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Monetary Transmission in Low Income Countries

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Abstract

This paper reviews monetary transmission mechanisms in low-income countries (LICs) to identify aspects of the channels that may operate differently in LICs relative to advanced and emerging economies. Given the weak institutional frameworks, reduced role of securities markets, imperfect competition in the banking sector and the resulting high cost of bank lending to private firms, the traditional channels (interest rate, bank lending, and asset price) are impaired in LICs. The exchange rate channel is also undermined by central bank intervention in the foreign exchange market. These conclusions are supported by review of the institutional frameworks, statistical analysis, and previous literature.

<div align="center">Contents   Page</div>

<div align="center">2</div>

Tables

I. INTRODUCTION

Economists have devoted a substantial amount of attention to the monetary transmission mechanism, but typically in the context of economies with highly sophisticated and well-functioning financial markets. Much less is known about monetary transmission in economies with more rudimentary financial systems – not just quantitatively, but even qualitatively. Consequently, the links between the central bank's policy instruments and the behavior of aggregate demand in such countries remain something of a black box. This situation may be acceptable from the perspective of policy formulation as long as those links do not change – i.e., as long as the reduced-form effect of monetary policy instruments on aggregate demand remain stable – but in a world of financial reform and financial innovation this situation is not common.

Financial development is highly correlated with income per capita. Accordingly, most countries with rudimentary financial systems tend to be low-income countries (LICs). Since low-income countries typically peg their exchange rates and are characterized by fiscal rigidities, monetary policy is often the only short-run stabilization instrument at their disposal.[1] A situation in which the functioning of the primary short-run macroeconomic stabilization policy that is available to the majority of the world's countries remains a black box is clearly not acceptable for policy makers.

This paper is essentially an elaboration of the points made in the two preceding paragraphs. It provides an overview of the *ex ante* reasons for believing that the monetary transmission mechanism in low-income countries may be fundamentally different from what is typically described in economies with more sophisticated financial systems, focusing specifically on the implications for the various conventional channels of monetary transmission of the financial environment that tends to characterize LICs.[2] We conclude that there are strong *a priori* reasons to believe that monetary transmission may be both weak and unreliable in the context of LICs, and find that the existing empirical evidence is indeed consistent this view.[34]

The paper is structured as follows. The next section provides an overview of the monetary transmission mechanism in advanced countries as conventionally understood, with the goal

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[1] Monetary and exchange rate policy tend to be independent instruments in the short run in most LICs, because these countries generally are characterized by very limited capital mobility.

[2] Our focus is on transmission mechanisms and not on other aspects of monetary policy, including the broad goals of monetary policy, the choice of monetary policy frameworks, and coordination with fiscal policy.

[3] We limit our analysis to "typical" LICs. The usual definition of LICs refers to countries with PPP-adjusted income per capita of less than US$1,000 per year. We use this definition in a broad sense, considering that some countries with higher incomes per capita share many characteristics with typical LICs. Notably, we exclude India and China from our analysis. This is mostly because these countries present economic and institutional characteristics that are very different from the usual LICs. In addition, a vast and growing literature is devoted to these countries.

[4] By referring to monetary transmission in low-income countries as "weak" or "ineffective", we mean that the effect of monetary policy on aggregate demand is small; and by "unreliable", we mean that the effect depends on country-specific structural and institutional features and is likely to vary over time in unpredictable ways.

of highlighting the assumptions about the economy's financial structure that underpin the various channels of monetary transmission typically identified for such countries. Section III examines the extent to which the stylized facts about financial structure in low income countries match the assumptions identified in Section II. Differences in financial structure suggest that the bank lending channel is likely to be the dominant channel for monetary transmission in LICs. Accordingly, Section IV develops a small model of commercial bank behavior to explore the factors that are likely to determine the effectiveness of this channel. Section V examines some cross-country evidence on this issue, comparing transmission from central bank policy rates to bank lending rates in LICs, advanced, and emerging economies. Section VI provides a selective critical review of the systematic country-specific evidence on the effectiveness of monetary transmission in LICs.[5] The final section provides a summary.

II. MONETARY TRANSMISSION IN ADVANCED ECONOMIES

The standard description of the monetary transmission mechanism in advanced economies proceeds as follows:

A. The formulation of monetary policy

Monetary policy is assumed to be formulated by an independent or quasi-independent central bank in pursuit of broad macroeconomic objectives, rather than with the objective of meeting the government's financing needs. In the United States, for example, this situation dates to the Fed-Treasury Accord of 1951, which freed the Fed to pursue its own macroeconomic objectives, rather than simply pegging the interest rate on Treasury bills for fiscal reasons.[6]

B. The policy instrument

Although the Finance Ministry is assumed to hold periodic auctions of government securities to finance deficits and refinance maturing debt (the *primary* market for government securities), these are assumed to be purchased by the domestic or foreign private sectors or by foreign official institutions, rather than by the domestic central bank. The central bank conducts monetary policy by buying and selling short-term government securities in a well-functioning *secondary* market. In doing so, its objective is to control the value of some financial market variable (e.g., the interbank interest rate, the stock of unborrowed reserves, the monetary base, or the money stock) as an intermediate target. In recent years, central banks in advanced and emerging economies have most commonly targeted an interbank rate (e.g., the federal funds rate in the United States). The value of this intermediate target is assumed to influence aggregate demand through the transmission mechanism and thus to affect the central bank's ultimate macroeconomic objective(s) (typically, price stability

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[5] A companion appendix not included with this draft reports the conclusions of a more extensive list of previous studies on monetary transmission in individual low-income countries.

[6] The role of central bank independence in monetary *transmission* (as opposed to monetary policy formulation) is discussed later in this section (see footnote 10).

and/or full employment). The intermediate target is accordingly typically set through a feedback rule that depends on the observed values of the ultimate macroeconomic objective(s).

C. The transmission mechanism

The transmission mechanism from open market transactions by the central bank to aggregate demand can be described as follows (consider for concreteness the example of a central bank *purchase* of government securities):

- From central bank intervention in the market for short-term government securities to interest rates in the interbank market for reserves.

The sellers of short-term government securities to the central bank hold the proceeds in commercial banks (these sellers are often the commercial banks themselves), thereby increasing commercial banks' free reserves. The increased stock of reserves causes a reduction in the interbank rate.

- From interest rates in the interbank market to interest rates on short-term government securities.

Arbitrage in commercial bank portfolios between the interbank market and bank holdings of very short-term government securities creates an equilibrium relationship between the return on those securities and the interbank rate. When the interbank rate is low relative to the prevailing rate on short-term government securities, banks reallocate their asset portfolios away from reserves, which can be used for lending in the interbank market, and into purchasing short-term Treasury bills, which lowers the rate of return on those bills (and vice versa when the interbank rate is high). The arbitrage condition between the return on short-term government securities and the interbank rate leads to the following relationship:

$$i_T = i_R, \tag{1}$$

where i_T is the interest rate on very short-term government securities and i_R is the interbank rate. Notice that this arbitrage condition describes the relationship between the two interest rates, but does not pin down the value of either rate.

To see how the central bank can set i_R, note that banks purchase short-term Treasury bills by issuing deposits on themselves, but for financial market equilibrium to hold, these new deposits must be willingly held by the nonbank public. For this to be the case, the rate of return on alternative assets has to fall. These alternative assets are precisely short-term Treasury bills. Write the demand for deposits as $D(i_T, Y)$, where Y denotes real income and $D_1 < 0, D_2 > 0$. Let rr be the required reserve ratio, er the ratio of excess reserves to deposits (taken to be a decreasing function of the differential between the Treasury bill rate i_T and the

return on reserves i_R, with er equal to some equilibrium value er^* when that differential is zero), equilibrium in the market for reserves requires:

$$H = [rr + er(i_T - i_R)]D(i_T, Y),   \qquad (2)$$

where H is the supply of reserves. Using (1), this becomes:

$$H = (rr + er^*)D(i_B, Y)$$

To hit a desired target for the money market rate, say i^*_R, the central bank therefore has to set:

$$H^* = (rr + er^*)Pd(i^*_R, Y)$$

This "liquidity effect" creates the first channel through which monetary policy may affect aggregate demand. Under sticky prices and rational expectations, the short-run expected rate of inflation is unaffected by the central bank's intervention in the Treasury bill market, so the effects of open-market operations on the interest rate on short-term Treasury bills should be reflected in the short-term *real* interest rate, which (at least potentially) affects aggregate demand directly by altering the intertemporal profile of household consumption (in formal terms through the Euler equation). The effectiveness of this channel, which is one component of the *interest rate channel*, depends on the degree of intertemporal substitutability in consumption as well as on the extent to which households are rationed in credit markets. The higher the degree of intertemporal substitution in consumption and the less prevalent is credit rationing the more effective this channel is likely to be. As we shall discuss below, there is a separate component of the interest rate channel which affects spending on durable goods by households and firms. Accordingly, to be precise, we can refer to this first channel as the *short-term interest rate channel*.

- From the interbank rate to bank lending rates.

In principle, an increase in the size of banks' deposit base should increase the volume of resources that banks intermediate (but see below), thus increasing banks' supply of loanable funds. Competition among banks would be expected to cause this increased supply of funds to reduce bank lending rates as well as to increase the availability of credit for rationed borrowers, if any. This induces a second effect on aggregate demand, as the reduced interest rates on bank loans and greater availability of bank credit induces an increase in spending by bank-dependent agents (typically small, opaque firms). This second channel of monetary transmission is referred to as the *bank lending channel*, one component of a broader *credit channel*. The effectiveness of this channel depends on the extent that an expansion of reserves does increase the supply of bank loans, and that an increase in the supply of bank loans reduces the cost of finance for the nonbank sector.

