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Inflation in Low-Income Countries

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Abstract

This paper studies the effects of global and domestic inflation shocks on core price inflation in 105 countries between 1970 and 2016, by using a heterogeneous panel vector-autoregressive model. The methodology allows accounting for differences across groups of countries (advanced economies, emerging markets and developing economies, and low-income countries) and across groups with different country characteristics (such as foreign exchange and monetary policy regimes). The empirical results indicate that most of the variation in inflation among low-income countries over the past decades is accounted for by external shocks. More than half of the variation in core inflation rates among low-income countries is due to global core price shocks, compared with one-eighth in advanced economies. Global food and energy price shocks account for another 13 percent of core inflation variation in low-income countries—half more than in advanced economies and one-fifth more than in emerging markets and developing economies. This points to challenges in anchoring domestic inflation expectations, which have been most evident among low-income countries with floating exchange rates, especially in cases where central bank independence has been weak.

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1. Introduction

Low and stable inflation helps promote long-term economic growth, and it has become the primary objective of the monetary policies of central banks around the world (Ha, Kose, Ohnsorge 2019).[1] One of the key factors that determine the ability of central banks to achieve this objective is the degree to which inflation expectations are well anchored (Blinder et al. 2008). To steer inflation expectations, central banks typically establish a nominal policy anchor, which can either be quantity-based (for example, broad money supply or M2), price-based (for example, the exchange rate), or a target for inflation itself.[2]

Inflation expectations are shaped by many factors, including the history of inflation and the degree of credibility of the central bank. If the central bank's commitment to its nominal anchor has high credibility, temporary inflation shocks—for example, due to commodity price shocks—will not set inflation expectations adrift. A central bank's credibility, in turn, depends on whether it is (i) committed to achieving its objective of low and stable inflation, (ii) has sufficient institutional capability to deliver on its commitment, and (iii) has a track record of achieving its objective.

Ensuring monetary policy credibility is particularly important for low-income countries (LICs), which have historically had to cope with frequent domestic feed through to food prices (Frankel 2011).[3] Moreover, LIC central banks face several other impediments to their ability to anchor inflation expectations. First, they are likely to face a broader set of objectives, compared with those in advanced economies and other emerging market and developing economies (EMDEs); for example, the exchange rate is more likely to be a separate and important policy objective (Rodrik 2007; Berg and Miao 2010).[4] Second, the weak institutional capacity of central banks in LICs may complicate monetary policy management. Third, central banks in LICs generally lack a track record of low inflation. Finally, globalization has increased LICs' exposure to external price shocks.[5]

Although LICs have achieved significant progress in reducing inflation over the past two decades, they have done so in an international environment characterized by significantly lower worldwide inflation. How much of LICs' progress represents homegrown gains in central bank credibility,

[1] Central banks are responsible for maintaining not only price stability (low and stable inflation) but also (especially more recently) financial stability (the soundness of the domestic financial system). The instruments of monetary policy are generally used mainly for the former objective; a different set of instruments is generally used for the latter (Taylor 2005; Hammond, Kanbur, and Prasad 2009).

[2] The use of targets for the growth of monetary aggregates has generally fallen out of favor since the 1980s, at least in advanced economies, because of such problems as instability in relationships between monetary growth and inflation and the divergent behavior of different aggregates.

[3] The definition of LICs in this paper follows the World Bank classification. The LICs in the sample include Afghanistan, Burundi, Benin, Burkina Faso, the Comoros, Ethiopia, Guinea, Liberia, Mali, Mozambique, Malawi, Niger, Rwanda, Senegal, Sierra Leone, Togo, Tanzania, and Uganda.

[4] An important reason is that, as argued in the "fear of floating" literature (for example, Calvo and Reinhart 2002; Agénor and da Silva 2013), nominal exchange rate fluctuations may be particularly disruptive in the EMDE context, due to the prevalence of balance sheet currency mismatches arising from "original sin" and inadequate domestic financial regulation. Another reason is the thinness of the foreign exchange market in many cases, with a lack of stabilizing hedging and speculation. Under these conditions, LIC central banks may seek to pursue stability of the nominal exchange rate.

[5] This not only includes a direct channel via import prices, but also a variety of indirect channels. Section 2 summarizes the literature on monetary policy challenges in LICs and the channels through which globalization may change the environment in which LIC central banks operate.

and how much is simply the result of a more favorable global environment? This paper attempts to shed some light on this issue.

The paper addresses the following questions. First, what are the monetary policy challenges in low-income countries? Second, how has inflation in LICs evolved? Third, how well anchored are inflation expectations in LICs? Finally, what country characteristics have been associated with stronger anchoring?

In this paper, the question of the degree of anchoring of medium-term inflation expectations in LICs is tackled by estimating a novel heterogeneous panel structural vector autoregression (SVAR) model.[6] The model examines the extent to which core inflation in LICs has remained stable in the face of a variety of external shocks, including shocks to global core, energy, and food price inflation, and other shocks transmitted to the domestic economy through exchange rate fluctuations. The assessment is made based on the degree of sensitivity of domestic core inflation, which is determined by the degree of anchoring of inflation expectations, to external shocks. The estimation is based on a monthly panel data set that covers 104 countries (25 advanced economies and 79 EMDEs, including 18 LICs) for 1970M2-2016M12. The data set contains at least 36 months of continuous data for each country, for six variables—headline consumer price index (CPI), food CPI, energy CPI, core CPI, nominal effective exchange rate (NEER), and rainfall. Differences across income groups and subgroups in LICs in the extent to which domestic core inflation performance has been insulated from international factors are analyzed in terms of country characteristics, institutional factors, and policy regimes under a simple ordinary least squares regression framework.

The paper's principal conclusions are as follows.

LICs, like other EMDEs, have experienced higher average levels and volatility of headline inflation than have advanced economies. However, the level and volatility of headline inflation have declined in all three country groups over the past two decades. The fall in inflation volatility in LICs is largely accounted for by declines in the volatility of core and energy price inflation. Food price inflation volatility has remained elevated.

Among LICs, core inflation has tended to be lower in countries with lower public debt ratios, fixed exchange rates, a higher degree of capital account openness, and greater central bank transparency. Although these results are largely consistent with those for advanced economies and other EMDEs, the effects of these characteristics seem to be more prominent for LICs.

Core inflation in LICs was more susceptible to external disturbances than in the other country groups. Around three-quarters of the variation in domestic core inflation rates among LICs was accounted for by external inflation shocks, and very little by shocks to domestic core inflation. This result is exactly opposite of that of advanced economies where only a quarter of the variation in domestic core inflation is explained by global inflation shocks.

[6] The heterogeneous panel SVAR methodology, which is a variant of the Pedroni (2013) methodology, allows analyzing the consequences of various unanticipated global and domestic inflation shocks on the domestic core consumer price index. Rather than using pooled estimation, the approach incorporates group mean panel estimation methods to avoid inconsistent estimation that can occur under pooled methods when the dynamics associated with endogenous variables are heterogeneous. See Appendix for details.

Consistent with earlier findings, domestic characteristics appear to matter not just for the level of domestic core inflation, but also for determining the susceptibility of core inflation to external shocks, although further research is needed to solidify this evidence.

Importantly, however, the results indicate that what sets LICs apart may not be so much that they differ from the other country groups in terms of these characteristics, but that these characteristics appear to operate differently in the LIC environment. Notably, although LICs that fix their exchange rates seem to succeed in anchoring inflation expectations about as well as other economies, those that float have had a much more difficult time in anchoring inflation expectations. This finding suggests that LICs may have in essence imported their anti-inflation credibility.

