mauritius: Optimistic Scenario, 2014–33

	With Human Capital			Standard		
Elasticity	0.25	0.35	0.50	0.25	0.35	0.50
			5% depreciation			
Real growth, *Y*	**4.01**	**4.23**	**4.56**	**4.23**	**4.42**	**4.70**
Contribution of:						
L	1.01	0.88	0.68	0.36	0.31	0.24
K	1.22	1.70	2.43	1.22	1.70	2.43
A	1.78	1.65	1.45	2.66	2.41	2.03
			7% depreciation			
Real growth, *Y*	**3.97**	**4.17**	**4.47**	**4.19**	**4.36**	**4.62**
Contribution of:						
L	1.01	0.88	0.68	0.36	0.31	0.24
K	1.12	1.71	2.44	1.22	1.71	2.44
A	1.60	1.58	1.35	2.61	2.34	1.94
			10% depreciation			
Real growth, *Y*	**3.94**	**4.13**	**4.41**	**4.16**	**4.32**	**4.56**
Contribution of:						
L	1.01	0.88	0.68	0.36	0.31	0.24
K	1.23	1.73	2.46	1.23	1.73	2.46
A	1.69	1.52	1.27	2.57	2.28	1.86

Source: Authors' projections.

Table 5
Mauritius: Pessimistic Scenario, 2014–33

	With Human Capital			Standard		
Elasticity	0.25	0.35	0.50	0.25	0.35	0.50
			5% depreciation			
Real growth, *Y*	**1.62**	**1.78**	**2.03**	**2.17**	**2.26**	**2.39**
Contribution of:						
L	-0.09	-0.08	-0.06	-0.42	-0.36	-0.17
K	0.72	1.00	1.43	0.72	1.00	1.43
A	0.99	0.86	0.66	1.87	1.62	1.24
			7% depreciation			
Real growth, *Y*	**1.53**	**1.64**	**1.82**	**2.06**	**2.10**	**2.17**
Contribution of:						
L	-0.07	-0.06	-0.05	-0.42	-0.36	-0.28
K	0.65	0.91	1.30	0.65	0.91	1.30
A	0.95	0.79	0.57	1.83	1.56	1.15
			10% depreciation			
Real growth, *Y*	**1.39**	**1.46**	**1.57**	**1.94**	**1.94**	**1.94**
Contribution of:						
L	-0.09	-0.08	-0.06	-0.42	-0.36	-0.28
K	0.57	0.80	1.15	0.57	0.80	1.15
A	0.90	0.74	0.48	1.78	1.50	1.07

Source: Authors' projections.

Growth could approach 5 percent if the optimistic scenario materializes (Table 4). Interestingly, the estimate is not particularly sensitive to the choice of the depreciation rate and capital ratio, with the highest average growth rate at 4.6 percent and the lowest at 3.9 percent in the AHCM. Roughly speaking (in the case of $\alpha = 0.35$, $\delta = 7\%$), the largest contribution to growth would come from capital at about 1.7 percentage points, which underlines the importance of increasing savings and investment rates. Total factor productivity is similarly important at 1.5 percentage points, which would require significant improvements in the efficiency of resource allocation in

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the economy. Labor accounts for slightly less than 1 percentage points, of which half is expected to come from human capital accumulation as opposed to labor force increases.

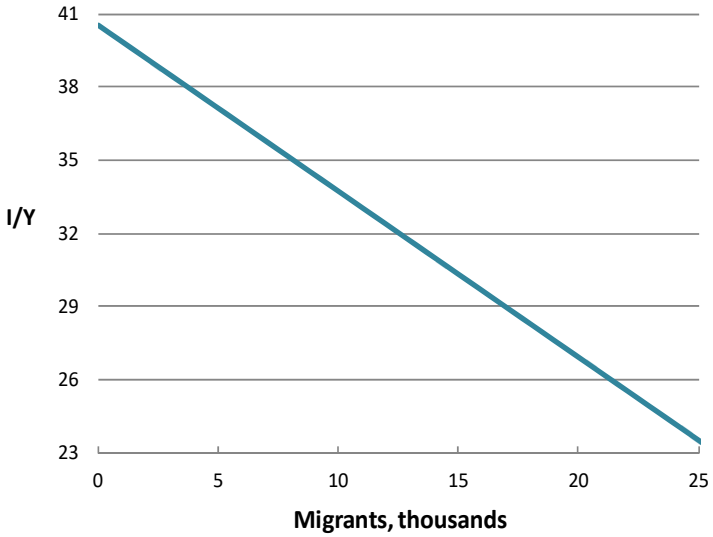
In the pessimistic scenario growth might only be about 2 percent on average (Table 5). Most of the growth would still come from capital accumulation and TFP growth and little from labor. The pessimistic scenario is a reminder that good policies matter. In the optimistic scenario per-capita income in 2033 would be some 64 percent higher than in the pessimistic scenario (capital share $\alpha = 0.35$ and depreciation rate $\delta = 7\%$). Alternatively, Mauritius would reach high-income status (US$12,616 or more in World Bank definition) in the year 2028 under the optimistic scenario, but only in the year 2036 in the pessimistic scenario.

6. POLICY OPTIONS TO RAIST THE LONG-RUN GROWTH RATE

The results of the growth accounting exercise suggest that a target growth of 6 percent is likely too ambitious and that even to raise growth closer to 5 percent strong pro-active policies are needed, including: (i) improving investment and savings rates; (ii) labor market reforms; (iii) investment in education and education reform; and (iv) further reforms to reduce bottlenecks and increase productivity.

Raising medium-term growth to 6 percent would require substantial changes in the investment and migration policies. To achieve 6 percent growth, either the investment to GDP ratio would need to rise to about 40 percent (compared to the projection average of 23 percent under the baseline) or the labor market would need to open to accept about 25 thousand migrant workers per year. A combination of the two policies would require less dramatic changes. Increasing investment ratio by about 10 percentage points compared to the projection average to reach Mauritius' historical highs and integrating about 12 thousand migrant workers per year would be sufficient. As can be seen in chart 17, the island economies of Singapore, Taiwan, and Hong Kong were able to sustain high growth rates partly because they were open to importing foreign skilled labor. In practice, TFP growth would likely rise with the technology and skills transfers related to increased FDI and/or foreign skilled labor, necessitating less of an adjustment.

Figure 21
Mauritius: Migration and Investment Needed to Raise Growth to 6 Percent



Under the baseline scenario for 2014–2033:
Capital share $\alpha = 0.35$
Depreciation rate $\delta = 7\%$
Average productivity growth $A = 1.19$
Average labor quality growth = 0.7
Average population growth = 0.02

Source: Authors' calculations.

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6.1. Investment and capital formation

There is a need to upgrade and expand the country's capital stock, especially infrastructure, in order to improve competitiveness and facilitate transformation into a knowledge-based economy. Improving the investment rates would need to be accomplished through (i) acceleration in the implementation of current investment projects; and (ii) further measures to encourage FDI and domestic savings. On the side of the public sector, while the government has planned a large infrastructure investment program to alleviate road congestion and increase other infrastructure capacity (port, airport, power sector), actual expenditure from the capital budget has been low, highlighting design and implementation capacity constraints. Looking forward, investments would need to be financed through other channels, given low fiscal space due to the need to reduce the public debt levels, in accordance with the Debt Law.

A comparison of Mauritius and the Asian Tigers suggests that investment rates and FDI seem to have played a significant role in explaining growth. Both investment rates and FDI's share in investment were relatively low in Mauritius compared to Singapore and Hong Kong (Figures 12.A and 12.E).

Tapping into these other channels of investment funds – private domestic savings and FDI – would require some policy actions. Even though Mauritius boasts a well developed financial sector relative to the rest of Sub-Saharan Africa, the domestic savings rate has been low and falling, compared to the Asian Tigers (Figure 12.F). Over longer periods, there is a close empirical relationship between investment and savings, and it would be desirable for savings rates to return from the current low levels of about 15 percent of GDP to historical levels of around 25 percent. In this respect, medium-term fiscal adjustment and pension reform could help increase the savings rate.[20]

Historically, FDI played a role not so much through facilitating the investment rates, but through technology transfers. For example, while the FDI from Hong Kong based textile producers in the 1980s helped establish the EPZ, its share in domestic investment never exceeded 6 percent. Improvements in the business environment in the 2000s, combined with economic and political stability and spillovers from the double taxation treaties, increased the share of FDI in domestic investment to 20 percent by 2010. Yet, it is only a fifth of similar ratios for Singapore and Hong Kong (Figure 12.E) and further increases would benefit both investment rates and technology transfers.

The World Bank Ease of Doing Business survey gives relatively good ratings to Mauritius in general, but it also indicates that Mauritius still has some room for improvement in the access to credit subcategory of the business environment, ranking only 9th in Africa and 53rd in the world on this subcategory in 2013 (Table 6). Access to credit category describes the legal rights of borrowers and lenders with respect to secured transactions and the sharing of credit information. It measures how well collateral and bankruptcy laws facilitate lending, as well as the coverage, scope and accessibility of credit information available through public credit registries and private credit bureaus. According to Djankov et al. (2007), both creditor protection through the legal system and information sharing institutions are associated with higher ratios of private credit to GDP. They also show that credit rises after improvements in creditor rights and in information sharing. Improving the business and investment climate would benefit both capital accumulation and TFP growth, particularly because there is learning through investment.

[20] See appendix on pension reform in IMF (2013) – Mauritius 2013 Article IV Consultation, IMF Country Report No. 13/97.

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6.2. Labor market

The labor market in Mauritius since the 1990s has been characterized by a rising share of foreign workers in the labor force (from 0.2 percent in 1990 to 4 percent in 2009) and a rise in female unemployment over the same horizon from 2 to over 10 percent, driving up the total unemployment rate to over 8 percent in 2013. At the same time, increased demand for skilled workers in the financial services, ITC, and tourism sectors relative to the low-skilled textile and sugar sectors.

Table 6
Business Environment, 2014

	Ease of Doing Business Ranking											Corruption Perception Ranking
	Overall	Starting a Business	Dealing with Construction Permits	Getting Electricity	Registering Property	Getting Credit	Protecting Investors	Paying Taxes	Trading Across Borders	Enforcing Contracts	Resolving Insolvency	
World ranking												
Singapore	1	3	3	6	28	3	2	5	1	12	4	5
Hong Kong	2	5	1	5	89	3	3	4	2	9	19	15
New Zealand	3	1	12	45	2	3	1	23	21	18	12	1
United States	4	20	34	13	25	3	6	64	22	11	17	19
Denmark	5	40	8	18	7	28	34	12	8	32	10	1
Malaysia	6	6	43	21	35	1	4	36	5	30	42	53
Korea (South)	7	34	18	2	75	13	52	25	3	2	15	46
Georgia	8	8	2	54	1	3	16	29	43	33	88	55
Norway	9	53	28	17	10	73	22	17	26	4	2	5
United Kingdom	10	28	27	74	68	1	10	14	16	56	7	14
Australia	11	4	10	34	40	3	68	44	46	14	18	9
Finland	12	55	36	22	26	42	68	21	9	8	3	3
Iceland	13	52	41	1	12	42	52	37	50	3	11	12
Sweden	14	61	24	9	38	42	34	41	6	25	20	3
Ireland	15	12	115	100	57	13	6	6	20	62	8	21
Taiwan	16	17	7	7	31	73	34	58	18	84	16	36
Lithuania	17	11	39	75	6	28	68	56	15	17	44	43
Thailand	18	91	14	12	29	73	12	70	24	22	58	102
Canada	19	2	116	145	55	28	4	8	45	58	9	9
Mauritius	20	19	123	48	65	42	12	13	12	54	61	52
Sub-Saharan regional ranking												
Mauritius	**1**	**2**	**22**	**1**	**7**	**7**	**2**	**1**	**1**	**7**	**2**	**5**
Rwanda	2	1	14	2	1	1	3	3	31	2	22	**4**
South Africa	3	7	1	27	15	5	1	4	7	12	8	**9**
Botswana	4	12	11	13	2	11	7	6	23	14	1	**1**
Ghana	5	20	37	6	4	5	5	9	8	4	16	**8**
Seychelles	6	16	10	25	9	40	9	2	2	13	3	**3**
Zambia	7	6	7	29	17	1	12	9	32	20	5	**13**
Namibia	8	23	2	4	43	9	12	18	20	10	9	**7**
Cape Verde	9	8	28	28	6	14	24	11	4	1	38	**2**
Swaziland	10	39	5	34	24	9	21	7	13	41	4	**12**
Ethiopia	11	37	6	7	19	14	35	17	35	5	6	**21**
Kenya	12	25	4	35	36	1	16	33	27	30	19	**31**
Uganda	13	32	31	40	22	7	19	14	33	18	7	**33**
Lesotho	14	10	32	20	13	35	16	15	22	25	12	**6**
Mozambique	15	11	13	37	32	22	7	21	14	26	26	23

Sources: World Bank Doing Business, 2014; Transparency International, 2013.

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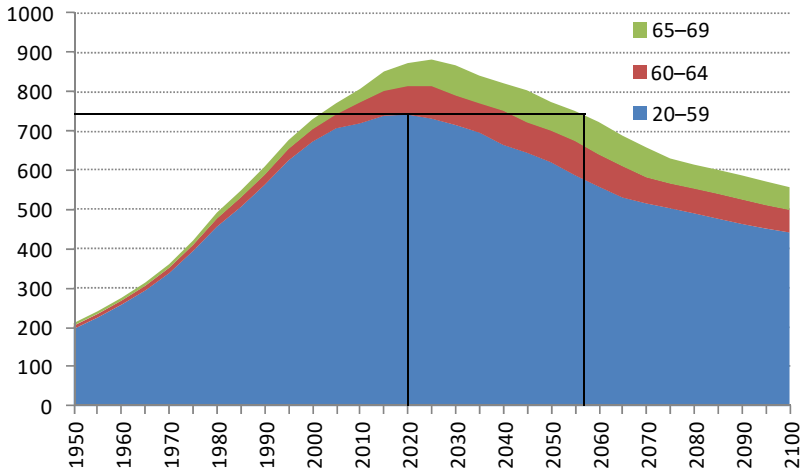
On paper, the labor market appears highly regulated and complex. The government establishes a separate set of labor market regulations, called Remuneration Orders, for each industry, which specify the exact duties and compensation scheme for every type of worker. However, World Bank (2007) shows that there is but a tenuous relation between the orders and actual salary outcomes, while the skill premium in different industry pay schemes is actually substantial. Furthermore, the introduction of the National Pay Council in 2006 has helped to better link wage growth to productivity advancements, with wage adjustments differentiated across sectors, thereby reducing wage rigidity and containing the wage-price spiral. However, the reversal to the older system of the national tripartite negotiations in 2010 may make it more difficult to maintain competitiveness. Under the old system, wage increases were linked to the CPI, and real wages grew much faster than labor productivity in 2000–2006.

A rigid system of determining pay increases and complex labor regulations tend to limit the ability of the economy to undergo structural changes by reducing the ability and incentives to create new jobs and explore new opportunities. The absence of collective bargaining at the firm level prevents firm- and sector-specific factors to be taken into account, for example relative productivity increases. While an appropriate balance between worker protection and labor market flexibility has to be found, in the longer term, the labor market needs to support flexibility, reward higher productivity and support expansion into more innovative activities to enable the transition to the knowledge-based economy. In that process, the concept of protecting the worker, but not the specific job could be the guiding principle in judging labor market reforms.

The rise in unemployment indicates the challenge of absorbing unskilled and semi-skilled workers as Mauritius transforms into a more services-oriented economy. The EPZ sector shifted to employing foreign workers, who are predominantly Chinese female workers coming to work on three-year contracts in the textile industry. The shift is due both to Mauritian workers viewing employment in the EPZ sector as unattractive, with lower wages and job security, and foreign workers being better trained, willing to work overtime and providing a more flexible labor input due to the short-term nature of their contracts. Structural unemployment can be addressed through retraining programs and improving alternative venues of employment, such as improving the business environment for the SMEs with the Business Facilitation Act of 2006. SMEs and self-employment are considered to be substantial channel of job creation for this skill group.

Figure 22
Mauritius: Long-Term Working Age Population Projections, 1950–2100



Sources: UN population projections; and authors' calculation.

Very long-term population projections suggest that the working age population will decline from about 2025–2100. The projections are based on the assumption of unchanged migration patterns and fertility rates (Figure 22). If the projections were to become reality, future very

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long run growth rates might even be lower than calculated abovegiven the scarcity of labor. However, over such long periods, policies might have an influence on both migration and fertility, which might affect actual developments. In addition, there is also a role for increasing labor force participation rates, particularly for women.

6.3. Human capital

Investment in education and education reform are needed to increase secondary and tertiary enrollment rates to address the shortage of skilled labor in the market. Around a third of students consistently fail at the Certificate of Primary Education (CPE), which makes it hard for them to benefit from the current transformations in the Mauritian economy. There is also evidence that the failure rate is concentrated in poor households, perpetuating the poverty trap.[21] According to the CSO Poverty Analysis for 2006/07, 65 percent of heads of poor households and 60 percent of poor households' members (aged 20 and over) haven't passed the CPE, compared to the 39 and 34 percent of the national average. There were more visible improvements in tertiary enrollment, with the rate rising from 3 to 43 percent between 1990 and 2009. Still, enrollment rate translate very slowly into the educational attainment of the labor force. While the share of the labor force with only primary education decreased by 20 percent between 1990 and 2010, it is still 3.5 times higher than in the Asian Tigers, where only about 10 percent of the working population has only primary education (Figure 23). In contrast, tertiary attainment is only 10 percent in Mauritius but 30 percent for the Asian Tigers (AT). There is therefore considerable scope to improve educational attainment in Mauritius. Moreover, educational reforms are needed to provide the work force with appropriate and relevant skills.

6.4. Productivity

With the labor no longer the driver of growth and with capital formation limited by investment rates, a significant part of future growth would need to come through the productivity improvements, especially in the context of the transition towards a high-income economy. Here, there is scope for further reforms to reduce bottlenecks and increase productivity via: (i) upgrades and restructuring of public utilities; (ii) public enterprise reform; (iii) investments in road decongestion; (iv) a growth friendly tax regime; (v) growth-enhancing public expenditures; and (vi) further improvements in the business environment.

Public sector performance is emerging as a binding constraint on growth. Public utilities that provide critical services such as water and electricity need to become more efficient and have their infrastructure upgraded.[22] For example, while all population has access to safe potable water, it is not unusual to have water rationing, especially during the dry season, both due to water losses as a result of leakage and to non-market tariff schedule. Public enterprises control significant parts of the Mauritian economy and do not always address market failures or operate according to market principles. Reforms in that sector could increase efficiency and create fiscal space for more productive spending.[23] Investment in the road and public transport system would go a long way in reducing traffic jams in and out of Port Louis and optimizing the national road system, designed for quick access to sugar plantation, which no longer form the basis of the economy.

[21] See also David and Petri, 2013, "Inclusive Growth and the Incidence of Fiscal Policy in Mauritius – Much Progress, But More Could be Done", IMF Working Paper No. 13/116.

[22] See also appendix on physical infrastructure needs and pricing policies in IMF (2013) – Mauritius 2013 Article IV Consultation, IMF Country Report No. 13/97.

[23] See also appendix on state-owned enterprises in IMF (2012) – Mauritius 2012 Article IV Consultation, IMF Country Report No. 12/62.

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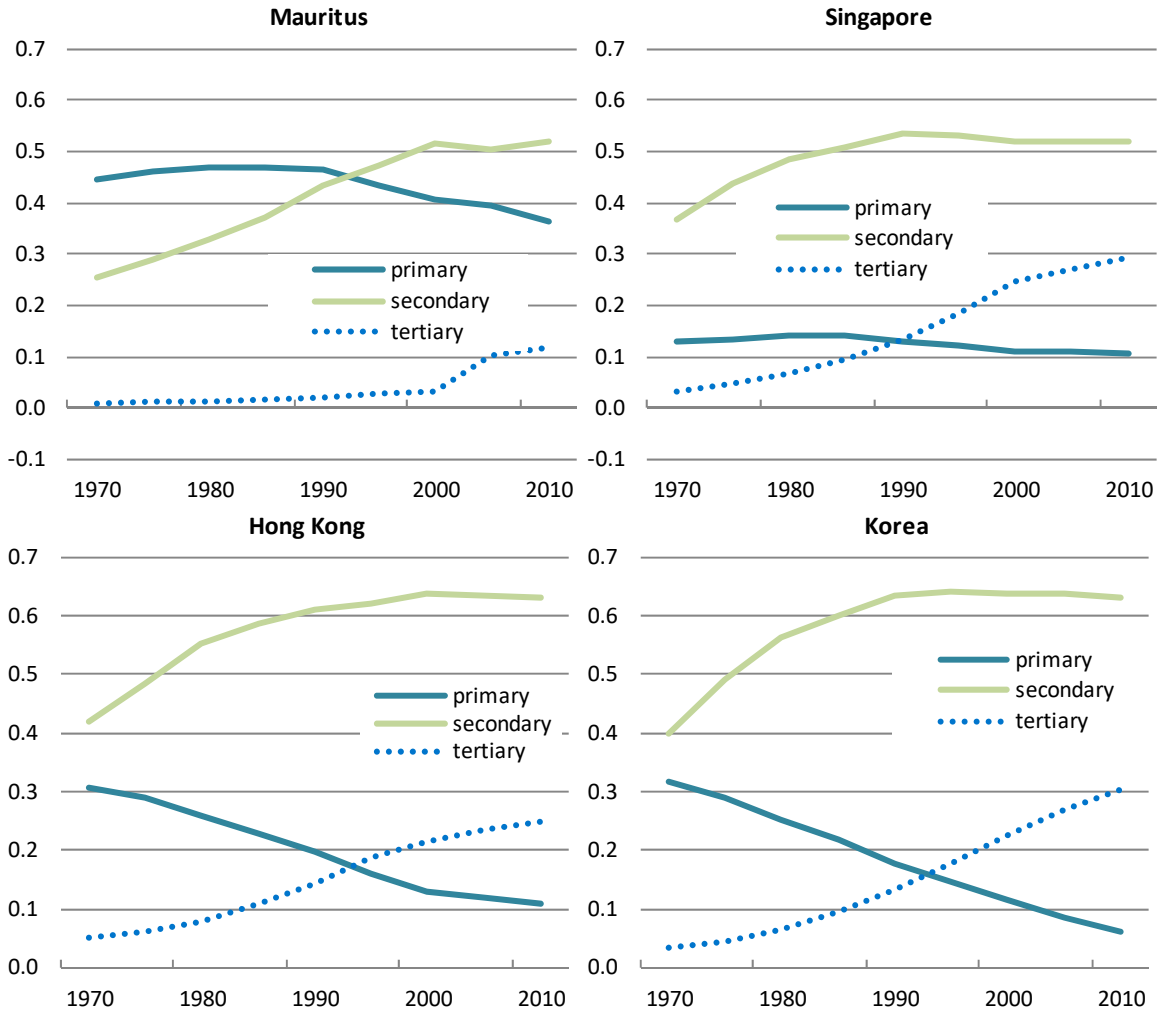
Figure 23
Mauritius: International Comparison of Educational Attainment
(Share in total population aged 15–64)
Mauritius still needs to increase secondary and tertiary enrollment rates compared to the AT.



Sources: Statistics Mauritius; and Samir et al., 2010.

Mauritius has a well-functioning tax system with low and stable rates, but some further improvements could be made. For example, the tax system could be made greener through appropriate taxes on energy and congestion; further broadening of the VAT; reduction in tax exemptions for civil servants, and more reliance on real estate taxes.[24] Likewise, there is substantial scope to create fiscal space through social benefit reform, which is badly targeted at the moment, but consumes substantial fiscal resources. Means-testing of benefits and better targeting to the truly poor would allow higher expenditure allocations to human and physical capital.

While Mauritius has made significant leaps in improving its business environment with the Business Facilitation Act of 2006, there is still room for further reforms in getting credit, enforcing contracts, closing a business, and registering property (Table 6). The hoped for transition to a knowledge-based higher value added economy will need to rely also on private sector discovery as a source of growth, facilitating technology absorption. Mauritius needs to maintain its positioning as a friendly and progressive environment for private sector development in order to tap into firms from India and China wishing to do business in Africa.

[24] See Parry (2011), "Reforming the Tax System to Promote Environmental Objectives: An Application to Mauritius", IMF Working Paper No. 11/124.

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7. CONCLUSION

In this paper, we used growth accounting to assess the drivers of growth in Mauritius over the past sixty years; to identify the sources of future growth; and to determine potential ranges of growth through 2033 under various policy options.

Mauritius has done well in the past, anticipating and aggressively tackling change. Its transition into the high-middle income group was underpinned by creating a well-managed Export Processing Zone, conducting diplomacy regarding trade preferences, spending on education, avoiding currency overvaluation, and facilitating business.

The question of when it will be able to join high income country status will depend on the implementation of strong pro-active policies, especially given subdued growth in Mauritius' main trading partners following the Global Financial Crisis. Our baseline suggests future growth rates around 3¼ percent, but growth could reach 4–5 percent if Mauritius is able to improve the skill set of its labor force, the quality of infrastructure, and the speed of technology adoption. Further improvements in business environment will be essential to attract FDI, generate domestic investment, and maintain and improve on Mauritius' image as an open, stable, and well-functioning place to do business. For the longer term, policies to attract foreign high skilled labor, increase fertility rates and labor force participation should also be analyzed. Finally, reforms for pensions, public enterprises, social benefits, and the tax system can make the public sector more efficient, while macro-policies to increase public and private savings can create the room for further productive investments. By adopting policies that generate 5 percent growth, Mauritius could reach high-income status in 2021, 4 years earlier than under the baseline.

References

Aiyar, S., Duval, R., Puy, D, Wu, Y., Zhang, L. (2013) Growth Slowdowns and the Middle-Income Trap. IMF Working Paper No. 13/71. International Monetary Fund, Washington, D.C.

Barro, R. J., Lee, J.W. (2001) International data on educational attainment: Updates and implications. *Oxford Economic Papers* 53(3), pp. 541–563.

Bosworth, B. P., Collins, S.M. (2003) The Empirics of Growth: An Update. *Brookings Papers on Economic Activity* 34 (2003–2), pp. 113–206.

Bu, Y. (2006) Fixed capital stock depreciation in developing countries: Some evidence from firm level data. *The Journal of Development Studies* 42(5), pp. 881–901.

Central Statistics Office. (2010) Digest of Productivity and Competitiveness Statistics, 2009. Mauritius.

Central Statistics Office. (2009) Poverty Analysis 2006/07. Mauritius.

Cohen, D., Soto, M. (2007) Growth and human capital: good data, good results. *Journal of Economic Growth* 12(1), pp. 51–76.

Dadush, U., Stancil, B. (2010) The World Order in 2050. *Carnegie Endowment for International Peace Policy Outlook.*

Day-Hookoomsing, P., Essoo, V. (2003) Promoting Female Entrepreneurship in Mauritius: Strategies in Training and Development. *SEED Working Paper No. 58*, ILO.

David, A., Petri, M. (2013) Inclusive Growth and the Incidence of Fiscal Policy in Mauritius – Much Progress, But More Could be Done. IMF Working Paper No. 13/116. International Monetary Fund, Washington, D.C.

Diwan, I. (2001) Debt as Sweat: Labor, financial crises, and the globalization of capital. Washington D.C.: *World Bank, mimeo*.

Djankov, S., McLiesh, C., Shleifer, A. (2007) Private credit in 129 countries. *Journal of Financial Economics* 84(2), pp. 299–329.

Frankel, J. A. (2010) Mauritius: African Success Story. NBER Working Paper 16569, National Bureau of Economic Research, Inc.

Gollin, D. (2002) Getting Income Shares Right. *Journal of Political Economy* 110(2), pp. 458–474.

Greenaway, D., Dabee, R. (Eds). (2001) *The Mauritian Economy: A Reader*. Palgrave: London, 2002.

Harrison, A.E. (2002) Has Globalization Eroded Labor's Share? Some Cross-Country Evidence. Berkeley, CA: University of California at Berkeley and NBER, mimeo.