7

Why might the supply of bank loans *not* be affected? There are two reasons. First, on the liability side of banks' balance sheets, banks may be able to attract resources not just by issuing deposits, but also by issuing their own short-term securities (e.g., negotiable CDs in the United States). Thus, when their supply of deposits increases, they may simply cut back on the securities they issue, leaving the asset side of their balance sheets unchanged. This happens when short-term securities and deposits are close substitutes.[7] Second, on the asset side of banks' balance sheets, when their deposit base increases, banks may simply purchase more securities, rather than make more loans. This would be more likely to happen when securities and *loans* are close substitutes (in the portfolios both of banks and their customers) – in other words, when bank lending is not "special" in the usual sense.[8] The strength of that channel depends on the degree of competition among banks (which determines the response of banks' lending rate to banks' cost of funds).   In a non-competitive environment (because of regulation or collusion), banks will not pass on their reduced costs of funding to their loan rates.

- From short-term government securities to the exchange rate.

Whatever the strength of the bank lending channel, up to this point the expansion of bank reserves has been associated with a reduction in short-term interest rates. At this point various other types of arbitrage kick in.

Under floating exchange rates and perfect capital mobility, arbitrage between domestic and foreign short-term government securities causes incipient capital flows which change the equilibrium value of the exchange rate required to sustain uncovered interest parity. This triggers a third channel of transmission, the *exchange rate channel*. With sticky prices, this change in the nominal exchange rate is reflected in a real exchange rate depreciation that induces expenditure switching between domestic and foreign goods. The effectiveness of this channel depends on the central bank's willingness to allow the exchange rate to move (which may be constrained by "fear of floating"), on the degree of capital mobility (for a given change in domestic short-term interest rates, there will be less movement in the exchange rate the lower the degree of capital mobility), on the strength of expenditure-switching effects (this depends on the commodity composition of production and consumption), on the importance of currency mismatches (because adverse balance sheet effects could create negative expenditure-reduction effects that may offset or even dominate expenditure-switching effects), and on the degree of exchange rate pass-through (because what induces expenditure switching is a change in the *real* exchange rate, which is less likely to follow from a change in the nominal exchange rate when pass-through is large).

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[7] Notice that this implies a very high elasticity of demand for money – i.e., a very flat LM curve.
[8] Not everyone agrees that the role of securities and large CDs necessarily weakens the credit channel in advanced economies. For a contrary view, see Keeton (1993).

8

- From interest rates on short-term government securities to interest rates on long-term government securities.

An expectation mechanism operating on the term structure ties interest rates on short-term securities to rates on longer-term securities. The effectiveness of this mechanism depends, among other things, on the perceived permanence of the change in short-term rates – i.e., on the information content of a change in the current short-term rate for expected future short-term rates. Changes in long-term interest rates in turn give rise to two additional channels. The *long-term interest rate channel* operates through the effects of changes in long-term interest rates on firms' and households' purchases of durable goods. While the short-term interest rate affects mostly household consumption, the long-term real interest rate affects firms' spending on investment through the cost of capital and household spending on durables.[9]

- From long-term interest rates to asset values.

Changes in long-term interest rates affect the discount factors applied to future income streams, including those from long-maturity bonds, equities and real assets. The *asset channel* operates through the implications of changes in long-term interest rates for the prices of such assets, which exert wealth effects on private consumption. The effectiveness of this channel depends on the sensitivity of asset values to changes in long-term rates, on the ratio of these components of wealth to household incomes, and possibly on the distribution of these assets among households if the marginal propensity to consume varies across households.

- From asset values to external finance premia

Changes in asset values affect the collateralizable net worth of firms and households. Because the availability of collateral reduces the severity of the moral hazard problem that is associated with external finance for firms and households, it reduces the premium that lenders charge such borrowers over the risk-free interest rate, known as the external finance premium. Fluctuations in asset values are therefore negatively correlated with fluctuations in the external finance premium. This creates a mechanism that reinforces the effects of changes in interest rates on the cost of external financing: higher interest rates reduce asset

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[9] Why does central bank independence matter from the perspective of monetary *transmission* as opposed to that of policy *formulation*? The answer is that, as suggested in the previous paragraph, the transmission from short-term interest rates to longer-term rates depends on agents' interpretation of what an unanticipated change in monetary policy indicates about future monetary policy. This in turn depends on their understanding of the central bank's policy reaction function. Because the degree of central bank independence affects the nature of the central bank's policy reaction function, it may thus be expected to also affect agents' interpretation of the implications of current monetary policy actions for expected future monetary policy.

values and therefore increase the external finance premium. This financial accelerator is a manifestation of a distinct channel for monetary transmission, the *balance sheet channel*.

D. Underlying assumptions

Note that this conventional description of monetary transmission relies on effective arbitrage along several margins: between different domestic short-term securities, between domestic short-term and long-term securities, between long-term securities and equities, between domestic and foreign securities, and between domestic financial and real assets. It is therefore clearly intended to apply to an economy with a highly developed and competitive financial system. As such, it implicitly assumes the following institutional setup, which is typically taken for granted in discussions of monetary transmission in OECD countries:

- A strong institutional environment so that loan contracts are protected, and financial intermediation is conducted through formal financial markets.

- An independent central bank.

- A well-functioning and highly liquid interbank market for reserves.

- A well-functioning and highly liquid secondary market for government securities.

- Well-functioning and highly liquid markets for equities and real estate.

- A high degree of international capital mobility.

- A floating exchange rate.

As we shall argue below, these conditions are rarely satisfied in low-income countries, which raise doubts about the relevance of the standard description of monetary transmission for such countries. The question is how far off the mark the standard description of monetary transmission is in a "typical" LIC.

III. THE MONETARY POLICY ENVIRONMENT IN LICs

To the extent that financial structures in LICs depart from the assumptions listed at the end of the last section, we should expect the transmission mechanism in those economies to differ from the standard description. In this section we will examine the extent to which the conditions listed at the end of the previous section are satisfied in LICs, before turning in the sections that follow to empirical evidence on mechanisms of monetary transmission in LICs.

A. Size of the formal financial sector

Financial intermediation may be carried out either inside or outside the formal financial sector. Informal finance may involve transactions between related parties, reliance on

specialized moneylenders, or the use of informal credit cooperatives. All of these have in common that they rely on informal means to overcome asymmetric information and contract enforcement problems, and they are likely to play a dominant role in financial intermediation when the formal institutional environment is weak. Under these circumstances the formal financial sector is likely to be small and to conduct a relatively minor fraction of financial intermediation.

Panel A of Table 1 suggests that this is indeed the case in low-income countries. Relative to advanced and emerging economies, LICs exhibit substantially smaller ratios of deposit money bank assets to GDP as well as of nonbank financial intermediary assets to GDP.[10] The ratio to GDP of assets held by deposit money banks and other formal financial institutions in advanced countries is 1.24, while in LICs it is only 0.32. Thus, relative to what is typically the case in advanced countries, the formal financial sector is a relatively much smaller player in LICs.

How should this be expected to affect monetary transmission? The transmission mechanism can be decomposed into two steps: from central bank actions to financial variables such as those described in the last section, and from financial variables to aggregate demand. When the formal financial sector is small, much of the economy does not interact with the formal financial sector. Consequently, any effects of monetary policy on formal financial sector variables (e.g., on bank loan rates) would tend to have weaker effects on aggregate demand than would be true where formal financial intermediation is extensive. In other words, the second step in the transmission mechanism, which depends on the elasticity of the IS curve with respect to formal-sector financial variables, would tend to be weak when the formal financial sector is small. As indicated in Section VI, the existing evidence suggests that this is indeed frequently true in low-income countries.

B. Central bank independence

Arnone, Laurens and Segalotto (2006) constructed a measure of central bank independence for a group of 145 advanced, emerging, and low-income economies. Panel B of Table 1 provides a comparison of this measure for groups of countries classified into each of these categories. The key observation is that central banks in both emerging and low-income countries appear to be significantly less independent than those in advanced economies, with LIC central banks being roughly half as independent as those in emerging economies. As indicated before, this affects not just the scope for the exercise of monetary policy, but also the effects of that policy, because it influences the perceived implications of any current monetary policy action for future monetary policy.

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[10] The data are from Beck, Demigurc-Kunt and Levine (2010).