This paper presents the results of what is the first investigation reported in the literature of the effects of various inflation shocks, domestic and global, on core inflation in a large group of countries, with a specific focus on LICs. The study takes advantage of the flexibility of a heterogeneous panel SVAR framework and a large data set that includes core inflation series for 18 LICs and 61 other EMDEs. The empirical framework makes possible the analysis of the impact of global and domestic shocks on core inflation in different groups of countries in a unified framework. Moreover, it helps identify the global component of core inflation endogenously and produces a parsimonious representation of the common and idiosyncratic components of core inflation in the countries in the sample. To help identify the exogenous component of domestic agricultural supply shocks, which are typically associated with food price inflation, the study uses rainfall data as an exogenous instrument.[7] Finally, the paper also contributes to the literature by analyzing the country characteristics that help explain differences in core inflation responses to shocks between LICs and other country groups.

The next two sections summarize the monetary policy challenges in LICs and document the evolution of inflation over time and across countries, with special focus on LICs. The following sections introduce the heterogeneous panel SVAR model and the database, and examine the impact of global and domestic inflation shocks on core inflation in LICs. The subsequent section distills the country characteristics associated with a larger role of global shocks. The final section concludes with a discussion of policy implications for LICs' control of inflation.

2. Monetary policy challenges in low-income countries

2.1. The role of monetary policy and its recent performance in low-income countries

A key factor in determining the ability of central banks to achieve low and stable inflation is their success in anchoring the inflation expectations of wage and price setters. If expectations are well anchored at a low inflation rate, temporary departures of inflation from this level will be less likely to set inflation expectations adrift and have prolonged effects on the inflation rate. Inflation expectations are shaped importantly by the credibility of the central bank, which depends partly on the clarity of its stated objectives, and partly on its demonstrated commitment to its objectives and ability to achieve them (Blinder et al. [2008], among many others). As indicated in the text,

[7] The relevance of the instrumental variable is tested using statistical methods. It is significant at the 5 percent level. Refer to Appendix for details on the test results.

it seems that overall, central banks in LICs have not been as successful during recent years at anchoring inflation expectations to the objective of low and stable inflation as have central banks elsewhere, despite a global environment that has been conducive to this aim. This may be due in part to special challenges faced by monetary policy in LICs. These challenges are the subject of this section.

One challenge is simply that the history of inflation in LICs is unfavorable for establishing confidence in future price stability. LICs therefore face more of a challenge than advanced economies in establishing a convincing track record of low and stable inflation.

More fundamentally, however, monetary policy in LICs faces challenges arising from conflicts among policy objectives, difficulties in specifying appropriate policy objectives, weaknesses in the instruments and transmission mechanism of monetary policy, and shortcomings in the analytical capacity of central banks. These are considered in turn.

2.2. Conflicts among policy objectives

There are several reasons why it may be more challenging in LICs than in advanced economies and many other EMDEs for central banks to focus their policies on the objective of low and stable inflation.

First, because LICs start with relatively high inflation, it is more difficult for a central bank to make a credible commitment to low and stable inflation. This commitment will require the bank to be willing to tolerate relatively weak activity—negative output gaps—perhaps for an extended period, which will conflict with its secondary objectives (Kasa 2001; Gemayel, Jahan, and Peter 2011).

Second, in LICs there tend to be relatively more frequent supply shocks than in other country groups, arising, for example, from the effects of weather events on agricultural production (Frankel 2011). A poor harvest will tend to increase inflation in the short term while depressing economic activity. Supply shocks thus push inflation and output growth in opposite directions, tending to give rise to a conflict between monetary policy's primary objective of stabilizing prices and its secondary objectives of supporting growth and maintaining a narrow output gap. Stabilizing inflation in response to supply shocks may thus require the sacrifice of the secondary objectives of monetary policy (Nguyen et al. 2017; Adam 2011; Bashar 2011). This contrasts with demand shocks, which are relatively less prevalent in LICs than in other country groups, where stabilizing inflation should simultaneously serve the objective of containing output and employment gaps ("divine coincidence") (Blanchard and Galí 2007).

Third, central banks in LICs are more likely to face conflicts between price stability and fiscal considerations, including the demands of the authorities' fiscal policy (Mas 1995; Prasad 2010). Because they are public sector institutions with the capacity to generate seigniorage revenue through the issuance of interest-free liabilities (most notably, currency), central banks can face pressures to provide cheap financing to governments. These pressures will tend to be greater in LICs, because systems for raising revenue from taxes are relatively less well developed. In the extreme case of fiscal dominance, in which the central bank is institutionally subservient to the finance ministry, meeting the demands of fiscal policy becomes the bank's overriding objective, regardless of its adverse consequences for price stability.

Endowing central banks with legal independence has become more prevalent since the early 1990s, partly as a means to allow them to give primacy to price stability over fiscal objectives and enhance their anti-inflation credibility. However, such de jure independence does not necessarily translate into de facto independence. Researchers have constructed measures of the latter based on various indicators, including for EMDEs (for example, Cukierman 2008; Garriga 2016). One study found that although central bank independence increased around the world with reforms undertaken from the early 1990s, EMDEs and the subgroup of LICs remained characterized by less independent central banks than did advanced economies (Garriga 2016).[2]

But even independent central banks may find their commitment to price stability undermined by fiscal constraints. To the extent that a central bank depends on the finance ministry to recapitalize it if it incurs large losses, it may be more receptive to government pressure; and to safeguard its independence in light of this possibility, it may abstain from policies that would require it to incur sustained losses (most notably the sterilization of capital inflows), even if by doing so it endangers price stability. Furthermore, a central bank may find its pursuit of price stability constrained by fiscal considerations even in the absence of concern for its own solvency. For example, when the government's solvency is itself precarious, the central bank may be reluctant to pursue anti-inflation policies that would increase the government's borrowing costs and potentially reduce tax revenues.

Therefore, there are several ways in which fiscal considerations can constrain central banks' policies in pursuit of price stability and undermine their anti-inflation credibility in LICs.

Fourth, in LICs (as in some other EMDEs) the exchange rate may be a more important policy objective than it is in advanced economies (Taylor 2001; Mishkin and Savastano 2001; Buffie et al. 2004; IMF 2015). A declared strategy of stabilizing the nominal exchange rate against one or more currencies of trading partners that have a track record of low and stable inflation may well be compatible with the achievement of domestic price stability. Indeed, for some LICs, such a strategy may offer a particularly effective way to achieve this objective. Given the limited international financial integration of many LICs, the adoption of such an exchange rate peg may leave some scope for monetary management directed toward domestic objectives. For many LICs, therefore, monetary and exchange rate policies may remain potentially independent, as noted by Ostry, Ghosh, and Chamon (2012). This contrasts with advanced economies and many EMDEs that are highly integrated with international financial markets, where the open-economy trilemma implies that it would be impossible to maintain independent monetary and exchange rate policies.

However, conflicts between monetary and exchange rate policies may arise. Thus, an ad hoc assignment of monetary policy to an objective of exchange rate stabilization—motivated, for example, by currency mismatches in balance sheets that mean that depreciation of the domestic currency would increase debt burdens—may be attempted when important preconditions (relating, in particular, to international cost competitiveness and inflation differentials) are not met. Such an effort is likely to prove unsustainable and disruptive and a distraction from monetary stabilization. In such cases, it would be more advisable to address the causes of the balance sheet mismatches, including shortcomings in financial regulation, although constraints on official borrowing in domestic currency (associated with "original sin") may be difficult to address in the short term (Calvo and Reinhart [2002], among many others).

There may also be an inclination in LICs, as in other EMDEs, to adopt the real exchange rate as a policy objective. As argued by Rodrik (2007) and Berg and Miao (2010), the real exchange rate may have an important role to play in development policy through its impact on the traded/nontraded composition of domestic real output and, in particular, as a means to promote export-led growth. Thus, LIC central banks may be led to include a depreciated real exchange rate target among their objectives. But attempting to use monetary policy to serve this objective will not only distract from the objective of price stability, but also be destabilizing for inflation. Thus, a domestic inflation shock will call for monetary policy to be eased to generate a depreciation of the domestic currency that stabilizes the real exchange rate; but the original inflation shock will consequently be magnified.