DOI: 10.7172/2353-6845.jbfe.2017.2.3

Iman, P., Minoiu, C. (2008) Mauritius: A Competitiveness Assessment. IMF working paper 08/212. International Monetary Fund, Washington, D.C.
International Monetary Fund. (2013) Mauritius: 2013 Article IV Consultation. IMF Country Report No. 13/97. International Monetary Fund, Washington, D.C.
International Monetary Fund. (2012) Mauritius: 2012 Article IV Consultation. IMF Country Report No. 12/62. International Monetary Fund, Washington, D.C.
Lutz, A., Goujon, S.K.C., Sanderson, W. (2007) Reconstruction of population by age, sex and level of educational attainment of 120 countries for 1970–2000. *Vienna Yearbook of Population Research*, vol. 2007, pp 193–235.
Mankiw, N., Romer, D., Weil, D. (1992) A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics* 107(2), pp. 407–37.
McDonald, C., Yao, J. (2003) Mauritius: Unemployment and the Role of Institutions. IMF Working Papers 03/211. International Monetary Fund, Washington, D.C.
Meade, J.E. (1961) Mauritius: a Case Study in Malthusian Economics. *Economic Journal* 71, pp. 233–35.
Meade, J.E., et al. (1961) The Economic and Social Structure of Mauritius – Report to the Government of Mauritius. London: Metheun.
Mauritius Commercial Bank. (2013) Mauritius Inc. – The Challenge of Investing in Growth. MCB Focus, Occasional Paper No. 55. Mauritius.
Narrainen, Streevarsen Pillay. (2013) Industrialization: The Mauritian Model in: Esteban, J., Stiglitz, J., Lin Yifu, J. (Eds.), The Industrial Policy Revolution II: Africa in the Twenty-first Century, Palgrave Macmillan, pp. 572–87.
Nehru, V., Dhareshwar, A. (1993) A New Database on Physical Capital Stock: Sources, Methodology, and Results. *Rivista de Analisis Economico* 8, pp. 37–59.
Odit, M. P. , Dookhan, K., Fauzel, S. (2010) The Impact of Education on Economic Growth – The Case of Mauritius. *International Business & Economics Research Journal (IBER)* 9 (8), pp. 141–152.
Parry, I. (2011) Reforming the Tax System to Promote Environmental Objectives: An Application to Mauritius. IMF Working Paper No. 11/124. International Monetary Fund, Washington, D.C.
Porter, N. (2004) Wage compression, employment restrictions and unemployment: the case of Mauritius. IMF Working Paper WP/04/205. International Monetary Fund, Washington, D.C.
Psacharopoulos, G., Patrinos, H. A. (2004) Returns to investment in education: a further update. *Education Economics* 12(2), pp. 111–134.
Romer, P. (1992) Two Strategies for Economic Development: Using Ideas and Producing Ideas. Proceedings of the World Bank Annual Conference on Development Economics.
Sachs, J. D., Warner, A. (1995) Economic Reform and the Process of Global Integration (with comments and discussion). *Brookings Papers on Economic Activity* 1, pp. 1–118.
Sachs, J., Warner, A. (1997) Sources of Slow Growth in African Economies. *Journal of African Economies* 6, pp. 335–76.
Samir, K.C., Barakat, B., Goujon, A., Skirbekk, V., Sanderson, W., Lutz, W. (2010) Projection of populations by level of educational attainment, age, and sex for 120 countries for 2005–2050. *Demographic Research 22(15)*, pp. 383-472.
Subramanian, A. (2001) Mauritius: A Case Study. *Finance and Development* 38 (4). International Monetary Fund, Washington, D.C.
Subramanian, A. (2009) The Mauritian Success Story and Its Lessons. UN/WIDER Research Paper No. 2009/36. UNU-WIDER, Helsinki.
Subramanian, A., Roy, D. (2001) Who Can Explain the Mauritian Miracle: Meade, Romer, Sachs, or Rodrik? IMF Working Paper 01/116. International Monetary Fund, Washington, D.C.
Stiglitz, J. (2011) The Mauritius Miracle. Project Syndicate, 2011.
Trinh Le, J.G., Oxley, L. (2005) Measures of human capital: A review of the literature. Treasury Working Paper Series 05/10, New Zealand Treasury.
World Bank. (2007) Managing Change in a Changing World. *Mauritius Country Economic Memorandum.* World Bank Group, Washington, D.C.
World Bank. (2010) Enhancing and Sustaining Competitiveness in Mauritius: Policy Notes on Trade and Labor. World Bank Group, Washington, D.C.
Young, A. (1995) The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience. *The Quarterly Journal of Economics* 110(3), pp. 641–80.
Zafar, A. (2011) Mauritius: An Economic Success Story, in: Chuhan-Pole, P., Angwalo, M. (Eds.), Yes Africa Can: Success Stories from a Dynamic Continent. World Bank Group, Washington D.C., pp. 91–106.

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The European system of financial supervision – regulatory impact assessment

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ABSTRACT

Complexity and uncertainty in the application of the regulations of the European system of financial supervision are due to the fact that its particular elements were implemented over a period of time. First, it was a system of European financial supervision authorities i.e. the European Banking Authority (EBA), the European Insurance and the Occupational Pensions Authority (EIOPA) and the European Securities and Markets Authority (ESMA), whose main objective was to coordinate national actions. Then there were established the European Banking Union, including the Single Supervisory Mechanism (SSM), the Single Resolution Mechanism (SRM), as well as the European Stability Mechanism (ESM), which constitutes also a part of the system of support for endangered banks. Legal interpretation problems are a result of differences in the scope of competences of these entities. For example, there is uncertainty whether the regulations refer to the eurozone or the whole European Union and if they refer to banks only or to other financial institutions as well. An analysis of the SSM, the SRM or the ESM does not always offer a clear answer to questions such as: who, when and using what tools should act; when, for example, the ECB may and should correct the decisions of national supervisors; what is the role of the ESRB, if we take account of the enhanced competences of the ECB in the banking union; if and when banks may question supervisory decisions concerning, for example, establishing a buffer or classifying an institution as SIFI, etc. Similarly, the role of the EBA or the ESM is unclear in the context of the establishment of the banking union, the SSM, the SRM, the ESM and the delegation of power of the ECB and the European Commission to regulatory agencies (Meroni doctrine) or the practice of establishing regulatory agencies outside the bounds of the treaty (Pringle doctrine). Therefore the regulatory landscape in this context requires impact assessment.

JEL Classification: G28, K23, L51, N24

Keywords: European banking union, European Central Bank, Single Supervisory Mechanism, Single Resolution Mechanism, European Stability Mechanism, Meroni, doctrine, regulatory impact assessment.

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1. INTRODUCTION

The aim of this paper is to provide a critical overview of regulatory shortcomings within the framework of the European banking union. The article does not seek to create a new theoretical model of European supervision of the financial market, but to provide a critical analysis of its extremely complex legal status and - on this basis – to indicate the directions of interpretation of EU and national law (e.g. the division of powers between the ECB and national supervisors, the presumption of competence of national supervisors, the possibility of corrective and regulatory actions of ECB to all banks, not just those systemically important or those in the euro area, if it comes to the issue of financial stability throughout the EU). The article aims at presenting the existing normative solutions against the background of very complex system of structural links within the supervisory authorities (e.g. ECB and ESRB, ECB and national regulators). It also gives a general assessment of the expected economic effects of the existing regulatory solutions.

It should be stressed that the analysis of the European system of financial supervision, as well as the interplay of micro- and macroprudencial supervision has already been provided many times in the European economic and legal literature (e.g. Lo Schiavo 2013; Lo Schiavo 2014; Faia et al., 2015; Kämerer, 2016, Tröger T 2015, Schoenmaker D 2014, Gurlit E. 2015).

Also in the Polish literature there are many examples of research in this field (e.g. Fedorowicz, 2011; Fedorowicz, 2014; Jurkowska–Zeidler, 2008; Szczepańska, 2012; Koleśnik, 2013; Stanisławiszyn, 2014; Szpringer, 2015).

The regulations of the banking union have met with substantial criticism (Faia et al., 2015; Kämerer, 2016). There is a risk of excessive centralization of the ECB's competences, which may lead, on the one hand, to a decision paralysis, and, on the other, to the ECB's excessive power over the market and financial institutions and to the appearance of new challenges of the ECB's supervision over the sector and problems of the integrated supervision (supervision of banks, insurance undertakings and investment firms) in some EU Member States. Supervisory competences of the ECB have their shortcomings. This, for example, refers to filing for bankruptcy in the banking sector or the bank's powers of investigation, moreover, there are no clear regulations concerning the cooperation between the supervisory authorities of non-participating and third countries. This raises a question about the prospects of creating an effective ECB supervision and building a financial potential of institutions, both national and European ones, responsible for recovery and resolution and guaranteeing deposits so as not to affect too much the financial results of banks.

The ECB has never been responsible for prudential supervision. The level of generality of the division of competences between the ECB and national supervisory authorities may result in excessive duration of the decision making process. There is also a risk that the regulations will not be well adjusted to the situation in the local markets. Conferring on the ECB almost all the supervision over credit institutions based in the countries of the eurozone may raise doubts from the point of view of Article 127(6) TFEU.

Pursuant to Article 127(6) TFEU final supervisory decisions are taken by the ECB's Governing Council, which limits parliamentary control because heads of central banks are independent. Supervisory decisions have extreme consequences for taxpayers, shareholders and banks' employees, therefore, they should be subject to control by the European Parliament and national parliaments. Moreover, delegating the decision-making power to the Governing Council means it will be easier to outvote non-eurozone countries and, therefore, the SSM is less attractive for such countries. It is especially important for the countries highly integrated with the eurozone, e.g. Poland and Hungary, which will find themselves at a disadvantage in comparison with banks from the eurozone (Szpringer, 2013).

The new supervision system performs both micro- and macroprudential functions. This means multiplying of supervisory structures, generating costs and hampering the transparency, including

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clear delineation of competences and responsibilities. It is also a challenge to ensure proper supervision over banks from outside the eurozone. Implementing a proper macroprudential policy which takes into consideration economic and social interests of individual countries, especially the peripheral ones and those outside the system of the common currency, may prove difficult.

The ECB single supervision will not have proper instruments to supervise the whole banking sector. What is most important is to manage a crisis in financial institutions "too big to fail". Strict supervision of the ECB over such entities appears to be the best solution. The controversies around the banking union arose due to the fact that the draft law prepared by the European Commission soon proved to be imprecise or too far-reaching and infringing on, sometimes conflicting, interests of some member states or generating additional costs for them. There are opinions that the banking union may increase the systemic risk (Koleśnik, 2013)

2. THE DELEGATION OF POWERS OF THE COMMISSION OR THE COUNCIL TO REGULATORY AGENCIES (MERONI, DOCTRINE)

The problem of defining the extent of the regulatory powers of the Commission or the Council without starting a complex, lengthy and uncertain procedure of amending the treaty was considered by the Court of Justice of the European Union in the Meroni case. The Court ruled that the legislative power of the Commission and hence its discretionary power may refer to the development of technical standards which are not legally binding, which are not politically influenced and which are within the framework of the treaty and the characteristics of a given public entity operating on the basis of the treaty. Moreover, they should contribute to a goal clearly defined in the Treaty for example, to the European integration or harmonisation of the laws and regulations. It is admissible to establish a new entity or a regulatory agency to this end.

Currently it is considered that the Single Resolution Mechanism (SRM) complies with the criteria of the Meroni case judgment. A single set of SRM tools contributes to the European integration and does not breach the TFEU regulations concerning the approximation of laws, including Article 114. In this context, the question of discretionary powers of regulatory bodies is of great importance. The power of discretion is used by the Single Recovery Board (SRB) mainly during the preparation of resolution plans to be presented to the Commission. However, there are questions raised concerning the SRB's criteria when evaluating the solvency of an institution and recommending a recovery and resolution plan and obliging the shareholders and bondholders of a bank to contribute to the bail-in. Discretionary power in such a case is, to a great extent, an act of knowledge, which should be based on the achievements of the science of finance and economics and should not be used for case-based reasoning, which is often subject to political bargaining.

The scope of discretionary powers of regulatory agencies was a subject of the court judgment on short selling. The UK government lodged a challenge to the Regulation of the European Parliament and the Council of the European Union No 236/2012 of 14 March 2012 on short selling and certain aspects of credit default swaps, which grants the European Securities and Markets Authority (ESMA) a power to prohibit or control short selling of credit default swaps in exceptional circumstances. Article 28 of this Regulation grants the ESMA a power to pass binding acts. However, such a power can be exercised only when there is a threat to the orderly functioning and integrity of financial markets in the Union.

The UK government argued that this regulation stands in contradiction to Treaty and invoked the Meroni and the Romano judgments, which, it claimed, set a standard for the proper reasoning and interpretation of the law (Case 9/56 Meroni vs High Authority [1957&1958]) Romano Case (Case 98/80 Giuseppe Romano vs Institut National d'Assurance Maladie-Invalidité [1981]), (Griller, http://www.eba.europa.eu/documents/10180/498024/Presentation+-+Stefan+Griller.

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pdf, Armstrong http://europeanlawblog.eu/?p=2176 Retrieved March 30, 2016). Especially, in the light of the Meroni judgment the delegation of powers to the regulatory agencies cannot be excessive and, therefore, should not disturb the balance of the institutional powers of the EU and the member states. Additionally, according to the Romano judgment, administrative regulatory agencies are not empowered to adopt legally binding decisions. The UK invoked also Articles 290 and 191 of TFEU, which delegate the power to adopt acts of general application which have the force of law to the Commission and not to lower-tier agencies.

The opinion of Advocate General confirmed that the ESMA enjoys inordinately broad discretionary powers and this cannot be treated as mere implementation of acts of general application or the Treaty itself. However, the Court of Justice of the European Union found that the range of the discretionary powers does not go beyond the bounds of the regulatory framework as the exercise of such powers is circumscribed by various conditions. It is, by no means, free decision-making administrative discretion but a constrained decision which is subject to court's supervision. Therefore, it is compliant with the Meroni doctrine. The Court ruled also that the ESMA does not adopt measures of general application and thus it is not at odds with the Romano doctrine.

Referring to the alleged incompatibility with Articles 290 TFEU and 291 TFEU, the Court ruled that while the articles do not contain expressis verbis any provision to the effect that powers may be delegated, a number of provisions in the Treaty, nonetheless, presuppose that such a possibility exists. What is more, it is not about political acts but very specific measures implemented to preserve financial stability. The ESMA's decisions laid down in its regulations, to a large extent, can be considered as acts of knowledge based on a technical expert opinion. According to the Court, Article 28 of Regulation No 236/2012 must be read in conjunction with the other regulatory actions and cannot be regarded as contravening Articles 290 TFEU and 291 TFEU.

The Meroni doctrine was also disputed in the context of discretionary powers conferred on a new authority, the Single Resolution Board (SRB) under the Single Resolution Mechanism (SRM). First of all, in the light of the regulations banks or group of banks can be directed to take measures to change their organizational structure, if this structure is an impediment to restructuring of a group of banks, which is to be efficient and based on trust. The SRB acts in agreement with a national regulator, however, it may eventually enforce structural changes. Additionally, Article 10 of Regulation on a Single Resolution Mechanism requires taking into account the principle of proportionality when removing threats.

Both the SRB and the national regulator should in advance issue a notification informing the interested financial institution about the discovered threats so that the recovery and resolution plan could be implemented efficiently. Thus the institution has a chance to implement on its own the recovery measures it considers appropriate. It is within the discretion of the SRB to decide whether it will apply informative and warning measures instead of binding ones, whether it will use financial tools, or whether it will conduct structural intervention, which is the most far-reaching form of intervention.

It is natural that structural measures in market economy always raise doubts as in the case of an antitrust instrument of splitting up a company or restructuring it after a merger. However, such tools are at the disposal of these institutions. The SRM gives rise to a debate on the SRB's right to decide on the contribution of the owners and even the bondholders to a bank's recapitalisation, so called bail-in. With this respect the SRB enjoys a discretionary power of deciding how to share the costs of rescuing a bank and if and to what extent use the SRF's public resources when, for example, a bank has completely lost access to private market. There are opinions that the SRB's wide discretionary powers may reduce trust of other market participants which might enter into contract with a bank at risk.

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Research is being conducted to find out to what extent the Single Supervisory Mechanism (SSM) adds to the institutional value when it comes to financial stability. To this end, the location of responsibility is being considered, which, effectively, means transferring it to the EU level, integrating the EU financial market and centralizing the supervision executed in cooperation with national supervision (top-down approach). The centralization of supervision is seen as an institutional addition to the banking union and the common currency, the euro.

Article 127(6) TFEU and the Statute of the ECB serve as a legal framework for vesting the ECB with the supervisory power, and hence, for centralizing financial supervision at the EU level. Despite continuous discussion on the scope of that power, as some writers see it as broad and blanket and others are very strict in interpreting its limitations, it is the only solid foundation of centralization. Other regulations of the Treaty, such as the so-called flexibility clause of Article 352 TFEU or Article 114 TFEU are considered to be insufficient. Article 127(5) of implied powers doctrine may serve as a partial basis for the centralization of supervision, however, it cannot be considered the only and sufficient one. As it has already been mentioned the court judgments in the Meroni and the Romano cases may offer some guidelines as to the interpretation of the scope of the power.

An analysis of the relations between the ECB and the European Banking Authority (EBA) leads to very interesting conclusions. In fact the Single Supervisory Mechanism has a supervisory function rather than a regulatory one, hence the ECB's actions should not interfere with the prerogatives of the EBA when it comes to the creation of technical standards or guidelines for the cohesion of banking supervision. However, Article 132 TFEU, which grants the ECB the power to make regulations, may raise concerns that the ECB may undermine the competences of the EBA. The regulations made by the ECB pursuant to Article 132 TFEU, by no means, are limited to the supervisory mandate of the ECB.

There are two options to strengthen the Single Supervisory Mechanism: the expansion of the supervisory role of the ECB or the enhancement of the functions of the EBA. In this case the EBA's role under Article 114 TFEU should not be limited to actions of last resort but should be treated as an organ of constant supervision with extensive instruments, including the power to take preventive measures. Article 114 entitles the EU to establish agencies, whose aim is to enforce the EU law. This competency was confirmed by the judgments of the Court of Justice of the European Union (ENISA) (Case C-217/04, *United Kingdom/Parliament and Council (ENISA)*, ECR 2006, I-3771). After the crisis of 2010, by means of regulations, three new authorities were established: the European Banking Authority (the EBA), the European Insurance and Occupational Pensions Authority (EIOPA) and the European Securities and Markets Authority (ESMA), which together create a system of financial market supervision. A variety of different agencies and organizations have been established outside the bounds of the Treaty. Only some were Treaty-based (Europol). (Görisch, 2016)

In the light of the doctrine, delegation of power to such an agency created outside the bounds of the Treaty should not get out of control, competences should be clearly defined in the law establishing this institution. Political responsibility cannot be transferred to such a body and measures of legal protection should be specified. In the light of Article 291 TFEU such agencies are a product of so called comitology, which facilitates and speeds up the regulation of technical issues within the law of the EU and the application of the EU law. At the European level the need for more flexibility in the regulation of technical details led to the launch of a new approach to the development of regulations, so called Lamfalussy Process. (Christensen, 2005; Jacobson, 2007; Moynihand, 2006) Control over the EBA is exercised in such a way that, for example, the EBA's regulations require a resolution of the European Commission upon the request of the EBA. If the EBA's actions affect all member states, an approval of the European Parliament is required.

It has to be emphasized that, in the light of the law and Article 127(6) TFEU in particular, it is not possible to entrust the ECB with full supervision over all banks including those outside the

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eurozone and those outside the "specific tasks" of the ECB. Whatever solution will be adopted a question about the role of the EBA will persist. Certainly, expanding the tasks of the EBA would require tightening control by creating not only the Management Board with regulators from member states but also the Supervisory Board similar to German financial market supervisor (BaFin). (Repasi, 2012)

It is evident that the EBA as a regulatory agency is much constrained in its regulatory decisions which must be approved by the Commission. In the light of Regulation 1022/2013 the EBA Management Board in order to be able to perform regulatory, executive or mediation tasks needs a resolution of countries participating and not participating in the SSM taken by a qualified majority. In conclusion, we can say that the SSM and a new institutional position of the ECB will gradually limit the role of the EBA. There are concerns that even commitment to close cooperation may not eliminate conflicting situations, which will, in turn, not foster financial stability. The EBA will probably evolve from a typical supervisory institution to a bridge institution between the ECB and national authorities, especially these of non-eurozone countries. The role of the EBA in terms of technical standards, interpretation of the banking law and formulation of guidelines and recommendations fostering the harmonisation of legislation, so called Single Rulebook, remains unchanged. (Ferran, 2015)

The ESMA is an example of a reflection on the status of a regulatory agency in the context of the Meroni doctrine. Article 1 of the regulation establishing the ESMA refers directly to systemic risk. The ESMA may offer additional guidelines and recommendations to systemically important institutions in order to reduce systemic risk. For this reason the ESMA may investigate both the activity of financial institutions and their particular financial products and give recommendations to national authorities. The ESMA in cooperation with the European Systemic Risk Board (ESRB) develops stress tests procedures, which are used to assess the systemic importance of particular market participants. (Frank, 2012)

The ESMA is in possession of instruments influencing financial institutions. There arises a question about the regulatory intensity, the extent of binding effect and legal measures which could be used to challenge the ESMA's decision. The competences of the ESMA, which it took over from the Committee of European Securities Regulators (CESR), were later enhanced especially on Levels 2 and 3 of the Lamfalussy process. The ESMA, like the EBA, develops regulatory and implementing technical standards, which are adopted in the form of delegated Regulations by the Commission at the request of the ESMA. In fact, it is the Commission which has legislative power conferred on it by the Council and the European Parliament. Under Article 290(2)(b) TFEU both these entities may express objection to the standards adopted by the Commission. If that happens, the standards are suspended and do not enter into force.

In addition to technical standards the ESMA issues guidelines and recommendations which formally do not have the force of law but work on the principle of comply or explain. The ESMA acts also as an intermediary in disputes between national authorities. The power of the Commission to initiate a recovery procedure in a member state is not limited by the fact that in the case of a violation of the EU law the ESMA has three instruments at its disposal: non-binding recommendations, negotiations with the participation of the Commission and national regulators and legally binding decisions.

Issuing a binding decision by ESMA is possible only if three cumulative conditions are met: ineffective expiry of the time-limit of negotiations, a need to restore neutral conditions of competition or a need to ensure the orderly functioning of the financial system, and finally, when the regulation directly affects a financial institution, for example, when it comes to standards. Moreover, the decision of the ESMA should be consistent with the opinion of the Commission expressed during negotiations.

When the Council in cooperation with the ESRB determines that there is a situation of a crisis, the ESMA may direct legally binding decisions to national authorities with an aim to

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restore the orderly functioning of the financial system. The ESMA exercises this power under the authorization of the Council. If the measures adopted by a national institution prove insufficient, the ESMA may direct its legally binding decision to a specific financial institution or even suspend its operation. Both financial institutions and national authorities may appeal the ESMA's decision, however, they may not do so with reference to technical standards or guidelines and recommendations. The Board of Appeal, which is a joint body of the European Supervisory Authorities, decides on appeals against the ESMA's decisions. When it finds an appeal justified, the ESMA has to reconsider its decision. The decisions of the Board of Appeal can themselves be appealed to the Court of Justice.

It should be stressed that the ESMA's decisions in a crisis situation or reducing differences in opinion of national authorities are subject to so called budget clause. This means that the member states have a right not to respect the ESMA's resolutions if, in their opinion, they interfere with the budgetary sovereignty. A member state must inform about it the ESMA, the Commission and the Council. Such a statement of a member state suspends the implementation of the decision. In due time the Council determines whether the ESMA's decision will be overruled. If the Council confirms the ESMA's decision, a member state may apply for reconsideration of the decision. The procedure is similar in the case of the ESMA's resolutions settling differences between national institutions.

The Lamfalussy process is a response to the shortcomings of the system based on minimum harmonisation directives, whose implementation was inconsistent and which were often introduced with delays in different member states. These differences, especially gold-plating and inconsistent interpretation of general clauses and vague terms led to regulatory competition between member states with all its negative and positive consequences. However, it did hamper the integration of the common financial market. Therefore, three regulatory levels of the Lamfalussy process were developed and more focus was placed on maximum harmonisation directives and directly applied regulations.

Transformations in the system of the sources of the law gave rise to hybrid forms, which are difficult to classify. Even the ESMA's guidelines and recommendations are to some extent legally binding because they are used by other institutions and national courts (the Grimaldi case) when issuing judgments and they offer possibilities for questioning this kind of ESMA's actions (the Fiskano case). Extensive procedures of consultations with the Commission, the Council and national authorities – the member state must definitely confirm the existence of a situation of a crisis, in which the ESMA is empowered to issue legally binding decisions – cause that the ESMA's non-treaty based position and its executive and technical rather than political powers allay most of the doubts about the compatibility of the ESMA's status with the Treaty (the Meroni case).

Similar doubts concerning the possibility of creating new legal mechanisms outside the Treaty in the context of the European Stability Mechanism were a subject of the Court's consideration in the Pringle case. The European Stability Mechanism (ESM) is based on an agreement between member states. Subject to certain conditions, the ESM may support member states experiencing financial problems. The ESM's instruments can also be used directly to recapitalise banks in a EU member state. In order to do this a decision of a banking supervisor is required and the rules on state aid must be met, including the framework rules for aid to banks.

There are links between the ESM, the European Banking Union and the Single Supervisory Mechanism (SSM). Application of international law (the stability pact) was supposed to be a strategic maneuver aimed at avoiding difficult, complex and unpredictable procedure of amendments to the treaty – especially in the face of the UK's objection – like it was in the case of the Single Resolution Fund (SRF) when Germany was reluctant to mutualisation.

The Supreme Court of Ireland has asked the Court of Justice of the European Union if it is lawful to use simplified revision procedures to introduce rules that provide for the establishment

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of a permanent stability mechanism, and what is more, to create a possibility for the member states of the eurozone to sign an agreement establishing a permanent stability mechanism in compliance with the EU law. The Court envisaged a possibility of the variable geometry of integration by supplementing the EU law regime with provisions of public international law. This judgment is a proof of pragmatism and flexibility of the Court, for which financial stability in the context of European integration is a priority. (Jagiełłowicz, 2013)

Previously the Court refused to examine direct compliance with the law of the amendments affecting the TFEU (O.J. EU C 83/47, 30 March 2010) stating the reason that these amendments were introduced by international agreements between the member states and the Court did not consider itself competent to examine the lawfulness of such agreements. The Pringle case (Case C-370/12), is the first example of court's examination of the constitutionality of amendments to the EU law. ((Schiavo, 2013) The Court's judgment in the Pringle case may be considered one of the most important judgments concerning the EU governance. Not only does it specify the legal framework for intergovernmental groups of member states acting on the matters relevant to the whole European Union, but what is most important, it defines the scope of the lawful differentiation in the situation of particular countries. (Nadolska, 2014)

3. THE EUROPEAN BANKING UNION AND THE SINGLE SUPERVISORY MECHANISM (SSM)

The Banking Union means the delegation of sovereignty of member states to the EU institutions. The Single Supervisory Mechanism (SSM) (http://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:32013R1024&from=PL) Retrieved March 30, 2016) entails a substantial increase of the role of the ECB. Pursuant to Article 127(6) TFEU after consultation with the European Parliament and the ECB the Council may entrust the ECB with supervision over credit or other financial institutions with the exception of insurance undertakings. However, it is interpreted as merely macroprudential supervision and cannot serve as a basis for the European Banking Union or the Single Supervisory Mechanism (SSM). The range of the ECB's supervisory power can be interpreted following Article 13(2) TFEU, which confers on authorities established pursuant to the Treaty powers that are limited, conditioned and related to issues set out in the Treaty (conferred power).

However, there are still doubts if the term "credit institutions and other financial institutions" includes financial conglomerates, investment firms and shadow banking. It is also not clear to what extent the ECB can take over the function of a national regulator and exercise supervision of the whole financial system by, for example, structural intervention as part of the recovery and resolution mechanism.

There is also a constitutional concern, which is the compatibility of central bank independence in terms of monetary policy with its supervisory power, which, by nature, is not free from political influence, like in the case of the pressure on rescuing a big and important bank. This may lead to an over-lenient monetary policy of the ECB, which will have an adverse affect on price stability. Thus, during the Cyprus EU presidency in 2012 some amendments were introduced to establish institutional guarantees of the independence of the Single Supervisory Board and the Governing Council of the ECB, for example, the chair and vice-chair of the SSB is appointed by Ecofin (Witte, 2014; Cleynenbreugel, 2014, Martinico, 2014; Lo Schiavo, 2014; Kern, 2015; Lehmann, Manger-Nestler, 2014; Berger, 2015; Sherman&Sterling, 2014)

The ECB's macroprudential supervision covers four areas:

– adaptation of macroprudential norms to particular financial institutions subject to the macroeconomic situation. Introducing, for example, additional procyclical capital requirements or buffers,

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– supervisory analysis of contractual relations between market players (e.g. collaterals, margins, Loan-to-Value or Loan-to-Income ratios for mortgage financing),
– monetary policy instruments, interest rates, capital flow control, money supply,
– prudential requirements for financial institutions of the financial market infrastructure (central counterparties, central depositories, payment, clearing and settlement system).

There arises a question about the legal basis for the application of the whole array of supervision instruments: from ex ante measures of authorisation or monitoring of compliance to ex post measures of crisis management, state aid, guarantee schemes and recovery and resolution planning. Under the Single Supervisory Mechanism (SSM) the Council and the European Parliament have adopted the compromise SSM Regulation, which confers on the ECB additional, strong power exercised by a new body, the Single Supervisory Board (SSB) in particular situations. An example of these new competences is a power to set additional capital requirements or buffers under CRD IV.

All the above instruments are first of all used by regulators, i.e. national supervisory authorities. The ECB may also apply them, however, as additional measures when it is required due to the situation of the country or the whole market. The ECB has more power over banks from countries belonging to the banking union as apart from introducing the buffers, the ECB in cooperation with the SRB may carry out a recovery and resolution plan under the Single Supervisory Mechanism (SSM). The ECB may also apply structural instruments of another type which may force big, systemically relevant banks to separate their commercial and deposit operations. This, in a sense, means to some extent, a return to the old division into investment and commercial banking and a shift away from universal banking.

The question arises, how the governance structure of the SSM should look. In particular, two criteria are being considered: independence and accountability. Independence is understood as an ability to avoid unwanted pressure from other subjects, especially political ones, whereas accountability is a proper relation between such an independent institution and the state, as the institution is obliged to explain and justify its actions, which may be evaluated by other bodies, however, the consequences of this evaluation should not affect institutional independence of the evaluated body as its independence is in the public interest.