Table 1. Financial Environment Across Countries, 2005

Groups	A. Size of banking sector		B. Central Bank Independence	C. Governance Indicators 2008					
	Deposit money bank assets / gdp	Other financial institutions assets / gdp		Voice and accountability	Political Stability & Absence of Violence/Terrorism	Government Effectiveness	Regulatory Quality	Rule of Law	Control of Corruption
Advanced									
Mean	1.24	0.55	0.96	1.08	0.92	1.44	1.34	1.47	1.54
# countries	28	5	28	29.0	29.0	29.0	29.0	29.0	29.0
Emerging									
Mean	0.63	0.17	0.60	-0.03	-0.35	0.40	0.37	0.09	0.07
# countries	26	11	26	28.0	28.0	28.0	28.0	28.0	28.0
LIC									
Mean	0.32	0.06	0.33	-0.34	-0.30	-0.52	-0.45	-0.51	-0.49
# countries	91	18	91	118.0	118.0	118.0	118.0	118.0	118.0
Total									
Mean	0.55	0.17	0.50	-0.06	-0.10	-0.05	-0.02	-0.09	-0.06
# countries	145	34	145	175.0	175.0	175.0	175.0	175.0	175.0

Groups	D. Securities market				E. Bank competition			F. Degree of financial repression
	Arnone-Laurens-Segalotto 2003	Private bond market capitalization /	Public bond market capitalization /	Security Markets Index	Net interest margin	Bank concentration	Entry barriers/pro-competition measures index:	Interest rate controls index
Advanced								
Mean	0.73	0.51	0.46	1.00	0.02	0.67	1.00	1.00
# countries	29	22	22	21	28	28	21	21
Emerging								
Mean	0.58	0.12	0.29	0.86	0.05	0.57	0.87	0.96
# countries	27	24	24	28	28	28	28	28
LIC								
Mean	0.55	0.00	0.43	0.56	0.06	0.73	0.89	0.83
# countries	89	3	3	42	85	87	42	42
Total								
Mean	0.59	0.28	0.38	0.75	0.05	0.69	0.91	0.91
# countries	145	49	49	91	141	143	91	91

Table 1. Financial Environment Across Countries, 2005 (continued …)

| Groups | G. Stock market | | | | H. International Financial Integration |
	Stock market capitalization / gdp	Stock market total value traded / gdp	Stock market turnover ratio	No. Of listed companies per 10k population	
Advanced					
Mean	0.90	0.79	0.77	0.43	4.40
# countries	29	29	29	29	20
Emerging					
Mean	0.82	0.53	0.61	0.24	1.03
# countries	28	28	28	28	20
LIC					
Mean	0.27	0.02	0.11	0.23	0.92
# countries	51	52	51	51	61
Total					
Mean	0.58	0.35	0.41	0.29	1.63
# countries	108	109	108	108	101

| Groups | I. Exchange Rate Classification (IMF) | | | | J. Exchange rate classification (Ilzetzki, Reinhart and Rogoff) | | | | |
	1	*2*	*3*	*4*	*1*	*2*	*3*	*4*	*6*
Advanced									
# countries	19	0	0	10	19	0	7	3	0
% countries	22	0	0	34	29	0	23	38	0
Emerging									
# countries	7	0	11	9	5	9	10	2	1
% countries	8	0	20	31	8	17	33	25	50
LIC									
# countries	60	4	44	10	41	45	13	3	1
% countries	70	100	80	34	63	83	43	38	50
Total									
# countries	86	4	55	29	65	54	30	8	2
% countries	100	100	100	100	100	100	100	100	100

Notes: Securities market index relates to securities markets and covers policies to develop domestic bond and equity markets, including (i) the creation of basic frameworks such as the auctioning of T-bills, or the establishment of a security commission; (ii) policies to further establish securities markets such as tax exemptions, introduction of medium- and long-term government bonds to establish a benchmark for the yield curve, or the introduction of a primary dealer system; (iii) policies to develop derivative markets or to create an institutional investor's base; and (iv) policies to permit access to the domestic stock market by nonresidents. Entry barriers/pro-competition measures index measures competition restrictions, such as limits on branches and entry barriers in the banking sector, including licensing requirements or limits on foreign banks. Interest rate controls index covers interest rate controls, such as floors or ceilings.
Sources: International Financial Statistics (IFS) of IMF; Beck, Demirguc-Kunt and Levine (2009), "A New Database on Financial Development and Structure"; IMF Structural reform (SR) database "Structural Reforms and Economic Performance in Advanced and Developing Countries" (2008), prepared by the Research Department of IMF; Dhungana, Sandesh (2008), "Capital Account Liberalization and Growth Volatility," Williams College, unpublished. Governance Indicators (2008), are taken from Daniel Kaufman, Aart Kraay and Massimo Mastruzzi (2009). "Governance Matters VIII: Governance Indicators for 1996-2008" World Bank Policy Research June 2009. The index of Central Bank Independence and the first securities market index are taken from Arnone, Laurens and Segalotto (2006).

C. Quality of the institutional and regulatory environment

The small size of the formal financial sector in many LICs is undoubtedly due in large part to the serious deficiencies in the institutional and regulatory environment that characterizes many of these countries. As indicated in Panel C of Table 1, LICs score substantially lower than both advanced and emerging economies on the full range of the Kaufmann, Kraay and Mastruzzi (2009) governance indicators.

This poor institutional environment affects not just the overall size of the formal financial sector, but also the environment in which that sector operates. Political instability, poor accounting and disclosure standards, weak property rights, limited government accountability, a weak regulatory environment, a poorly functioning legal system, and the prevalence of corruption would all tend to contribute to high costs of financial intermediation.

D. Money and interbank market development

While we know of no comprehensive dataset on this issue, substantial case study evidence suggests that money and interbank markets are poorly developed or nonexistent in many LICs (see IMF 2005). The poor institutional environment provides a plausible reason. In the absence of an institutional infrastructure that promotes bank transparency, with a weak regulatory and supervisory structure, and with the occasional inability to enforce contracts, mutual distrust causes banks to avoid lending to each other.   Moreover, these same institutional deficiencies also make lending to the nonbank sector an expensive proposition, which means that unlike banks in advanced countries, which sometimes demand or supply excess reserves, banks in many LICs have chronic excess reserves. With all potential participants on one side of the market, there is no demand for interbank transactions.

E. Secondary market for government securities

The secondary markets for government securities tend to be poorly developed in LICs. Panel D in Table 1 provides some evidence for this observation. For example, the average of the index of securities market development presented in the last column attains only half of its average advanced country value in LICs. [11] The implication of poor securities market development is that central banks cannot conduct monetary policy through open market transactions in liquid secondary markets. Instead, monetary policy instruments tend to

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[11] The index is drawn from the IMF structural reform database. It relates to securities markets and covers policies to develop domestic bond and equity markets, including (i) the creation of basic frameworks such as the auctioning of T-bills, or the establishment of a security commission; (ii) policies to further establish securities markets such as tax exemptions, introduction of medium- and long-term government bonds to establish a benchmark for the yield curve, or the introduction of a primary dealer system; (iii) policies to develop derivative markets or to create an institutional investor's base; and (iv) policies to permit access to the domestic stock market by nonresidents.

consist of purchases of Treasury bills in primary auctions (which effectively give the central bank control over the share of new Treasury issues that must be held by the public) and of the amounts and terms of credit extended by the central bank to the commercial banking system (rediscounts).[12]

F. Competition in the banking sector

Banking sectors in LICs tend to be only imperfectly competitive, partly because the banking industry is characterized by a small number of banks and by an important role for government-owned banks, but also because the industry faces weak competition from nonbank financial intermediaries. As shown in Panel E of Table 1, banking sectors in LICs on average exhibit both larger net interest margins as well as higher degrees of concentration than those in advanced and emerging economies. As shown in Panel A, the size of the nonbank financial sector is very small compared to those in advanced and emerging economies not only in absolute terms, but also relative to the size of the banking sector.

The relevance of this observation for monetary transmission concerns the connection between policy rates and market rates: when the banking system is imperfectly competitive, changes in policy interest rates (e.g., the central bank's rediscount rate) may have weak effects on market rates, since imperfectly competitive banks may not pass on changes in policy rates. If so, changes in policy rates may largely affect banking spreads, rather than market rates.

G. Financial repression

The flexibility of market rates may also be reduced by legal restrictions on the interest rates that banks can apply both to their liabilities as well as to their assets. As shown in Panel F of Table 1, financial liberalization has been undertaken widely in LICs [13].However, this process is not complete. Restrictions on the role of the market in setting bank loan rates remain notably more important in LICs on average than in advanced or emerging economies.

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[12] In contrast to advanced economies, discount credit is used very commonly as a monetary policy instrument in LICs. As a rough indicator, approximately three-quarters of our LIC sample of 109 countries report at least 5 years of monthly data on discount rates, and there is significant variation in discount rates over time. A simple variance decomposition exercise suggests that 95 percent of the variation in discount rates in our sample is within countries (as opposed to across countries). Buzeneca and Maino (2007) report that, while no advanced countries in the IMF's Information Systems for Instruments of Monetary Policy (ISIMP) database used discount credit as a monetary policy instrument, 69 percent of low-income countries did so.

[13] Financial repression is measured by controls on interest rate including whether the government directly controls interest rates or whether floors, ceilings or interest rate bands exist. The index is taken from the IMF structural reform database and is normalized between zero and one, with higher values indicating less financial repression and higher degrees of liberalization.

H. Maturity of government obligations

As documented in the "original sin" literature (see Eichengreen and Hausmann 1999), governments in LICs are typically unable to issue long-term domestic currency-denominated bonds. The absence of long-term government bonds means that there is no observable market-based term structure. This implies more uncertainty about future short-term interest rates than would be the case with a well-developed term structure, since in the absence of long-term securities agents are unable to contract in the present for the interest rate that will prevail over the life of an asset and are forced to finance such assets by rolling over short-term loans at whatever interest rate prevails at the time.