The upshot is that central banks in LICs may be faced with a broader set of objectives than those in advanced economies.[3] Distraction from the primary objective of monetary policy—price stability—by its secondary aims (supporting employment and growth), fiscal considerations, or the aim of a depreciated real exchange rate will typically call for more expansionary monetary policies than the central bank would otherwise pursue.

2.3. Difficulties in specifying appropriate policy objectives

The anchoring of inflation expectations depends on more than the central bank's commitment to the broad objective of low and stable inflation. It is also likely to require a declared, quantitatively specific inflation objective for the medium term that has public support, and against which the public can judge the central bank's performance.[4]

However, specification of an inflation objective may prove relatively challenging in LICs. It is unlikely that simply importing the inflation targets of advanced economies (about 2 percent per year) would be optimal for LICs. There are grounds for believing that official inflation objectives in LICs should be somewhat higher than in advanced economies.

First, the weakness of formal tax systems in LICs, and the high collection costs frequently associated with them, point to the argument for a larger relative role of seigniorage as a source of government revenue, particularly from the relatively large informal sector, where tax collection is limited (Huang and Wei 2006; Di Bella et al. 2006). However, the argument for a larger role for seigniorage revenue, and therefore a higher optimal inflation rate than in advanced economies, depends partly on the productivity of public sector spending. Where there are grounds for believing that public sector spending yields a particularly high marginal social rate of return (for example, in areas such as health and education), the social value of marginal government revenue to finance these outlays will be high, suggesting a greater role for seigniorage revenue and therefore a higher optimal inflation rate than in countries where such marginal social returns are lower. This is one reason why appropriate inflation objectives will tend to vary from country to country.

Second, there is empirical evidence that higher inflation begins to exert negative effects on economic growth at significantly higher inflation rates in EMDEs than in advanced economies (for example, Khan and Senhadji 2001), with significant variation in the effects among individual countries.

These considerations suggest that the challenge is to identify appropriate country-specific inflation objectives. The specification of inflation objectives has indeed proven to be a challenging task for central banks in LICs. The survey of International Monetary Fund (IMF) country desk economists reported in IMF (2015) found that most low- and lower-middle-income countries that listed price stability as a central bank objective, but that had not adopted formal inflation targeting, did not have a numerical inflation target, and those that had such a target simply tended to align it with the bank's inflation forecast.[5]

To the extent that central banks in LICs have objectives in addition to low and stable inflation, such as small output or employment gaps, these will also need to be quantified. This too may pose serious challenges for LICs. Estimation of output and employment gaps, and of appropriate objectives for them, is highly problematic in advanced economies, because of instability in the relationship between unemployment and inflation and uncertainty surrounding estimates of potential output. It is likely to be even more so in LICs, for example, because of the higher incidence of supply shocks and the greater prevalence and variability of underemployment.

2.4. Weaknesses in the instruments and transmission mechanism of monetary policy

In advanced economies and many of EMDEs, the key (conventional) monetary policy instrument is a very short-term interest rate, most often an interbank rate such as the federal funds rate in the United States. The central bank can exert close control over the interbank rate through its supply of reserves to the banking system and administration of standing facilities. In LICs, however, interbank markets are typically absent, as are liquid secondary markets in government securities, which the central bank could seek to influence through open-market operations. The government securities market in LICs tends to be a primary market in which the counterparties to the central bank are commercial banks that adopt a buy-and-hold strategy for such securities. Thus, the central bank conducts monetary policy by directly lending to and borrowing from the commercial banking system (for example, through repo transactions) or by doing so indirectly through the primary market for government securities. These transactions operate by altering the cost of official funds for the banking system.

Thus, in LICs monetary policy heavily depends on the bank lending channel, and it is typically not activated through an interbank market. Other channels of transmission that are operative in advanced economies, including through interest rates on traded securities, exchange rates, and asset prices, are much weaker in LICs (Mishra, Montiel, and Spilimbergo 2012). This reflects the absence of highly liquid markets for privately issued traded securities; weak links with international financial markets, coupled with relatively inflexible exchange rates; small and illiquid markets for equities; and poorly organized real estate markets.

The strength and reliability of the bank lending channel are therefore particularly important in LICs. But they tend to be limited by several factors. First, LICs are generally characterized by limited financial inclusion and relatively small formal financial sectors that have only weak links to economic activity in the important informal sectors of the economy. Second, the institutional and legal environment in these economies—including property rights, accounting and disclosure standards, and contract enforcement—tends to be relatively weak (see, for example, Beck, Demirgüç-Kunt, and Levine [2009] on LICs in Sub-Saharan Africa). This makes financial intermediation from private savers to private borrowers costly and risky, inducing banks to limit this activity and prefer holding safer government securities. Third, productive activity in these economies is often dualistic, characterized by a few large, well-established firms and many very small, opaque, and often unstable ones. The marginal cost of bank lending to large firms tends to be relatively low despite the imperfections in the domestic institutional environment. But the marginal cost of extending credit to small firms is likely to rise steeply, so that the volume of lending to such firms may be very insensitive to fluctuations in bank funding costs induced by monetary policy. In short, Tobin's description of the effects of easing monetary policy under conditions of high liquidity preference as "pushing on a string" may be an especially apt analogy in the case of LICs, and the effects of tightening policy are also likely to be limited. A survey of studies of the strength and reliability of monetary transmission in LICs, by Mishra and Montiel (2013), and the empirical evidence based on a large panel of countries by Mishra et al. (2014) are consistent with this perspective.

The challenges created for monetary policy by weak monetary transmission could conceivably be overcome if the strength of monetary policy effects on such variables as inflation, real output, and the exchange rate could be reliably estimated, since weak effects could be offset by stronger policy measures. However, the strength of monetary transmission in LICs has proven difficult to estimate because of data limitations (Li et al. 2016). Several investigators have focused more narrowly on the extent of pass-through from policy rates to bank lending rates. Saborowski and Weber (2013), for example, find that although changes in policy rates tended to be transmitted almost one-for-one into retail bank lending rates in advanced economies, pass-through in developing countries was only in the range of 30-45 percent. Abuka et al. (2015) find similar evidence for Uganda in relation to advanced economies, and that pass-through was particularly weak in less financially developed Ugandan districts. But they find evidence that increases in policy rates were associated with a reduced supply of bank credit, suggesting that a bank lending channel was operative in Uganda, although it was weaker than in advanced economies.

2.5. Shortcomings in the analytical capacity of central banks

Because monetary policy affects the economy with lags, an important component of inflation targeting—or, for that matter, any other activist monetary policy regime—is the ability of the central bank to forecast with a modicum of accuracy its target variables on the assumption of unchanged policies as well as to assess the effects on those variables of potential changes in the settings of its instruments. In many advanced economies and non-LIC EMDEs, these tasks are performed using structural macroeconomic models of the economies in question. However, few LIC central banks have such models with proven track records (IMF 2015). Although work on such models is underway at many LIC central banks, the task is formidable, not least because of the lack of relevant historical data, insufficient knowledge about the macroeconomic structure of the economies concerned, rapid structural change in the economy, and shortages of research expertise. The analytical capacity of LIC central banks—even their ability to monitor and assess recent and current economic developments—is generally hampered by serious data deficiencies (Gemayel, Jahan, and Peter 2011; IMF 2015). Thus, data on economic developments in informal sectors, which are often large, are typically absent or grossly inadequate. Official estimates of real gross domestic product (GDP) are typically available only with annual frequency and often with substantial lags.[6] Labor market data, including on wages and unemployment rates, are generally poor. The absence of a well-defined term structure of yields in financial markets makes it difficult to assess market expectations of future monetary policy actions. Finally, estimates of inflation expectations are generally unavailable because of the absence of survey evidence and market-based measures derived from differences between yields on comparable indexed and non-indexed securities.