In the case of the ECB, independence is an inherent quality of this institution and means independence in performing its tasks and in managing its finances. Article 19 of the SSM Regulation guarantees also independence of the SSB as its new organ. Accountability is reflected in the agreement with the European Parliament and the legal instruments of reporting and hearings. Earlier debates on the independence and accountability of the ECB in its monetary policy may offer some background here.

There arises a problem of the division of tasks between the ECB and national supervisory authorities under the SSM. It is the competence of the ECB to supervise systemically relevant banks in the countries belonging to the banking union and in cross-border cases, when more than one member state is involved. However, ECB also has decisive powers to grant and withdraw authorisations for all banks across the Eurozone, pursuant to procedures (including cooperation with national competent authorities within the SSM) – laid down in the SSM Regulation.

Apart from quantitative criteria of systemic importance such as a bank's assets value exceeding 30 billion or 20% of GDP of the country of origin and more than 5bn euros, a national regulator may request the ECB to classify an institution as systemically relevant and, thus, to submit it to the ECB's supervision, if the ECB's analysis confirms systemic importance of the institution. Finally, the ECB supervises also banks which are beneficiaries of European or international aid programs.

The SSM is discussed also in the context of granting and taking back a right to provide services by credit institutions**.** A rule has been adopted that a national regulator serves always as an entry

DOI: 10.7172/2353-6845.jbfe.2017.2.4

point where suitable documents are submitted and where the evaluation if a subject fulfills the criteria required to provide services in the banking sector is performed. If an application is made by a systemically relevant institution, the ECB accepts it or rejects it. The ECB has also the decision making power and takes over the competences of the country of origin when a credit institution wants to establish a branch or to exercise the freedom to provide services within the territory of a country which does not belong to the banking union. Article 17(3) requires the ECB to respect the balance between institutional EU supervision and national supervision.

In this way, the ECB remains the centre of gravity in the SSM and does not infringe on the rights of national regulators, which know their financial markets better, and thereby cooperation with them is beneficial for the execution of the ECB's supervision and ensuring financial stability of the EU. The ECB's ability to exercise its supervisory functions directly is a new standard in the institutional system of the EU. Previously European supervisory authorities did not have such a power and served rather as a forum for exchanging information and consulting legislative proposals. There is little doubt that the ECB's powers are legally binding, which is evidenced by Article 18, which gives the ECB a right to impose administrative penalties.

In order to perform responsibilities conferred on the ECB under Council Regulation (EU) No 1024/2013 the ECB, pursuant to Article 18 of the Regulation, may impose administrative pecuniary penalties if credit institutions, financial holding companies, or mixed financial holding companies, intentionally or negligently, breach a requirement under relevant directly applicable acts of Union law. Thus, the ECB may impose sanctions in a case of a breach of the ECB's decisions and resolutions. In the context of the Single Supervisory Mechanism, when national law is breached, competent national institutions still enjoy the power of imposing sanctions. However, they may impose such sanctions on credit institutions directly supervised by the ECB only when the ECB directs them to start a proceeding. Decisions to impose sanctions are subject to control of the Administrative Board of Review of the European Central Bank and the Court of Justice of the European Union. Cf. Recommendation of the ECB for a Council Regulation concerning an amendment to Council Regulation (EC) No 2532/98 concerning the powers of the European Central Bank to impose sanctions (ECB/2014/19).

However, the ECB can now ensure – to some extent - the uniformity of regulation, as it is the competent authority and can make use of supervisory options and discretions in its own way: The European Central Bank (ECB) published the ECB Regulation on the exercise of options and discretions available in EU law and the ECB Guide on options and discretions available in EU law. These documents lay down how the exercise of options and discretions in banking legislation is to be harmonised in the euro area (https://www.bankingsupervision.europa.eu/ecb/legal/pdf/oj_jol_2016_078_r_0011_en_txt.pdf Retrieved 30 March, 2016). This is a step in the right direction but still remain some doubts concerning regulatory and supervisory power of the ECB. (Faia, 2015; Kämerer, 2016)

The relations between the ECB and the EBA and between the ECB and the European Systemic Risk Board (ESRB) with reference to macroprudential policy are a subject of a current debate. On the one hand, the SSM Regulation underlines the necessity of tight cooperation between the ECB and the ESRB but, on the other, their supervisory tasks and competences should not overlap. Article 5 of the SSM Regulation confers on the ECB a right to use macroprudential tools. The ECB may increase capital requirements in certain situations, regardless of the actions of national regulators. This instrument of macroprudential supervision puts into question the role of the ESRB and raises doubts about the relations between these two institutions.

There are also doubts and concerns about the SSM distinction between supervision within the eurozone and the banking union and outside of it. However, one may claim that the SSM is a kind of a benchmark for further development of the financial market also for the non-eurozone countries and its spill-over effects should have a beneficial impact on them. It needs to be taken into consideration that countries not participating in the SSM will sign memoranda

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of understanding between supervisory agencies. The SSM Regulation affirms that accountability of non-participating countries will be fully respected. Moreover, the Regulation provides for the possibility of signing memoranda of understanding between non-participating countries and the SSM, which, in fact, means joining the SSM, however, without a right to vote. These countries would also be subject to the ECB's supervision, which would make them "second-rate" members.

The SSM encompasses three elements which constitute supervisory authority: power conferred pursuant to the SSM Regulation, power conferred pursuant to internal regulations created under Articles 4, 6 and 9 of SSM Regulation giving the ECB a right to instruct national authorities to apply national law in particular situations and the power to apply the national law by the ECB as the EU supervisory institution.

It is worth underlying that under this system, individual, legally binding decisions directed at particular financial institutions may be issued on the basis of general and abstract regulations. This raises a question about the range and form of legal protection against administrative decisions, which is a standard in democratic countries based on the rule of law. The assumption of the existence of typical legal protection creates a problem of delay or disruption of actions aimed at preserving or strengthening the financial stability of the EU and preventing a financial crisis.

During the discussion on instructive power that the ECB has over all banks and not only those which are systemically relevant some experts invoke Articles 101 and 102 of TFEU about European rules on competition protection, for implementation of which Council Regulation (EC) No 1/2003 was issued. The Regulation establishes interdependence between the Commission and national antitrust regulators. The same matter is subject to both national law and European law and falls within the competences of both the Commission and national institutions and the decision which institution will consider a given case depends on whether the case is of community dimension. However, there are discrepancies as decisions in antitrust cases are of declaratory nature – some anticompetitive activities are illegal even if no such judgment has been passed – and banking supervision decisions are constitutive in nature. There are also differences in courts competences: competition protecting cases are in fact civil cases between natural persons and legal entities and administrative courts, which rule on the legality of decisions, may be treated as sui generis supervisory authorities.

Under the SSM, like in the cases concerning the state aid, supervisory decisions may be subject to appeals and are considered by national courts. "Triangular" legal relations are established: the ECB acts vis-à-vis banks but also national regulators. The ECB is obliged to take into consideration all the law, including directives which need to be implemented on a national level and, hence, may not foster cohesion. There might be also conflict situations when the same decision concerning a bank may be taken by a national institution pursuant to a law implementing a directive and also by the ECB, which was conferred with this authority by the SSM Regulation.

Article 4(3) of the SSM Regulation can be interpreted in two ways. The first is transposition of supervisory power. To this end the regulation establishes directly applicable laws. According to the second interpretation Article 4(3) obliges the ECB to follow certain rules in relation with the national supervision. The ECB applies the SSM Regulation looking for a regulation based on the national law and ordering the implementation of supervisory measures. Thus, an obligation to apply a regulation does not change the essence of this regulation. This interpretation is supported by the fact that EU law is constituted by the Treaty, regulations and directives and not national law. One can talk about a spillover effect of both EU law and national law: a spillover of EU law on national law and an influence of national law on EU law, which results in a given EU legal act.

One can expect shaping of new relations between the EBA and the ECB. Naturally, the creation of the banking union strengthened the legal and real position of the ECB. Since 2014 the ECB has been exercising supervisory power over a certain number of big EU banks. Performing this function the ECB must respect the Commission delegated acts created by the EBA, although

DOI: 10.7172/2353-6845.jbfe.2017.2.4

institutional position of the ECB is provided for in the Treaty and the ECB is only one of many regulatory agencies, whose decision making power is limited by the Meroni judgment.

The aim of the ECB under the SSM Regulation is to ensure a level playing field and prepare a supervisory strategy of compliance. This requires tight cooperation of the ECB with banks and national regulators and taking into consideration the differences in risk weights for different categories of assets or so called national options and review options and national discretions.

Banks under direct supervision of the ECB are subject to closer scrutiny of the Supervisory Review and Evaluation Process (SREP) and the Asset Quality Review (AQR). However, the review is usually carried out based on the data from national supervisors gathered under Internal Capital Adequacy Assessment Process (ICAAP) and Internal Liquidity Adequacy Assessment Process (ILAAP), as well as quarterly collected data on credit and market risk, liquidity, profitability, investments, etc. The ECB attaches special importance to capital planning of banks which failed Asset Quality Review and stress tests.

The Single Supervisory Mechanism (SSM) is based on three legal pillars:

– Article 127(2) of TFEU, which confers regulatory power on the ECB,
– the SSM Regulation (http://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:32013R1024&from=PL Retrieved March 30, 2016) which outlines regulatory tasks for the ECB,
– the SSM Framework Regulation (http://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:32014R0468&from=EN Retrieved March 30, 2016) regulating the cooperation between the ECB and national supervisory authorities.

This last regulation underlines the fact that partners must act in good faith and exchange information. The answer to the question which entity should supervise a given institution on the basis of the criteria specified in Article 6(4) of the SSM Regulation depends on the systemic relevance of this institution defined according to Part IV of the SSM Framework Regulation.

The SSM Framework Regulation specifies some procedures, for example, Article 22 stipulates that the ECB may not make use of procedures which are not set out in national law. This causes concern about how the ECB should behave towards national banks. There is also a question about interpretation and the practice of implementing EU law in this context: are there areas where EU law will not be applied and areas where national law is not based on EU law. How should the ECB act in such situations?

In such situations the ECB and national regulators would have to collaborate closely and national regulations would be applied by a national institution. National regulations are in most cases based on European law, for example, policy of remuneration for bank employees under CRD IV. In the light of both regulations concerning the SSM it is the ECB which decides whether financial institutions being subject to Capital Requirements Regulation, which means not only credit institutions, are systematically relevant.

It is worth noticing that the scope of Article 6(4) of the SSM Regulation is unclear. It provides for a threshold of EUR 30 billion, over which an institution cannot be classified as not systemically relevant and in such a case it is clear who the regulator is. However, the SSM Regulation provides for many exceptions to the main criterion, which may be a premise for the decision to bring the institution under national supervision.

Detailed criteria for such exceptions have not been defined yet. There have been cases when institutions applied for such an exemption but due to the lack of criteria the applications could not be considered and were rejected. The Administrative Board of Review, a new organ created pursuant to Article 24 of the SSM Regulation, is entitled to present opinions about the decisions taken by the ECB.

However, taking into consideration that, pursuant to Article 256 TFEU, the European General Court has jurisdiction over the ECB's decisions, the lack of procedures impedes exercising of this jurisdiction. It is true that resolving disputes concerning the regulation of the financial market

DOI: 10.7172/2353-6845.jbfe.2017.2.4

in court is not common as financial institutions are unwilling to undermine good relations with a regulator. However, fees imposed pursuant to Article 18 of the SSM Regulation are much higher than those imposed by a national regulator, therefore, one can expect an increase in the number of cases settled in court. In conclusion, the ECB in its new role of a regulator of regulators will face some new challenges like, for example, making use of experience of national supervisors on the Supervisory Board. (Hanten, Heljula, 2015)

As it is unlikely that the responsibility for macroprudential policy will rest with a single institution, it is important to assign key functions in such a way that will allow avoiding gaps and inconsistencies. A system of regulations should take account of such aspects as: requirements of interinstitutional coordination and exchange of information, autonomy, management, accountability and transparency.

4. THE EUROPEAN BANKING UNION AND THE SINGLE RESOLUTION MECHANISM (SRM)

Under the Single Supervisory Mechanism stress tests of a broader scope were run, preceded by Asset Quality Review covering a larger number of subjects, i.e. banks. These tests are not new but serve here a different purpose. Their purpose is not bank risk management but they are a macroeconomic tool which measures the financial system's resistance to crises. Stress tests include scenario and sensitivity analysis and the focus is placed on combined occurrence of unfavourable factors. The fact that stress tests are not intended only for communication between two subjects: the supervisor and the supervised institution, but they are also published, may increase discipline and transparency of the market. Whether such an impact does exist is a subject of empirical studies. For example, there are studies on the influence of stress tests on share prices. (Horsch, Kleinow, 2015)

In 2014 twenty six member states signed the intergovernmental agreement on the transfer and mutualisation of contributions to the Single Resolution Fund (SRF). An international agreement is an essential component of the European Banking Union and thus of the Single Supervisory Mechanism (SRM), whose aim is the recovery and resolution of endangered banks of the eurozone. The SRF is part of this mechanism.

It is interesting to notice that the SRF was established pursuant to international law. From a legal point of view choosing a way of an international agreement was unjustified. The reason given for using international law was the argument that the EU cannot unilaterally impose financial burdens on the member states. However, international law gives rise to uncertainty with reference to the European policy in this matter. Nonetheless, the European Parliament recommended a regulation which would prohibit national actions going beyond the single European mechanism. The banking union is based on three pillars: the SSM, the SRM and a common deposit guarantee scheme. Applying international law, outside European law, for the SRF may disturb the institutional balance of the banking union.

The problem of recovery and resolution of credit institutions raises concerns about the implementation of the BRR Directive. The objective of the Directive is to establish a framework for the recovery and resolution of banks. Due to the size, complexity and mutual interconnection, resolution of endangered banks is not easy as, on the one hand, it may cause a chain reaction and a domino effect and, on the other, it poses a danger to the real economy.

To minimize these problems banks all over the world were bailed out. The owners and creditors were protected against enormous losses, which were distributed over all taxpayers. At that time a maxim about "privatizing profits and socializing losses" was coined. This implicit government guarantee increased moral hazard and pressure on excessive exposure to a risk higher than it was economically justified. In Poland the BRR Directive will be implemented through an amendment

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to the Bank Guarantee Fund (BGF) Act of 10 June 2016 (Official Journal of 2016, item 996). The BGF is supposed to receive supplementary powers in recovery and resolution of banks. This appears to be an appropriate solution because so far, apart from guaranteeing deposits, the BGF's has been also empowered to offer support. The recovery and resolution regulation in Germany is an interesting case from the point of view of the evolution of such regulation.

In Germany already in 2010 a law on banks restructuring (*Kreditinstitute-Restrukturierungs-gesetz*) was passed and then in 2013 – a law that imposes restrictions on combinging commercial and investment banking (*Trennbankengesetz – Gesetz zur Abschirmung von Risiken zur Planung der Sanierung und Abwicklung von Kreditinstituten und Finanzgruppen*). Thus, Germans are pioneers of regulations which were later found apropriate in the whole EU. Later Germany passed also a law (*Sanierungs- und Abwicklungsgesetz* – SAG), which incorporates all essential BRR Directives in national law. The previous regulations of banking law (*Kreditwesengesetz* – KWG) concerning recovery and resolution of banks were annulled.

In the eurozone the BRR Directive was systemically supplemented by the SRM Regulation. (http://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:32014R0806&from=PL Retrieved March 30, 2016) The Regulation invoking the BRR Directive establishes uniform conditions of recovery and resolution of banks in the eurozone. Recovery and financial decisions will be made by a new body, the Single Resolution Board (SRB), in cooperation with the Single Resolution Fund (SRF). The BRR, the SRM Regulation Directive and the Deposit Guarantee Scheme (DGS) constitute the foundations for the banking union. (Engelbach, Friedrich, 2015; Fabrini, 2014; Binder, 2015)

The key element of the BRR Directive is recovery plans, which must be prepared by all banks and not only those in bad financial situation. These plans have to be regularly updated. They are supposed to be an instrument preparing banks in advance for difficult situations. Pursuant to the SRM Regulation similar business reorganisation plans are prepared by organs responsible for restructuring of credit institutions. The objective is to establish a new procedure which would take account of multilateral and complex relations in the banking sector and to create a systemic approach that would take into consideration these relations. This objective is not fulfilled under the current bankruptcy proceedings. Thus, there are two interrelated instruments: recovery plans and business reorganisation plans, which corresponds with the concept of *Key Attributes of Effective Resolution Regimes for Financial Institutions* developed by the Financial Stability Board (FSB) in 2011. The requirement to prepare recovery plans by all banks is a new idea, until recently only banks at risk of bankruptcy had to prepare such plans.

Business reorganisation plans should foresee probable scenarios of the development of a crisis situation and answer, for example, the question whether a bank should be restructured or it should file for bankruptcy. However, this does not have to mean the termination of the bank's operations. It may continue its operations after a sale of the whole bank or a bail-in, when the owners or bondholders are obliged to recapitalise the bank. There is a possibility of transferring liabilities to so called a bridge institution, a private or state one.

Reorganisation plans are created with some objectives in mind, such as: maintaining the continuity of a bank's operations, protection of clients' resources, preserving trust in the financial market and avoiding the necessity of state aid. Pursuant to the BRR Directive a reorganisation plan should be implemented if an institution is at risk of bankruptcy. The assets and liabilities of the institution are evaluated by experts and auditors appointed by court. However, time pressure may cause that these proceedings can infringe on the owners' rights, which are limited under this procedure. The decision to implement a business reorganisation plan cannot be appealed, however, it is possible to file a complaint with superior Administrative Court, which will not stop the proceeding. Nonetheless, the court may only rule whether the decision was legitimate and not whether it was justified.

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Business reorganisation plans are prepared individually for each institution, including also holding companies. However, there are different strategies concerning big groups of companies. For example, there is Single Point of Entry (SPOE) option, where the plan concentrates on the holding or parent company and Multiple Point of Entry (MPOE) model, where endangered subsidiaries are examined. The SPOE strategy often involves transferring bad debts to a bridge institution and obliging the owners to recapitalise the bank. As a result, the business operation of the bank can be continued to the benefit of its clients, the bank's reputation and confidence in the bank. Different jurisdictions of the bank's subsidiaries, causing logistical, legal, organizational and coordination difficulties are a frequent problem of MPOE.

The problem of banks too big to fail is extremely expensive for taxpayers, depletes state finances, distorts the competition and increases moral hazard. That is why – in the context of the BRR Directive and the SRM Regulation – the EU created a concept of a bail-in, which means transferring the cost of restructuring or bankruptcy of a bank to the owners and creditors and not to all taxpayers. In the USA, pursuant to Dodd-Frank Act, a new body, the Orderly Liquidation Authority, was established. The authorities competent to introduce recovery and resolution procedures have broad powers and, to some extent, may influence the market conditions, change the order or the date of payments and even cancel liabilities or prevent a closure of a contract in the derivatives market. The concept of bail-out causes many problems, especially problems connected with the future of derivative contracts. Therefore, a new ISDA glossary contains such terms as: financial reference entity with standard reference obligations and governmental intervention as market events under Recovery and Resolution procedure. Standard procedures provided for by ISDA may be supplemented by arrangements between parties to the contract. These changes were inspired by, among others, the SNS Bank and Bankia cases. It is about the guarantee that the seller of an instrument will get the payment, so called deliverable obligation (Benton, Ajitsaria, 2014; Dwyer, Tredgett, 2014).

The conditions of constructive certainty have to be guaranteed, e.g. a bank's access to liquidity, which will ensure gone-concern loss absorbing capacity (GLAC). The objective of GLAC is to create for a bank opportunities to increase CET1 capital to the required minimum. For global systemically important institutions resolution plans are created by authorities competent to introduce recovery and resolution procedures in cooperation with the Crisis Management Group (CMG), which comprises central banks, financial market supervisory authorities and recovery and resolution authorities of each country where parts of a given G-SIFI holding company operate (Huertas, 2014).

Total Loss-Absorbing Capacity (TLAC) framework creates additional capital requirements for global systemically important financial institutions. It is due to the fact that during the crisis big banks were considered "too big to fail" and governments felt obliged to rescue banks at the taxpayers' expense. The importance of imposing additional requirements and thus reducing the moral hazard of G-SIFIs has been underlined by the FSB in its numerous documents (FSB, 2010; FSB, 2014). This also inspired the European Legislator to issue the BRR Directive.

Under the banking union, the SSM and the SRM abandoning the traditional institution of bankruptcy and taking account of multilateral relations in the financial system, which is provided for in the BRR Directive and the SRM Regulation, aims at ensuring financial stability and preventing a contagion effect. However, this is criticized from the point of view of politics and competition law. There are opinions that rescuing failing banks in a special, institutional way will distort competition and cause a loss of welfare and well-being and long-term state support strain on the budget when the SRF resources prove inadequate. Similar criticism refers also to guarantees for depositors and investors.

It should be stressed that the Single Resolution Mechanism (SRM) in the eurozone and a new system of recovery and resolution of credit institutions based on the BRR Directive in the whole EU do not render the system of state support for banks unlawful (Kok, 2015). State support for

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banks may be an important tool when bail-in and resources from the Single Resolution Mechanism (SRM) are not sufficient. Under this system the Commission examines the viability of a bank, or effectiveness of support, burden sharing and competition – in order to ensure equal conditions of competition restrictions may be imposed on the bank. To some extent, the Commission takes account of the nature of an aid to banks, which has to guarantee financial stability and prevent systemic risk. In order to ensure this the Commission may use both structural and behavioral measures. Since the beginning of the crisis the Commission has produced a number of guidelines.

The question of interdependence of Deposit Guarantee Schemes Directive (DGSD) and the BRR Directive arises. It is important to notice the change of the role of the guarantors of deposits in crisis management. They contribute to the financing of restructuring plans, so called paybox function. The role of a guarantor of deposits under the enhanced model of crisis management is essential. Good resolution procedures ensure continuous access to guaranteed deposits, which causes that there is no need to pay out the deposited funds. When eligible deposits at an institution under resolution are transferred to another entity through P&A tool or the bridge institution tool, the depositors have no claim under Article 109(4) of the BRR Directive 2014/49/EU against the deposit guarantee scheme. In fact, resolution instruments are a substitute for classic disbursement of guaranteed funds. They should enable resolution of the whole or part of a financial institution in an orderly manner and timely disbursement of guaranteed deposits or their transfer to another entity. Transferring guaranteed deposits through P&A tool is one of the options.

5. THE REGULATORY BACKGROUND OF SSM, SRM IN THE EUROPEAN BANKING UNION

Not without significance for the functioning of the European system of financial supervision is the partial transfer of supervisory powers to the European level (SSM, SRM). In this context, the fact that national regulators were given wide discretionary powers (due to a number of so-called national options) may be a source of practical problems (i.e. divergence between national supervisory practices). However, EU Member States must keep some options and discretions because of specific economic issues in different countries (European Parliament, 2016; EBI Workshop, 2016; Kunschke, Huertas, 2016). Therefore, there is a contradiction between the need to ensure a high level of regulatory uniformity and the need to take into account the specificity of local financial markets.

In addition, there are still many doubts or inconsistencies e.g. concerning legal protection in SSM and SRM. (Kämerer, 2016). Therefore, an integrated approach to the financial market law is needed. This can be seen in regulatory packages such as CRD IV / CRR, MiFID 2 / MiFIR, and other acts such as EMIR, Solvency 2, PSD, where regulations include also activities of near-banks including Fin-Tech institutions (E. Faia, A. Hackenthal, M. Haliassos, K. Langenbucher, 2016).

Regulations combining the purposes of micro- and macro-prudential policy which are aimed at counteracting pro-cyclicality and minimizing the impact of other factors of systemic risk should generally be appreciated.

Capital adequacy standards established under Basel III with a view to reducing the risk of crises, despite the generally positive assessment also raise some criticism. Similar discussions taking place around the new, complicated tools used to cover the costs of the crisis by creditors and bank owners (bail-in instead of bail-out), the concept of MREL (minimum requirements for own funds and by eligible liabilities) the concept of TLAC (total loss absorbing capacity). Concerns are expressed that the requirements are excessive as they will induce banks to take excessive risks or forcing too higher prices of financial services to consumers. In addition, high and restrictive capital requirements can result in shifting the part of the banks to the realm of

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banking shadow (shadow banking), which is not fully subject to the regulatory requirements (Long, Bannister, 2015).

Many problems arise as a result of the lack of global harmonization of trading derivatives and the lack of comparability of clearing houses (central counterparties – CCP). In the EU CCP situated outside the EU require approval by a decision of ESMA, on the basis of the consent of the Commission. In Asia, regional regulations are initiated that follow the pattern of the European AIFMD and EMIR. Moreover, there arises the question, to what extent should near-banks, including FinTech, be granted the access to the financial market infrastructure (clearing and settlement services), without prejudice to financial security and stability (Wickersham, 2015).

We have to deal with the regulation on transparency of securities financing transactions and of reuse, which will help to monitor also near-banks (the requirement of reporting of transactions to registered trade repositories). It expanded the disclosure requirements applicable to the management of investment funds, and tightened the requirements for reuse of collateral. Important is also the Regulation on the indexes used in the financial market, which expanded the list of indexes (e.g. not only LIBOR, but the DAX or indexes of commodity markets), explains the key issues related to the establishment and use of indexes to reflect market realities and not to cause conflicts of interest. (Brändli, Guggenheim, Jüttner, 2015)

Also the new regulatory package on the European Capital Markets Union should be mentioned. The aim of the European Commission is a differentiation of sources of financing of enterprises, especially small and medium-sized. The EU provides a wide and accessible market for debt securities (simple, transparent and standardized securitizations – STS), which also requires changes to CRR Regulation. At stake are: a new approach to cover capital for investment in infrastructure projects and the principles of financing with the risk capital. In the context of extending the sources of financing for small and medium-sized businesses it should be emphasized that crowdinvesting platforms are already regulated in many countries. (Pötzsch, 2016; Ovenden, Stubbs, 2015)

The study has verified the hypotheses concerning the importance of regulations – in the compliance context – as a strategic tool and an element of the new strategic thinking. (Poniatowska – Jaksch Ed. 2016). However, the EU must take further action within the financial market institutions in order to fully implement the European Banking Union. The new macro-prudential supervision regime has a bearing on the existing institutions (e.g. the development of new tasks both for the ECB and national supervisory authorities). This new regime also supplemented, in the legal sense, a broad understanding of systemic risk, pointing to specific areas where the macro-prudential supervision should particularly pursue its goals, i.e. capital buffers and counter-cyclical actions.

Both the ECB and the EU authorities recognised the inadequacy of existing regulations, and even more – the lack of appropriate institutional solutions, which was a prerequisite for the establishment of the so-called de Larosière Group. Hence, a series of solutions have been developed so as to, firstly, stop the functioning of the adverse phenomena in the financial markets and, secondly, to create defense mechanisms that would protect the economy against similar phenomena in the future.

With respect to the economic analysis of the banking union regulation it should be stressed, however, that a full quantitative impact assessment is not possible due to the information deficiencies, gradual implementation of the regulations, including executive acts, difficulties in separating the impact of individual legal acts on the market, complementarity and substitutability of the impact of the given regulations, the interdependencies (synergies or conflicts) between them, ever new possibilities of circumventing the law through financial innovations (law arbitration) or regulatory competition that occurs between national jurisdictions. In this context it is worth mentioning that a new innovative concept is used to study the so-called principle

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of proportionality has been elaborated recently. It consists of 3 components (proportionality in the strict sense, the appropriateness and necessity). It is an example of an analytical approach in relation to the regulatory impact assessment which places value not only on quantitative analysis, but also – to a large extent – on qualitative considerations (Kasiewicz, Kurkliński, Szpringer 2014).

6. CONCLUSIONS

There is a risk of excessive centralization of the ECB's competences, which may lead, on the one hand, to a decision paralysis, and, on the other, to the ECB's excessive power over the market and financial institutions and to the appearance of new challenges of the ECB supervision. According to the judgement of the Court of Justice of the EU, the scope of regulatory powers of the EBA and the ESMA is compliant with the Treaty (Meroni case).

The centralization of supervision in the ECB is seen as an institutional addition to the banking union and the common currency, the euro. The banking union means the delegation of sovereignty of member states to the EU institutions. The SSM entails a substantial increase of the role of the ECB in context of the role of ESRB or EBA. There are two options to strengthen the SSM: the expansion of the supervisory role of the ECB or the enhancement of the functions of the EBA.

It is unlikely that the responsibility for macroprudential policy will rest with a single institution, it is important to assign key functions in such a way that will allow avoiding gaps and inconsistencies. A system of regulations should take account of such aspects as: requirements of interinstitutional coordination and exchange of information, autonomy, management, accountability and transparency.

The ECB's ability to exercise its supervisory functions directly is a new standard in the institutional system of the EU. The ECB may increase capital requirements in certain situations, regardless of the actions of national regulators. This instrument of macro-prudential supervision puts into question the role of the ESRB and raises doubts about the relations between these two institutions.

In addition, there arises a problem of the division of tasks between the ECB and national supervisory authorities under the SSM. It is the competence of the ECB to supervise systemically relevant banks in the countries belonging to the banking union and in cross-border cases, when more than one member state is involved. However, ECB is also solely competent to grant and withdraw authorizations and to accept, or reject, shareholders in banks as fit and proper across the Eurozone, i.e. for all banks.