In principle, the effects of the absence of long-term securities on monetary transmission are ambiguous. On the one hand, because the average maturity of financial contracts is shorter, it means that monetary policy can have a more significant short-run impact on the cash-flow positions of firms and households. On the other, because long-maturity assets are scarce, wealth effects operating through changes in the value of such assets are likely to be weaker (Kamin et al 1998).

I. Stock market size and liquidity

Many low-income countries are characterized by the complete absence of a domestic stock market, or where such a market is present, by a small number of listed firms and minimal turnover in the market. Panel G of Table 1 indicates that stock market capitalization relative to GDP is significantly smaller in low-income countries than in either advanced or emerging economies, and both the ratio of value traded to GDP and the turnover ratio in the market are dramatically smaller in low-income countries than in the others.

The implication is that the value of physical capital in place is not easily marked to market in low-income countries, and the illiquidity of physical capital may short-circuit the asset channel working through equity prices.

J. Efficiency of real estate markets

Data on the functioning of real estate markets in LICs is notoriously difficult to obtain. Nevertheless, there is substantial indirect evidence that such markets are poorly developed and highly illiquid. Many low-income countries are characterized by poorly-defined property rights, which inhibits the buying and selling of real estate. While property rights have many dimensions, at bottom they require a low risk of predation, either by the government or by other private agents. A poor institutional environment is likely to be associated with a high risk of predation, and thus with *de facto* weak property rights. As panel C in Table 1 indicates, in this respect LICs are far worse than advanced economies. The implication is that, like the market for shares in productive firms, the real estate market is also likely to be highly illiquid and market prices for real estate poorly defined. Again, the

implication for monetary policy is that a potentially important channel for arbitrage is weakened, diminishing the power of the asset channel.

K. International financial integration

Panel H of Table 1 reports the ratio of the sum of gross external assets and liabilities (net of foreign exchange reserves on the asset side and of official borrowing on the liability side) to GDP, an indicator of *de facto* international financial integration. This indicator provides evidence that low-income countries are characterized by a significantly smaller degree of *de facto* integration with international capital markets than are advanced countries, and by a smaller degree of integration than emerging economies as well. This affects another important arbitrage margin: that between domestic and foreign financial assets. The implications of imperfect capital mobility for monetary transmission depend on the exchange rate regime. Under fixed exchange rates, the weakening of this arbitrage margin allows at least some degree of monetary autonomy, and thus allows the functioning of an interest rate channel. Under floating rates, it implies a smaller change in the exchange rate for a given change in the domestic interest rate, and thus weakens the exchange rate channel.

L. Exchange rate flexibility

The very presence of an exchange rate channel depends on the exchange rate regime adopted by the country. Here again, low-income countries tend to differ from advanced and emerging economies. As indicated in Table 1, whether classified by their official (*de jure*) announced regimes Panel I), or by *de facto* exchange rate behavior (Panel J), low-income countries tend to restrict exchange rate flexibility to a much greater extent than do either advanced or emerging economies. This reduced exchange rate flexibility leaves relatively limited scope for an exchange rate channel.

M. Summary

The evidence presented above has important implications for the channels of monetary transmission in a "typical" low-income country. Specifically, the poor development of domestic securities markets suggests that both the short-run and long-run interest rate channels should be weak, while small and illiquid markets for assets such as equities and real estate would tend to weaken the asset channel. The exchange rate channel is weak in countries that maintain relatively fixed exchange rates, but may play a role in monetary transmission in LICs with more flexible exchange rates. In general, therefore, we should expect monetary transmission to occur primarily through the effects of central bank actions on the short-term interest rates charged by banks on loans and (possibly) paid by them on deposits – i.e., the banking lending channel should be the dominant mode of monetary transmission in low-income countries.

IV. EFFECTIVENESS OF THE BANK LENDING CHANNEL IN LOW-INCOME COUNTRIES

The previous section suggested some strong *a priori* reasons to believe that the monetary transmission mechanism in LICs should differ substantially from that in advanced countries. In particular, the bank lending channel is likely to be the dominant channel for monetary transmission in LICs. If so, the effectiveness and reliability of monetary transmission in these countries depends on the properties of this specific channel. The relevant properties concern two links in the causal chain from monetary policy actions to aggregate demand: that between monetary policy actions and the availability and cost of bank credit, and that between the availability and cost of bank credit and aggregate demand. The previous section has already suggested that when the formal financial sector is small, the second of these links is likely to be weak. This section explores the factors that are likely to determine the effectiveness of the first link.

The literature suggests that the effectiveness and reliability of the link between monetary policy actions and the availability and cost of bank credit may be undermined by two factors:[14]

- If the banking industry is noncompetitive, changes in banks' costs of funds may be reflected in bank profit margins, rather than in the supply of bank lending.

- If a poor institutional environment increases the cost of bank lending, banks may restrict lending activity, in a manner that weakens the effects of monetary policy actions on the supply of loans.

This section develops a simple model of bank lending behavior that explores the possible roles of both of these factors, before turning to the empirical evidence in the sections that follow.

Consider a representative LIC commercial bank that manages a portfolio consisting of loans (L), government securities (B), as well as reserves (R), and finances it by issuing deposits (D) and obtaining central bank credit (C). The bank's demand for central bank credit is therefore given by:

$$C = L + B + R - D \qquad (3)$$

To capture the role of imperfect competition in the banking sector, assume that the bank has market power in both the loan and deposit markets, so it faces a demand for loans given by:

$$L = L(i_L), \ L' < 0, \qquad (4a)$$

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[14] See, for example, Cottarelli and Kourelis (1994), as well as Kwapil and Scharlet (2006).

and a supply of deposits:

$$D = D(i_D), \ D' > 0, \tag{4b}$$

where i_L and i_D are respectively the loan and deposit rates set by the bank. The bank has no market power, however, in the market for government securities, where it faces the market interest rate i_B. Credit market frictions (asymmetric information and costly contract enforcement) make lending a costly activity and justify the existence of banks. To capture this phenomenon, costs of intermediation are taken to be an increasing and convex function of the volume of loans intermediated:

$$c = c(L), \ \text{with } c' > 0, \ c'' > 0 \tag{5}$$

The more unfavorable the domestic institutional environment is for financial intermediation, the more rapidly these costs increase with the volume of funds being intermediated – i.e., when the institutional environment is very unfavorable, as in the case of LICs, we should expect $c'' >> 0$. The idea is that lending becomes more costly as banks expand beyond their traditional customers that they know well. This effect is stronger in countries with weak institutional settings.[15]

The "lemons" problem associated with asymmetric information about loan quality makes bank loans illiquid, and the absence of a secondary market for government securities makes those instruments illiquid as well. The bank therefore values reserves because they provide the only available liquid buffer against unanticipated deposit withdrawals (for simplicity, we assume that there are no required reserves). This "liquidity premium," which we denote ρ, is a decreasing and convex function of the ratio of reserves to deposits, i.e.:

$$\rho = \rho(R/D), \ \text{with } \rho' < 0 \text{ and } \rho'' > 0. \tag{6}$$

The central bank charges the interest rate i_C for credit extended to commercial banks, but rations this credit among individual commercial banks, so that our bank faces the constraint:

$$C \leq C_{bar}, \tag{7}$$

with C_{bar} denoting the maximum amount of central bank credit available to this bank.

Under these conditions, the bank's problem is to set its lending and deposit rates, and to choose its holdings of government securities and reserves, so as to maximize profits, subject to its balance sheet constraint (3) and the supply of central bank credit (7). In other words, its problem is to:

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[15] This assumption is widely confirmed by the country evidence reported in Section VI.

$$Max\ \pi\ (i_L,\ i_D,\ B,\ R) = i_L L(i_L) + i_B B + \rho(R/D)R - c(L) - i_D D(i_D) - i_C C$$

subject to (3) and (7), as well as to nonnegativity constraints on its balance sheet variables. We will assume that the nonnegativity constraints are not binding, but that the central bank's credit constraint (7) is. Under these assumptions, the first-order conditions are given by:

$$L + i_L\,L' - c'L' - i_C L' - \lambda L' = 0 \tag{8a}$$

$$-\rho'(R/D)^2 D' - D - i_D\,D' + i_C D' + \lambda D' = 0 \tag{8b}$$

$$i_B - i_C - \lambda = 0 \tag{8c}$$

$$\rho - \rho'(R/D) - i_C - \lambda = 0 \tag{8d}$$

Notice from (8c) that for the central bank credit constraint to be binding (i.e., for $\lambda > 0$), we must have $i_B > i_C$. The intuition is straightforward: as long as the return on government securities exceeds the interest rate on bank credit, the bank would always prefer to borrow additional amounts from the central bank in order to purchase more government securities. We are assuming that this is the case. Notice also from (8c) that $i_C + \lambda = i_B$. Substituting this expression in (8d) yields the bank's demand for reserves as a function of its deposit base and the interest rate on government securities:

$$R = h(i_B)D,\ \text{where}\ h' = 1/\rho'(1 - \eta) < 0.^{16}$$
(9)

From (8a) and (8c) we can express the optimal lending rate as:

$$i_L = (1 + 1/\xi_L)\,(i_B + c'(L)\,), \tag{10}$$

where ξ_L is the elasticity of loan demand. This equation expresses the loan interest rate as a markup $(1 + 1/\xi_L)$ over the marginal cost of loanable funds, where the latter is given by the foregone return on government securities plus marginal intermediation costs. This markup is larger the less competitive the banking environment – i.e., the less elastic the demand for loans facing an individual bank. Finally, using (8c), (8d) and (9) in (8b), the deposit rate is given by:

$$i_D = (1 + 1/\xi_D)^{-1}\,[i_B\,(1 - h\,) + \rho h]. $$
(11)

where ξ_D is the deposit supply elasticity.