2.6. Complications introduced by globalization

Finally, globalization changes the environment in which LIC central banks operate in significant ways, both aggravating and easing the challenges they face in attaining their objectives. Consider the following four aspects of globalization: (i) increasing size of the domestic traded goods sector, (ii) increasing volume of inflows of workers' remittances in many LICs, (iii) larger presence of foreign-owned banks in the domestic economy, and (iv) increased (although still limited) integration with the international financial market.

Understood in this way, globalization has several effects on the environment in which LIC central banks operate. First, globalization is likely to alter the stability properties of the domestic economy in complicated ways. It increases the economy's exposure to external shocks, in the form of exogenous changes in the foreign-currency prices of traded goods, remittance flows, and capital flows. Larger remittance flows, for instance, simultaneously magnify the channels of transmission from the international real economy to domestic aggregate demand.[7] Second, globalization may alter the trade-offs the central bank faces between competing objectives. Although most LICs remain poorly integrated with international financial markets, international financial shocks will increasingly pose challenges for central banks in LIC economies as well, especially in the form of destabilizing central bank objectives such as high levels of economic activity, stable exchange rates, and financial sector robustness. This will make the potential conflicts between such objectives and the central one of achieving medium-run price stability potentially more acute. Third, globalization may affect the monetary transmission mechanism in several ways (Abuka et. al. 2015; Montiel and Pedroni 2018). Much research has found a link between individual bank characteristics and the extent to which those banks tend to pass through changes in policy interest rates to their own retail lending rates.[8] More generally, globalization may also affect the relative merits of alternative exchange rate and monetary policy regimes in LICs. For instance, a larger traded goods sector increases the effectiveness of fixed exchange rates in importing anti-inflation credibility, because a larger share of the domestic price level is directly affected by international goods arbitrage.

3. Stylized facts: Evolution of inflation in LICs

Data for two periods are examined: 1980-99 and 2000-16. In both periods, LICs, like other EMDEs, generally experienced higher levels and volatility of consumer price inflation than did advanced economies (Figure 1). This is true of headline, core, food, and energy price inflation. The level and volatility of inflation declined between the two periods in each of the three groups, but the level and volatility of headline and core inflation in LICs remained generally higher than in advanced economies. Median headline inflation in LICs was around 6 percent in 2000-16, three times median inflation in advanced economies. Inflation performance in LICs has improved markedly over the past three decades but the decline happened later (starting in the 1990s) than in advanced economies (starting in the late 1970s).[8]

Inflation volatility in LICs has also declined in recent decades (except food price inflation). This decline in volatility is not simply the result of the decline in median inflation among LICs: the cross-country correlation between the level of inflation and its volatility has tended to be much

[8] See, for instance, Ha et al. (2019) on the evolution of inflation in low income countries.

lower in LICs than in other country groups.[8] The higher volatility of inflation in LICs suggests that these countries may have experienced more frequent and/or larger shocks that tended to destabilize the inflation rate, or that their inflation rates have been more susceptible to shocks.

Food and energy prices, like other primary commodity prices, are known to be more volatile than the prices of services and manufactured goods. The historically high volatility, as well as the lower correlation between inflation levels and inflation volatility in these countries, may therefore be the result of greater sensitivity of inflation in LICs to global commodity prices. Indeed, simple correlations reveal that food inflation, but not energy inflation, has been a more important driver of fluctuations in headline inflation in LICs and other EMDEs than in advanced economies (Figure 1). For core inflation, however, the evidence is more mixed: its correlation with food and energy inflation has not been clearly higher in LICs than in the other two country groups. The food and energy components of the CPI have historically been more volatile in LICs and other EMDEs than in advanced economies, reflecting the closer link of consumer prices with primary commodity prices in the former groups of countries, where food and energy prices have a smaller service component embedded in them than in advanced economies. Combined with the greater importance of food in LIC consumption baskets, one would expect that movements in global food price inflation would play a relatively more important role in inflation variation in LICs.

Median core inflation has tended to be lower in LICs with the following features: greater capital account openness; lower public debt ratios, fixed exchange rate regimes, higher degrees of central bank independence and transparency, higher degrees of participation in global value chains, and, to a lesser extent, higher degrees of trade openness (Figure 2). The findings for advanced economies and other EMDEs are similar to those for LICs, except that advanced economies with relatively high public debt have tended to have lower core inflation. Higher degrees of capital account openness, fixed exchange rate regimes, and greater central bank transparency are associated with more pronounced differences in core inflation in LICs than in advanced economies and other EMDEs.

Although greater reliance on exports of primary commodities and less financial openness than in other country groups have continued to characterize LICs in recent years, structural changes, including changes in macroeconomic institutions and policy regimes, may have helped reduce inflation and its volatility in these countries (Ha et al. 2018). First, trade openness has increased for all country groups since the early 1990s, with the degree of openness as well as its evolution over time being similar in advanced economies and EMDEs (including LICs). Although capital account openness has also increased for all groups since the early 1990s, it remains much lower in EMDEs than in advanced economies and has increased at a much slower pace. Second, the proportion of EMDEs with pegged exchange rates fell sharply after the collapse of the Bretton Woods system in the early 1970s but stabilized in the mid-1990s and has been stable since then. Finally, an index of central bank independence and transparency is markedly lower in LICs and other EMDEs than in advanced economies, although it underwent a notable increase between 1991 and 2016.

4. Methodology and database

4.1. Methodology

To examine how well anchored core inflation is in LICs, a heterogeneous panel SVAR methodology is adopted to identify the effects of various global and domestic inflation shocks on domestic core CPI inflation in an orthogonalized reduced-form setting. The approach can be thought of as an adaptation of the Pedroni (2013) methodology, such that the adaptation relaxes the diagonality of the loading matrix for the common versus idiosyncratic orthogonalized shocks in a way that is particularly well suited for reduced form Cholesky analysis through the use of global versus domestic block Granger causality restrictions in the panel (see Appendix for details).

In particular, the panel SVAR structure includes a 3 x 3 block of global variables, namely, global energy, global food, and global core price inflation obtained by the cross-sectional average of individual country inflation rates, with the three variables arranged in that order.[9]

It also includes a 3 x 3 block of panel variables, composed of individual country food inflation, core inflation, and the NEER, with the three panel variables arranged in the corresponding order. Each block is then orthogonalized via a standard Cholesky decomposition, and additional restrictions are imposed such that the domestic variables do not have an impact on the global variables, while the global variables are permitted to have an impact on the country-specific variables. In other words, this paper adopts a two-step estimation process. First, the global block is estimated and fixed. Second, the global block is used to help in the selection of parameters for the domestic block, but not vice versa.

An important issue is that identified domestic food price shocks can be endogenous to domestic core inflation in the case that both variables are significantly influenced by common components, presumably domestic demand shocks. To avoid this, domestic food inflation is instrumented by external variables, rainfall and the square of rainfall, which reflect exogenous shocks such as weather events.[10] Finally, all dynamics are permitted to be heterogeneous across countries, so that the distribution of country-specific impulse response functions (IRFs) can be estimated (see Appendix for more details).

The cumulative response of domestic core inflation to unanticipated innovations in the three global inflation measures is computed as the response to a standardized 1 percentage point increase in the relevant global inflation rate. A muted response of domestic core inflation is interpreted as weaker transmission of the global shocks into domestic core inflation. Next, variance decompositions for domestic core inflation are computed, which supplement the information contained in the IRFs by providing estimates of the portion of variation in domestic core inflation

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[9] One could also consider using principal component or dynamic factor estimates in place of the global variables. However, a combination of observed global variables and cross-section averages is used in this paper for three reasons: (i) cross-sectional averages tend to be close proxies for the first principal component (Pesaran 2006); (ii) even if they differ slightly, asymptotically as the number of countries gets large, which one is used should not matter for the panel vector autoregression method in terms of orthogonalizing global core shocks from domestic shocks; and (iii) the data set is unbalanced, which makes the estimation of the dynamic factors more cumbersome.