The SSM and the SRM abandoning the traditional institution of bankruptcy and taking account of multilateral relations in the financial system, which is provided for in the BRR Directive and the SRM Regulation, aims at ensuring financial stability and preventing a contagion effect. However, this is criticized from the point of view of politics and competition law.

The SSM is discussed also in the context of granting and taking back a right to provide services by credit institutions**.** A rule has been adopted that a national regulator serves always as an entry point where suitable documents are submitted and where the evaluation if a subject fulfills the criteria required to provide services in the banking sector is performed.

The relations between the ECB and the EBA and between the ECB and the ESRB with reference to macroprudential policy are a subject of a current debate. On the one hand, the SSM Regulation underlines the necessity of tight cooperation between the ECB and the ESRB but, on the other, their supervisory tasks and competences should not overlap. The ECB and national regulators would have to collaborate closely.

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Bibliography

Armstrong K. *The legal limits to "agencification" in the EU? Case C 270/12 UK v. Parliament and Council* http://europeanlawblog.eu/?p=2176 Retrieved March 30, 2016.

Shearman&Sterling (2014) *Banking Supervision within the Eurozone. The Single Supervisory Mechanism*, http://www.shearman.com/~/media/Files/NewsInsights/Publications/2014/11/Banking-Supervision-Within-the-Eurozone-The-Single-Supervisory-Mechanism-FIAFR-111714.pdf Retrieved March 30, 2016.

Bauer D. A., Werner K. (2015) *TLAC – Neue Herausforderungen für die Kapitalstruktur*? "Zeitschrift für Wirtschafts- und Bankrecht" No 24.

Benton D., Ajitsaria S. (2014) *The new 2014 ISDA Credit Derivatives Definitions* "Butterworths Journal of International Banking and Financial Law" No 7–8.

Berger H. (2015) *Der einheitliche Aufsichtsmechanismus (SSM) – Bankenaufsicht im europäischem Verbund* "Zeitschrift für Wirtschafts- und Bankrecht" No 11.

Binder J. H. (2015) *Gleichung mit (zu) vielen Unbekannten: Nachhaltige Bankenstrukturen durch Sanierungs- und Abwicklungsplanung* „Zeitschrift für Bankrecht und Bankwirschaft" No 3.

Brändli B. Guggenheim B., Jüttner M. (2015) *Financial Benchmarks: Bedeutung, Problematik und regulatorische Ansätze* „Schweizerische Zeitschrift für Wirtschafts- und Finanzmarktrecht" nr 2.

Christensen T (2005) *Agencification and Regulatory Reforms* Stanford University, 2005, http://soc.kuleuven.be/io/cost/pub/paper/AgencificationRegulatioryReforms_Final21021.pdf Retrieved March 30, 2016.

Cleynenbreugel P. (2014) *Meroni Circumvented? Art.114 TFEU and Regulatory Agencies* "Maastricht Journal of European and Comparative Law" Vol. 21, No 4.

Deloite (2015) *The Single Supervisory Mechanism. Getting to Grips with the New Regime* http://www2.deloitte.com/content/dam/Deloitte/uk/Documents/financial-services/deloitte-uk-single-supervisory.pdf Retrieved March 30, 2016.

Dwyer, E. Tredgett R. (2014) *OTC derivatives: Client Clearing Agreements: framing the main negotiation* "Butterworths Journal of International Banking and Financial Law" No 7–8/2014.

EBI Workshop: Challenges for banks in a changing regulatory environment, Frankfurt 27–28 January 2016 https://www.ebi-edu.eu/files/Presentation%20Slide%20Packs%20Conference%2027-28-01/20160127%20Presentation%20Prof%20Bart%20Joosen.pdf.

Engelbach S., Friedrich T. (2015) *Die Umsetzung der BRRD in Deutschland* „Zeitschrift für Wirtschafts- und Bankrecht" No 14.

Fabrini F. (2014) *On Banks, Courts and International Law. The Intergovernmental Agreement on the Single Resolution Fund in Context* „Maastricht Journal Of European and Comparative Law" Vol. 21, No 3.

Faia E.,, Schnabel I. (2015), *The Road from Micro-Prudential to Macro-Prudential Regulation* oraz T. H. Tröger *A Political Economy Perspective on Common Supervision in the Eurozone* , in: E. Faia, A. Hackenthal, M. Haliassos, K. Langenbucher (eds.), *Financial Regulation. A. Transatlantic Perspective*, Cambridge University Press, Cambridge 2015.

Fedorowicz M. (2014) *W sprawie przyszłej organizacji nadzoru makroostrożnościowego w Polsce* „Bezpieczny Bank" Nr 4.

Fedorowicz M. (2011) *Regulacja nadzoru nad rynkiem finansowym w UE – integracja czy dezintegracja prawnych instrumentów antykryzysowych* „Ekonomia i Prawo" Tom VII.

Ferran E. (2015) *The Existential Search of the European Banking Authority* University of "Cambridge Faculty of Law Working Papers" No 40.

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2634904 Retrieved March 30, 2016.

Frank A. (2012) *Die Rechtswirkungen der Leitlinien und Empfehlungen der Europäischen Wertpapier- und Marktaufsichtsbehörde* Baden-Baden, Nomos.

Görisch Ch. (2012) *Die Agenturen der Europäischen Union* "Jura" No 1, www.degruyter.com Retrieved March 30, 2016.

Griller S. *The European institutional setup on financial regulation – Meroni revisited* http://www.eba.europa.eu/documents/10180/498024/Presentation+-+Stefan+Griller.pdf Retrieved March 30, 2016.

Gurlit E., *Instrumente makroprudenzieller Bankenaufsicht – unter besonderer Berücksichtigung zusätzlicher Kapitalanforderungen* Teil I und II, „Zeitschrift für Wirtschafts- und Bankrecht" Nr 26/2015 oraz Nr 27/2015.

Hanten M., Heljula K. (2015) *The ECB as the new regulator: a lawyer`s perspective* "Butterworths Journal of International Banking and Financial Law", April, 2015.

Horsch A., Kleinow J. (2015) *Der Bankenstresstest 2014 im Vorfeld des Single Supervisory Mechanism: Theorie und Empirie zu einem Lackmustest der neuen europäischen Bankenregulierung* „Zeitschrift für Bankrecht und Bankwirtschaft", No 1.

DOI: 10.7172/2353-6845.jbfe.2017.2.4

Huertas T. F. (2014) *From bail-out to bail-in: are banks becoming safe to fail?* "Butterworths Journal of International Banking and Financial Law" No 9.

Jacobsson B., Sundström G. (2007) *Governing State Agencies. Transformations in the Swedish Administrative Model* Pisa, ECPR, http://www.score.su.se/polopoly_fs/1.26595.1320939800!/20075.pdf Retrieved March 30, 2016.

Jagiełłowicz Ł. (2013) *W stronę Europy zmiennej geometrii? Analiza orzeczenia Trybunału Sprawiedliwości UE w sprawie Europejskiego Mechanizmu Stabilności*, Centrum Europejskie Natolin, „Analiza Natolińska" No 3, http://www.natolin.edu.pl/pdf/analizy/Natolin_Analiza_3_2013.pdf Retrieved March 30, 2016.

Jurkowska-Zeidler A. (2008) *Bezpieczeństwo rynku finansowego w świetle prawa Unii Europejskiej* WoltersKluwer, Warszawa.

Kasiewicz S., Kurkliński L. „Szpringer W. (2014) *Zasada proporcjonalności. Przełom w ocenie regulacji*, ALTERUM Centre for Research and Analysis of Financial System, Warsaw.

Kämerer J. A. (2016) *Rechtsschutz in der Bankenunion* „Zeitschrift für Wirtschafts- und Bankrecht" Nr 1.

Kern A. (2015) *European Banking Union: a Legal and Institutional Analysis of the Single Supervisory Mechanism and the Single Resolution Mechanism* "European Law Review" No 4.

Kok J. (2015) *Competition Policy in the Framework and Application of State Aid in the Banking Sector* "European State Aid Law Quarterly" Vol. 14, No 2.

Koleśnik J. (2013) *Europejska unia bankowa – nowy wymiar ryzyka systemowego* „Problemy Zarządzania" No 2.

Kunschke D., Huertas M. (2016) *Regulation 2016/445 of the European Central Bank on the Exercise of Options and Discretions Available in Union Law (the NODE Regulation): A Milestone towards a Single Rulebook for all Banks in the EU?* "Journal of International Banking Law and Regulation" Issue 8.

Lehmann M., Manger-Nestler C . (2014) *Einheitlicher Europäischer Aufsichtsmechanismus: Bankenaufsicht durch die ECB* "Zeitschrift für Bankrecht und Bankwirtschaft", No 1.

Long, A. Bannister A., (2015) *The shadow of MREL and TLAC* „International Financial Law Review" nr 4.

Martinico G. (2014) *Assymetry and Complex Adaptive (Legal) Systems: the Case of the European Union* "Maastricht Journal Of European and Comparative Law" Vol. 21, No 2.

Moynihand D. P. (2006) *Ambiguity in Policy Lessons: The Agencification Experience Public Administration* Vol. 84, No 4 http://www.lafollette.wisc.edu/facultystaff/moynihan/PA06Ambiguity.pdf Retrieved March 30, 2016.

Nadolska A. (2014) *O charakterze prawnym decyzji Europejskich Urzędów Nadzoru – rozważania w kontekście sprawy C-370/12 Pringle* „Zeszyty Prawnicze BAS no 1(41), http://orka.sejm.gov.pl/wydbas.nsf/0/D342BC2DCC14D897C1257D07003A3BD3/$File/Strony%20od%20Zeszyty%20Prawnicze%201%202014_Nadolska.pdf Retrieved March 30, 2016.

Ovenden S., Stubbs D., *Practice What You Preach* „International Financial Law Review" nr 11.

Poniatowska-Jaksch M. (Ed.) (2016) *Tools in Business Management. Towards a New Strategic Thinking* SGH Publishing House, Warsaw.

Pötzsch T. (2016) *Aktuelle Schwerpunkte der Finanzmarktregulierung – national, europäisch, international* „Zeitschrift für Wirtschafts- und Bankrecht" Nr 1.

Pruski J. (2014) *Ewolucja światowego systemu ochrony depozytów oraz systemu recovery i resolution*, IX Kongres Ryzyka Bankowego, Warszawa, http://www.bfg.pl/sites/default/files/dokumenty/prezentacja_prezesa_zarzadu_bfg_na_ix_kongresie_ryzyka_bankowego.pdf Retrieved March 30, 2016.

Repasi R. (2012) *A study on the legal feasibility of perspectives of reforms towards a genuine European economic and monetary union*, European Parliament,, www.sven-giegold.de Retrieved March 30, 2016.

Lo Schiavo G. *The European Supervisory Authorities. A True Evolutionary Step along the Process of European Financial Integration* http://www.tf.vu.lt/dokumentai/Admin/Doktorant%C5%B3_konferencija/Schiavo.pdf Retrieved March 30, 2016.

Lo Schiavo G. (2013) *The Judicial 'Bail Out' of the European Stability Mechanism: Comment on the Pringle Case* College of Europe, "Research Papers in Law" No 9 https://www.coleurope.eu/system/files_force/research-paper/researchpaper_9_2013_loschiavo.pdf Retrieved March 30, 2016.

Lo Schiavo G. (2014) *From National Banking Supervision to a Centralised Model of Prudential Supervision in Europe*, Maastricht Journal of European Comparative Law, Vol. 21, No 1/2014.

Schoenmaker D., *Allocating macroprudential powers,* ESRB, Reports of Advisory Scientific Committee Nr 5, November 2014, https://www.esrb.europa.eu/pub/pdf/asc/Reports_ASC_5_1411.pdf?9edec4e98fd4a72eb2cbcb88a646a1c6#page=1&zoom=auto,-12,842.

Stanisławiszyn P. (2014) *Nadzór makroostrożnościowy w Unii Europejskiej. Jak bardzo potrzebny? Jak bardzo skuteczny*?, [w:] *Nowe koncepcje nadzoru i regulacji rynku finansowego* pod red. W. Rogowskiego, Oficyna Wydawnicza Instytutu Allerhanda, Warszawa–Kraków.

Szczepańska O. (2012) *Nadzór makroostrożnościowy* „MF Bank" Nr 10.

Szpringer W. (2015) *Prawo i ekonomia stabilności finansowej* Oficyna Wydawnicza SGH, Warszawa.

Szpringer Z. (2013) *Unia Bankowa* Seria: Infos, No 3, Warszawa, Kancelaria Sejmu RP.

Thomas S. (2014) *Die kartellrechtliche Bewertung des sog. Kapitalmarktrechtlichen "cornering"* „Wirtschaft und Wettbewerb", No 2.

DOI: 10.7172/2353-6845.jbfe.2017.2.4

Tröger T., *Regulatory Influence of Market Conditions in the Banking Union*, „SAFE Newsletter" Nr 3/2015, www.safe-frankfurt.de/news-media/newsletter.html

Węc J. (2014) *Proces konstytuowania Unii Bankowej. Geneza, podstawy prawne, cele i zasady działania* „Rocznik Integracji Europejskiej", No 8, http://pressto.amu.edu.pl/index.php/rie/article/view/485, Retrieved March 30, 2016.

Wickersham C. (2015) *New World Disorder* „International Financial Law Review" nr 11.

Witte A. (2014) *The Application of National Banking Supervision Law by the ECB: Three Parallel Models of Executing EU Law* "Maastricht Journal of European and Comparative Law" Vol. 21, No 4.

Zaleska M. red., (2013) *Unia bankowa*, Difin, Warszawa.

Zetsche D. (2014) *Beihilfe durch Staatliche Kreditgewährung an die Entschädigungseinrichtung der Wertpapierhandelsunternehmen: Der Fall Phoenix* „Wirtschaft und Wettbewerb" No 10.

Zimmer D., Weck T., Schepp N. P. (2014) *Wiederherstelung des Wettbewerbs als Ordnungsprinzip auf den Finanzmärkten: Ist die Bankenunion ein taugliches Mittel hierzu?* „Zeitschrift für Wettbewerbsrecht" No 3.

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Assessing Countries' Financial Inclusion Standing – A New Composite Index

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ABSTRACT

This paper leverages the IMF's Financial Access Survey (FAS) database to construct a new composite index of financial inclusion. The topic of financial inclusion has gathered significant attention in recent years. Various initiatives have been undertaken by central banks both in advanced and developing countries to promote financial inclusion. The issue has also attracted increasing interest from the international community with the G-20, IMF, and World Bank Group assuming an active role in developing and collecting financial inclusion data and promoting best practices to improve financial inclusion. There is general recognition among policy makers that financial inclusion plays a significant role in sustaining employment, economic growth, and financial stability. Nonetheless, the issue of its robust measurement is still outstanding. The new composite index uses factor analysis to derive a weighting methodology whose absence has been the most persistent of the criticisms of previous indices. Countries are then ranked based on the new composite index, providing an additional analytical tool which could be used for surveillance and policy purposes on a regular basis.

JEL classification: C43, C82, O16, G00, G21

Key words: Financial inclusion, access and usage of financial services, factor analysis, index.

1. INTRODUCTION

The purpose of this paper is to develop an index of financial inclusion that addresses the issue of weighting as well as that of perfect substitutability between dimensions. The paper uses factor analysis to identify financial inclusion dimensions and assign weights. The composite index is derived from a non-linear aggregation of intermediate dimensional indicators and is subsequently used to rank countries.

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Financial inclusion has emerged as an important topic on the global agenda for sustainable long-term economic growth. A number of central banks both in emerging and developed countries have put in place various initiatives to promote financial inclusion in their countries. In addition to central bank's initiatives, the IMF, G20, International Finance Corporation (IFC), the Alliance for Financial Inclusion (AFI), and the Consultative Group to Assist the Poor (CGAP) are assuming an increasingly active role at the international level in collecting the data and setting standards to improve financial inclusion.

This topic has also attracted a growing interest from the academic community. Burgess and Pande (2005), for example, find that the expansion of bank branches in rural India had a significant impact on alleviating poverty. Brune et al. (2011) conduct a field experiments in rural Malawi analyzing venues through which access to formal financial services improves the lives of the poor, with respect to saving products. Allen et al. (2013) explore determinants of financial development and inclusion among African countries.

While the importance of financial inclusion is well-established, a formal consensus on how it should be measured has yet to be reached. Different approaches have been proposed in the literature including the use of a variety of financial inclusion dimensions to econometric estimation. One of the first efforts at measuring financial sector outreach across countries was done by Beck et al. (2006). The authors designed new indicators of banking sector outreach for three types of banking services—deposits, loans, and payments—across three dimensions—physical access, affordability, and eligibility. This approach provides valuable information on particular aspects of financial inclusion, but combining these elements to evaluate overall progress accomplished by countries can be tricky. For example, in Beck et al. (2007), Albania ranks fourth in loan-income ratio but ranks 85th in bank branches per 100,000 adults. Such variation across dimensions makes it difficult to assess the state of financial inclusion in a country or across countries. Similarly, Honohan (2008) estimates the proportion of households having access to formal financial services for roughly 160 countries. Nevertheless, as Sarma (2012) puts it: "[the econometric estimates of this approach] provide only a one-time measure of financial inclusion and are not useful for understanding the changes over time and across countries."[2]

In an attempt to overcome these shortcomings, Sarma (2008, 2010, and 2012) and Chakravarty and Pal (2010) have proposed composite indices of financial inclusion that incorporate various banking sector variables to reflect the level of accessibility, availability and usage of banking services. However, these indices assign equal weights to all variables and dimensions, which assumes that all dimensions have the same impact on financial inclusion.

The remainder of the paper is structured as follows: Section II discusses the definition of financial inclusion and its dimensions. Section III describes the variables used in the analysis. Section IV presents the methodology used to compute the index; Section V summarizes the main results of the index and the output of the index as it relates to country rankings. The final section of the paper concludes by suggesting some possible future extensions of the work and policy implications.

2. DEFINING FINANCIAL INCLUSION AND ITS DIMENSIONS

Financial inclusion can be broadly defined as an economic state where individuals and firms are not denied access to basic financial services based on motivations other than efficiency criteria. The 2014 Global Financial Development Report (World Bank, 2014) identifies four major forms of financial exclusion, which are classified into voluntary and involuntary exclusion.

[2] Sarma (2012), p. 5.

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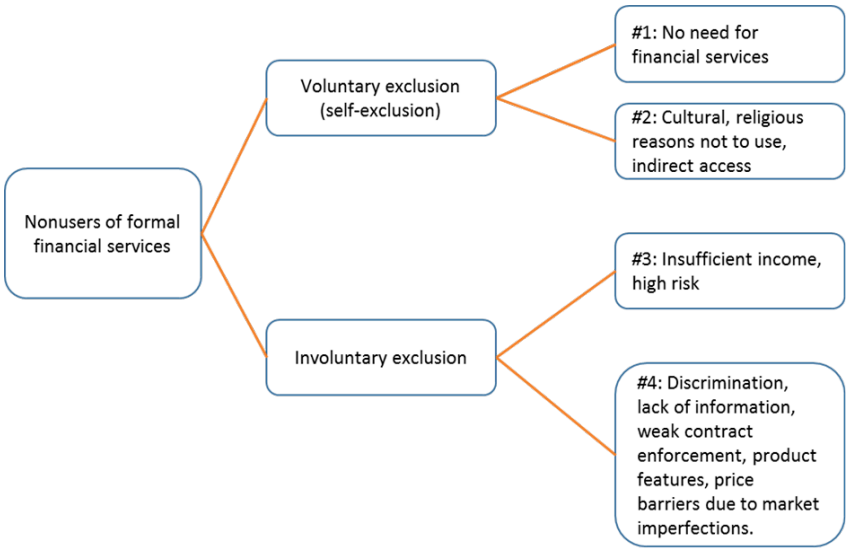
Figure 1
Financial Exclusion



Source: Adapted from World Bank (2014).

Voluntary exclusion refers to the segment of the population or firms that choose not to use financial services either because they do not need those services due to the lack of promising projects[3] or because of cultural or religious reasons. Since this type of exclusion is not a direct consequence of market failure, little can be done to address it. Of course, as pointed out in the aforementioned report, there is always room for improvement, by increasing, for example, financial literacy or encouraging the entry of specialized financial institutions that offer financial products tailored to meet cultural and religious requirements. From a macroeconomic viewpoint, this exclusion is driven by a lack of demand. Some individuals or firms may be involuntarily excluded from the financial system because they do not have sufficient income or, in the case of the credit markets, have an excessive lending risk profile. This type of involuntary exclusion is also not the result of market failure. A second category of involuntarily excluded entities consist of the segment of individuals and firms that are denied financial services as a result of government failures or market imperfections.

From a macroeconomic perspective, the main objective for building an inclusive financial system should be, in principle, the minimization of the percentage of individuals and firms in group 4 of Figure 1. In many developing economies, financial institutions are routinely faced with a number of barriers that lower their efficiency. For instance, because of various shortcomings in contract enforcement and a poor information environment, formal financial institutions in a number of developing economies are overcautious about extending loans to individuals or firms, especially small and medium enterprises (SMEs). Financial exclusion arising from incomplete/imperfect information may also arise in competitive markets. Stiglitz and Weiss (1981) demonstrate that, because of principal agent problems (moral hazard and adverse selection), individuals and firms in advanced economies may be excluded from the credit market even in equilibrium. Without complete information, and because beyond a certain interest rate level (r^* in Figure 2) the rate of return of the loan may decrease, financial institutions may deny loans to additional applicants even if these applicants could afford a loan at higher interest rate (r^{me} in Figure 2).

[3] See also Kempson and Whyley (1999a and 1999b).

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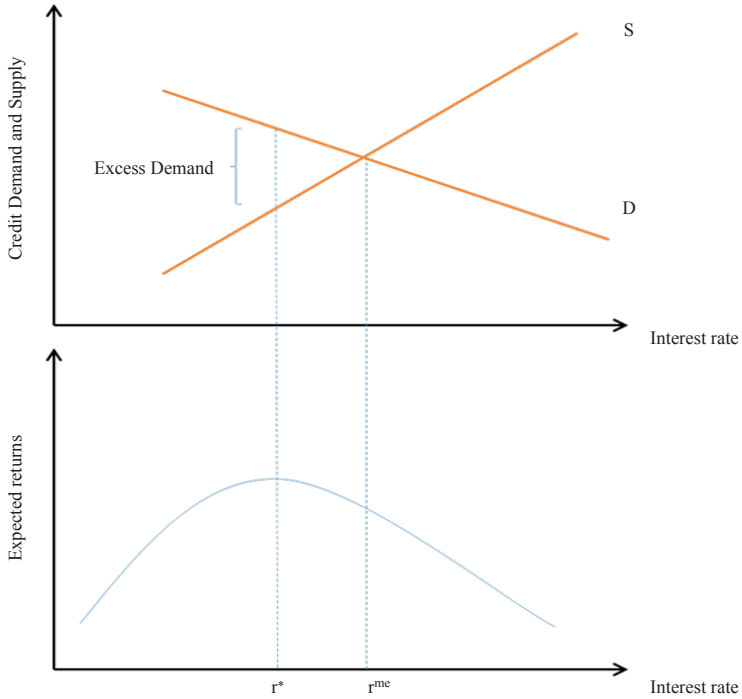
Figure 2
Credit rationing in a competitive market



Note: D = Demand; S = Supply

Source: Adapted from Stiglitz and Weiss (1981).

More recently, using a survey of low-income households conducted in Washington D.C., Los Angeles, and Chicago, Seidman et al. (2005) find that a significant number of individuals in those cities use informal non-bank services.

A stringent definition of financial inclusion should, therefore, theoretically be closely associated with the minimization of financial exclusion arising from market or government failures. However, distinguishing between the four categories of exclusion listed in Figure 1 is not straightforward. Information on each category may be obtained from user-side surveys, such as the World Bank's Global Financial Inclusion (Global Findex) database. However, since survey-based data are costly to collect, there is no guarantee that such data can be made available to users with a reasonable frequency.

From a practical viewpoint, the concept of financial inclusion should be approached through its dimensions. There is a consensus, at least from a policy maker's perspective, that financial inclusion encompasses three main dimensions, namely the outreach, usage, and quality of financial services. The outreach dimension refers to the (physical) ability to easily reach a point of service.[4] According to the World Bank's Global Findex survey, of the 2.5 billion of individuals excluded from financial systems worldwide, 20 percent cite the distance to a point of financial service as being the main reason for not having an account with a formal financial institution.[5] The shortage of physical points of financial services affects mostly the populations who live in rural areas, but in a number of countries this is the case for individuals living in urban areas as well. The usage dimension measures the use of financial services, while the quality dimension measures the extent to which financial services address the needs of the consumers.

[4] Access points are defined in this paper as points where cash-in and cash-out transactions are performed.

[5] See Demirguc-Kunt and Klapper (2012), p. 3.

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In light of the above discussion, we define financial inclusion in this paper as the optimal combination of its dimensions. The main challenge with this definition is that the data may not be readily available for some dimensions. The dimensions considered in this paper are those for which the data are reported to the IMF.

3. VARIABLES SELECTION

A number of variables could be theoretically relevant for inclusion in each of the three dimensions of financial inclusion. However, because the data for a number of these variables are usually not readily available, we use their proxies to measure each dimension.

The outreach dimension is usually defined using geographic or demographic penetration indicators.[6] Proxies for these indicators are the number of automatic teller machines (ATMs) and financial institutions' branches rescaled by land mass (number of ATMs and branches per 1,000 km square) or adult population (number of ATMs and branches per 100,000 adults). The IMF disseminates the data on the number of ATMs and branches in terms of both land mass and adult population. The raw data for the number of ATMs and branches are collected from the financial service providers through the IMF's Financial Access Survey (FAS) while land mass and adult population data used to rescale the raw data are extracted from the World Bank's World Development Indicators (WDI) dataset. We use the geographic penetration indicators—ATMs and branches per land mass – as variables for the outreach dimension, because the physical distance to physical points of service tends to be an important barrier to financial inclusion.[7] ATMs and branches refer to physical points of financial service offered by other depository corporations[8] (ODCs) in a given country – that is, financial intermediaries (central bank excluded) that collect deposits included in broad money or issue liabilities that are close substitute of deposits and are included in broad money.

Typical indicators of the usage dimension are the percentage of adults with at least one type of regulated deposit account and the percentage of adults with at least one type of regulated loan account. Proxies to these two indicators are the number of regulated deposit accounts per 1,000 adults, number of regulated loan accounts per 1,000 adults, number of household borrowers per 1,000 adults, and the number of household depositors per 1,000 adults. We use the last two indicators as proxies of the usage dimension variables.[9] The data for these variables are also disseminated by the IMF through its FAS website.[10] Household depositors refer to households with at least one deposit account. Deposits include all types of deposits: transferable deposits, sight deposits, savings deposits, and fixed-term deposits. Also included are liabilities of money-market funds in the form of shares or similar evidence of deposit that are, legally or in practice, redeemable immediately or at relatively short notice. For the purpose of the present analysis, deposits that have restrictions on third-party transferability are also included in this category even though they are excluded from broad money. Household borrowers refer to households who have at least one loan account. Loans are financial assets that are created when a creditor lends funds directly to a debtor and are evidenced by non-negotiable documents. These include mortgage loans, consumer loans, hire-purchase credit, financial leases, securities repurchase agreements, etc.

[6] See Beck et al. (2007).

[7] Data on the number of mobile banking service providers and mobile agents could also be included in the outreach dimension. However, comparable data do not exist at present.

[8] The ODC sector includes commercial banks, credit unions, saving and credit cooperatives, deposit taking microfinance (MFIs), and other deposit takers (savings and loan associations, building societies, rural banks and agricultural banks, post office giro institutions, post office savings banks, savings banks, and money market funds).

[9] We exclude the variables on the number of accounts because they could potentially introduce a bias in the dataset. In cases where an individual has multiple deposit or loan accounts, the use of formal financial services in a country would be overstated.

[10] http://fas.imf.org/

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A variety of indicators are used to theoretically characterize the quality dimension. These indicators are classified in various sub-categories that include financial literacy, disclosure requirements, dispute resolution, and the cost of usage. Because the data on the quality dimension are rather scarce, this dimension is not considered in the computation of the proposed index. Table 1 below summarizes the final list of variables used to compute the index.

Table 1
List of Variables

Variable	Description
Number of ATMs per 1,000 square kilometers	Sum of all ATMs multiplied by 1,000 and divided by total area of the country in square kilometers.
Number of branches of ODCs per 1,000 square kilometers	Sum of all branches of commercial banks, credit unions & financial cooperatives, deposit-taking microfinance institutions and other deposit takers multiplied by 1,000 and divided by total area of the country in square kilometers.
Total number of resident* household depositors with ODCs per 1,000 adults	Sum of all household depositors with commercial banks, credit unions & financial cooperatives, deposit-taking microfinance institutions and other deposit takers multiplied by 1,000 then divided by the adult population.
Total number of resident household borrowers with ODCs per 1,000 adults	Sum of all household borrowers from commercial banks, credit unions & financial cooperatives, deposit-taking microfinance institutions and other deposit takers multiplied by 1,000 then divided by the total adult population.