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[16] η is the elasticity of the liquidity premium with respect to the reserve/deposit ratio. For an interior solution, we must have $0 < \eta < 1$, which implies $1/\rho'(1 - \eta) < 0$.

Our primary concern is with the "pass-through" from the interest rate on government securities, which is the policy rate determined by the central bank, and commercial banks' lending rates.[17] Assuming constant loan demand elasticity, equation (10) and the loan demand equation (4a) together determine the optimal lending rate and loan supply as a function of the interest rate on government securities and the elasticity of loan demand. Substituting (4a) into (10) and differentiating, we can derive the "pass-through" coefficient:

$$di_L/di_B = \underline{\;\;\frac{(1 + 1/\xi_L)}{1 - c''L'(1 + 1/\xi_L)}\;\;} > 0 \qquad (12)$$

The key point for our purposes is that this "pass-through" coefficient is a decreasing function of c'', the slope of the marginal intermediation-cost curve. What this means is that if a deficient institutional environment causes problems of asymmetric information and costly contract enforcement to generate a steeply rising cost of financial intermediation when banks try to expand their lending, banks are less likely to adjust their lending rates in response to changes in the central bank's policy rate. Moreover, since equations (4a) and (10) imply that the lending rate depends only on i_B, any other central bank action, such as changes in the supply of credit to banks or in the discount rate, would also leave the lending rate unchanged so long as such actions do not change the policy rate i_B. Finally, it is easy to see that it is not just the strength of the pass-through effect that is at issue here, but also its reliability, since any factor that unexpectedly alters the shape of commercial banks' intermediation cost curve (including changes in the stability of the domestic macroeconomic environment, in the policy regime, or in the institutional framework governing financial intermediation) will also affect the extent of pass-through from policy to lending rates through c''.

In short, the bank lending channel may be dominant in the LIC context, but the effectiveness and reliability of this channel are not guaranteed. Its effectiveness depends on the extent to which central bank policy actions affect commercial bank lending rates, and its reliability on the extent to which factors that determine commercial banks' intermediation costs prove to be stable.   Since such factors may include non-structural ones that are subject to frequent change in LICs, the upshot is that the transmission mechanism may prove both weak and unreliable in the LIC context. We next turn to an examination of the evidence on this issue.

V. MONETARY TRANSMISSION IN LOW-INCOME COUNTRIES: CROSS-COUNTRY EVIDENCE

Section III suggested some *a priori* reasons to expect the functioning of the monetary transmission mechanism to be quite different in LICs from what we observe in industrial and emerging economies. Specifically, in the context of the limited degree of financial development that characterizes many LICs, the strength and reliability of the monetary

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[17] Notice that i_C does not serve as the policy rate. This follows from the assumption that the central bank credit constraint is binding i.e. it does not extend unlimited amounts of credit at this rate.

transmission mechanism depend critically on the effectiveness of the bank lending channel. In turn, the previous section showed that the deficient institutional environment in which banks operate in LICs makes the functioning even of this channel potentially quite different from what is observed in advanced economies, implying that the strength and reliability of this channel cannot be taken for granted in LICs. To get a sense of the empirical relevance of these issues, this section presents some cross-country evidence on the effectiveness of various steps in the bank lending channel in countries at different income levels. Specifically, we examine broad cross-country differences in the links between central bank policy actions and bank lending rates by computing some simple correlations among the relevant financial variables in advanced, emerging, and low-income economies.

A. From policy rates to market rates

The first step of the transmission mechanism relates changes in policy rates to changes in money market rates. Table 2 reports statistics on the relationship between discount rates (as a proxy for policy rates) and money market rates in advanced, emerging, and low income countries, where such rates are available. Since direct central bank lending to commercial banks is more often used as a policy instrument in LICs than in countries with more sophisticated financial systems, we would expect changes in discount rates to be more closely associated with changes in money market rates in LICs where such markets exist than in advanced and emerging economies.[18]

The second column of Table 2 reports the average contemporaneous correlations between changes in discount rates and changes in money market rates in all three types of economies. Despite the likelihood that the discount rate represents a better indicator of the monetary policy stance in the LIC context, this correlation actually turns out to be somewhat *lower* on average in low income countries than in advanced and emerging countries. Columns 3 and 4 report the average short and long term correlations between the policy rate and money market rates.[19] These correlations are calculated by estimating the equation
$y_{it} = \alpha_i y_{it-1} + \beta_i y_{it-2} + \gamma_i x_{it} + \delta_i x_{it-1} + \eta_i x_{it-2} + \varepsilon_{it}$ (where y is change in the money market rate and x the change in the discount rate) for each country. The short term effect reported in column 3 is the average estimated γ; the long-term effect reported in column 4 is calculated

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[18] However, consistent with our observation in Section II, such markets are not common in LICs. Out of a total of 109 LICs in our sample, only 30 report data on both discount rates and money market rates. Of the 109 LICs in our sample, 83 report discount rates, but only 45 report money market rates. Only countries with at least 60 observations are included in the sample. For simplicity we use the same specification for all countries. Similar results are obtained if we use different specifications, including different lag structure.

[19] It may be more appropriate to give this regression a causal interpretation in the LIC case than in the case of the other country groups, because of the aforementioned role of central bank lending to commercial banks as a policy instrument in LICs.

as the average $\dfrac{\widehat{\gamma}_i + \widehat{\delta}_i + \widehat{\eta}_i}{1 - \widehat{\alpha}_i - \widehat{\beta}_i}$. These results suggest that an increase in the policy rate by one

percentage point is associated with a 0.81 percentage point increase in the money market rate in advanced countries within one month, but only with a 0.29 percentage point increase in LICs. In the long run, the increase in the policy rate is fully transmitted to an increase in the money market rate in advanced countries, but is only partially transmitted (0.40) in LICs. This suggests a much weaker link between the policy instrument and market rates in LICs, both in the short and in the long run.[20]

Table 2. Correlation between changes in discount rate and changes in money market rate

	Contemporaneous Correlation	Short-term Effect	Long-term Effect	R-squared	Number of countries
Advanced	0.29	0.81	0.96	0.32	24
Emerging	0.30	0.74	0.59	0.93	26
LICs	0.23	0.29	0.4	0.31	30

Note: the discount rate corresponds to IFS line 60 and the money market rate to IFS line 60b. The data are monthly from January 1960 to December 2008, where available. Only countries with at least 5 years of data (i.e. 60 or more observations) are included. The second column reports the average of the contemporaneous correlations. The third column reports the

average estimated γ. The fourth column reports the average of the long term impact calculated as $\dfrac{\widehat{\gamma}_i + \widehat{\delta}_i + \widehat{\eta}_i}{1 - \widehat{\alpha}_i - \widehat{\beta}_i}$ from the

regression $y_{it} = \alpha_i y_{it-1} + \beta_i y_{it-2} + \gamma_i x_{it} + \delta_i x_{it-1} + \eta_i x_{it-2} + \varepsilon_{it}$ where y is change in the money market rate and x the change in the discount rate. The second to last column reports the average R-squared for the previous regression. The last column reports the number of countries for each category.

B. From money market rates to bank lending rates

The discussion of financial structure in LICs in Section III suggested that the bank lending channel may play a particularly prominent role in the LIC environment. A necessary condition for this mechanism to be operative, however, is that the lending rate charged by banks is responsive to the money market rate, where that rate exists. 43 LICs report data on money market and bank lending rates. [21] Table 3, which follows the same structure as Table 2, shows a strong contemporaneous correlation between money market rates and bank lending rates in advanced and emerging economies, but a much weaker correlation in low-

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[20] These results are not driven by outliers. Taking the medians rather than the means of the various income groups gives qualitatively similar results.

[21] Almost all the LICs in our sample report at least 5 years of data on bank lending rates.

income countries. The short-term partial correlation between money market rates and lending rates is also significantly weaker among-low income countries than among either advanced or emerging economies (column 3), and while differences in long-term effects are not as pronounced, they remain weaker in low-income countries. Most importantly, note that changes in money-market rates explain a much smaller proportion of the variance in lending rates in low-income countries than in either advanced or emerging economies.

Table 3. Correlation between changes in money market rate and changes in lending rate

	Contemporaneous Correlation	Short-term Effect	Long-term Effect	R-squared	Number of countries
Advanced	0.34	0.2	0.36	0.41	24
Emerging	0.35	0.37	0.58	0.65	27
LICs	0.17	0.1	0.3	0.16	43

Note: the lending rate corresponds to IFS line 60p and the money market rate to IFS line 60b. The data are monthly from January 1960 to December 2008, where available. Only countries with at least for 5 years (i.e. 60 or more observations) are included. The second column reports the average of the contemporaneous correlations. The third column reports the average estimated γ. The fourth column reports the average of the long term impact calculated as $\dfrac{\widehat{\gamma}_i + \widehat{\delta}_i + \widehat{\eta}_i}{1 - \widehat{\alpha}_i - \widehat{\beta}_i}$ from the regression $y_{it} = \alpha_i y_{it-1} + \beta_i y_{it-2} + \gamma_i x_{it} + \delta_i x_{it-1} + \eta_i x_{it-2} + \varepsilon_{it}$ where y is change in the lending rate and x the change in the money market rate. The second to last column reports the average R-squared for the previous regression. The last column reports the number of countries for each category.