[10] More specifically, the predicted value of domestic food inflation from a regression of food inflation rates on rainfall and rainfall squared is used as a proxy for domestic food inflation net of demand-side effects. This proxy is included as one of the endogenous variables in the vector autoregression framework.

that is explained by global shocks. It is expected that if inflation expectations are well anchored, then the variance of domestic core inflation is more likely to be explained primarily by its own domestic core price shocks, and that relative price shocks (global or domestic) will have more modest effects. The values of the IRFs and variance decompositions are then projected on institutional and policy characteristics of each country. This allows us to determine the characteristics associated with relatively high versus low response rates of domestic core inflation to various global inflation innovations, and to assess which characteristics are more closely associated with well-anchored inflation expectations in LICs.

4.2. Database

A monthly panel data set was used, covering 104 countries, including 25 advanced economies, 61 non-low-income-country (LIC) emerging market and developing economies (EMDEs), and 18 LICs for 1970M2-2016M12.[11] The panel data set is unbalanced, with the number of observations varying across countries. Various sources were used to construct the monthly series on headline, food, and energy inflation. The main sources for headline consumer price index (CPI) inflation include Haver Analytics, the International Monetary Fund (IMF) International Financial Statistics, and OECDstat. Similarly, food and energy inflation data are covered by OECDstat, the Economic and Statistical Observatory for Sub-Saharan Africa, and Haver Analytics. And, for some countries, data were obtained from national sources. The NEER data were obtained from the International Financial Statistics.

Core inflation is obtained by subtracting the contributions of volatile components of the CPI, such as food and energy inflation. First, a measure of core inflation is obtained by using official core data from OECDstat and Haver Analytics. For the countries for which official core inflation was not available, it was estimated by deducting food and energy inflation multiplied by their corresponding weights from headline CPI inflation and dividing this contribution from the core by the weight of core inflation in the total CPI. The following formula for calculating core inflation was utilized:

$$Core\ inflation = \frac{[\pi - w_F\pi_F - w_E\pi_E]}{1 - w_F - w_E}$$

where π, π_F, and π_E are the current monthly inflation rates for headline, food, and energy, respectively, and ω_F and ω_E are the current weights for food and energy, respectively. Weights of the sub-indexes in the total index were obtained from the Consumer Price Index database published by the IMF as well from OECDstat and Haver Analytics.

Rainfall is used as an instrumental variable in identifying supply-driven changes in domestic food prices. Rainfall monthly data come from the World Bank's Climate Change Knowledge Portal: Historical Data. The data set is produced by the Climatic Research Unit of the University of East Anglia, and reformatted by the International Water Management Institute. The monthly mean historical rainfall data can be mapped to show the baseline climate and seasonality by month. Rainfall is measured as millimeters per month for all countries for 1970-2016. To test the relevancy

[11] The 104 countries included in the data set satisfy the panel SVAR condition that for a country to be included in the sample, it must contain at least 36 months of continuous data for the intersection of the country block, for all variables, namely (i) headline CPI, (ii) food CPI, (iii) energy CPI, (iv) core CPI, (v) NEER, and (vi) rainfall.

of the instruments, panel-based Lambda-Pearson statistics (or Fischer statistics) are used.[12] Specifically, the Lambda-Pearson statistic is constructed as $2.0 \times \sum_i lnP_i$ (where, lnP_i is the natural log of the significance level associated with the F-test for significance of the rainfall instrumental variable for country i). Under the null hypothesis of significance of the rainfall instrumental variable for the panel, the Lambda-Pearson panel statistic will have a chi-square distribution with 2xN degrees of freedom, where N is the number of countries. The results show that the instrumental variables are significant at the 5 percent level. (In the case of LICs, they are significant at the 1 percent level.)

To help explain the variation of domestic inflation, several potentially important country-specific characteristics were used that may affect a nation's inflation rate. The characteristics considered are (i) the exchange rate regime by the classification of Shambaugh (2004) (where "1" is assigned to countries that have pegged or fixed exchange rates, and "0" is assigned to those with flexible exchange rates); (ii) an indicator of whether a country has an inflation targeting framework; (iii) Dincer and Eichengreen's (2014) central bank transparency index (the higher the index is, the more transparent and independent the central bank is); (iv) gross public debt as a percentage of gross domestic product (GDP); (v) trade openness, defined as the sum of exports and imports of goods and services as a share of GDP from the World Bank's World Development Indicators and the IMF's World Economic Outlook; (vi) an indicator of the degree of global value chain (GVC) participation (where "1" is assigned to countries that are considered to be well-integrated into GVCs and "0" otherwise); (vii) the Chinn and Ito (2018) index of capital account openness; (viii) an indicator of whether a country is a commodity importer or exporter; and (ix) central bank turnover, using data compiled by Dreher, Sturm, and de Haan (2010).

5. Transmission of shocks into core price inflation

5.1. Impact of global shocks

Medians and interquartile ranges of the cumulative IRFs of domestic core inflation (which are equivalent to responses of the level of the log CPI) in advanced economies, non-LIC EMDEs, and LICs are shown in Figure 3, for 6 and 18 months after the shock, to illustrate the persistence of the impact. During the sample period, 1970-2016, core inflation responded very differently in LICs, compared with advanced economies and other EMDEs, to global core price shocks. A 1 percentage point increase in global core inflation increased median core inflation in LICs by close to 0.6 percentage point after 18 months, compared with less than 0.2 percentage point in advanced economies and other EMDEs. Thus, LICs appear to import more of the fluctuations in core global inflation than do the other country groups. Next, the effects on domestic core inflation of international relative price changes is considered, in the form of separate shocks to global food and energy inflation, holding global core inflation constant. Shocks to global food inflation have more notable consequences for domestic core inflation in LICs. A 1 percentage point increase in global food inflation raised median core inflation in LICs by around 0.1 percentage point (and by up to 0.3 percentage point) within six months, larger than the effects in advanced economies and other EMDEs. With respect to shocks to global energy inflation, median core inflation in LICs responded more sharply and quickly than that in advanced economies and other EMDEs, although

[12] Constructing the F-statistic for joint significance of all the corresponding members of the panel would not be desirable, because F-statistics are well known to behave poorly as the number of implied restrictions grows large.

with more heterogeneous responses across countries.

These results likely reflect the relatively large weight of food more generally, as well as the relatively large weights of imported food and energy, in headline CPI in LICs, and the weaker response of many LIC central banks to the "second-round" effects of these shocks that allow them to be transmitted to core prices. Alternatively, it could also be the case that labor can shift secure wage changes in response to these such shocks in these countries. Shocks to global core, food, and energy prices all tend to create increases in domestic core inflation in LICs. However, core inflation in LICs appears to be more sensitive to global core inflation than to changes in international relative prices of food and energy. By contrast, other EMDEs show limited sensitivity to global core price shocks, but they more closely resemble LICs in their response to international prices of food and energy. Core inflation in advanced economies displays minimal sensitivity to changes in global core inflation and international energy inflation, but some sensitivity to changes in the international price of food, although less than that of LICs.

5.2. Impact of domestic food price shocks

The dynamic response of core inflation to domestic food price shocks is examined (Figure 4). Such shocks are likely to contain a strong endogenous component—they are likely, in part, to be responses to variables that similarly affect domestic core inflation. The estimation therefore uses rainfall measures (rainfall and rainfall squared) to isolate domestic food supply shocks. Since consumer prices in LICs contain relatively large food components, and since much of the food consumed in these countries is produced in large domestic agriculture sectors, one would expect that supply shocks to domestic food prices would tend to destabilize core inflation in LICs, with smaller effects on core inflation in other EMDEs and advanced economies. Indeed, we find that a supply-driven domestic food price shock tends to raise median core inflation in LICs, and to have a negligible effect on core inflation in advanced economies and other EMDEs (Figure 4). However, the effect in LICs is short-lived, fading within six months of the shock.