* The concept of residency used in this paper is taken from the sixth edition of the Balance of Payments and International Investment Position Manual (http://www.imf.org/external/pubs/ft/bop/2007/pdf/bpm6.pdf). According to that definition, an institutional unit is said to be a resident of a given economy if it has a center of economic interest in that economy.

The size of the sample is relatively small for each year, as few countries are reporting the data for the four variables simultaneously. When all four variables are taken together, data are available for 23 countries in 2009, 26 countries in 2010, 28 countries for 2011, and 31 countries for 2012. However, as underlined in Section V, even with a small sample, the computed index casts interesting results with respect to financial inclusion.

4. COMPUTATION OF THE INDEX

We derive the composite index by aggregating intermediate sub-indices pertaining to different dimensions. The multidimensional approach is generally implemented following a three-step sequence that consists of: (i) normalization of variables; (ii) determination of dimensional sub-indices; and (iii) aggregation of sub-indices. Most popular composite indices of well-being constructed by the United Nations Development Programme (UNDP) such as the Human Development Index (HDI), Human Poverty Index (HPI), and Gender-related Development Index (GDI) follow this basic sequence.[11] Similarly, other indices of financial inclusion, such as those proposed by Sarma (2008 and 2012) and Chakravarty and Pal (2010), are based on this three-step sequence. We follow a five-step sequence to compute the index. First, like the UNDP's approach, the variables are normalized so that the scale in which they are measured is irrelevant. Then, using factor analysis (FA) we introduce a statistical identification of financial inclusion

[11] See UNDP (2010) for the computation of the HDI for example.

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dimensions in order to ascertain whether the statistical groups obtained from FA are the same as the theoretical dimensions. We show that such is the case. With the statistical dimensions matching the theoretical ones, we then use in the third step the statistical properties of the dataset to assign weights to both individual variables and sub-indices. Finally, unlike the UNDP's indices which are computed using the simple geometric mean, the outcomes of the second and third steps allow us to choose in the fourth and fifth steps a weighted geometric average as the functional form of the aggregator for the computation of the dimension and composite indices, respectively.

A. Normalization of variables

Aggregation over variables that are expressed in different measurement units and have varying ranges requires normalization. Normalization is meant to address the lack of scale invariance. Various normalization approaches have been proposed in the literature. A comprehensive review of the different approaches may be found in Freudenberg (2003), Jacobs et al. (2004), and OECD (2008), among others. In more practical terms, however, the most common methods are the standardization, the min-max, and the distance to a reference. We use the distance to a reference method in this paper.[12] The distance to a reference measures the relative position of a given variable with respect to its reference point. The reference point is usually a target to be reached in a given time frame or the value of the variable in a reference country.[13] We define the reference point for each variable to be the maximum value of the variable across countries. This means that, for a given variable, the benchmark country is the group leader. The normalized variable is therefore bounded between 0 and 1 where a score of 1 is attributed to the leading country and the others countries are given percentage points away from the leader. If $\boldsymbol{x_{ic}}$ is the raw value of variable i for country c, and $\boldsymbol{M_i}$ the maximum value of the variable across countries, then the normalized value nx_{ic} of x_{ic} is given by:

$$\boldsymbol{nx_{ic}} = \frac{\boldsymbol{x_{ic}}}{\boldsymbol{M_i}}. \tag{1}$$

The choice of the maximum value across countries for each variable is mainly motivated by the fact that countries with more inclusive financial systems tend to also have higher values for all variables considered in this paper. The World Bank's Findex surveyed the users of financial services in 148 countries in 2011. The survey confirmed an important gap of financial inclusion performance between the advanced economies and developing countries, the former group having more inclusive financial systems than the latter.

In addition, this normalization method satisfies most of the required technical properties, including the scale invariance property which is provided by the fact that the image set of the normalizer is a sub-set of the unit interval.[14] As indicated previously, it is also consistent with nonlinear aggregators that require prior transformation of raw variables using a logarithmic function.[15]

[12] This method is chosen mainly because it is consistent with nonlinear aggregators that require prior transformation of raw variables using a logarithmic function.

[13] The United States and Japan are often used as external benchmark countries.

[14] A useful discussion about the technical properties that normalizers should meet is provided in Chakravarty and Pal (2010).

[15] A logarithmic transformation cannot be used with the standardization approach because countries with values below the average have negative normalized variables. Similarly, a logarithmic transformation applied to min-max normalized variables would require truncating the series by excluding countries where the minimum is attained.

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B. Statistical identification of dimensions

The classification of variables in the relevant dimensions is needed to ensure proper allocation of the weights between dimensions. When a composite index is computed using a variety of variables, some variables that appear to be *ex ante* good candidates for inclusion into a specific dimension may possess attributes of other dimensions, thereby making it difficult to assign the weights adequately. Hence, there is a need for a clear criterion to determine the relevant variables in each dimension. The index proposed in this paper is computed using four variables. From the theoretical perspective the outreach variables are clearly distinguishable from the usage variables. Hence, the goal in this section is to ensure that this theoretical taxonomy is confirmed statistically.

We use FA to group the variables into the relevant dimensions. FA posits that each observed variable of the dataset is a combination of unobserved factors. Coefficients that relate the observed variables to common factors are called factor loadings. Variables with high factor loadings have a high affinity with the latent variable. Following Berlage and Terweduwe (1988) and Nicoletti et al. (2000), we group variables that share higher affinity with a specific factor into the same dimension, that is, variables are included in the dimension for which they have the highest factor loading.[16]

The basic form of an FA model is as follows:

Let $\vec{X}$ be the vector of our 4 observed random variables described in section III $\left(\mathbb{E}(\vec{X}) = \vec{\mu}\right)$, $\vec{F}$ the vector of m unobservable random variables called the common factors of $\vec{X}$, $\vec{\epsilon}$ the vector of specific factors of $\vec{X}$. Working with centered variables $\vec{Y} = \vec{X} - \vec{\mu}$ our *m-factor* model is given by equation 2 below:

$$\vec{\boldsymbol{Y}} = \boldsymbol{L}\vec{\boldsymbol{F}} + \vec{\epsilon} \tag{2}$$

where the covariance of $\vec{X}$ is $Cov(\vec{X}) \equiv \boldsymbol{\Sigma}$, $\boldsymbol{L} = (\boldsymbol{l}_{ij})_{\substack{1 \le i \le 4 \\ 1 \le j \le m}}$ is the matrix of factor loadings, and l_{ij} the loading of the i^{th} variable Y_t on the j^{th} common factor F_j.

We make the traditional assumptions of FA models that: $\mathbb{E}(\vec{F}) = \vec{O}_m$, $Cov(\vec{F}) = \boldsymbol{I_m}$, $Cov(\vec{\epsilon}, \vec{F}) = \boldsymbol{O_{4\times m}}$, $\mathbb{E}(\vec{\epsilon}) = \vec{O}_{\boldsymbol{4}}$, and $Cov(\vec{\epsilon}) = \boldsymbol{\psi}$.

These assumptions provide the following results that we use for the identification of financial inclusion dimensions and the derivation of the weights assigned to variables and dimensions:

$$\boldsymbol{\Sigma} = \boldsymbol{L}\boldsymbol{L}' + \boldsymbol{\psi} \tag{3}$$

$$\boldsymbol{L} = \boldsymbol{Cov}(\vec{\boldsymbol{Y}}, \vec{\boldsymbol{F}}) \tag{4}$$

$$\boldsymbol{Var}(\boldsymbol{Y_i}) = \sum_{j=1}^{m} \boldsymbol{l}_{ij}^2 + \boldsymbol{\psi_i} \tag{5}$$

where $\sum_{j=1}^{m} l_{ij}^2$ is the i^{th} commonality, that is, the portion of the variance of Y_i explained by the common factors and ψ_i the specific variances. The contribution of the first factor to $Var(Y_i)$ is l_{ij}^2.

The dimension of X_i is j_0 such that $\max_{1 \le j \le m}(l_{ij}) = l_{ij_0}$.

[16] We estimate the factors loading using the principal components analysis method and rotate the axes using the varimax technique.

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Since FA requires that the variables be correlated, we investigate associations among variables.[17] The correlation structure of the dataset is assessed through multivariate tests of the covariance matrix of the data. First, we test if the covariance matrix is diagonal, and then add a spherical restriction using the Bartlett's spherical test whose null hypothesis is that the covariance is the identity matrix.

Table 2
Multivariate tests of the covariance matrix

Year	Null	LR chi2	Degree of freedom	Prob > chi2
2009	Covariance matrix is diagonal	67.92	6	0.00
	covariance matrix is spherical	72.24	9	0.00
2010	Covariance matrix is diagonal	84.25	6	0.00
	covariance matrix is spherical	91.44	9	0.00
2011	Covariance matrix is diagonal	66.33	6	0.00
	covariance matrix is spherical	70.93	9	0.00
2012	Covariance matrix is diagonal	83.95	6	0.00
	covariance matrix is spherical	87.34	9	0.00

All these tests reject the null hypothesis. We conclude, therefore, that the dataset considered in this paper satisfies the required conditions for the use of FA.

All main criteria for selecting the optimal number of factors suggest that two factors should be considered each year.[18] Grouping subsequently the variables according to their factor loadings we obtain the components of each dimension. As shown in Table 3 below, the delineation between the two theoretical dimensions is confirmed by FA. The variables included in each dimension are exactly those mentioned in the literature.

Table 3
Rotated factor loadings in 2012

Variables	Factor 1	Factor 2	Uniqueness
# of resident household depositors with ODCs per 1000 adults	0.0772	0.9465	0.0982
# of resident household borrowers from ODCs per 1000 adults	0.0449	0.9466	0.1019
# of branches of ODCs per 1000 km square	0.9811	0.0418	0.0357
# of ATMs per 1000 km square	0.9667	0.1683	0.072

Factor loadings in 2011

Variables	Factor 1	Factor 2	Uniqueness
# of resident household depositors with ODCs per 1000 adults	0.0784	0.9291	0.1306
# of resident household borrowers from ODCs per 1000 adults	0.0269	0.9329	0.1290
# of branches of ODCs per 1000 km square	0.9786	0.0588	0.0389
# of ATMs per 1000 km square	0.9649	0.1673	0.0410

[17] From equation (3), it is indeed unlikely that variables that are not correlated would share common factors.

[18] These criteria are: the Kaiser criterion of dropping all factors with eigenvalues below 1, Joliffe, percentage of variance explained, and scree plot.

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Factor loadings in 2010

Variables	Factor 1	Factor 2	Uniqueness
# of resident household depositors with ODCs per 1000 adults	-0.0101	0.9530	0.0917
# of resident household borrowers from ODCs per 1000 adults	0.1117	0.9410	0.1020
# of branches of ODCs per 1000 km square	0.9886	-0.0684	0.0180
# of ATMs per 1000 km square	0.9736	0.1725	0.0224

Factor loadings in 2009

Variables	Factor 1	Factor 2	Uniqueness
# of resident household depositors with ODCs per 1000 adults	-0.0138	0.9361	0.1236
# of resident household borrowers from ODCs per 1000 adults	0.1074	0.9217	0.1390
# of branches of ODCs per 1000 km square	0.9879	-0.0757	0.0183
# of ATMs per 1000 km square	0.9732	0.1699	0.0240

C. Weights assignment

Assigning weights to variables and dimensions is not a straightforward task. Because of the complexity surrounding the allocation of weights, a number of papers that have attempted to calculate composite indices assign equal weights to all variables and dimensions. This is the case not only for most of the UNDP's indices but also for the composite indices proposed by Sarma (2008) as well as Chakravarty and Pal (2010).[19] Assigning equal weights to all variables and dimensions leads to the consideration that all individual variables contribute equally to the index. As a result, each normalized variable is implicitly considered as constituting a specific dimension.

We use the properties of our FA model to derive the weighting scheme. Since the variables are grouped into the relevant dimensions based on the way they load on the corresponding factor, it is legitimate to consider the proportion of the variance explained by the corresponding factor to the total variance to be the weight of the variable in the corresponding dimension. The corresponding variance is the squared factor loading. The derived weights are given in Table 4 and Table 5.[20]

Table 4
Weights assigned to variables

Year	Dimension 1		Dimension 2	
	Number of ODC branches per 1,000 km^2	Number of ATMs per 1,000 km^2	Household Depositors per 1,000 adults	Household Borrowers per 1,000 adults
2009	51%	49%	51%	49%
2010	51%	49%	51%	49%
2011	51%	49%	50%	50%
2012	51%	49%	50%	50%

[19] In the updated version of her 2008 paper, Sarma (2012) assigns weights to dimensions, yet the weights appear to have been derived arbitrarily.

[20] As the size of the sample expands, the weights are likely to further differentiate over time.

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Table 5
Weights assigned to dimensions

Year	Dimension 1	Dimension 2	Total
2009	52%	48%	100%
2010	51%	49%	100%
2011	51%	49%	100%
2012	51%	49%	100%

D. Functional form of the aggregator

With the statistical dimension identification and a clear weighting scheme in place, we are now in a position to clarify the functional form of our aggregator. As stated before, our aggregator is the weighted geometric mean. We use it to calculate both the intermediate dimensional variables and the cross-dimension composite index. The reason for choosing the weighted geometric mean is that it addresses in a satisfactory manner the issue of perfect substitutability between variables within a dimension and/or between dimensions. This was the main drawback of the versions of the HDI prior to 2010 that used the arithmetic mean. In general, using a linear operator (as in previous versions of the HDI) implies considering the variables as perfect substitutes of each other. This is the case because the elasticity of substitution between variables or dimensions is equal to infinity. Perfect substitutability is not a relevant assumption in the particular case of financial inclusion. In fact, although some kind of compensation is possible between variables, it is not in general true that the compensation would be in the same proportion.[21] Thus, the use of a non-linear function is critical for addressing the issue of perfect substitutability. However, since we recognize that different combinations of variables pertaining to different dimensions may lead to the same level of financial inclusion, we also need a non-linear function for which the elasticity of substitution is not null. We must therefore avoid the extreme situations of both linear aggregator (because of perfect substitutability) and non-substitutability (arising from the use of a Leontief function, for example). The best aggregator will therefore provide an elasticity of substitution, which is a non-null real number. It is easy to see that our weighted geometric aggregator A, which is given by equation (6) below, satisfies the required property.

Additionally, our aggregator preserves the scale invariance property of the variable in the sense that multiplying any component of the index by a scalar does not change the relative weight of the variable.

The explicit formula of our aggregator is:

$$A = \exp\left(\frac{\sum_{i=1}^{N} w_i Logx_i}{\sum_{i=1}^{N} w_i}\right) \tag{6}$$

where w_i is the weight associated with variable i.

[21] For the geographic outreach dimension, for example, it might be relevant that a country that has a good geographic branch penetration may compensate with somehow insufficient geographic ATM penetration.

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For any x_{i0}, the partial derivative of A with respect to x_{i0} is:

$$\frac{\partial A}{\partial x_{i0}} = w_{i0} \frac{\exp\left(\frac{\sum_{i=1}^{N} w_i Logx_i}{B}\right)}{Bx_{i0}}$$

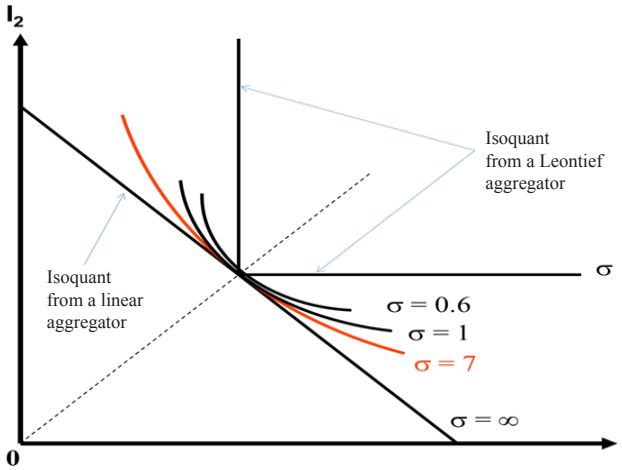
where $B = \sum_{i=1}^{N} w_i$ and the marginal rate of technical substitution between x_{i1} and x_{i0} is:

$$MRTS_{x_{i1,i0}} = \frac{w_{i1}}{w_{i0}} \frac{x_{i0}}{x_{i1}}$$

Therefore, the elasticity of substitution between x_{i0} and x_{i1} is $\sigma = 1$.[22]

In the case of the composite index where x_i is the sub-index associated with dimension i that is I_i, the isoquant from this aggregator ($\sigma = 1$) is shown in Figure 3 below and is located between the linear case ($\sigma = \infty$) and the Leontief aggregator ($\sigma = 0$).[23]

Figure 3
Isoquants from linear and non-linear aggregators



5. RESULTS

The index is computed for the period from 2009 to 2012. Despite the limited size of the sample, some interesting lessons can be drawn from both dimensional and the composite index. In general, country rankings relative to one another remain stable over the observed periods. The change in the composition in rankings results largely from changes in the underlying sample. In some cases, however, countries rise and fall in the rankings due to changes in the magnitude their underlying variables. A more detailed summary of the results is presented in the Appendix.

[22] The elasticity of substitution between x_{i0} and x_{i1} is the percent change in the ratio of the two variables to the percent change in $MRTS_{x_{i1,i0}}$.

[23] As the size of the sample expands, our results are likely to differentiate significantly from those generated from a non-weighted geometric mean.

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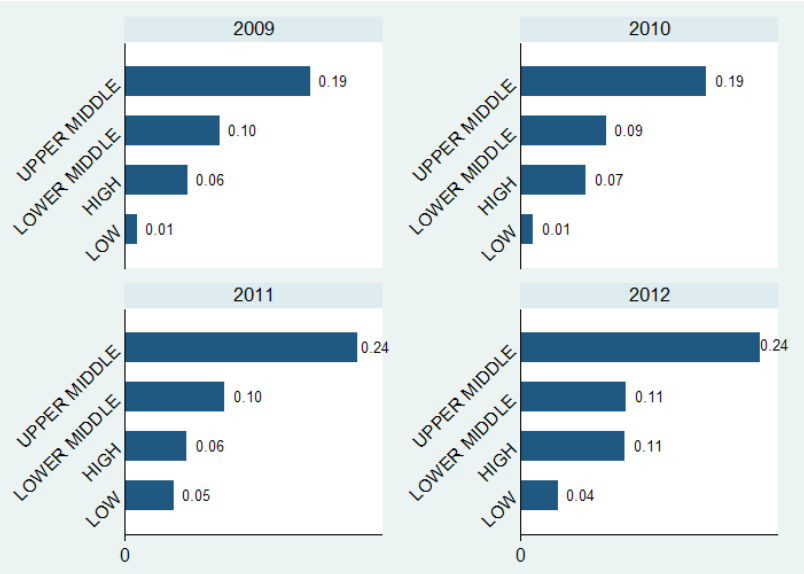
Dimension 1: Outreach of financial services

The rankings of the first dimension indicate an increasing polarization of countries over time. For example, in 2009, high and upper middle income countries accounted for half of the top ten. By 2012, these groups accounted for eight of the top ten. It is noteworthy that upper middle income countries consistently outperform high income countries in the sample. Mauritius and the Maldives in particular perform significantly better than all others in the sample for this dimension, ranking one and two in every year of the sample where their data are available. To illustrate, these two countries have an index of .99 and .94 in 2012 while the third ranked country in the sample, West Bank & Gaza, has an index of .35. Such rankings could indicate that geographically small, densely-populated countries fare best in terms of financial outreach.[24] The top of the rankings also contain countries from diverse regions of the world, regardless of the period. For example, in 2012 every region is represented in the top six countries: Mauritius, Maldives, West Bank & Gaza, Hungary, Thailand, and Dominican Republic. Figure 4 provides a snapshot of the average index values for the first dimension by income group for 2009–12.

The lowest ranked countries in the first dimension follow a similar pattern in terms of country income. In 2009, six of the lowest ten ranked countries are low or lower middle income. By 2012, the concentration increased to eight of ten. The regional diversification at the bottom of the rankings does not follow that of the top of the list. African and Middle East & Central Asian countries account for nearly all countries in the bottom ten for each year. In 2009, these regions combined to account for nine of the lowest ten ranked countries. In 2012, all countries in the bottom ten fell into one of these regions. The indices of the bottom two countries were significantly lower than that of the Republic of Congo, the country third from the bottom. In 2012, the indices for Central African Republic and Chad were 150 and 170 percent lower than the Republic of Congo.

Figure 4
Dimension 1: Outreach of Financial Services by Income Group, Year



[24] Allen et al. (2013) argue that population density is more strongly associated with financial development and inclusion in Africa than in other developing countries. In their analysis, small, densely populated African countries such as Cape Verde, Comoros and Mauritius come on the top as countries with the highest levels of financial depth and inclusion on the continent. The authors, nevertheless, acknowledge these countries are not representative of the overall African experience.

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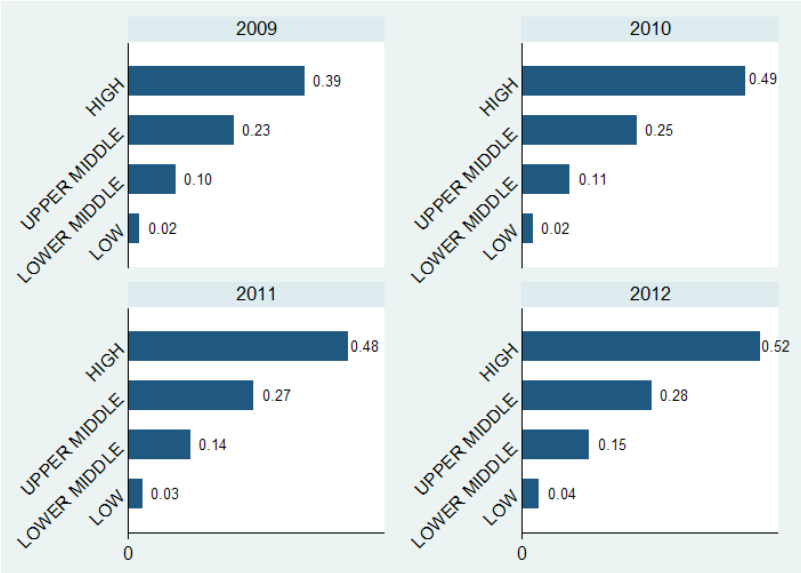
Dimension 2: Use of financial services

The second dimension measures use of financial services by households by combining the variables for household depositors with ODCs and household borrowers from ODCs per 1,000 adults. Again, the data provide rankings for a four-year span (2009–12).[25] The number of countries in the sample is consistent with the first dimension. A higher ranking in this dimension indicates that a higher proportion of the population makes use of the formal financial services for a given country relative to other countries in the sample.

In terms of income groups, the top of the rankings displays the same polarization as the first dimension. In 2009, seven of the top ten countries were in the high or upper middle income groups. In 2011 and 2012, these groups accounted for nine of the top ten. Unlike the first dimension, high income countries have a significantly higher average index than countries in the upper middle income group. The top ten countries appear to be more mixed in regards to geographic area and population relative to the first dimension. For example, Brunei Darussalam and Thailand consistently rank in the top three, despite their disparity in terms of size and population. Brunei in particular performs well in this dimension, with an index over 30 percent higher than Maldives in 2012. Regionally, the top ten also follows a similar pattern to that of the first dimension, with a wide range of regions represented. In 2012 for instance, countries from four regions are represented in top five: Brunei Darussalam, Estonia, Thailand, Hungary, and Georgia. The African region, however, is notably absent from the top of the list, regardless of the period. In fact, Botswana and Mauritius are the only two African countries to reach the top ten in any year of the sample. Figure 5 below provides an overview of the average index values for the second dimension by income group for 2009–12.

The lowest ranked countries again follow the trends of the first dimension, with low and lower middle income countries concentrated at the bottom. In 2011 and 2012, eight of the lowest ten countries fall into one of these groups. The absence of African countries at the top of the rankings for this dimension results in a greater concentration of countries from this region at the bottom of the list. In 2009, six of the bottom ten countries are from the African region. The concentration increases to eight of ten in 2012. The indices of the bottom three countries display the same significant decline as the first dimension, particularly for more recent periods.

Figure 5
Dimension 2: Use of Financial Services by Income Group, Year



[25] Relative changes in financial inclusion may be assessed over time provided countries report data for the same years.

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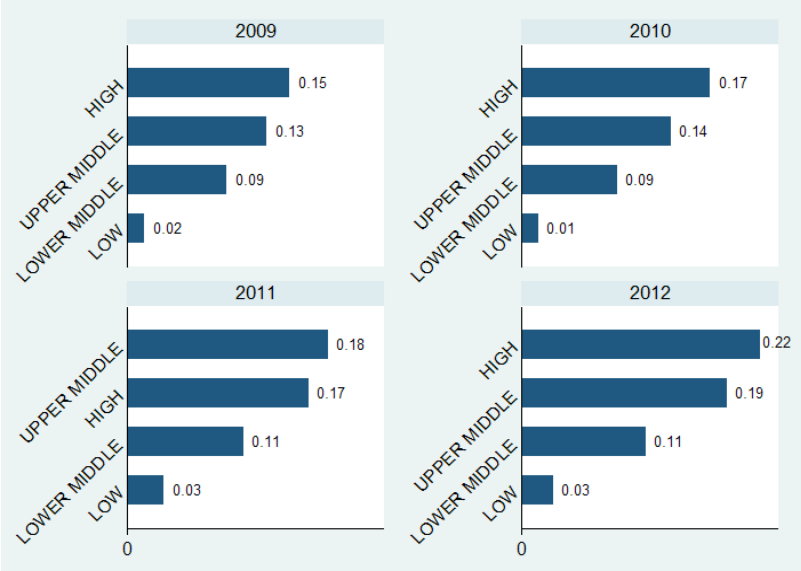
Composite index

For 2009, the weights of dimension one and dimension two are .52 and .48, respectively. In each subsequent year, the difference narrows to .51 and .49. The even weighting for each dimension results in a composite index that largely follows the trends of the individual dimensions. By combining the two dimensions, the output of the composite index should be a ranking of countries in the sample from the most financially inclusive to the least. Countries at the top of the rankings should be more financially inclusive relative to countries at the bottom of the rankings.

The highest ranked countries show an increased presence of countries from the high and upper-middle income groups over time. In 2009, seven of ten fell into one of these groups, while in 2012, the concentration increased to eight of ten. As a result of the even weighting, the average index for high and upper middle income countries are nearly even over time. Regionally, the top ranked countries display nearly the same diversity as the first dimension. Unlike the first dimension, however, the top three countries in the composite index for 2011 and 2012 are in the Asia and Pacific region (Maldives, Thailand, and Brunei Darussalam). The top of the list does not show the same wide differences as the individual dimensions. For example, the index for the Maldives is 17 percent higher than Thailand in 2011 and 2012. Figure 6 displays the results of the average composite index values by income group for 2009–12.

The countries ranked at the bottom of the list again display many of the trends of the individual dimensions. By way of illustration, six of the bottom ten in the composite index are low or lower middle income countries for 2010-12. Similarly, eight of ten are from the African region, an increase from six of ten in 2011. As was the case with the individual dimensions, the index rapidly declines toward the bottom, particularly in recent years. In 2012, the composite index for Central African Republic and Chad were 95 percent and 160 percent lower than that of the Republic of Congo, the country ranked third from the bottom. A summary of results of the index is provided in the Appendix.

Figure 6
Composite index by Income Group, Year



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6. CONCLUDING REMARKS

In this paper we have presented a new index of financial inclusion that addresses many of the persistent criticisms of similar indices, namely the lack of an adequate weighting scheme for variables and dimensions and the inability of certain aggregators to capture imperfect substitutability between dimensions. The use of factor analysis method makes it possible to be less arbitrary in the identification of financial inclusion dimensions, thereby permitting proper weight assignment, while the weighted geometric mean is an appropriate aggregator of imperfect substitutes.

Our index is easy to compute and can be used not only to assess the state of financial inclusion in a country, region, or income group, but also, at the operational level, as a meaningful tool for checking the quality of financial inclusion data. Since the IMF collects the data used to generate the index on an ongoing (annual) basis, the results could be replicated to provide a more dynamic picture of the state of financial inclusion on a national or global level on a regular basis. The index could also become part of the regular toolkit for the IMF's bilateral and multilateral surveillance work, as well as financial sector surveillance activities.

The index presents several possible avenues for further research. For example, the household depositors and borrowers variables could be replaced with the corresponding FAS variables on SMEs. In addition, the household and SME indices could be combined to create an aggregated index. Another area of possible research would be expanding the coverage of the index to include other types of financial institutions, notably insurance corporations. Finally, should adequate data on the quality dimension become available, the inclusion of these data into the index as a possible third dimension could be explored.

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References

Allen, Franklin, Elena Carletti, Robert Cull, Jun Quian, Lemma Senbet and Patricio Balenzuela, 2013, "The African Financial Development and Financial Inclusion Gap," Wharton Financial Institutions Center Working Paper 13-09, University of Pennsylvania.

Australia Agency for International Development (AusAID), 2010. *Financial Services for the Poor: A Strategy for the Australian Aid Program 2010–2015*, Canberra.

Barajas, Adolfo, Ralph Chami and Seyed Reza Yousefi, 2013, "The Finance and Growth Nexus Re-Examined: Do All Countries Benefit Equally," IMF Working Paper No. 13/130 (Washington: International Monetary Fund).

Beck, Thorsten, Demirguc-Kunt, Asli and Maria S. Martinez Peria, 2007, "Reaching out: Access to and use of banking services across countries," *Journal of Financial Economics*, Elsevier, Vol. 85, pp. 234–266.