We consider these findings to be important, since they suggest that the links between the policy instrument controlled by central banks and the mechanism for transmission to the economy's IS curve that is likely to be most relevant in LICs may actually be relatively loose and unreliable.

Possible explanations, as alluded to before, are institutional deficiencies that discourage bank lending activity and/or noncompetitive behavior by banks. To explore these explanations, we first run panel regressions in which monthly changes in bank lending rates are regressed on changes in discount rates, a measure of bank concentration, and interaction terms between changes in discount rates and the index of bank concentration. The first column of Table 4 shows that one percentage point increase in the discount rate is associated on average with a contemporaneous 0.31 increase in lending rate. The second column of the table shows that the pass-through from discount to lending rates indeed appears to be affected by the degree of bank concentration (this index is equal to one if the index of bank concentration is higher than the median and 0 otherwise). However, this result is not robust to the introduction of an index of transparency (column 3), our proxy for institutional quality. As shown in column (3), improved transparency increases the correlation of changes in policy rates with lending

rates, suggesting that the institutional deficiencies that discourage bank lending may be more important than bank concentration in explaining the limited pass-through from policy rates to lending rates in LICs, as suggested by the model of the last section. However, the specification in column 4 shows that a dummy variable for low income countries interacted with changes in the policy rate is highly significant in explaining the (lack of) transmission of policy rate to lending rate in LICs, even after controlling for bank concentration and institutional variables. Thus, although bank concentration and transparency may be part of the story, other unidentified factors also play a key role in explaining the difference between LICs and other countries. Notice that the estimated pass-through from the discount rate to the lending rate (for sample average levels of concentration and transparency) is roughly 1 in column [2] and [3]. However it is much lower, around 0.1 for LICs (column [4]).

Table 4. Transmission mechanisms and bank concentration					
Dependent variable: monthly changes in lending rate					
	[1]	[2]	[3]	[4]	[5] After 2000
Change in discount rate	0.31***	2.93***	1.44	1.52	0.18**
	[0.09]	[0.39]	[1.28]	[1.29]	[0.09]
Concentration * Change in discount rate		-2.39***	-1.15	-1.21	0.04
		[0.45]	[1.52]	[1.52]	[0.17]
Concentration		-0.25	-1.39	1.31	-0.33
		[0.21]	[1.21]	[1.21]	[0.23]
Transparency * Change in discount rate			0.64**	0.60*	0.15**
			[0.31]	[0.31]	[0.05]
LIC * Change in discount rate				-0.76***	-0.23***
				[0.19]	[0.05]
Total effect of change in discount rate					
Average		1.2	1.1		
LIC				0.1	0.0
non-LIC				1.2	0.3
Country fixed effects	X	X	X	X	X
Number of observations	33,296	14,480	9,650	9,650	3,806
Number of countries	140	116	67	67	51
R squared	0.03	0.51	0.53	0.53	0.15

Note: * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors clustered by country in parentheses. The index of bank concentration is 1 if banks are highly concentrated. The index of transparency is from Transparency International. The total effect of a change in discount rate is calculated at the sample average levels of concentration and transparency in Columns [1] and [2]; and the LIC and non-LIC specific sample average levels in Columns [3] and [4].

Finally, column (5) reports regression results using the same specification as in column (4) but restricting the sample to observations after 2000. This is done because in the past financial repression was especially pervasive in LICs, so that lending rates were often fixed administratively or were subject to strong administrative constraints. In recent years, especially in the last decade, financial liberalization has become more widespread. The results indeed confirm that, even in the absence of pervasive financial repression, transparency and the "LIC dummy" continue to play a relevant role in explaining the link between the discount and lending rates.

The cross-evidence presented above should be interpreted with caution, mainly owing to the poor quality of data for LICs. For example, in many LICs, there is no operational policy rate or a relevant money market rate. Nonetheless, the main message from the cross-country evidence is that there is indeed reason to question the effectiveness of transmission from central bank policy to commercial bank lending rates in LICs. Coupled with the suspicion that the small size of the formal financial sector would imply a weak effect of bank lending rates on aggregate demand, there are even stronger reasons to question the effectiveness of the bank lending channel in LICs.

VI. MONETARY TRANSMISSION IN LOW-INCOME COUNTRIES: COUNTRY-SPECIFIC EVIDENCE

The previous section presented some cross-country empirical evidence suggesting that the transmission channel that we would expect to be dominant in the LIC context – the bank lending channel – may indeed work rather imperfectly in such countries. However, such cross-country evidence is at best crude and impressionistic. At present the literature lacks a cross-country or cross-regional study capable of producing general stylized facts about monetary transmission in LICs. However, there are now a large number of studies that consider this issue more systematically from a country-specific perspective. This section briefly surveys the results of these studies.[22] Not surprisingly, most of the literature on the effectiveness of monetary transmission in LICs focuses on the bank lending channel. However, since the exchange rate channel may be operative in countries that allow some exchange rate flexibility, we also examine some evidence on the effectiveness of this channel in LICs. Because our survey is selective and because even among the included studies several need to be interpreted with caution, our review of the evidence is intended for illustrative purposes only – i.e., to provide a flavor of where the literature stands at the present time.[23] [24]

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[22] An appendix table provides a summary of the studies included in our survey, and a companion appendix (not included in the draft) provides a more comprehensive list of recent studies.

[23] Among other things, as we will discuss below, many of these studies rely on VARs estimated with short spans of data and employing dubious identification strategies.

26

A. The bank lending channel

The last section raised doubts about the strength of links between central bank policy actions and bank lending rates in LICs. Consistent with these doubts, evidence on the role of the bank lending channel in individual low-income countries is in fact rather mixed.

The empirical methodology of choice for investigating monetary transmission in LICs has been the estimation of impulse response functions (IRFs) and variance decompositions based on VARs with a small number of macro variables. Note that establishing the empirical importance of the bank lending channel requires two steps: from central bank policy actions to the bank lending rate (as considered above) and/or supply of credit, and from the latter to aggregate demand. Unfortunately, much of the existing literature on LICs focuses on one step or the other. Few papers consider both steps, though in some cases the issue investigated is the reduced-form effect of central bank policy variables on an indicator of aggregate demand (output or prices). In a small number of cases, the role of specific channels of transmission is investigated by comparing IRFs in which all channels are operative to ones in which the channel in question is turned off by making the variable that captures that channel exogenous, following Ramey (1993).

1.   Sub-Saharan Africa

Uanguta and Ikhide (2002) considered both steps in the transmission channel in a study for Namibia. They used the "narrative approach" of Romer and Romer (1990) (see also De Fiore (1998) and Morsink and Bayoumi (1999)) to identify focal episodes of monetary tightening by the South African Reserve Bank (because Namibia maintains a currency board pegged to the South African rand) and performed a dynamic forecasting analysis to see how changes in the policy instrument -- the repo rate/bank rate -- translated into deviations of several key variables from their "normal" behavior after each tightening episode. They found that interest rates indeed tended to be higher and private investment lower after tightening episodes, thereby supporting the effectiveness of both steps in the transmission channel for Namibia. In addition, they estimated a VAR with private investment, consumer prices, lending rates, the repo rate and the money supply. Structural innovations were identified using a Choleski decomposition based on the ordering just described, justified by assumptions regarding the speed with which each variable responds to shocks. Their main finding was that changes in the South African Reserve Bank's policy rate is transmitted to lending rates in Namibia, as well as to private investment. Both approaches, therefore, supported the effectiveness of the bank lending channel in Namibia.

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[24] In ongoing work, Mishra, Montiel, Pedroni and Spilimbergo (2010) use panel VAR techniques allowing more rigorously for country-specific differences to analyze whether monetary transmission mechanisms differ systematically between advanced and low-income countries, and if so, what structural factors drive the difference.