Three possible interpretations of this finding may be mentioned. First, food price inflation seems to be more volatile and less persistent in LICs than in other countries (as shown in Figure 1), so that although domestic supply shocks may be more frequent and larger than in the other country groups, they may also be rapidly reversed, suggesting that, if the core price level is itself more flexible in LICs, the effects of domestic food price shocks in those countries may be short-lived. Second, food price subsidies tend to be used more commonly and more intensively in LICs than in the other country groups. To the extent that these keep the prices paid by consumers below producer prices, increases in prices received by domestic producers may have a muted effect on consumer prices. Third, assuming that domestically produced food cannot be easily substituted for imported food, the adjustment to international food price shocks through, for example, government subsidies may be costlier than the adjustment to domestic food price shocks, which can eventually be mitigated by adjustment in domestic food production.

5.3. Impact of exchange rate shocks

Finally, the NEER shock, which is the last variable in the Cholesky ordering, effectively picks up all shocks that move the NEER and are not covered by the first five shocks. Accordingly, the response of domestic core inflation to these NEER disturbances indicates the extent of the exchange rate pass-through to core inflation, irrespective of the underlying shock to the NEER. The estimated pass-through is more pronounced in LICs than in advanced economies or other EMDEs (Figure 4). This finding is overall consistent with the findings in Ha, Stocker, and Yilmazkuday (2019) where the estimates of the pass-through ratio are on average greater in EMDEs than in advanced economies, although the country group in that paper includes few LICs. This may again reflect a weaker anchoring of inflation expectations in LICs than in the other country groups, due to weaker commitment to medium-term inflation objectives on the part of LIC central banks and greater challenges to that commitment posed by larger imported components of headline CPI.

5.4. Impacts of the shocks, by exchange rate regime

To shed more light on the differences between LICs and other country groups in the transmission of global and domestic shocks into domestic core inflation, IRFs were estimated separately for countries with fixed and flexible exchange rate regimes (Figure 5). For advanced economies and other EMDEs, the response of domestic core inflation to global core price shocks was larger in countries with fixed exchange rate regimes. However, the opposite was true for LICs: the response to global core inflation was found to be less pronounced for LICs with fixed exchange rate regimes. An interpretation could be that LICs with fixed exchange rates are more successful in anchoring inflation expectations than those with flexible exchange rates. This may be because weak institutions make a credible commitment to price stability difficult without a credible anchor in the form of a fixed exchange rate.

5.5 Contributions of the shocks to core inflation variation

Variance decompositions of core inflation were examined for the three country groups, using within-group medians (Figure 6). The key differences were found between advanced economies, on the one hand, and LICs and other EMDEs on the other. Consistent with substantially stronger anchoring of domestic inflation expectations in advanced economies, more than three-quarters of the variance of core CPI inflation rates in these economies is explained by shocks to core inflation. In LICs and other EMDEs domestic core inflation is overwhelmingly explained by shocks to global core inflation. The variance share of global core price shocks in the total variation of domestic core inflation is around 60 percent for both these income groups. The contribution of shocks to domestic core inflation, by contrast, is much smaller. The share of domestic core inflation explained by global food and energy shocks is moderately larger for LICs than for advanced economies and other EMDEs. In LICs, global food and energy price shocks account for 12 percent of core inflation variation—half more than in advanced economies and one-fifth more than in non-LIC EMDEs. In line with the results from the IRFs, this result may suggest that central banks in LICs have not succeeded in anchoring inflation expectations in the face of shocks to inflation rates, and that much of LIC inflation seems to have been driven by spillovers from advanced economies and other EMDEs. This is discussed in more detail in the next section.

6. Country characteristics and the roles of shocks

6.1. Decomposition of core inflation variation by country group

Differences in structural characteristics, institutions, and policy regimes might explain the differences in the inflation process among LICs. To shed light on the contributions of these factors, variance decompositions are compared for the estimated response of core inflation 18 months after a shock across country groups, using group medians. The country characteristics are central bank transparency and independence, the public sector debt-to-gross domestic product (GDP) ratio (an indicator of potential fiscal dominance), the exchange rate regime, and the degrees of international trade and financial integration. For each characteristic, two subgroups are distinguished in each of the three main country groups: one consisting of countries with "high" values of the relevant characteristic and the other comprising countries with "low" values. The extent to which inflation performance has been homegrown is inferred from the share of the variance of domestic core inflation that is accounted for by domestic core inflation itself, rather than by external or domestic food price shocks.[13]

6.1.1. *Central bank transparency and independence*

For each country group, the differences between the two subgroups are quite pronounced: in countries with a high level of central bank transparency, external shocks play a less important role than in those with a low degree of central bank transparency (Figure 6). This suggests that inflation expectations are better anchored in the former than in the latter. However, although central bank transparency seems to matter for all country groups, it seems to play a greater role among LICs and other EMDEs in insulating them from external shocks than it does in advanced economies. Thus, there appear to be EMDE-specific and LIC-specific factors at play.

6.1.2. Public debt

Even independent and transparent central banks may be unable to resist pressures to provide financing to the fiscal authorities when public sector debt is very high, such that monetary restraint might trigger a solvency crisis for the government. Empirically, across all the country groups, economies with relatively high public-sector debt-to-GDP ratios exhibit a larger role for external shocks in explaining the variance of core inflation, and this effect is particularly pronounced for LICs (Figure 6). Moreover, external shocks explain a larger share of the variance in core inflation in LICs with higher public sector debt ratios than in any of the other subgroups. A somewhat surprising result among advanced economies is that high debt ratios appear to be associated with low inflation (as shown in Figure 2). This result may reflect that once monetary policy credibility is established, as is the case in many advanced economies, countries may be able to afford to accumulate higher debt without destabilizing expectations. It may also capture low-inflation, high-debt outcomes in advanced economies in the wake of the global financial crisis or

[13] The differences in IRFs between LIC subgroups are quite similar to the differences in variance decompositions. Higher public debt, lower central bank transparency, and lower capital account openness, which all may capture weaker monetary policy credibility, are associated in LICs with stronger responsiveness of domestic core inflation to global core price shocks. Trade openness does not appear to make an important difference for LICs' response to the global core.

the role of a few advanced economies (such as Italy and Japan) where high levels of public debt have gone together with low inflation for reasons not considered here.

6.1.3. Financial and trade openness

Panels D and E in Figure 6 compare variance decompositions across countries with different degrees of international trade and financial openness. If international financial integration, which brings the possibility of an abrupt reversal in capital flows, imposes more discipline on monetary policy makers and helps anchor inflation expectations over time, this could help explain why advanced economies, which are generally more financially open, exhibit relatively low sensitivity to external inflation shocks, with the lowest sensitivity of all in their highly open subgroup. A similar relationship is exhibited by LICs: for countries with higher capital account openness, the variance share of global shocks is about 50 percent, and for countries with lower capital account openness, the share is greater than 80 percent. The difference between the more and less integrated subgroups of LICs is larger than in the other country groups. Trade openness, which may also serve as a disciplining device, does not seem to play an important role in the sensitivity of domestic core inflation to global core shocks in LICs, although LICs with higher trade openness show smaller variance shares for global food and energy shocks. In the other country groups, higher trade openness has tended to be associated with higher variance shares for external factors. The latter could reflect that higher trade openness may be associated with higher exposure to global shocks.

Over the past three decades, the degree of synchronization of output growth has grown to become comparable to that for inflation (Figure 4). During 1970-85, inflation synchronization (with a median variance contribution of the global factor of 16 percent) was stronger than output growth synchronization (5 percent). During 1986-2000, however, the median share of the global factor in the variance of inflation declined to 10 percent, and the share of the global output growth factor remained low (6 percent), with wide differences across countries. Since 2001, the median contributions of the global factor to variation in output growth and inflation have increased significantly, to 12 and 22 percent, respectively. For the median advanced economy, the share is now greater for output growth (34 percent) than for inflation (27 percent). For the median EMDE, the global factor still contributed more to inflation variation (18 percent) than to output growth variation (7 percent).