Berlage, Lodewijk and Dirk Terweduwe, 1988, "The classification of countries by cluster and by factor analysis," *World Development*, Vol. 16, No. 12, pp. 1527–1545.

Brune, Lasse, Xavier Giné, Jessica Goldberg, Dean Yang, 2011, "Commitments to Save: A Field Experiment in Rural Malawi," *World Bank Policy Research Working Paper* 5748. Washington, D.C.: World Bank.

Burgess, Robin and Rohini Pande, 2005, "Do Rural Banks Matter? Evidence from the Indian Social Banking Experiment," *American Economic Review*, Vol. 95, pp. 780–79.

CGAP, 2011. *Global Standard-Setting Bodies and Financial Inclusion for the Poor: Toward Proportionate Standards and Guidance*. White paper prepared on behalf of the G-20 Global Partnership for Financial Inclusion. Washington, DC.

DOI: 10.7172/2353-6845.jbfe.2017.2.5

Chakravarty, Satya and Rupayan Pal, 2010, "Measuring Financial Inclusion: An Axiomatic Approach," *Indira Gandhi Institute of Development Research, Working Paper* No. WP 2010/003.
Demirguc-Kunt, Asli and Leora Klapper, 2012, "Measuring Financial Inclusion: The Global Findex Database," *World Bank Working Paper* 6025, Washington, DC.
Freudenberg Michael, 2003, "Composite indicators of country performance: a critical assessment," OECD, Paris.
Hawkins, Penelope, 2010, "Financial Access and Financial Stability," FEASibility Limited South Africa for BIS.
Honohan, Patrick, 2008, "Cross-Country Variation in Household Access to Financial Services," *Journal of Banking and Finance*, Vol. 32, pp. 2493–2500.
Jacobs, Rowena, Smith, Peter and Maria Goddard, 2004, "Measuring performance: an examination of composite performance indicators," *Centre for Health Economics*, *Technical Paper Series* 29.
Kempson, E. and C. Whyley 1999a, "Kept out or opted out? Understanding and combating financial exclusion", Policy Press, Bristol.
Kempson, E. and C. Whyley 1999b, "Understanding and combating financial exclusion", *Insurance Trends*, Vol. 21, pp. 18–22.
Nicoletti G., Scarpetta S. and O. Boylaud, 2000, "Summary indicators of product market regulation with an extension to employment protection legislation," *Economics department working papers*. No. 226, ECO/WKP (99)18.
OECD/JRC, 2008, *Handbook on constructing composite indicators*. Methodology and user guide. OECD Publisher, Paris.
Prasad, Eswar S., 2010. "Financial Sector Regulation and Reforms in Emerging Markets: An Overview," *IZA Discussion Paper* No. 5233, Bonn: Institute for the Study of Labor.
Sarma, Mandira, 2008, "Index of Financial Inclusion," *ICRIER Working Paper* 215.
Sarma Mandira, 2010, "Index of Financial Inclusion." *CITD Discussion Paper* 10-05.
Sarma, Mandira, 2012, "Index of Financial Inclusion – A measure of financial sector inclusiveness," *Berlin Working Papers on Money, Finance, Trade and Development*, Working Paper No. 07/2012.
Seidman, E., Hababou, M. and Kramer, J., 2005, "Getting to Know Underbanked Consumers: A Financial Services Analysis," *Report of the Center for Financial Services Innovation*, Chicago.
Stiglitz, Joseph E. and Andrew Weiss, 1981, "Credit Rationing in Markets with Imperfect Information," *American Economic Review*, Vol. 71, No. 3, pp. 393–410.
World Bank, 2014, *Global Financial Development Report 2014: Financial Inclusion*, Washington, DC: World Bank.
UNDP, 2010, *Human Development Report*, New York: Palgrave Macmillan.

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APPENDIX
Summary of results

Low income

	Dimension 1	Dimension 2	Composite Index	Overall rank
Burundi				
2009	0.019855	0.0096682	0.0140925	18
2010	0.02753	0.0122482	0.0185804	17
2011	0.0320389	0.0130235	0.0207571	21
2012	0.0389336	0.0182599	0.0268892	23
Central African Rep.				
2010	0.000204	0.0089671	0.00128	26
2011	0.0002369	0.009905	0.0014333	28
2012	0.0002357	0.010449	0.0015044	30
Chad				
2012	0.0001652	0.0014342	0.0004752	31
Comoros				
2011	0.1970154	0.0567047	0.1080678	15
2012	0.1995303	0.0660559	0.1162285	16
Madagascar				
2009	0.0037234	0.0022356	0.0029201	21
2010	0.0044028	0.0029981	0.0036535	23
2011	0.0056773	0.0029076	0.0041117	26
2012	0.0063214	0.0027567	0.0042133	28
Malawi				
2009	0.0152136	0.0340139	0.02232	15
2010	0.0187933	0.0300343	0.0235966	16
Myanmar				
2012	0.0018125	0.0692214	0.0107553	27
Tajikistan				
2009	0.0109136	0.053863	0.0233486	14
2010	0.0122772	0.0634058	0.0272423	15
2011	0.0149214	0.0724011	0.0319563	20
2012	0.0172723	0.0948458	0.0397135	20

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Lower middle income

	Dimension 1	Dimension 2	Composite Index	Overall rank
Congo, Republic of				
2009	0.000765	0.009532	0.0025442	22
2010	0.0009988	0.0108651	0.0031818	25
2011	0.0012054	0.0121645	0.0036748	27
2012	0.0013205	0.0126972	0.0039927	29
Côte d'Ivoire				
2010	0.0121713	0.0229356	0.0165547	19
Georgia				
2009	0.1007407	0.2534444	0.1563449	5
2010	0.1017967	0.3074795	0.1740974	6
2011	0.1043861	0.3747618	0.1933342	8
2012	0.1217889	0.4205616	0.2232124	8
Kiribati				
2011	0.038935	0.0356631	0.0373215	19
2012	0.037731	0.0365288	0.0371384	21
Moldova				
2009	0.1021391	0.1642403	0.1280753	6
2010	0.1038241	0.1654449	0.1301765	8
2011	0.1090913	0.1556928	0.1295021	10
2012	0.1113026	0.1606109	0.1331572	14
Pakistan				
2009	0.0621575	0.01845	0.0348497	13
2010	0.0642475	0.020276	0.0367032	14
2011	0.0666457	0.022324	0.039331	18
2012	0.0711895	0.0242508	0.0420518	19
Samoa				
2009	0.0669007	0.1368419	0.0940777	11
2010	0.0690066	0.1481718	0.1000003	12
2011	0.056805	0.1753752	0.0978261	16
2012	0.057538	0.2131195	0.1091313	17
Syrian Arab Republic				
2009	0.0265318	0.0001611	0.0023325	23
2010	0.0280215	0.0004142	0.0036222	26
West Bank and Gaza				
2009	0.3167805	0.1461074	0.2191041	4
2010	0.3203148	0.166724	0.2332986	5
2011	0.334919	0.1730587	0.243599	6
2012	0.3525071	0.1670376	0.2446848	6

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Upper income

	Dimension 1	Dimension 2	Composite Index	Overall rank
Azerbaijan, Rep. of				
2009	0.0937083	0.1070518	0.0998438	8
2010	0.0962156	0.1290844	0.1109694	11
2011	0.0990355	0.1595487	0.1246385	12
2012	0.0979282	0.1885883	0.1349082	13
Botswana				
2012	0.0035135	0.2960986	0.0306986	22
Colombia				
2009	0.0470802	0.3678128	0.1253584	7
2010	0.0506416	0.3770014	0.1341976	7
2011	0.0486352	0.3765268	0.1304779	9
2012	0.0515307	0.3785967	0.1366047	12
Dominican Republic				
2011	0.2101721	0.3493366	0.2685208	5
2012	0.2118768	0.2534247	0.2312593	7
Libya				
2009	0.0011527	0.2424735	0.0147347	17
2010	0.0011257	0.2594539	0.0157901	20
2011	0.001083	0.2638124	0.0153263	24
Maldives				
2011	0.8638237	0.3534624	0.5614337	1
2012	0.9441833	0.3303447	0.5650625	1
Mauritius				
2009	1	0.0798578	0.2999685	3
2010	1	0.0867039	0.3051161	3
2011	1	0.0867712	0.3076822	4
2012	0.9908484	0.0778325	0.2856942	5
Mexico				
2011	0.0818824	0.1499171	0.1096077	14
2012	0.0855362	0.2454015	0.1431893	11
Namibia				
2009	0.0019029	0.0971556	0.0123912	19
2010	0.0017836	0.100154	0.0126048	21
2011	0.0021726	0.1812316	0.018339	23
2012	0.0020911	0.2312989	0.0208686	25

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	Dimension 1	Dimension 2	Composite Index	Overall rank
Peru				
2009	0.037907	0.2679385	0.096233	10
2010	0.0456636	0.306407	0.1150562	10
2011	0.0541359	0.3250057	0.1284753	11
2012	0.0690538	0.3415529	0.150863	10
Serbia, Republic of				
2009	0.2319323	0.0008636	0.0161502	16
2010	0.221067	0.0012011	0.0175787	18
2011	0.2053204	0.001711	0.0204122	22
2012	0.191138	0.0021773	0.0214438	24
Thailand				
2009	0.2459627	0.6294311	0.3848343	2
2010	0.2456978	0.6767339	0.4017998	1
2011	0.2428796	0.6946368	0.4031285	2
2012	0.2466659	0.6960515	0.409593	2
Venezuela, Rep. Bol.				
2009	0.0384108	0.2813257	0.0991777	9
2010	0.0427582	0.3294855	0.1152204	9
2011	0.0426406	0.3538377	0.118288	13
2012	0.0424435	0.3594702	0.1206128	15

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High income

	Dimension 1	Dimension 2	Composite Index	Overall rank
Brunei Darussalam				
2009	0.173824	0.9417586	0.3887752	1
2010	0.1676521	0.9292914	0.3850021	2
2011	0.1615722	0.9276889	0.3752848	3
2012	0.1690544	1	0.4030946	3
Equatorial Guinea				
2009	0.0035105	0.0273052	0.0093277	20
2010	0.0041297	0.0302017	0.0108495	22
2011	0.0056426	0.0316217	0.0129538	25
2012	0.0062146	0.0440148	0.0161818	26
Estonia				
2010	0.0802283	0.7877687	0.2431834	4
2011	0.0717511	0.7528428	0.2228834	7
2012	0.0669607	0.733431	0.2157747	9
Hungary				
2012	0.275229	0.596806	0.4018059	4
Saudi Arabia				
2009	0.0135068	0.1887249	0.0474406	12
2010	0.0138515	0.2080997	0.0516142	13
2011	0.0139777	0.2119586	0.0518567	17
2012	0.0142814	0.2399552	0.0567271	18

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Bank prudential behaviour and bank stability – how far do they go

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ABSTRACT

This paper investigates how bank prudential behaviour affects bank stability, focusing only in the period after the global financial crisis. For this reason, we construct a new composite proxy as a measure for bank stability condition and another one for bank prudential behaviour. Then, we make use of a sample with a set of data for 16 banks operating in the Albanian financial sector over the period 2008–2015. The main results provide strong supportive evidence that there exist a strong positive relationship in the prudential – stability nexus, which confirms that prudential behaviour is a key fundamental contributor for bank stability. We also used a quadratic term of the prudential indicator to capture a possible non-linear relationship between bank prudential behaviour and stability, but found no supportive evidence. Finally, macroeconomic conditions are also found to be crucial for bank stability. Similarly, improving operational efficiency and capital structure boost bank stability.

JEL Classification: C26, E32, E43, G21, H63, L51.

Keywords: Bank Stability, Prudential behaviour, LLP.

I. INTRODUCTION

Bank's prudential behaviour is critical in assessing financial system stability, in that it is a fundamental key contributor for fluctuations in banks' profitability and capital positions, which has a bearing on banks' supply of credit to the economy (Beatty and Liao, 2009). In principle, bank focuses on the use of loan loss provisions (henceforth LLP) as a management micro-prudential surveillance tool to mitigate credit risk, which in return requires them to set aside sufficient additional buffers of reserve funds as a cushion to absorb anticipated future expected losses lurking in a bank's loan portfolio [Laeven and Majnoni, (2003)], even before the actual loss can be determined with accuracy and certainty, while unexpected losses have to be cover by bank capital [Dushku, (2016)]. When these anticipated loan losses eventually crystallize, banks can then draw on these reserves, thereby absorbing the losses without impairing precious capital and preserving banks' capacity to continue extending the supply of credit to the economy. The causes for such behaviour may lie not only in the deteriorating economic conditions during a recession,

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but in the credit risk that was accumulated during an economic boom and which materialised during a recession.

Ideally, the degree of bank prudential behaviour should reflect the beliefs of bank management on the quality of the loan portfolio that they have, indicating that provisions should be able to cover the whole spectrum of expected credit losses if they are to think of prudential behaviour as an attitude to prevent credit risk, without impairing capital, keeping banks safe, sound and able to continue extending credit (Dugan, 2009). Similarly, bank regulators view adequate LLP as a "safety and soundness" issue because a deficit in LLPs implies that ban's capital ratios overstate its ability to absorb unexpected losses [Balla and McKenna, (2009)].

Ever since, the political will to strengthen bank prudential behaviour and bank supervision and regulatory frameworks and to mitigate risks inherent in the financial system was indeed substantiated in the aftermath of the Global Financial Crisis (henceforth GFC), which showed that the potential mechanism to surge lending goes through lowering interest rates or relaxing collateral requirements, loosing credit standards, or a combination of both [Dell'Ariccia and Marquez, 2006; Ogura, 2006; Dell'Ariccia, et al., (2012)]. Therefore, it is trivial to conclude that banks can increase their interest income (and perhaps the absolute net interest result) by an increase of their lending volume [Foos, et al., (2010)], yet it is by far more difficult to assess how the degree of prudential behaviour [Salas and Saurina, (2002); Bikker and Metzemakers (2005); Hess, et al., (2009)] affects relatively bank stability and solvency, while fulfilling their lending functions to society.

Two stylised facts motivate our focus on this question. First, Table 1 in Appendix implies that financial intermediation in Albania is mostly based on the banking sector, which consists of 16 banks. At the same time, in Figure 1a[2] in Appendix, evidences show that banks have managed to adjust the adequate LLPs ratio by applying the provisioning coefficient on gross exposure adjusted with value of collateral accepted. However, the LLPs ratio, in annual growth terms, has picked by the end of 2008. Similarly, in absolute terms their stock has reached nearly 90% of total assets in 2013. Second, evidences (Figure 2 in Appendix) show that there is a high correlation between the degree of bank prudential patterns and bank stability, in particular after the GFC. Therefore, while the capital structure of the banking system in Albania allowed banks to enter the financial crisis in a more robust shape, it is less clear what kind of effect bank prudential behaviour has on bank stability conditions after the GFC. Similarly, empirical analysis on whether prudential behaviour mitigates instability is challenging for two important reasons. First, favourable regulatory prudential support may reduce excessive risk inherent taking, but it is often claimed that such approach may lead banks to cut back on lending [Fratzcher, et al., (2016)]. This may induce banks to take more risk because of moral hazard problems at a time when it is of great importance of restoring and maintaining a sufficient supply of credit to foster economic development and growth. Yet very little is known in the context of emerging market economies, in particular in the case of Albania.

Against this background, this paper investigates the inter-temporal relation between banks' prudential behaviour and bank solvency conditions. In particular we analyse how banks' prudential behaviour affects bank stability after the GFC in the case of the Albanian banking system. For this reason, we utilise quarterly macroeconomic and balance sheet and income statement data for 16 banks operating in the Albanian banking sector over the period 2008–2015. The empirical estimation approach follows a five-step procedure. First, we constructed a composite individual bank stability indicator as explained by Shijaku (2016a). Second, we calculate also a composite index as a measure of bank prudential behaviour, which includes discretionary

[2] According to the Regulation No. 62, Date 14.09.2011 "On Credit Risk Management from Banks and Branches of Foreign Banks" Article 14, Bank of Albania uses the prudential adjustment approach. The prudential provisions are recorded in the balance sheet accounts, while the adjustments are determined by applying the provisioning coefficient on gross exposure adjusted with value of collateral accepted, which are different on classification categories according to perceived risk. Classification on loans are made in five categories (standard, observation, substandard, doubtful and loss) based on debt services, financial performance and judicial proceedings.

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and non-discretionary components representing loan loss provisions made to cover expected loan losses, rather than focusing only on one variable. Then, empirical estimation is based on a dynamic two-step General Method of Moments (GMM) with unbalance panel with quarterly data. Finally, we deepen our empirical analysis either by splitting the sample with regards to large and small banks or checking for non-linearity relationship between bank prudential behaviour and bank stability.

This paper complements the existing literature in several aspects. First, at our best knowledge, no previous study has employed such proxies to investigate the prudential-bank stability nexus and we believe this is an important step forward toward a better understanding of the underlying mechanisms. Second, this is also the first study to investigate empirically how prudential behaviour affects bank stability focusing in particular in the period after the GFC. Third, the banking system in Albania consists mostly of foreign privately-owned banks that operate also in the Eurozone. Therefore, it would be quite interested to see how these banks behave in a small-open emerging economy, in particular after the GFC. Furthermore, since it focuses only on a single country, it avoids any pitfall as described by Uhde and Heimeshoff (2009) related to data issues and ensure comparability across both dependent and independent variables. Nor do we use data from the Bankscope database. On the one hand, we use alternative prudential indicators as means of robustness checks. Finally, we provide appropriate evidence, by fragmentising this sector according to the size of the banks, addressing whether certain institutions show different concentration behaviour than others.

By way of preview, results suggest that bank prudential behaviour is fundamentally crucial for bank stability. A number of robustness checks confirm that bank prudential is linked positively with bank stability. This suggests that the prudential behaviour is a crucial aspect for bank stability that would help banks to better absorb losses in the wake of a possible negative credit cycle. This relationship is found to be stronger for small banks. At same time, we did not find a non-linear relationship in the prudential – stability nexus. Nor, did we find in the case of small banks and large banks. Other results confirm that bank stability is positively linked with market conditions. The bank specific factors, such as operational efficiency and capital structure, are also crucial for bank stability.

The remainder of the paper is structured as follows. Section 2 reviews the existing literature on the use of bank prudential behaviour. Section 3 describes the data and research method. Section 4 discusses our main empirical results and presents robustness checks. The material concludes in section 5.

2. LITERATURE REVIEW

The issue of bank prudential behaviour have received intensive attention focusing mostly on the banks' loan loss provision patterns, but yet again the debate on stability – prudential behaviour remains still an unexplored area both at the theoretical and empirical level. From a theoretical point of view, the accounting and banking literature on banks' provisioning system mainly focus on three different issues. On strand of literature address the hypothesis the LLPs is discretionary, meaning that it is due to utilisation of LLPs for management objectives and arises from the uncertainty and subjectivity in the process of estimating expected losses, while empirical studies have shown that LLPs are used mainly to smooth income and tax-advantaged actions [Niswander and Swanson, (2000); Fonseca and González (2008), Cohen, et al., (2014)]; to manage capital [Ahmed, et al., (1999)]; and to signal financial strength [Beatty, et al., (2002)].

The second strand of literature deals this non-discretionary and addresses the cyclicality of LLPs. This approach is more closely linked to the concept of credit risk, wherein banks set

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aside LLPs, either specific or general provisions[3], according to the underlying quality of their loan portfolio, which is depend on certain credit risk considerations, such as default risk, risk tolerance and the other macroeconomic risks, but Alessi, et al., (2015) believes that in a situation characterised by an ample fluctuation of the business cycle, provisioning policy can be used to stabilise earnings and dividends. This kind of provisioning is said to be back-ward looking since banks mainly relate non-discretionary provisions to identify credit losses. This type of provisioning differs across countries and institutions types and depends of the banks; prudential behaviour. This approach assumes that during good times, few credit losses are identified and the level of LLPs is low. However, during bad times LLPs increase because loan defaults are usually high during this period. As a result, the non-discretionary component is a driving force in the cyclicality of LLPs and leads to a misevaluation of expected credit losses, which are therefore under-provisioned during an upswing phase because the expected credit risk appears as soon as the loan is granted and not only during the downturn when the losses is finally identified. Conversely, banks have to charge provisions too late during bad times. The cyclicality of LLPs directly affects bank profits and bank capital, which could influence the bank's incentive to grant new loans and increase the cyclicality of its lending. This approach includes among other studies those by Anandarajan, et al., (2003), Bikker and Metzemakers, (2005), Bouvatier and Lepetit, (2008).

The thirds strand of literature address the role of provisioning behaviour to mitigate the pro-cyclical effects of business cycles on banks due to risk sensitive capital requirements. Therefore, the counter-cyclical view is that credit risk is build up in a boom and materializes in a downturn (e.g. Borio, et al. (2001). In this view, LLPs should be positively correlated with lending cycle, and banks should build up loan loss reserves in good times to be drawn on in bad times. To that extend, forward looking provisioning behaviour reflected in discretionary loan provisioning practices within a country leads to smoother earnings [Bushman and Williams, (2012)], it raises the questions of whether the observed smoothing behaviour increases the usefulness of earnings by better reflecting risks of the underlying loan portfolio, or whether it reflects earnings management by bank attempting to obscure their risk-taking behaviour or achieve other reporting objectives.

From the empirical point, broadly there are two main strands approaches dealing with research on the bank prudential behaviour. The first strand of literature relates to studies test how prudential behaviour, measured through the use of the net change allows for loan losses (LLPs scaled by total loans) is affected by other explanatory variables. However, the explanatory variables differ. The main factors includes earning smoothing [Greenawalt and Sinkey, (1988); Laeven and Majnoni, (2003); Liu and Ryan (2006)], lending pro-cyclicality [Keeton, (1999); Saurina and Jiménez, (2006);], real loan growth [Foos, et al., (2010); Packer and Zhu, (2012)], credit quality measures [Cohen, et al., (2014)], the loan loss reserve [Bushman and Williams, (2012)], Tier 1 risk-based capital ratio [Liu and Ryan (2006)], the degree to signal financial strength [Bouvatier and Lepetit, (2008)], and liquidity positions of banks [Pabón and Kohlscheen, (2016)]. Some other studies have also use macroeconomic variables to explain patterns of LLPs, which includes the use of economic cycle and economic growth rate [Cavallo and Majnoni, (2001); Curcio and Hasan, (2015)], non-performing loans [Alessi, et al., (2015)], private sector leverage and a lack of capitalization within the banking system [Glen and Mondragón-Vélez. (2011)]. Other papers focusing in this approach includes [Leventis, et al., (2011); Bouvatier, et al., (2014); Balla and Rose (2015); Dushku, (2016)].

The second strands of literature focus on the inter-temporal relationship between bank health and individual risk-taking decisions. According to this latter approach, the difference between individual credit growth of a particular financial institution and the aggregate credit growth in

[3] See also Dushku (2016) for more details on specific and general loan loss provisions.

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a given economy can be a signal of individual risk-taking. In line with the importance of LLPs, some studies have investigated the impact of provisioning on banks future performance. For example, Tahir, et al., (2012) analysed the impact of LLPs on bank profitability using a proxy of return on asset (RoA) and return on equity (RoE). Other studies in this line of research include Ul Mustafa, et al., (2012), Alhadab and Alsahawneh, (2016). Bouvatier and Lepetit (2012) investigates the effects of LLPs on growth in bank lending, making first a difference between non-discretionary and discretionary LLPs. International comparisons are made between five panels of European, U.S., Central and South American, Japanese and South and East Asian banks. Except for Japanese banks, they find a negative and significant effect of non-discretionary loan loss provisions on growth in bank lending. In this line of research, using a sample of 488 listed and unlisted Italian banks for the period 2007–2013, Cucinelli (2015) investigates whether an increase of credit risk during the financial crisis can lead banks to reduce their lending activity. The author finds a negative impact of credit risk on bank lending behaviour, with regard to both credit risk measures: the nonperforming loans and the loan loss provision ratio. From another perspective, Elnahass, et al., (2014) examine the relationship between LLPs and bank value in the case of banks in the Middle East and North Africa region for the period 2006–2011, using a price-level valuation model and a Two-Stage analysis. The results show increasing LLPs is positively linked to bank book value and that there exits also a positive and highly significant cross-sectional associations with share prices.

At the same time, from an empirical point of view only a few papers are loosely related to the research question we address in the case of Albania. The most relevant work is by Barth, et al., (2004) who, using a new dataset on bank regulation and supervision in 107 countries, found that policies that rely on regulatory features that foster among others accurate information disclosure and provisioning standards work best to promote bank development, performance and stability. Silimarly, Demirgüç-Kunt, et al., (2006) whether compliance with the Basel Core Principles for Effective Banking Supervision improves bank soundness. The authors find a significant and positive relationship between bank soundness (measured with Moody's financial strength ratings) and compliance with principles related to information provision. They conclude that measuring bank soundness through means of the Z-scores yields similar results. In a cross-country study of banking systems across 49 countries in the 90s, Tadesse (2006), using a range of survey-based metrics find that banking crises are less likely in countries with greater regulated disclosure and transparency. Fratzscher, et al., (2016) uses a panel dataset for 50 advanced and emerging market economies to analyse how the post-crisis tightening in supervision and regulation affects aggregate bank stability and aggregate credit growth. The authors find that higher capital buffers improve aggregate bank stability after the GFC, whereas a strengthening of supervision independence helped to reduce the decline in domestic credit and improved bank stability of banks.

This paper complements existing literature on this issue in several aspects. First, different from previous empirical work, we do neither focus on real episodes of banking crises nor use binary approach as a proxy for instability episodes, as both approaches may either provide insufficient data for estimation purpose or be based on a threshold level that is not based on well-grounded theoretical or empirical benchmark and therefore are easily criticised. Similarly, with regards to bank stability index, we neither use the Z-score as an in-variant measure of the bank's risk-taking behaviour or distance to solvency, to which Fu, et al., (2014) provides some arguments against, nor use some form of credit risk measure such as non-performing loans (NPL). On the one hand, while the Z-score can be interpreted as the number of standard deviations by which a bank is removed from insolvency, it only focuses on the risk-taking from the profitability point of view. On the other hand, NPL ratio focuses on credit risk only and does not account for other sort of risk that banks may be faced, such as those linked with capital, liquidity or/and exchange rate. Hence, neither of them is a perfect substitute calculations to account for actual bank distress or the probability of default, which are without doubt the most appropriate concepts to define bank

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risk [Kick and Prieto, (2015)]. Instead, based on Shijaku (2016), we use a more sophisticated proxy for bank stability, which is advantageous for three reasons. First, different to Z-Score and NPL, it is based on a wider set of bank balance sheet data that includes information on capital, asset quality, earnings, liquidity and sensitivity to exchange rate market risk. Therefore, our proxy gauges better bank stability conditions. Second, it makes use of the principal component analyses, which highlights the most common factor identifying the patterns in the data without much loss of information and at the same time solves for any problem of endogeneity. Finally, it does not take the probability form of the binary approach, which might expose it either to limitations of insufficient number of episodes or to the vulnerability of the methodology employed to calculate the threshold level, which might even provide falls signals. Rather it consists of a simpler approach that is easier to explain and implements and most importantly allows analysing prudential behaviour as it develops and to that it is applicable for cross-section comparisons.

3. METHODOLOGY APPROACH

3.1. Dependant variable

The empirical literature provides a good description of how one might attempt to build a composite indicator of stability, but obviously this paper follows the Uniform Financial Rating System approach, introduced by the US regulation in 1979, referred to as CAELS rating (Capital adequacy, Asset quality, Earnings, Liquidity and Sensitivity to market risk (See Table 2 in Appendix)[4]. First, using the statistical methods, each indicator included in each of these categorises is normalised into a common scale with mean of zero and standard deviation of one[5]. The formula is given as:

$$Z_t = \left(\frac{X_t - \overline{\overline{\mu}}}{\overline{\sigma}} \right) \tag{1}$$

Where, X_t represents the value of indicators X during period t; μ is the mean and σ is the standard deviation. Second, all the normalised values of the set of correlated indicators used within one category is then converted into a single uncorrelated index by means of the statistical procedure, namely the principal component analysis (PCA) approach, which is yet again standardised through the procedure in Eq. (3). Then, the estimated sub-index are transformed between the values [0, 1] using exponential transformation [1 / (1 + exp(–Z^*)]. Finally, the BSI is derived as a sum of the estimated exponential transformed sub-indexes, as follows:

$$BSI_{t,w} = \omega_1 \sum_{i=1}^{n} Z^*_{t,C} + \omega_2 \sum_{i=1}^{n} Z^*_{t,A} + \omega_3 \sum_{i=1}^{n} Z^*_{t,E} + \omega_4 \sum_{i=1}^{n} Z^*_{t,L} + \omega_5 \sum_{i=1}^{n} Z^*_{t,S} \tag{2}$$

$$\sum_{*=a,b,c,d,e} \omega^* = 1 \tag{3}$$

Where, n is the number of indicators in each sub-index; 'C' relates to the capital adequacy; 'A' represents a proxy to asset quality; 'E' represents a proxy to earnings; 'L' represents a proxy to liquidity efficiency categorises; and 'S' is related to the sensitivity of market risk. Z^* is the exponential transformed simple average of the normalised values of each indicator included into the sub-index of the individual bank stability index. Then, the estimated index, as shown in

[4] This approach is also used by International Monetary Fund Compilation Guide 2006 on Financial Soundness Indicators, but others authors e.g. Sere-Ejembi, et. al., (2014) and Cleary and Hebb (2016).