However, others have argued that the importance of the bank lending channel elsewhere in Sub-Saharan Africa is limited by the small size of and imperfections in the financial sector. Sacerdoti (2005), for example, noted that banks in Africa tend to extend limited amounts of credit to the private sector, as the result of underdeveloped institutional means to cope with credit market frictions that increase the cost of financial intermediation. Instead, these banks hold 30-50 percent of their deposits as reserves at the central bank and in the form of short-term foreign assets. To the extent that credit market frictions make deposits at the central bank, government bonds and foreign securities much closer substitutes among themselves than these alternative assets are with private sector credit, this situation would tend to weaken the transmission mechanism through the bank lending channel.[25]

This hypothesis is supported by several studies that examine the strength of links between policy rates and ultimate macro objectives in a variety of African countries. Saxegaard (2006), for example, estimated that excess reserves amounted to over 13 percent of deposits on average in Sub-Saharan banking systems in 2004, reflecting banks' unwillingness or inability to lend, and argued that the impact of monetary policy on bank credit is likely to be limited under such circumstances. He tested this prediction by estimating four-variable (with output, inflation, exchange rate, and monetary policy as the endogenous variables) threshold structural VARs (TVARs) for the countries in the Central African Economic and Monetary Community (CEMAC), as well as for Nigeria and Uganda. The threshold variable was the existence of excess reserves over an estimated desired level of precautionary reserves, and identification was achieved for the policy variables by assuming that non-policy variables do not react contemporaneously to the policy variables, but the latter do react to the nonpolicy variables. He found evidence that monetary policy innovations indeed have weaker effects on output and inflation in Nigeria and Uganda in the excess-reserve regime, but have equally weak effects under both regimes in the CEMAC countries. Similarly, Buigut (2009) examined monetary transmission in three countries (Kenya, Tanzania, and Uganda) belonging to the East African Community (EAC). He used a three-variable VAR approach with real output, inflation and a policy interest rate as endogenous variables, and a Choleski decomposition to identify structural shocks, ordering output first and the policy rate last (on the assumption that the policy rate is based on contemporaneously-observed output and inflation numbers). He found that changes in policy interest rates had small and statistically insignificant effects on output and inflation, and concluded that monetary transmission is weak in these three countries. Finally, Lungu (2008) examined monetary transmission in Southern Africa, using a seven-variable VAR containing industrial production, prices, M2, the monetary base, the central bank policy rate, the supply of bank loans, and bank lending and deposit rates. Identifying monetary shocks using a Choleski decomposition with the central bank policy rate ordered first, he found mixed evidence for the bank lending channel

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[25] In addition to banks' preference for liquidity, Laurens (2005) argued that the transmission from policy instruments to market interest rates in Africa is also hindered by shallow or dormant interbank markets.

in Botswana, Malawi, Namibia, and Zambia. The general pattern was that while bank lending and deposit rates responded to innovations in the policy rate in the expected direction, such innovations seemed to have little effect on total bank lending, on output, or on prices.

While these results are disturbing, the evidence does not all point in one direction regarding the effectiveness of the bank lending channel in LICs, even within Sub-Saharan Africa outside Namibia. Ngalawa (2009), for example, using a seven-variable structural VAR found that policy rates had significant impacts on bank credit in Malawi, and that changes in bank credit subsequently affected both real output and inflation, confirming the effectiveness of both links in the transmission channel for that country.[26]

2. Transition economies in Central and Eastern Europe

Evidence for the effectiveness of the bank lending channel has also been mixed outside Sub-Saharan Africa. A useful early survey for the Central and Eastern European transition economies by Ganev et al. (2002) found weak evidence (using a variety of methodologies) for transmission from central bank policy rates to commercial bank lending rates in individual country studies for countries in this region, but almost no evidence for the effects of bank lending rates on aggregate demand. Individual country studies conducted subsequently in the same region found more mixed results for the link between policy instruments and bank lending rates. Lyziak, Przystupa and Wrobel (2008), for example, used 7-variable structural VARs to investigate the link between monetary policy and bank loan supply in Poland, using two alternative recursive identification schemes which differed with respect to assumptions about the information that is available to monetary policymakers, as well as with respect to the nature of contemporaneous interactions between the exchange rate and the interest rate. They found that the bank lending channel was very weak in Poland, primarily because of banks' use of excess reserves to stabilize loan supply in response to monetary policy changes. Benkovskis (2008) obtained a similar result for Latvia. Jimborean (2009), using micro data for ten Central European transition economies, found very weak evidence for a link between central bank policy rates and loan growth, with such links being detectable only for small banks with moderate liquidity. In contrast with these results, a more recent comprehensive survey for the European transition economies by Egert and Macdonald (2009) continued to find, as in Ganev et. al. (2002), that pass-through from monetary policy to bank lending rates has been extensive in these countries. However, support for the bank lending channel remained limited by the absence of evidence on the links between bank lending rates and aggregate demand.

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[26] However, the identification assumptions for the SVAR are questionable. They assume orthogonality of the structural disturbances; imposing the condition that output and consumer prices do not simultaneously react to monetary variables; while allowing feedback in the other direction. Moreover, Ngalawa does not take into account that Malawi's exchange rate was mostly pegged during the estimation period.

3. Transition Economies in Central Asia

Various studies have examined transition economies in Central Asia, though there appear to be no region-wide surveys comparable to those available for Central and Eastern Europe. Consistent with results for the transition economies in Central and Eastern Europe, Dabla-Norris and Floerkermeier (2006) found that policy rates were transmitted to bank lending rates in Armenia, but bank lending rates appeared to have little effect on output. Similarly, Samkharadze (2008) found that, while the bank lending channel appeared to operate in the expected direction in Georgia, the effects of bank interest rate changes on real output were very weak. Looking at the reduced-form effects of policy changes on indicators of aggregate demand, Isakova (2008) concluded that the bank lending channel has been unimportant in Kazakhstan, the Kyrgyz Republic, and Tajikistan, even though changes in policy rates have been effectively passed through to money market interest rates.

4. The Middle East and North Africa

There is comparatively little work on monetary transmission in Middle Eastern and North African (MENA) LICs. Boughrara (2008) used a VAR approach to examine monetary transmission in Tunisia and Morocco. He identified monetary policy innovations using a Choleski identification scheme in which macro outcome variables were ordered first, followed by transmission variables (such as the supply of loans), and with the monetary policy variable (a money-market rate) ordered last, on the assumption that policy reacts contemporaneously to all macro variables, but does not contemporaneously affect any of them. He used a Ramey (1993) approach to identifying the role of the bank lending channel – i.e., he contrasts the impulse response functions (IRFs) of prices and output to a monetary shocks in the case when bank loans were treated as an endogenous variable in the VAR to the responses of the same variables when bank lending was exogenized. Finding significant differences between the two sets of IRFs in both Morocco and Tunisia, he concluded that the bank lending channel has been important in both cases. Zeaei (2009) reached a similar conclusion for ten MENA countries using a different methodology. Finding a negative association between policy rates and bank lending in cointegrating vectors estimated by dynamic least squares (DOLS), he concluded that changes in policy rates moved bank lending in the opposite direction to the change in the policy rate in these countries, at least in the short run. However, he did not address the second step in the transmission channel from bank lending to aggregate demand.

5. Asia-Pacific

There is a similar scarcity of evidence for LICs from the Asia-Pacific region. Like Boughara, Agha et al (2005) implemented the Ramey (1993) approach to the identification of the role of bank lending in monetary transmission for Pakistan. Comparing the response of real output to a change in monetary policy when bank credit is allowed to respond endogenously and when it is not, they concluded that the bank lending channel has played an important role in transmitting monetary policy changes to economic activity. Ahmad (2008)

examined monetary transmission in Fiji and Papua New Guinea using a six-variable VAR with innovations identified via a Choleski decomposition with bank reserves ordered before other transmission variables, and macro variables ordered last. His analysis was based on variance decompositions for output and prices. He concluded that innovations in bank reserves and deposits played an important role in explaining output variation in Fiji, while bank loans were dominant in Papua New Guinea.

6. <u>Latin America and the Caribbean</u>

Finally, research on the bank lending channel in Latin America and the Caribbean has reached contradictory conclusions. Kendall (2001) used six-variable VARs with Choleski identification to examine the first stage of transmission from monetary policy (in the form of changes in discount rates, required reserve ratios, and short-term Treasury bill rates) on bank lending rates in six Caribbean countries. He found that responses of lending rates were highly heterogeneous in these countries, both with respect to magnitude as well as duration. On the other hand, Duran-Viquez and Esquivel-Monge (2008) found complete long-run pass-through from policy rates to lending rates in Costa Rica. Other authors have been able to document links from monetary policy actions to ultimate effects on prices and economic activity for countries in the region. For example, although Robinson and Robinson (1997) do not specifically trace transmission from monetary policy through bank lending rates to aggregate demand, they found that changes in the repo rate had important short-run effects on both prices and economic activity in Jamaica. More convincingly, Ramlogan (2004), using a structural VAR to examine monetary transmission in three Caribbean countries, found that monetary tightening resulted in a contraction in bank credit that was accompanied by slower growth and lower inflation, consistent with an effective bank lending channel operating in those countries.

B. The exchange rate channel

While most low-income countries intervene heavily in foreign exchange markets, there is some evidence to suggest that the exchange rate channel may be operative in at least some LICs that allow more scope for market determination of exchange rates. For example, in Kenya, which maintained a managed float during the sample period, Cheng (2006) used VAR techniques to find that policy-driven interest rates had a considerable impact on the foreign exchange value of the shilling. He found that the exchange rate channel accounted for about one-fourth of the variation in inflation, but suggested that the effect operated mostly through pass-through rather than expenditure-switching effects, since he found much weaker effects on real aggregate demand and economic activity. By contrast, Boughrara (2008) found no role for the exchange rate channel in Morocco and Tunisia, Ngalawa (2009) found no significant transmission from monetary policy instruments to the exchange rate in Malawi, and Ahmed and Islam (2005) could not support the importance of an exchange rate channel in Bangladesh.

In short, the systematic country-specific evidence is consistent with the cross-country evidence: the standard channels of monetary transmission tend to be weak and unreliable in LICs, and they are poorly understood.

VII. Conclusions

It has long been recognized that, while the general outlines of monetary transmission share many common features across economies, specific channels of transmission are highly country-specific, and depend among other things on each economy's financial structure. There are significant differences across economies in financial structure, even among those at very advanced stages of financial development. These differences are even more pronounced between economies at advanced stages of financial development and those – such as many low-income countries – that have long suffered from financial repression and have only recently begun the process of financial development. Unfortunately, research on mechanisms of monetary transmission has traditionally been focused on countries with advanced financial systems, leaving a significant gap in our understanding of monetary transmission in contexts that are more typical of low-income countries. This situation is particularly serious not only because it provides a more acute challenge for central banks in such countries to improve the credibility-flexibility tradeoff by committing themselves to deliver specific medium-term price level outcomes, but also because monetary policy is often the only countercyclical policy tool available in such countries, making its effective operation a very high priority.