6.1.4. Exchange rate regime

The effects of exchange rate regimes differ between advanced economies and non-LIC EMDEs, on the one hand, and LICs on the other (Figure 6). Ex ante, it might be expected that fixed exchange rate regimes would be associated with stronger transmission from external inflation shocks to domestic core inflation. This is because small countries that fix will tend to import the inflation performance of their trading partners, whereas those that float can, in principle, control their domestic inflation rates independently. This indeed seems to be what is observed in the case of advanced economies, and to a lesser extent, non-LIC EMDEs: shocks to global core inflation account for a much larger fraction of the variance of domestic core inflation in fixed regimes than in floating regimes. For LICs, however, these findings are reversed: core inflation in floaters is less robust in the face of external shocks than in countries that fix. This may reflect the challenges faced by LIC central banks. Because their domestic inflation rates are determined largely by those of their trading partners, LICs with credibly fixed exchange rates may be characterized by inflation expectations that tend to be anchored to the "normal" inflation experience of their trading partners and not be disrupted by transitory external inflation shocks. By contrast, LICs with floating regimes can avail themselves of no such external anchor; their anchor for inflation expectations has to be homegrown. In the face of such challenges, LIC central banks may find it difficult to provide such an anchor. In its absence, transitory external inflation shocks may create inflation expectations, which become self-fulfilling.

6.2. Correlates of the impacts of shocks on core inflation

The discussion above is suggestive and intuitive, but it does not quantify the implications of changes in the country characteristics. To investigate more comprehensively the implications of marginal variations in a wide set of country characteristics, all possible bivariate relationships between the country characteristics and estimated responses (and variance shares) 6 and 18 months after the shocks were systematically explored.

Three conceptually distinct types of investigation were conducted.

First, the country characteristics most likely to be important in explaining the differences in the magnitudes of the cumulative IRFs and variance decompositions between LICs and the other country groups were examined. This was done by first exploring whether an LIC dummy for the response was significant in a regression that also included only an EMDE (non-LIC) dummy and a constant, and then checking whether the addition of any country characteristics in the regression rendered the LIC dummy insignificant.

Second, policies that would allow LICs to reduce the transmission of global food, energy, and core price shocks to domestic core inflation were explored using two approaches: studying the marginal association of country characteristics attributable to policies with the cumulative IRFs of domestic core inflation to global shocks, and studying the marginal association of similar characteristics with the variance contributions of global shocks to domestic core inflation variation.

Third, the existence of an "LIC effect" was tested further by examining whether the responses of the dependent variables to country characteristics differed systematically between LICs and the other country groups. To this end, a series of cross-section estimations were conducted, using the entire sample of 104 countries, in an attempt to isolate the influence of individual country characteristics on the effects of external inflation shocks on the variance of domestic core inflation.

6.2.1. What is the LIC effect?

The results of the first investigation are presented in Table 1 for equations in which cumulative IRFs were the dependent variable and in Table 2 for equations in which the variance decomposition estimates were the dependent variable. The first row of each table indicates the coefficient estimates and significance levels (shown by asterisks) of the LIC dummy when it is included in a regression with a constant and an EMDE (non-LIC) dummy only. The subsequent rows show the results of regressions in which additional variables are included individually. Each row corresponds to a different regression, which includes not only an LIC dummy, EMDE dummy, and constant, but also the variable indicated in the row title. It is important to note that the numeric values and significance levels shown in the table are not those of the additional included variable, but rather of the LIC dummy. Thus, it is for cases in which row 1 shows statistical significance and some other row in the table shows insignificance that it can be inferred that a country characteristic renders an otherwise significant LIC dummy insignificant when included in the regression.

The response of core inflation in LICs to global shocks is only statistically significant in the case of global food price shocks (Table 1). However, global core price shocks explain 37-39 percentage points more of LIC core inflation variation than in other regions (Table 2). The latter set of results is consistent with what was noted earlier, in that global inflation shocks appear to make a larger contribution to the variation in domestic inflation in LICs than in other EMDEs or advanced economies.

For the transmission of global food-price shocks, several structural characteristics appear to be important, including dependence on commodity imports, labor market (or demographic) variables, capital account openness, and trade openness. The variable indicating the degree of central bank transparency and independence also appears to play a role. By contrast, for the transmission of global core price shocks, it was difficult to identify country characteristics that could explain the LIC dummy. To some extent, the degree of the LIC effect is influenced by central bank transparency, trade openness, and population growth, since the inclusion of these variables substantially changed the magnitude of the regression coefficients, although it did not render the coefficient on the LIC dummy insignificant. Although these results are not formal tests of causation, they suggest that the degree of central bank transparency, trade and capital account openness, as well as demographic variables are most likely associated with the higher contribution of global inflation shocks to variations in domestic core inflation in LICs. Further empirical investigation of the LIC effect is needed to identify the factors that could render the LIC dummy insignificant. Perhaps, additional structural characteristics of the economy (for example, industry structure) could help explain the LIC effect.

How can LICs reduce their vulnerability to global inflation shocks? To examine how LIC inflation rates respond to global shocks, the previous links are recomputed for LICs only, and thus without an LIC dummy. The results for IRFs of domestic core inflation as the dependent variable 1, 6, and 18 months after the original shock are shown in Table 3 and for variance decompositions as the dependent variable in Table 4. The coefficients and significance levels shown are now those of the variables indicated in the row titles.

The strength of the energy and food price shock transmissions are inversely associated with increased trade and financial openness as well as increased central bank transparency. Similarly, the results suggest that the magnitude of the transmission of the global core shock is negatively associated with increased central bank transparency.[17] Although they are less statistically significant, the results indicate that higher financial and trade openness is associated with increased strength in the transmission of global core shocks into core inflation in LICs.

Therefore, openness measures appear to play different roles for the cumulative IRFs and variance decompositions of domestic core inflation to global relative price shocks versus global core price shocks in LICs. It could be that relative price shocks (for example, shocks in energy and food prices) are mostly driven by supply shocks, and shocks to global core inflation are largely demand shocks. Thus, the differential consequences of openness for the transmission of these shocks into domestic core inflation reflect different channels through which demand and supply shocks are transmitted. Alternatively, it could also be the case that global relative price shocks are less destabilizing for domestic inflation expectations, because opening trade and the domestic financial market to global markets contributes to the anchoring of inflation expectations as a disciplining device. It is also possible that the global core price shocks could have different consequences for domestic core inflation in different groups of LICs, by interacting with other structural features, for example, exchange rate regimes.[18]

In sum, from the two types of regression analysis, it seems that the policy reactions for the LIC effect need not be the same as the causes of the LIC effect, especially for global core price shocks, which explain the largest portion of variation in LICs' core inflation. The exceptions to this might be the degree of openness and the degree of central bank independence, for the transmission of global energy and food price shocks. The above results point toward individual country characteristics that may be significant in helping to account for differences in the transmission of global shocks to domestic core inflation in LICs, or in helping to identify which policies might help reduce the magnitude and variance contribution of these transmissions. The next step is to use these results as a basis for investigating possible multivariate relationships, especially interaction effects that help identify policies that may be particularly effective in anchoring inflation expectations in LICs.

6.2.2. How do the effects of country characteristics differ in LICs from other country groups?

The presence of an "LIC effect" was explored further by using data for all country groups to examine whether the values of the dependent variable differ systematically for LICs. The results indicate that for LICs and other EMDEs, the share of the 18-month variance in domestic core inflation explained by global core inflation is much higher than for advanced economies, although not greatly different between these two groups (Table 5).