[5] Normalizing the values avoids introducing aggregation distortions arising from differences in the means of the indicators.

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Graph 3 in Appendix, is a relatively measurement, where an increase in the value of the index at any particular dimension indicates a lower risk in this dimension for the period, compared with other periods.

The advantage of this approach is fourfold. First, CAELS represents a useful "complement" to on-side examination, rather than a substitute for them [Betz, et. al., (2014)], and thereby creates an internal comprehensive monthly-based supervisory "thermometer" measurement to evaluate bank stability in real time and on an uniform basis and for identifying those institutions requiring special supervisory attention and concern with regards to both the present and future banking sector conditions. Second, as suggested by ECB (2007), it reflects more the Albanian financial structure by attaching more weight to banking sector as it is the most prominent agents in the financial markets, while it takes advantages of a broad range of bank level data. Finally, the estimated index is a relatively measurement, where an increase in the value of the index at any particular dimension indicates a lower risk in this dimension for the period, compared with other periods.

3.2. Measuring Banks' prudential behaviour

Bank regulators desire flexibility in recognition of the importance of LLR for bank safety and soundness [Balla and KcKenna, (2009)]. The regulation on bank's LLPs level is a macro-prudential accounting tool for enhancing bank soundness, with an anti-cycle character that allows to establish higher level of reserve funds during periods of economic booming, which in return could be used in order to cover for possible future credit losses with the economic decline phases. The literature on provisioning practices shows that LLPs are made of two components. The non-discretionary components represents LLPs made to cover expected credit losses, which as a backwards-looking approach is mainly related to the identification of problems loans and exhibit a cyclical pattern. The discretionary component captures LLPs made for managerial objectives such as income smoothing, capital management or signalling [Ahmed, et al., (1999)]. The empirical literature provides a good description of how one might attempt to build a composite indicator of prudential behaviour, but obviously this paper materialise on these two approached as used by others studies[6] to build a composite index. This index is built upon four components, rather than focusing only on one. Each component captures different aspect of bank prudential behaviour, including both the discretionary and non-discretionary components. Therefore, the approach to build this index is as follows. First, using the statistical methods, all four indicators are normalised into a common scale with mean of zero and standard deviation of one[7]. The formula is given as:

$$Z_{i,t} = \left(\frac{X_{i,t} - \overline{\mu}_{i,t}}{\overline{\sigma}_{i,t}} \right) \tag{4}$$

Where, $X_{i,t}$ presents the value of one indicator for bank during the period t; μ is the mean and σ is the standard deviation. Second, all of these indicators are then transformed between the values [0, 1] using exponential transformation as follows:

$$Z'_{i,t} = \left(\frac{1}{1 + \exp(-Z_{i,t})} \right) \tag{5}$$

Then, all the normalised values are converted into a single uncorrelated index by means of the statistical procedure, namely the principal component analysis (PCA) approach, which is yet again standardised through the procedure in Equation (4), and then transformed between the

[6] Among others see Glen and Mondragón-Vélez, (2011), Bouvatier and Lepetit, (2012).

[7] Normalizing the values avoids introducing aggregation distortions arising from differences in the means of the indicators.

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values [0, 1] using Equation [5]. Finally, the proxy for bank prudential index (BPI) is derived as a sum of the estimated exponential transformed sub-indexes, as follows:

$$BPI_{t,w} = \omega_1 * Z'_{1i,t} + \omega_2 * Z'_{2i,t} + \omega_3 * Z'_{3i,t} + \omega_1 * Z'_{4i,t} \tag{6}$$

$$\sum_{*=1,2,3,4} \omega^* = 1 \tag{7}$$

Where, $Z'_{1i,t}$ is the ratio of reserve funds to cover loan losses to non-performing loans (gross); $Z'_{2i,t}$ presents the ratio of reserve funds to cover loan losses to outstanding loans (gross); $Z'_{3i,t}$ shows the ratio of specific fond reserve to outstanding regular loan (gross); and $Z'_{4i,t}$ is the annual growth rate if reserve funds to cover loan losses to total bank asset.

The advantage of this approach is fourfold. First, similar to *CAELS*, *BPI* is also a useful monthly based supervision instrument that can be used for on-side examination purposes in real time and on an uniform basis. It is also based on the *PCA* approach. Neither it is based on the binary approach. Rather it consists of a simpler approach that is easier to explain and implements and most importantly allows analysing prudential behaviour as it develops and to that it is applicable for cross-section comparisons. Finally, the estimated index is a relatively measure, where an increase in the value of the index at any particular dimension indicates a higher degree of bank prudential behaviour in this dimension for the period, compared with other periods.

3.3. The Empirical Approach

The empirical model specification draws on the extensive review as explained in the previous section, but differently this paper departs from them to the fact that it analyses how prudential behaviour affects bank stability conditions. Therefore, our empirical model as expressed in Equation [1] is re-specified as follows:

$$\begin{aligned} CAELS_{i,t} = \alpha + B_1 * BPI'_{i,t} + \beta_2 * EFFICIENCY'_{i,t} + \beta_3 * LEVERAGE'_{i,t} + \\ + \beta_4 * GDP'_{j,t} + \beta_5 * PSRISK'_{j,t} + \varepsilon_{i,t} \end{aligned} \tag{8}$$

Where, $BPI'_{i,t}$ is a proxy for bank prudential behaviour. All other things are as previously explained.

In addition, we re-specify equation [9], in which we use the same proxy related to bank prudential behaviour, but to some methodological changes. First, we include also an additional market-specific explanatory variable that accounts for the degree of competition in the banking sector, namely the Boone indicator. The model, then takes the form as follows:

$$\begin{aligned} CAELS_{i,t} = \alpha + B_1 * BPI'_{i,t} + \beta_2 * EFFICIENCY'_{i,t} + \beta_3 * LEVERAGE'_{i,t} + \\ + \beta_4 * GDP'_{j,t} + \beta_5 * PSRISK'_{j,t} + \beta_6 * BOONE'_{j,t} + \varepsilon_{i,t} \end{aligned} \tag{9}$$

Where, $BOONE_{i,t}$ is our competition indicator for bank i at time t, with $i = 1, ..., N$ and $t = 1, ..., T$, taken from Shijaku (2016b). All other things are as previously specified. Then, following other recent studies[8], we also control for possible non-linearity behaviour in the stability – prudential nexus. For this reason we use a quadratic term of BPI as shown in Table 3 in the Appendix. Therefore, equation [9] is re-specified as follows:

[8] See also among other Jiménez, *et al.* (2013), Liu, *et al*. (2013), Fu, *et al.* (2014), Kasman and Kasman (2015).

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$$CAELS_{i,t} = \alpha + B_1 * BPI'_{i,t} + B_2 * BPI^2_{i,t} + \beta_3 * EFFICIENCY'_{i,t} + \\ + \beta_4 * LEVERAGE'_{i,t} + \beta_5 * GDP'_{j,t} + \beta_6 * PSRISK'_{j,t} + \varepsilon_{i,t} \quad (10)$$

One potential problem with Equation [8] is the fact that as a partially specified model it put together a variety of variables and, so, it nests a conditional restriction with a variety of unconditional ones leading to over-identification problem. Under these circumstances Maximum Likelihood estimators need to identify the moments whose squares are minimized in order to satisfy only the subset of correct restrictions. To correct for this issue, the estimation approach strictly follows the methodology as in Shijaku (2016), which, based on the dynamic General Method of Moments (GMM) weighs differences (AB-1-step) as proposed by Arellano and Bond (1991) and Arellano and Bover, (1995). Han and Phillips (2010) suggest GMM is constructed to be capable of achieving partial identification of the stochastic evolution and to be robust to the remaining un-modelled components. In practical terms, GMM is also a virtuous approach to deal with potential endogeneity and dynamic panel data problems in model estimation [Anderson and Hsiao (1981)]. Furthermore, the GMM weighs differences first step (AB-1-step) approach would also resolve for un-ward (down-ward bias in standard errors (t-statistics) due to its dependence on estimated values (as it uses estimated residuals from an one-step estimator). This may lead to unrealistic asymptotic statistical inference [Judson and, Owen, (1999); Bond and Windmeijer (2002); Ansari and Goyal (2014)] particularly in the case of a data sample with relatively small cross section aspect [Arellano and Bond (1991)]. The instrument variable is based on past information of $X'_{i,t}$, and to limit the number of instruments, we restrict ourselves to 4, i.e., the lag range used in generating the instruments as suggested by Roodman (2006). Then, the Sargan and Hansen test is used for over-identifying restrictions based on the sample analogy of the moment conditions adopted in the estimation process, thereby determining the validity of instrument variables (i.e., tests of lack of serial correlation and consistency of instrument variables).

3.4. Sample and the Data

Sample of this study consist of a quarterly macroeconomic data and a unique set of supervisory micro data taken from balance sheet and income statement items of 16 banks operating in Albania. The strength of the micro data is its sample coverage and reliability of information. The sample consists of 960 sets of quarterly data, coving all 16 banks operating in Albania, since 2001 Q01.

The empirical study focuses on the period 2008 Q04−2015 Q03, while 2008 Q4 marks the beginning of pass-through effect of GFC in the Albanian economy[9]. That includes a total panel balanced observations with 425 observations and 28 periods. Variables used for empirical analysis are as follows. Bank-specific variables and the stability indicator are estimated individually for each bank. *CAELS* and BPI are transformed into indices, taking the average performance during the year 2010 as the base year. Both of them are relatively measurement, where an increase in the value of the index at any particular dimension indicates a lower risk (or a higher attitude toward prudential as for BPI) in this dimension for the period, compared with other periods. *EFFICIENCY* is proxy as gross expenditure to gross income ratio. *LEVERAGE* presents the equity to asset ratio of individual banks. *BPI* is transformed into an index, taking the average performance during the year 2010 as the base year. The macroeconomic variables are aggregated indicators that represent the state of the economy. *GDP* represents gross domestic production.

[9] The Albanian economy was not affected directly by the GFC, but the spill-over effects through financial and trade linkages were immediately transmitted from 2008 Q04, which at the same time provides a justification why we choose to the empirical estimation from this period.

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It is transformed in real terms by deflated with the Consumer Price Index. *PSRISK* represents the spread between domestic 12 months' T-Bills and the German 12 months' T-Bills. They are transformed in real terms by subtracting the respective domestic and German annual inflation rate. *CRISIS* takes the value of 1 during the period 2008 Q03 – 2010 Q04, and 0 otherwise. All the data represent the end-period values. They are log-transformed, besides the *PSRISK* and *CRISIS*. Further, the dataset developed for this paper has several sources. Data on GDP are taken from the Albanian Institute of Statistics. Data on the domestic T-Bills rates are taken from the Ministry of Finance. Data on German 12 months T-Bills rates and German Consumer Price Index are taken from Bloomberg. The rest of the data are taken from Bank of Albania.

With regards to the sample, Table 1 in Appendix provides some stylised facts with regards to the Albanian financial sector. First, we notice that the value of financial sector asset as a ratio to GDP has increased substantially from 78.6% in 2008 to nearly 105.1 % in 2015. A large portion of financial intermediation is due to banking sector, where bank assets shifts from about 75.9% in 2007 to nearly 94.9% by the end of 2015. Second, the actual structure of the banking sector is mostly dominated by foreign-owned banks, while by 2015 the number of the Albanian-owned banks reached three. Among the 13 foreign-owned banks, 9 banks are European-based banks and the rest are non-European-based banks. We notice also that in 2016 the largest 4 banks (CR-4) holds nearly 68.7% of total assets from nearly 63.1% it was in 2007, while the banking system is consider to be moderately concentrated as the HHI shows. Similarly, in Table 3 in Appendix, we summarise the main variables that we use in our empirical analyses, with regards to quarterly observations. The data show that the mean (median) of GDP annual growth rate is 3.1% (2.5%), with a maximum value around 9.7% and a minimum of 0.5%. The sovereignty primary risk (PSRISK) has a mean nearly 5.9% and a maximum of nearly 8.6% and minimum of nearly 3.2%. LLP to asset (loan) ratio has a maximum nearly 23.1% (71.6%) and a minimum of nearly 0% in both cases, while the means is nearly 5.4% (10.5%). The equity to asset ratio (LEVERAGE) has a mean of nearly 14.2%, with a maximum value of 23.1% and a minimum of nearly 6.9%. The capital adequacy ratio (CAR), which banks are expected to meet at 12% under the Basel I rules, has in average been at nearly 30.1%. At the same time, in Table 4 we present the correlation matrix between the variables of our interest for the period 2008 Q3 – 2015 Q4. Results show that there is a positive correlation between our stability index, CAELS, with variables such as GDP, LEVARGE and BPI, while the correlation with PSRISK, and EFFICIENCY is negative. The degree of correlation is stronger with GDP and EFFICIENCY.

Finally, as to generate some consistent and unbiased results, we ensure also that variables are stationary using the Augmented Dickey-Fuller (ADF) and the Phillips-Peron (PP) Fisher Chi-square tests[10]. The reason to use these tests is twofold. First, these tests are built on the same null hypothesis that panel variables are stationary. Second, they are mostly used for unbalanced panel models, as it is our sample. Results are presented in Table 5 in the Appendix. Findings imply that some of the variables included in our specified model are integrated of order zero I(0). This means that they are stationary. Therefore, they enter the model at level. This set of variables includes *LERNER*, *EFFICIENCY* and *LEVERAGE*. The other variables, namely *CAELS*, *GDP* and *PSRISK* are found to be integrated in order one, I(1). This means they pose non-stationary properties. Therefore, they enter the model as first difference, since it will transform them into a stationary stance[11].

[10] This approach helps us to understand the properties of the variables and also to be sure that their order of integration fulfils the criteria for our empirical estimation approach. The latter is a pre-required condition in order to receive consistent and unbiased results.

[11] These results are robustness also to other unit root test approaches, including the Im, Pesaran and Shin W-stat test and Fisher test. Data can be provided upon request.

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4. EMPIRICAL RESULTS

4.1. Main results

This section present the results of the model as specified in Equation [8]. The results are reported in Table 6 in Appendix. Column [1] reports the baseline equation in the case of the banking system. Column [2] shows results of an augmented model specification that includes also an additional explanatory variable that accounts for the degree of competition in the banking sector, namely the Boone indicator as is explained by Shijaku (2016c)[12]. Following other recent studies[13], we also control for possible non-linearity behaviour in the stability – prudential nexus. For this reason we use a quadratic term of BPI as shown in Table 3 in the Appendix. Results are reported in Column [3]. Then, columns [4], [5] and [6] provide results on the same approach as previously explained, but this time it consists of only large banks. Similarly, columns [7], [8] and [9] provide respectively results with regards to a sample that consists of only small banks. All models were estimated based on the GMM approach. At the bottom of the table, we report specification test results for the GMM estimation. First, AR(1) and AR(2) are the Arellano-Bond tests for first and second order autocorrelation of residuals. One should reject the null hypothesis of no first order serial correlation and not reject the null hypothesis of no second order serial correlation of the residuals. Second, the Sargan and Hensen test of over-identifying restrictions indicates whether instruments are uncorrelated with the error term. The GMM does not require distributional assumptions on the error term and it is more efficient that the Two Least Two Square approach, since it accounts for heteroskedasticity Hall (2005). Results show that, in our case, requirements are met as suggested by the p-values of AR(1) and AR(2) tests. In addition, Sargan and Hensen test suggests that the instruments used in all specifications are appropriate. This means that all GMM equations are properly specified.

Analyses of estimated coefficients, both external and internal variables, suggest that all explanatory variables have the expected signs and are statistically significant at conventional level. They are also compatible with previous studies as reported by Shijaku (2016a) and (2016b). For example, the coefficients of the variables linked to macroeconomic patterns bear the relatively the same level of significance and on bank stability as in previous studies. The coefficient of *GDP* is positive in all regressions. This suggests that *GDP* is positively related to *CAELS* as in the case of Demigruc-Kunt and Detragiache, (2002). The effect is found to be statistically significant at 1 percentage (%) level. Therefore, one may expect that higher economic growth would play a relatively crucial role for bank stability conditions. It is also of great important to understand, however, that from another point of view this result implies that banks place also a relatively consider manner to the economic conditions in which they operate, since an upward movements in economic activity would improve the situation of the banking system through a higher financial intermediation or for low risks related to bank sovereignty risks.

Further, *PSRISK* has the expected negative effect on bank stability. This means that decreasing sovereignty primary risk, as measured by the spread ratio of domestic and foreign risks, increases bank stability. Therefore, lower risks are expected to materialise through improving stability conditions of banks. This result complements the findings of Jutasompakorn, *et al.* (2014), but by contrast, the estimated marginal effect is considered to be relatively small, even though it is statistically significant at 10% level. This suggests that banks consider shocks related to primary sovereignty risk, even though the pass-through is relative small. The reason is fourfold. First, public borrowing has been orientated towards longer term maturities and towards foreign

[12] Boone is transformed into an index, taking as the base year the average performance during the year 2010. It is a relatively measurement, where an increase in the value of the index at any particular dimension indicates a lower risk in this dimension for the period, compared with other periods. It is log-transformed and enters the model in first difference based on unit root tests.

[13] See also among other Jimenez, et al., (2013), Liu, et al. (2013), Fu, et al., (2014), Kasman and Kasman (2015).

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borrowing. This has lowered the pressure on banks and at the same time has provided the market with more foreign liquidity. Second, the government has taken several structural reforms to minimise possible fiscal risks, which includes the pension system reform, energetic sector, etc. Third, banks in Albania operate under a flexible interest rate to which they place a marginal fixed rate. Therefore, any negative shock that leads to an interest rate hike is reflected immediately to their interest barging, making them to some extend hedge to interest rate. Finally, but not the least, different from other countries, banks in Albania have been well-capitalised and have not vulnerable to a shortage of liquidity, despite the recent trends and financial disintermediation.

On the other hand, the coefficients linked to bank specific factors are found to be also relatively crucial for bank stability. They have the expected sign and are statistically significant at conventional level. The coefficient related to *EFFICIENCY* is negatively related to *CAELS*. This suggests that there is a reverse relationship between operational inefficiency and bank stability at the bank level patterns. Therefore, bank stability would increase proportionally to upturn in operational efficiency. At the same time, this relationship is found to be stronger for large banks compared to small banks. The effect is also statistically significant at conventional level. Similarly, the positive coefficient of *LEVERAGE* reveals that *CAELS* is positively related with improving bank's capital structure. This relationship is statistically significant in our entire sample. This means that bank stability increases through improving operational efficiency and a better capital structure. Similarly, results demonstrate also a positive relationship between bank competition and bank stability. The coefficient of *BOONE* indicator is also statistically significant at conventional level. This means that improving degree of competition would stimulate further bank stability, given that higher value of the *BOONE* indicator signifies a higher degree of competition, thus confirming the competition-stability view in the case of Albania. This is also similar to other findings of Berger and Bouwman (2013), Fiordelisi and Mare (2014), Schaeck and Cihak (2014). At the same time, since the Boone indicator is statistically significant, change of marginal cost has more effects on profits, which means the market share is subject to more competition.

Finally, a relatively very central result is linked to findings with respect to the estimated coefficient associated with *BPI*. The sign of the coefficient of BPI is positive. This indicates that there is a positive nexus between *BPI* linked with *CAELS*. This suggests that policies oriented towards higher bank prudential behaviour would be positive and enable bank greater stability. The coefficient of BPI is also found to be statistically significant at conventional level. That is that prudential behaviour would be relatively crucial for bank stability. Surprisingly, among other bank-specific factors, bank prudential behaviour is found to have the highest effect. Therefore, it would reasonable to suggest that banks must pay great attitude towards prudential behaviour, among policies linked to operational efficiency and capital structure. Furthermore, results as reported in Table 3, column [3] in Appendix reveal an important consideration that is that we did not find evidence of non-linearity relationship between prudential behaviour and stability in the case of the Albanian banking system. Nor did we find when we spitted the sample with regards to small and large banks as reported in Table 2, column [6] and column [9] in appendix][14].

4.2. Robustness checks

In an attempt to provide complementary proof we test the robustness of our results in Section 4.1 by considering five different alternative measures as proxy for bank prudential behaviour. This means that we re-estimate Equation [8] and use respectively each alternative proxies for bank prudential behaviour as explanatory variables to get more robust results. For example, Column [1] in Table 7 in the Appendix, show results when we use *BPI**, an alternative proxy of bank prudential behaviour, which is based on the same approach as explained in Section 3.1., but this

[14] We used also a cubic term of the measures of competition to capture a possible non-linear relationship between bank prudential behavior and bank stability, bust still found no supportive evidence. Results are provided upon request.

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time we did not include in the calculation process the variable on the annual growth of the ratio of reserve funds to total asset[15]. Then, Column [2] show results when instead we used *BPI** as an alternative variable, namely *BPINEW*[16], which includes in the calculations process the ratio of bank provisional expenses to the ratio of bank total asset. In Column [3] we report results linked to the use of *LLP*[17], which presents the ratio of loan loss provision to total bank asset. Furthermore, column [4] provides evidences with regards to another proxy that refers to the difference between LLPs to total bank asset and loan to total bank asset, *LLPNEW*[18]. Finally, Column [5] presents results when instead we used the ratio of reserve funds to cover loans losses to outstanding loan (gross), *MP*[19]. At the same time, in Table 8 we also report results of the augmented model specification, which includes also the *BOONE* indicator as explanatory variable.

All models are estimated based on the GMM approach using quarterly data for the period 2008 Q02 – 2015 Q03. The past information of are used as instrument and their number is limit to 4 lags. Yet again, at the bottom of the table, we report the specification test results for the GMM estimation. Results show that null hypothesis cannot be rejected. The Sargan and Hensen test is used for over-identifying restrictions based on the sample analogy of the moment conditions adapted in the estimation process, thereby as to determine the validity of the instrument variables (i.e. tests of lack of serial correlation and consistency of instruments variables). According to this test, all GMM equations are properly specified. They are also not over-identified as the probability of the Sargan and Hensen test suggests.

Results are generally robust with those of the previous section[20]. Firstly, all coefficients have the expected theoretical sign, albeit with same relatively small changes in terms of the statistical significance level. This means that our model specification is robust as results are insensitive to the inclusion of alternative explanatory variable in our augmented and re-specified. Second, all explanatory variables used as alternative proxies for bank prudential behaviour have the expected positive sign. This confirms previous findings. It also implies a robust conclusion on the assumption that policies toward greater prudential behaviour would provide banks with greater stability conditions in case of negative shocks. Not surprisingly, we see that the size of the coefficients on *BPI** and *BPINEW* are relatively higher compared to those of the other proxies. This is in fact expected given that these two variables are based on a set of different indicators represented through the principal components approach. At same time, it also confirms that prudential behaviour is better capture by proxies that do not solely based on one indicator, but rather includes a set of information based on different aspects of bank prudential policies.

5. CONCLUSIONS

The scope of recent banking crises have fuelled an interestingly growing focus to understand what works best in the bank regulation and supervision and how provisioning plays a crucial role for bank stability and soundness while fulfilling their lending functions. Therefore, with the occurrence of the financial crisis, it becomes more stringent the need to promote stronger norms on macro-prudential supervision tools, such as capital buffers and liquidity resources by credit

[15] It is transformed into an index similar to the approach followed for MPI. An increase of the index indicates a higher degree of bank prudential for the period, compared with other periods. It is log-transformed and enters the model in level based on unit root tests.

[16] It is transformed into an index similar to the approach followed for MPI. An increase of the index indicates a higher degree of bank prudential for the period, compared with other periods. It is log-transformed and enters the model in level based on unit root tests.

[17] See among other papers that make usage of this proxy Fonseca and González, (2008); Glen and Mondragón-Vélez, (2011); Beatty and Liao (2014); Dushku, (2016).

[18] It enters the model in level based on unit root tests.

[19] It is log-transformed and enters the model in level based on unit root tests.

[20] Results are robust also to methodological changes to which we used the GMM White Period 2nd Step approach. The Arellano and Bond test results also require significant AR(1) serial correlation and lack of AR(2) serial correlation (See also Kasman and Kasman, 2015).

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institutions, whose role is to reduce the exposure to the risk of insolvency and hereby the ability of banks to damage the economy by taking on excess risk.

For these reasons, this paper analyses how bank prudential behaviour affects bank stability conditions. This is of obvious interest from an efficiency policy point of view, as banking regulation approach should move towards a prudential behaviour that is closer related to bank stability concerns. To our best knowledge, this paper is the first one to investigate the effect that bank provisions policies have on bank stability, in particular after the global financial crises. The empirical specified model analyses bank stability as a function of indicators linked to macroeconomic conditions, market and bank's specific patterns. The model is estimated based on the GMM approach for 16 banks operating in Albania, using quarterly panel data for the period 2008–2015. This paper improves the existing literature along three crucial dimensions. First, in contrast to other bank-level studies, we use the most direct measure of bank stability and prudential behaviour available, which are generated from the unique supervisory dataset collected by the Bank of Albania. Both of these indicators are constructed based on the principal component of set of different indicators which provides us with a rating based approach on bank stability conditions and prudential behaviour. Therefore, they represent two useful monthly-based supervision instruments that can be used for on-side examination purposes in real time and on a uniform basis. At the same time, they consist of a simpler approach that is easier to explain and implements. Most importantly they allow analysing the stability conditions and prudential behaviour as it develops and is also applicable for cross-section comparisons. Second, among other variables, we use both of these indicators to analyse the prudential-stability nexus in particular in the aftermath of the GFC. Finally, we run a number of robustness checks to control for the consistency of our results through a set of methodological changes, which includes different number of instrument variables and alternative proxy of bank prudential behaviour.

In summary, this paper provides strong supportive evidences indicating that there exists a pro-cyclical behaviour between bank stability and bank prudential behaviour. This means that bank prudential is positively linked with bank stability. Results appear to hold for a wide array of other alternative model specifications and estimation approaches, as well as variable construction. Therefore, any policy oriented towards greater bank prudential behaviour merit special attention as a tool that would enhance further the extent to which banks would be more stable in the wake of a possible negative credit cycle. At same time, we did not find a non-linear relationship in the prudential – stability nexus. In addition, as for other control variables, our results confirm that banks' behaviour towards greater competition has been crucial for boosting bank stability in the aftermath of GFC, thus bolstering the "competition – stability" view. Therefore, we suggest that perfect competition is the desirable market structure in order to promote great stability in the banking sector in the case of Albania. Moreover, our results confirm also that supervisors and policy-makers should carefully monitor macroeconomic risks since lower economic growth and higher sovereignty risks are associated with greater bank instability. Finally, evidences show that a great attention should be paid also to developments within the banking sector, which seems to affect more bank stability conditions. On the one hand, we see that there exists a negative linkage between operational efficiency and bank stability implying that lower efficiency banks are more destine to bank instability. On the other hand, special interest should be given also to capital structure of banks as higher capital ratio significantly boosts the state of bank stability conditions. This effect was found to be among the highest.

Bank loss provision system has become the most debated accounting number in bank financial reporting after bank profitability and derivatives since the 2008 global financial crisis. On problem is linked to the fact that the level of provisioning has had a historically pro-cyclical bias, as it is basically linked to contemporaneous problem assets, so that provisioning mainly rise during downturn [Laeven and Majnoni, (2003)] when credit risk has already materialised. Therefore, one possible future research is to analyse how a cyclical based approaches, e.g. Bank of Spain

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as reported by Saurina, (2009a, 2009b), has introduced such statistical provisioning for loan loss reserves since 2001 in order to dampen excess pro-cyclicality in credit growth. Under this system, banks must make provisions according to the latent risk over the business cycle, or based on the historical information regarding credit losses for different types of loans. By anticipating better the expected losses lurking in a loan portfolio, statistical provisions should provide additional buffers and mitigate pro-cyclicality. Therefore, some policy makers advocate the need for a counter-cyclical or dynamic loan loss provisioning system, which is a macro-prudential tool for enhancing bank soundness with that allows to establish higher LLPs during the economic growth periods and report fewer LLPs during economic downturns so that the surplus LLPs accumulated during good times is used to cover the losses with the economic decline phases. That is why future research on the stability – prudential nexus should take into account the possibility of adopting a dynamic provisioning indicator. Similarly, is important to mention that one limitation of this research is the extent to which current results can be compatible internationally.

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Note

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References

Ahmed, A., Takeda, C., and Thomas, Sh. (1999). "Bank Loan Loss Provisions: a Re-examination of Capital Management, Earnings Management and Signalling Effects." Journal of Accounting and Economics 28(1): 1–25.

Alessi, M., Di Colli, S., and Lopez, J. (2015). "Loan Loss Provisioning and Relationship Banking in Italy: Practices and Empirical Evidence." Journal of Entrepreneurial and Organizational Diversity 3(1).

Alhadab, M., and Alsahawneh, S. (2016). "Loan Loss Provision and the Profitability of Commercial Banks: Evidence from Jordan." International Journal of Business and Management; 11(12).

Anderson, Th. and Hsiao, Ch. (1981). "Estimation of Dynamic Models with Error Components." Journal of American Statistical Association, 76(375): 598–606.

Ansari, J., and Goyal, A. (2014). "Bank Competition, Managerial Efficiency and Interest Rate-Pass-through in India." Contemporary Issues in Bank Financial Management, in Simon Grima, Frank Bezzina (ed.), 97, Emerald Group Publishing Limited.