This paper has provided an overview of the reasons why we might expect monetary transmission to be different in a low-income country context from what we are familiar with in industrial countries. We have argued that at lower levels of financial development, the transmission mechanism is likely to be dominated by the bank lending channel. Yet in many low-income countries a combination of institutional deficiencies that restrict bank lending, as well as high levels of bank concentration, may make the transmission from central bank monetary policy actions to bank lending rates both weak and unreliable. We have provided some simple cross-country evidence in support of this proposition, and our overview of the existing, more systematic, country-specific evidence largely comes to the same conclusion.

This situation poses a significant challenge for quantitative monetary policy design in low-income countries. Specifically, the thrust of our argument is that simple postulated relationships between monetary instruments and aggregate demand drawn from industrial country experience are likely to perform poorly in the context of LICs. Improving our ability to quantify the specific links in the monetary transmission mechanism that operate in individual low-income countries requires opening up the "black box" of monetary transmission in such countries. What we need to know is which variables, other than central bank policy instruments, influence the commercial bank lending rate in individual low-income countries, and how such variables affect the relationship between monetary policy instruments and the lending rate. In short, the challenge is to determine how specific characteristics of the domestic institutional environment, as well as of the industrial

organization of the domestic banking sector, influence the effectiveness and reliability of monetary transmission.

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IX. APPENDIX

Summary of Individual Country Studies on the Bank Lending Channel in LICs

Region	Paper	Country	Methodology	Main findings
Sub-Saharan Africa	Uanguta and Ikhide (2002)	Namibia	Narrative approach (De Fiore (1998) and Morsink and Bayoumi (1999)); VAR with Cholesky ordering	(i)Interest rate higher and private investment lower after tightening episodes. (ii) Changes in South African Reserve Bank's policy rate are transmitted to lending rates and private investment in Namibia
	Sacerdoti (2005)	Broad sample of sub-Saharan African countries	Descriptive	Banks extend limited credit to the private sector; instead they hold 30-50% of deposits as reserves in the Central Bank and in the form of short-term foreign assets.
	Saxegaard (2006)	Central African Economic and Monetary Community (CEMAC), Nigeria and Uganda.	Non-linear structural or threshold vector autoregressive (TVAR); identification for policy variables by assuming that non-policy variables do not react contemporaneously to policy variables but latter do react to the former.	The impact of monetary loosening on credit expansion is likely to be limited under conditions of excess liquidity.
	Buigut (2009)	Kenya, Tanzania and Uganda	VAR; Cholesky ordering	Bank lending channel is not important. The effect of a monetary policy shock on output and inflation is not significant.
	Lungu (2008)	Botswana, Malawi, Namibia, South Africa and Zambia	VAR; Cholesky ordering	Mixed evidence on the bank lending channel. While bank lending and deposit rates respond to innovations in the policy rate, the impact on prices, output and bank lending is limited.

	Ngalawa (2009)	Malawi	Structural VAR	Bank lending channel is important. (i) an unanticipated increase in the bank rate of about 2.2 percent causes bank lending to decline, bottoming at 2 percent below baseline after 18 months. This response is significant between 6 and 24 months. (ii) a 7.2 percent sudden increase in reserve money leads to an increase in bank loans, peaking at 1.5 percent above baseline after 3 years. This response is not significant. (iii) an unexpected 5.5 percent rise in bank loans, on the other hand, leads to an increase in both output and consumer prices.
Central and Eastern Europe	Ganev et. al. (2002)	Bulgaria, Estonia, Latvia, Lithuania, Romania, Slovakia	Single equation model	Weak evidence for transmission from bank policy rates to bank lending rates and no evidence for the effects of bank lending rates on aggregate demand
	Lyziak, Przystupa, Wrobel (2008)	Poland	Structural VAR	Bank lending channel is weak, due to banks' holding of excess reserves.
	Benkovskis (2008)	Latvia	Standard panel level regression using bank-level data	(i) Some banks have a statistically significant negative reaction to a domestic monetary shock, but the weighted average reaction of loan growth is not statistically significant. (ii) a domestic monetary shock has only a distribution effect and affects banks that are small, domestically owned and have lower liquidity or capitalization (iii) The bank lending channel is limited to the supply of lats loans, which dramatically reduces the importance of this channel.
	Jimborean (2009)	Bulgaria, Czech Rep., Estonia, Hungary, Latvia,	Individual bank balance sheet data; Kashyap and Stein (1995) approach to control for	Evidence for existence of a bank-lending channel through small banks with moderate liquidity only; applies in the short-run to

		Lithuania, Poland, Romania, Slovak Rep., Solvenia	heterogeneity across banks	several, but not all, of the analyzed banks.
	Egert and MacDonald (2009)[1]	Slovakia, Estonia, Lithuania, Latvia, Ukraine	Micro bank-level data	Banks react differently to monetary policy changes depending on certain characteristics e.g. size, liquidity, capitalization, ownership structure and cost of funds
	Egert and MacDonald (2009)	Estonia, Latvia, Lithuania, Romania, Slovakia	Error correction model	(i) Pass-through from monetary policy key rate to short-term money market rates is very high or complete. (ii) pass-through from money market rates to market interest rates of shorter maturity is also very high (iii) pass-through to long-term market rates is unstable (iv) the results are very similar to the findings for the euro area
Central Asia	Dabla-Norris and Floerkemeier (2006)	Armenia	VAR; Cholesky ordering	Bank lending channel remains weak. Lending rate responds immediately and significantly to an unexpected change in the repo rate. However, output and prices do not respond significantly to lending rate shocks.
	Samkharadze (2008)	Georgia	VAR; Choleski ordering	Bank lending channel operates in the expected direction in Georgia, but the effects of bank interest rate changes on real output are very weak.
	Isakova (2008)	Kazakhstan, Kyrgyz Republic, Tajikistan,	VAR; Cholesky ordering	The bank lending channel has been unimportant even though changes in policy rates are effectively passed through to market interest rates.
Middle East and North Africa	Boughrara (2008)	Tunisia Morocco	Structural VAR; Ramey (1993) approach to identify the bank lending channel	Lending channel is operative in Morocco and Tunisia. A tight monetary policy induces a decrease in the quantity of bank loans, the effects are less pronounced in Morocco.

	Ziaei(2009)	10 MENA (Middle East and North Africa) countries: Algeria, Bahrain, Egypt, Kuwait, Lebanon, Morocco, Oman, Qatar, Tunis and Turkey.	Johanson co-integration and dynamic ordinary least square (DOLS)	Bank lending channel is likely to be an effective monetary transmission mechanism in MENA countries. In particular, bank credit to the private sector increases with a monetary expansion.
Asia and Pacific	Agha et al (2005)	Pakistan	VAR; Ramey (1993) to identify the bank lending channel	Bank lending channel has played an important role in transmitting monetary policy changes to economic activity in Pakistan
	Ahmad (2008)	Fiji , Papua New Guinea	VAR; Cholesky ordering	Innovations in bank reserves and Deposits) play an important role in explaining output variation in Fiji, while bank loans are dominant in Papua New Guinea.
	Robinson and Robinson (1997)	Jamaica	VAR; Choleski ordering	(i) Following a unit shock to the reverse repo, the inflation rate decelerates within two months by approximately 0.1 percent per month. (ii) There are very strong, albeit temporary, real sector effects, as real economic activity declines by approximately 2.0 percent in four months.
	Kendall (2001)	Caribbean	VAR; Choleski ordering	(i) Divergence in lending rate responses across the region to similar monetary policy shocks. The differences in response relate not only to the magnitude but also to the duration of the response. (ii) There can also be differences in the direction of changes in lending rates
	Ramlogan (2004)	Caribbean -- Jamaica, Trinidad and Tobago, Barbados and Guyana	Structural VAR	(i) In each country except Barbados a shock to loans accounts for over 28 per cent of the variance in output over the long run. (ii) In Barbados although credit shocks are not as important as exchange rate shocks at any time horizon, a shock to loans

				retains a large role in explaining output variability compared to the role of money shocks. (ii) In Jamaica credit shocks are more important in the long run while exchange rate shocks are more important in the short to medium term. (iii) In Trinidad and Tobago credit shocks are at least as important as the exchange rate early on and more so in the long run.
Latin America and the Caribbean	Durán-Víquez and Esquivel-Monge (2008)	Costa Rica	Non-linear asymmetric VECM	(i) Evidence supporting the hypothesis of a complete pass-through of the policy rate in the long run. (ii) Since the introduction of the administrated band exchange rate system (October 2006) banks react faster in the short run to movements of policy rate. (iii) there is no evidence of an asymmetric reaction of retail interest rates to movements of policy rate (iv) On average, loan and deposit rates take 9.4 and 5 months respectively to fully pass a shock of policy rate. These average times are reduced to 3.5 and 2 towards the end of the sample. (v) private Banks pass a larger portion of any given movement of policy rate than State owned ones, but take more time to fully do so.

Note. In this table, we use a broad definition of LICs to include all countries classified as developing in Rogoff et. al., 2004.