Arellano, M., and Bond, S. (1991). "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." The Review of Economic Studies, 58(2): 277–297.

Arellano, M., and Bover, O. (1995). "Another Look at the Instrumental Variables Estimation of Error Components Models", Journal of Econometrics 68(1): 29–51.

Balla, E., and McKenna, A. (2009). "Dynamic Provisioning: A Countercyclical Tool for Loan Loss Reserves." Federal Reserve Bank of Richmond Economic Quarterly 95(4): 383–418.

Balla, E., and Rose, M. (2015). "Loan Loss Provisions, Accounting Constraints, and Bank Ownership Structure." Journal of Economics and Business 78: 92–117.

Barth, James, Gerard Caprio, and Ross Levine. (2004). "Bank Supervision and Regulation: What Works Best?" Journal of Financial Intermediation 13: 205–248.

Beatty, A., Ke, B., and Petroni, K. (2002). "Earnings Management to Avoid Earnings Declines across Publicly and Privately Held Banks." *The Accounting Review* 77(3): 547–570.

Beatty, A., and Liao, S. (2014). "Financial Accounting in the Banking Industry: A Review of the Empirical Literature." Journal of Accounting and Economics 58(2–3): 339–383.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

Berger, A., and Bouwman, C. (2013) "How Does Capital Affect Bank Performance During Financial Crises?.", Journal of Financial Economics, 19: 146–176.
Betz, F., Oprica, S., Peltonen, T., Sarlin, P. (2014), "Predicting Distress In European Banks", Journal of Banking and Finance, Vol. 45: 225–241.
Bikker, J., and Metzemakers, P. (2005). "Bank Provisioning Behaviour and Pro-cyclicality." Journal of International Financial Markets, Institutions and Money 15: 141–157.
Bond, S., and Windmeijer, F. (2002). "Finite Sample Inteference for GMM Estimators in Linear Panel Data Models." Institute of Fiscal Studies, London, January (2002).
Bouvatier, V., and Lepetit, L. (2008). "Banks' Pro-cyclical Behaviour: Does Provisioning Matter?." Journal of International Financial Markets, Institutions and Money 18(5): 513–526.
Bouvatier, V., and Lepetit, L. (2012). "Effects of Lon Loss Provisions on Growth in Bank Lending: Some International Comparisons." International Economics 132: 91–116.
Bouvatier, V., Lepetit, L., and Strobel, F. (2014). "Bank income smoothing, ownership concentration and the regulatory environment." Journal of Banking & Finance 41: 253–270.
Bushman, R., and Williams, C. (2012). "Accounting Discretion, Loan Loss Provisioning and Discipline of Banks' Risk-Taking." Journal of Accounting and Economics 54(1).
Cavallo, Michele, and Giovanni Majnoni. (2001). "Do Banks Provision for Bad Loans in Good Times? Empirical Evidence and Policy Implications." The World Bank, Financial Sector Strategy and Policy Department, Policy Research Working Paper Nr. 2619.
Cleary, S., Hebb, G., (2016), "An Efficient and Functional Model for Predicting Bank Distress: In and out of Sample Evidence", Journal of Banking and Finance, Vol. 64: 101–111.
Cohen, L., Marcia C., Marcus, A., Tehranian, H. (2014). "Bank Earnings Management and Tail Risk During the Financial Crisis." Journal of Money, Credit and Banking 46(1): 171–197.
Cucinelli, D. (2015). "The Impact of Non-performing Loans on Bank Lending Behaviour: Evidence from the Italian Banking Sector." Eurasian Journal of Business and Economics, 8(16): 59–71.
Curcio, D, and Hasan, I. (2015). Earnings and "Capital Management and Signaling: the Use of Loan-Loss Provisions by European banks." The European Journal of Finance, 21(1): 26–50.
Dell'Ariccia, G., and Marquez, R. (2006). "Lending Booms and Lending Standards." *The Journal of Finance* 61(5): 2511–2546.
Dell'Ariccia, G, Igan, I., and Laeven, L. (2012). "Credit Booms and Lending Standards: Evidence from the Subprime Mortgage Market." Journal of Money, Credit and Banking 44(2–3): 367–384.
Demirgüç-Kunt, A., Detragiache, E., and Tressel, Th. (2008). "Banking on the Principles: Compliance with Basel Core Principles and Bank Soundness." Journal of Financial Intermediation 17(4): 511–542.
Dushku, E. (2016). "Some Empirical Evidence of Loan Loss Provisions for Albanian Banks." Journal of Central Banking Theory and Practice, 2016, 2: 157–173.
Elnahass, M., Izzeldin, M., and Abdelsalm, O. (2014). "Loan Loss Provisions, Bank Valuations and Discretion: A Comparative Study Between Conventional and Islamic Banks." Journal of Economic Behaviour & Organization 103: 5160–5173.
European Central Bank, (2007), "Progress Towards a Framework for Financial Stability Assessment", Speech by José Manuel González-Páramo, Member of the Executive Board of the ECB, OECD World Forum on "Statistics, Knowledge and Policy", Istanbul, June 2007.
Fiordelisi, F., and Mare, D. (2014). "Competition and Financial Stability in European Cooperative Banks" Journal of International Money and Finance 45: 1–16.
Fonseca, R., and González, F. (2008). "Cross-country Determinants of Bank Income Smoothing by Managing Loan-Loss Provisions." Journal of Banking & Finance 32(2): 217–228.
Foos, D, Norden, L., and Weber, M. (2010). "Loan Growth and Riskiness of Banks." Journal of Banking & Finance, 34: 2929–2940.
Fratzscher, M., König, Ph., and Lambert, C. (2016). "Credit Provision and Bank Stability after the Great Financial Crisis: The Role of Bank Regulation and the Quality of Governance." Journal of International Money and Finance 66: 113–135.
Fu, X., a Lin, Y., and Molyneux, Ph. (2014). "Bank competition and financial stability in Asia Pacific." Journal of Banking & Finance, 38: 64–77.
Glen, J., and Mondragón-Vélez, C. (2011). "Business Cycle Effects on Commercial Bank Loan Portfolio Performance in Developing Economies." Review of Development Finance 1(2): 150–165.
Greenawalt, M., and Sinkey, J. (1988). "Bank Loan-Loss Provisions and the Income-Smoothing Hypothesis: An Empirical Analysis, 1976–1984." Journal of Financial Services Research 1(4): 301–318.
Hall, A. (2005). "Generalized Methods of Moments." Oxford University Press.
Han, Ch., and Phillips, P. (2010). "GMM Estimation for Dynamic Panels with Fixed Effects and Strong Instruments at Unity." Econometric Theory, 26: 119–151.

DOI: 10.7172/2353-6845.jbfe.2017.2.6

Jiménez, G., Lopez, J., and Saurina, J. (2013). "How does competition affect bank risk-taking?." Journal of Financial Stability, 9(2): 185–195.
Judson, R., and Owen, A. (1999). "Estimating Dynamic Panel Data Models: A Guide for Macroeconomist." Economics Letters, 65: 9–15.
Hess, K., Grimes, A., and Holmes, M. (2009). "Credit Losses in Australasian Banking." Economic Record, 85: 331–343.
Kasman, S., and Kasman, A. (2015). "Bank Competition, Concentration and Financial Stability in the Turkish Banking Industry." Economic Systems, 39, 502–517.
Keeton, W. (1999). "Does Faster Loan Growth Lead to Higher Loan Losses?." Federal Reserve Bank of Kansas City, Economic Review.
Kick, Th., and Prieto, E. (2015). "Bank Risk Taking and Competition: Evidence from Regional Banking Markets." Review of Finance 19(3): 1185–1222.
Laeven, L., and Majnoni, G. (2003). "Loan Loss Provisioning and Economic Slowdowns: Too Much, Too Late?." Journal of Financial Intermediation, 12(2): 178–197.
Leventis, S., Dimitropoulos, P., and Anandarajan, A. (2011). "Loan Loss Provisions, Earnings Management and Capital Management under IFRS: The Case of EU Commercial Banks." Journal of Financial Services Research 40(1): 103–122.
Liu, C., and Ryan, S. (2006). "Income Smoothing over the Business Cycle: Changes in Banks' Coordinated Management of Provisions for Loan Losses and Loan Charge-Offs form the Pre-1990 Bust to the 1990s Boom." The Accounting Review 81: 421–441.
Liu, H., Molyneux, Ph., and Wilson, J. (2013). "Competition and Stability in European Banking: A Regional Analysis." The Manchester School, 81(2): 176–201.
Niswander, F., and Swanson, E. (2000). "Loan, security, and dividend choices by individual (unconsolidated) public and private commercial banks." Journal of Accounting and Public Policy 19(3): 201–235.
Ogura, Y. (2006). "Learning from a rival bank and lending boom." Journal of Financial Intermediation 15(4): 535–555.
Pabón, A., and Kohlscheen, E. (2016). "Moving in Tandem: Bank Provisioning in Emerging Market Economies." BIS Working Papers No 548 (March 2016).
Packer, F., and Zhu, H. (2012). "Loan Loss Provisioning Practices of Asian Banks." BIS Working Papers No 375.
Roodman, D. (2009). "A Note on the Theme of Too Many Instruments." Oxford Bulletin of Economics and Statistics, 71(1): 135–158.
Salas, V., and Saurina, J. (2002). "Credit Risk in Two Institutional Regimes: Spanish Commercial and Savings Banks." Journal of Financial Services Research 22: 203–224.
Saurina, J., and Jiménez, G. (2006). "Credit Cycles, Credit Risk, and Prudential Regulation." International Journal of Central Banking 2: 65–98.
Saurina, J. (2009a). "Dynamic Provisioning: The Experience of Spain." Crisis Response Note No. 7, International Finance Corporation.
Saurina, J. (2009b). "Loan Loss Provisions in Spain. A Working Macroprudential Tool." Revista de Estabilidad Financiera, 17: 11-26.
Schaeck, K., and Čihák, M. (2014), "Competition, Efficiency, and Stability in Banking.", Financial Management 43 (1): 215–241.
Sere-Ejembi, A., Udom, I.S., Salihu, A., Atoi, N.V., and Yaaba, B.N., (2014), "Developing Banking System Stability Index for Nigeria", CBN Journal of Applied Statistics, Vol. 5 (1), June (2014).
Shijaku, G. (2016a). "Banking Stability and its Determinants: A Sensitivity Analysis on Methodological Changes." in the Economic Review 2016, 6H-1, 2016, Bank of Albania: 18–30.
Shijaku, G. (2016b). "Does primary sovereignty risk effect bank stability? Evidence from Albanian banking system." Bank of Albania, Forthcoming Bank of Albanian Working Paper. Presented at the 2nd Policy Research Conference of the ECBN "Macro-prudential Instruments financial cycles" organised by Bank of Slovenia ad CEPR, 29–30 September 2016, Slovenia.
Shijaku, G. (2016c). "Bank competition in Albania: An analysis through Boone indicator." in the Economic Review 2016, 6H-2, 2016, Bank of Albania: 52–67.
Tadesse, S. (2006). "The economic value of regulated disclosure: Evidence from the banking sector." Journal of Accounting and Public Policy 25(1): 32–70.
Tahir, S., Ahmad, F., and Aziz, B. (2014). "Impact of Loan Loss Provision on Bank Profitability in Pakistan." Research Journal of Social Science & Management, 3(12).
Uhde, A., and Heimeshoff, U. (2009). "Consolidation in Banking and Financial Stability in Europe Further Evidence." Journal of Banking and Finance: 33, 1299–1311.
Ul Mustafa, A., Ansari, R., and Younis, M. (2012). "Does the Loan Loss Provision Affect the Banking Profitability in Case of Pakistan?." Asian Economic and Financial Review, 2(7): 772–783.

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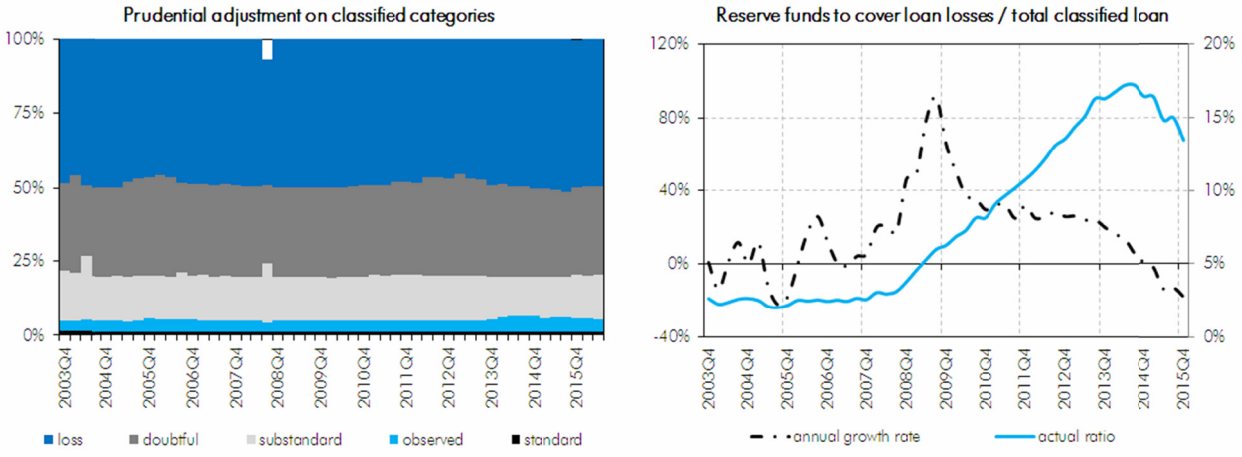
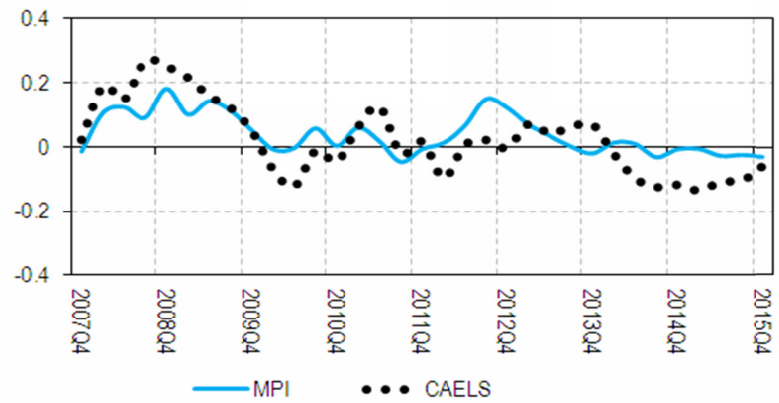
APPENDIX

Graph 1.
Classified reserve funds to cover loan losses, 2002–2015



Source: Bank of Albania, Author's calculations.

Graph 2.
Bank prudential behaviour and bank stability, 2008–2015



Source: Bank of Albania, Author's calculations.

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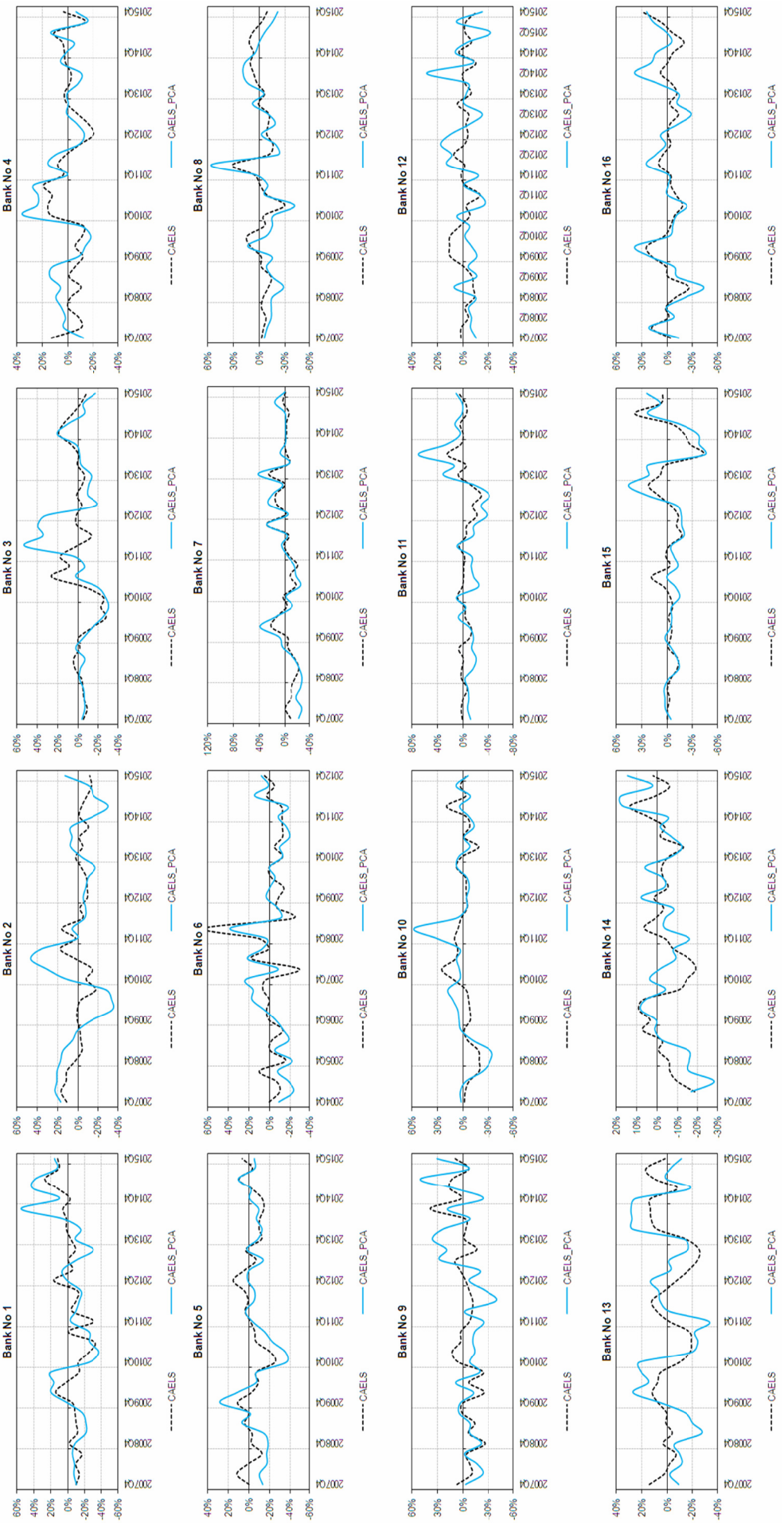
Graph 3.
Individual Bank Stability Indicator with and without Principal Component Analysis, Annual Growth Rate



Source: Author's Calculations.

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Table 1.
Banking Sector Developments

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Number of Banks	16	16	16	16	16	16	16	16	16
– *State owned-banks*	0	0	0	0	0	0	0	0	0
– *Albanian owned-banks*	2	2	2	2	2	2	2	3	3
– *Foreign owned-banks*	14	14	14	14	14	14	14	14	14
Financial Leverage (in % to GDP)	80.5	82.0	85.8	89.4	95.9	99.1	101.4	101.3	105.1
– Bank asset / GDP	76.7	77.5	80.9	84.7	89.6	90.5	91.7	91.3	94.9
– Others' asset / GDP	3.8	4.5	4.9	4.7	6.3	8.6	9.7	10	10.2
Herfindahl index (HHI in %)	15.1	14.3	14.2	14.3	14.5	13.8	14.1	14.9	15.3
Concentration Ratio CR-4 (in %)	60.2	61.4	62.8	63.9	65.4	64.9	66.6	69.3	68.7

Source: Bank of Albania, Financial Stability Report (2016).

Table 2.
Indicators used to estimate our bank stability index (CAELS)

Category	Indicator	Notation	Sub-Index
Capital adequacy	Capital Adequacy Ratio	C_1	Z_C
	Core Capital/Total Asset	C_2	
	Equity/Total Asset	C_3	
	Asset growth	C_4	
	Equity Growth	C_5	
	Fixed Asset/Regulatory Capital	C_6	
	ROE	C_7	
	Non-Performing Loan (net)/Regulatory Capital	C_8^*	
Asset Quality	Non-Performing Loan (net)/Total Loan (net)	A_1^*	Z_A
	Total Loan (net)/Total Asset	A_2	
	Growth of Loan Portfolio	A_3	
	Credit Loss (Gross)/Total Loan (Gross)	A_4^*	
	Large Risks (the number of beneficiaries over rate)	A_5^*	
	Provisions for Loan Loss Coverage/Non-Performing Loan (gross)	A_6^*	
Earnings	ROA	E_1	Z_E
	The growth of revenue from interest	E_2	
	Interest revenue/Total Revenue	E_3	
	Net Interest Margin	E_4	
	Efficiency Ratio	E_5	
	Interest Revenue (Net)/Operating Revenues (Gross)	E_6	
	Dividend/Income (Net)	E_7	
	The growth of net interest revenue	E_8	

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Category	Indicator	Notation	Sub-Index
Liquidity	Net Loan/Average Deposits	L_1	Z_L
	Active Liquid/Total Asset	L_2	
	Asset minus Passive with a maturity of three months/Total Asset that provide profit	L_3	
Sensitivity to Market Risk	Asset minus Passive sensitive to interest rate with a maturity up to 3 months/ Total Asset that Provide Profit	S_1^*	Z_S
	Asset minus Passive sensitive to interest rate with a maturity up to 12 months/ Total Asset that Provide Profit	S_2^*	
	Net Open Position in foreign currency	S_3^*	

* Linked to reverse risk order.
Source: Bank of Albania, Authors' Calculations.

Table 3.
Indicators used to estimate bank prudential index (BPI)

	Indicator	Notion
1.	The ratio of reserve funds to cover loan losses to non-performing loans (gross)	X_1
2.	The ratio of reserve funds to cover loan losses to outstanding loans (gross)	X_2
3.	The ratio of specific fond reserve to outstanding regular loan (gross)	X_3
4.	The annual growth rate if reserve funds to cover loan losses to total bank asset	X_4

Source: Bank of Albania, Authors' Calculations.

Table 4.
Descriptive Statistics

Sample: 2008Q3 2015Q4

Variable	Units	No of Obs.	Mean	Median	Standard Deviation	Maximum	Minimum
GDP*	(YoY)	464	0.031	0.025	0.023	0.097	0.005
PSRISK	In %	464	0.059	0.062	0.018	0.086	0.032
EFFICIENCY	Cost / Income	464	1.05	0.99	0.21	2.32	0.69
LEVERAGE	Equity / Asset	464	0.14	0.09	0.14	0.72	0.05
LLP	LLP / asset	464	0.054	0.036	0.051	0.231	0.0
LLP**	LLP / loan	464	0.11	0.07	0.10	0.72	0.0
NPL	NPL / asset	464	0.090	0.063	0.074	0.295	0.0
LOAN	Loan / asset	464	0.502	0.483	0.182	0.962	0.090
ASSET	In million ALL	464	68779.7	39142.6	80150.0	361152.6	1667.3
ASSET*	(YoY)	464	0.114	0.072	0.190	1.097	-0.420
Capital Adequacy Ratio	Equity / risk-weighted asset	464	0.301	0.165	0.455	2.669	0.041
Return on Asset	Ratio	464	-0.254	0.209	7.073	76.349	-44.859
Return on Equity	Ratio	464	-1.567	1.963	18.610	74.427	-70.923

* YoY – Annual growth rate.
Source: Bank of Albania, INSTAT, Bloomberg, Author's calculations.

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Table 5.
Correlation Analysis: Ordinary

Sample: 2008Q3 2015Q3, Included observations: 480
Balanced sample (listwise missing value deletion)

Correlation [*t-Statistic*]	CAELS	GDPR	PSRISK	BOONE	EFFICIENCY	LEVERAGE	BPI
CAELS	1.0 -----						
GDPR	0.103 [*2.29*]	1.0 -----					
PSRISK	-0.070 [*-1.56*]	-0.016 [*-0.36*]	1.0 -----				
DLNBOONE	0.047 [*1.04*]	0.061 [*1.35*]	-0.039 [*-0.87*]	1.0 -----			
EFFICIENCY	-0.103 [*-2.30*]	-0.036 [*-0.79*]	-0.031 [*-0.69*]	-0.068 [*-1.51*]	1.0 -----		
LEVERAGE	0.012 [*0.26*]	0.007 [*0.16*]	0.045 [*1.00*]	-0.005 [*-0.12*]	0.366 [*8.74*]	1.0 -----	
BPI	0.075 [*1.67*]	-0.111 [*-2.48*]	-0.233 [*-5.32*]	0.023 [*0.50*]	-0.289 [*-6.72*]	-0.364 [*-8.68*]	1.0 -----

Source: Author's calculations.

Table 6.
Panel Unit Root Test

Variable	ADF – Fisher Chi-square			PP – Fisher Chi-square		
	Intercept	Intercept and Trend	None	Intercept	Intercept and Trend	None
ΔCAELS	[0.0000]	[0.0000]	[0.0000]	[0.0018]	[0.0000]	[0.0000]
ΔGDP	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]	[0.0000]
ΔPSRISK	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]
BPI	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]
EFFICIENCY	[0.0000]	[0.0000]	[0.9649]	[0.0000]	[0.0000]	[0.8965]
LEVERAGE	[0.0000[	[0.0007]	[0.0001]	[0.0000]	[0.0006]	[0.0010]

Note: Δ is a first difference operator. Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Source: Author's calculations.

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Table 7.
The main empirical results based on GMM approach

Variable	Banking System		
	[1]	[2]	[3]
GDP	0.4652*	0.3894*	0.3845*
PSRISK	-0.0697*	-0.0657*	-0.0663*
BOONE		0.2002*	
EFFICIENCY	-0.3767*	-0.3019*	-0.3588*
LEVERAGE	0.4459*	0.4181*	0.4597*
BPI	0.3601*	0.3710*	-0.2830
BPI^2			0.0735
Cross-sections	16	16	16
No. of observations	448	448	448
Instrument rank	20	24	20
J-statistic	10.2	9.1	12.5
Probability (J-statistic)	0.51	0.52	0.57
AR(1)	0.0015	0.0017	0.0016
AR(2)	0.1663	0.1425	0.1344

Note: level of significance as * 1%, ** 5%, *** 10%.
Sargan and Hansen test (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid as they are not correlated with the error term. The Arellano and Bond test results also require significant AR(1) serial correlation and lack of AR(2) serial correlation (See also Kasman and Kasman, 2015).

Source: Author's calculations.

Table 8.
The empirical results based on methodological changes

Variable	Banking System					
	[1]	[2]	[3]	[4]	[5]	[6]
GDP	0.6418***	0.5343	0.5394	0.4469*	0.4683*	0.6227*
PSRISK	-0.0453*	-0.0643*	-0.0610*	-0.0514*	-0.0566*	-0.0638*
BOONE		0.2189***			0.1468*	
EFFICIENCY	-0.3178***	-0.3659**	-0.3583***	-0.5219*	-0.5423*	-0.5875*
LEVERAGE	0.4897*	0.5910*	0.5728*	0.3372*	0.4067*	0.5670***
BPI	0.3424***	0.3767**	-0.2974	0.1615**	0.1620***	-0.7884
BPI^2			0.0792			0.1045
Cross-sections	16	16	16	16	16	16
No. of observations	448	448	448	448	448	448
Instrument rank	20	24	24	14	16	14
J-statistic	17.5	16.0	12.5	14.0	11.0	5.5
Probability (J-statistic)	0.29	0.60	0.57	0.12	0.27	0.70
AR(1)	0.000	0.000	0.000	0.001	0.008	0.000
AR(2)	0.113	0.163	0.119	0.279	0.204	0.116

Note: level of significance as * 1%, ** 5%, *** 10%.
Sargan and Hansen test (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid as they are not correlated with the error term. The Arellano and Bond test results also require significant AR(1) serial correlation and lack of AR(2) serial correlation (See also Kasman and Kasman, 2015).

Source: Author's calculations.

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Table 9.
Other empirical results using alternative prudential indicators

Variable	[1]	[2]	[3]	[4]	[5]
GDP	0.7530*	0.6905*	0.6078*	0.6440*	0.5444*
PSRISK	-0.0306*	-0.0219*	-0.0472*	-0.0416*	-0.0468*
BOONE	0.2042*	0.2688*	0.2367*	0.2723*	0.2556*
EFFICIENCY	-0.6058*	-0.5006*	-0.4776*	-0.4857*	-0.4827*
LEVERAGE	0.4685*	0.5463*	0.5223*	0.7321*	0.6438*
BPI*	0.2269*				
BPINEW		0.2427*			
LLP			0.1308*		
LLPNEW				0.1477*	
MP					0.1391*
Cross-sections	16	16	16	16	16
No. of observations	427	427	427	427	427
Instrument rank	16	16	16	16	16
J-statistic	13.5	11.4	15.4	14.7	14.4
Probability (J-statistic)	0.20	0.32	0.12	0.14	0.16
AR(1)	0.00	0.00	0.00	0.00	0.00
AR(2)	0.15	0.14	0.10	0.10	0.10

Note: level of significance as * 1%, ** 5%, *** 10%

Sargan and Hansen test (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid as they are not correlated with the error term. The Arellano and Bond test results also require significant AR(1) serial correlation and lack of AR(2) serial correlation (See also Kasman and Kasman, 2015).

Source: Author's calculations.

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