Next, the robustness of these differences to the inclusion of other variables was examined. The initial results suggested that the various cross-country differences could affect the transmission of global core inflation to domestic core inflation. Accordingly, the variables capturing trade and financial openness, exchange rate regime, and central bank transparency were included in the regressions, one at a time (columns 2 through 4 of Table 5). However, none of these variables made a significant difference. The coefficients on the EMDE (non-LIC) and LIC dummies were essentially unaffected, and none of the additional variables was statistically significant (to save space, these results are not reported). Instead, in column 5, all the variables were included together. Again, none was statistically significant, and the coefficients on the dummies were unaffected. These results suggest that the differences between LICs and other EMDEs, on the one hand, and advanced economies on the other, are not due to systematic differences among these sets of countries with respect to the characteristics most naturally suggested by theory.

The next question considered was whether the different inflation performance of LICs and other EMDEs, relative to advanced economies, is attributable to differences in the effects of the relevant characteristics on the transmission from global to domestic core inflation between LICs and other EMDEs, on the one hand, and advanced economies on the other. This question was explored by interacting these characteristics with the EMDE and LIC dummies, one at a time. If the interaction term is statistically significant, the implication would be that the EMDE or LIC context makes a difference in the role of the relevant characteristics. This was not the case for either of the openness variables (the results are not reported here). However, the exchange rate regime made a substantial difference, as shown in columns 6 and 7 of Table 5. The interaction of the pegged exchange rate regime variable, *pegged XR*, with the EMDE and LIC dummies proved highly significant in both cases, but with opposite signs. Fixed exchange rates thus had a substantial negative effect on transmission from the global to the domestic core in LICs, but a modest positive effect in other EMDEs.

The implications are that the "EMDE effect" and "LIC effect" are regime-specific. For illustrative purposes, if *Pegged XR* is set to 0 for countries with floating rates and *Pegged XR* is set to 1 for countries with fixed rates, the EMDE effect (column 6 in Table 5) would be 0.39 for floating regime countries and 0.59 for fixed regime countries; for LICs, the corresponding values are 0.67 and 0.04, respectively. Focusing specifically on the LIC results, the upshot is that LICs that fix their exchange rates seem to be able to anchor inflation expectations about as well as advanced economies, and those that float are not able to do so. This result is consistent with the view that LICs have found it difficult to generate homegrown anchors for the domestic core.

To investigate this issue, the possible role of central bank independence in anchoring inflation expectations among LIC floating regime countries was considered. This was done by interacting a measure of central bank independence, central bank turnover, with exchange rate flexibility (1 – Pegged XR) in LICs.[19] The results are reported in column 7 of Table 5. The interaction term is not significant at conventional levels, but, in view of the small number of floating regimes among the LICs in the sample, the p-value of 0.27 makes the negative coefficient at least suggestive: LICs that float may be more successful at anchoring inflation expectations in the face of shocks to global core inflation when their central banks are more independent.

7. Conclusion

There has been a remarkable degree of convergence of views in academic and policy circles about the principles to which monetary policy should adhere to yield the low and stable medium-term inflation that is conducive to healthy economic growth. However, central banks in LICs face significant challenges in achieving low and stable inflation and anchoring inflation expectations to such an outcome. Meanwhile, globalization has proceeded apace in LICs, as it has elsewhere, affecting, through several channels, the challenges confronted by LICs in achieving this objective. It is difficult to take a firm view ex ante on the question of whether globalization has made these challenges more or less acute ex ante, because globalization has affected the challenges faced by LIC central banks in complicated ways that do not unambiguously make their anti-inflation objectives easier or more difficult to achieve.

The question must therefore be approached empirically. The heterogeneous panel SVAR technique used for this paper has allowed us to assess the relative roles of the external inflation environment and domestic factors in driving core inflation in a large group of countries, including LICs and other country groups. The inclusion of other countries provides better estimates of the influence of relevant global factors and the roles of different country characteristics in explaining the susceptibility of domestic core inflation to being dislodged by external shocks. Compared with the existing literature, the results of the analysis in this paper lead to some new conclusions.

First, LIC core inflation tends to respond more strongly to global core inflation than does core inflation in the other country groups. Second, LIC core inflation responds more strongly to global food inflation than does core inflation in the other country groups. Third, LIC core inflation responds more sharply, although more variably, to global energy inflation than does core inflation in the other country groups. Finally, exchange rate pass-through to core inflation also appears to be much larger for LICs than for the other country groups.

Together, these results suggest that, at least in this sample, core inflation was more susceptible to external disturbances in LICs than in the other country groups. Variance decompositions support this result, indicating that most of the variation in domestic core inflation among LICs was accounted for by external inflation shocks, and very little by shocks to domestic core inflation, a result exactly opposite of that of advanced economies.

What sets LICs apart is not so much that they differ from advanced economies (and other EMDEs) in characteristics that might be expected to contribute to importing global inflation, such as trade or financial openness or the exchange rate regime. Rather, it is that these characteristics appear to operate differently in the LIC environment.

Thus, LICs with floating exchange rates have had a difficult time stabilizing inflation at a low rate, although they seem to resist external inflation shocks better when their central banks are more independent. In contrast, LICs that fix their exchange rates seem to be able to succeed in stabilizing core inflation about as well as advanced economies, suggesting that these LICs might have, in essence, imported anti-inflation credibility. This result reflects the economic principle that a fixed exchange rate against a low-inflation currency is a monetary standard in which the foreign central bank provides the nominal anchor.

A flexible exchange rate regime, in contrast, is on its own monetary standard: a domestic nominal anchor must stabilize inflation expectations. A popular, and robust, choice for the latter in this century—for many EMDEs as well as advanced economies—is to set an explicit medium- and long-term inflation target for monetary policy (Adrian, Laxton, and Obstfeld 2018). In this regime, the flexible exchange rate provides an important means of adjustment to real sector shocks, which facilitates the robustness of the regime. Fixed exchange rate regimes, in contrast, have often proven fragile, and are prone to collapse. These factors underline the need for a reform agenda to strengthen the anti-inflation credibility of domestic monetary policy.

The upshot is that LIC central banks do not yet appear to have been sufficiently successful in meeting the challenges posed for them by the environment in which they operate, and they have not yet achieved the objective of securing low and stable medium-term inflation rates on a homegrown basis. Instead, the results in this paper suggest that their much-improved inflation performance might have largely been imported. Consequently, if global inflation were to rise, LICs would likely see their inflation rising in tandem. Hence, the reform agenda for achieving homegrown anti-inflation credibility in LICs remains unfinished.

Appendix Heterogeneous panel structural VAR model

This appendix explains the details of the heterogeneous panel structural vector autoregression (SVAR) methodology used in this paper. The technique is an adaptation of the heterogeneous panel SVAR methodology first developed by Pedroni (2013). The method is modified to accommodate some of the specific aspects of the analysis of this paper.

The most important of these adaptations is to accommodate the details of the reduced form specification used in the estimation and analysis of the inflation dynamics in a way that takes advantage of the relatively abundant data sample. To provide motivation for the adaptation, it is worth noting that the original specification developed in Pedroni (2013) works under any method of orthogonalization of the white noise impulses of a vector autoregression (VAR), including the type of Cholesky orthogonalization used in this paper. The original specification imposes a form of structural discipline on the relationship between the common and idiosyncratic components of these impulses that allows the estimation and inference to be done with very short panels, even though the dynamics are permitted to be heterogeneous among the countries of the panel. Specifically, the approach envisions that the panel vector of what are referred to as the structural impulses or "shocks" is decomposed into analogous mutually orthogonal vectors of common and idiosyncratic structural shocks such that the loadings on these vectors are diagonal.

To use a concrete example of this form of structure, taken from Pedroni (2013), if such a panel vector is thought of as composed of two composite structural shocks, "aggregate supply," ϵ_{it}^{AS}, and "aggregate demand," ϵ_{it}^{AD}, so that $\epsilon_{it} = (\epsilon_{it}^{AD}, \epsilon_{it}^{AS})'$, then the relationship between these composite shocks and the corresponding common shocks $\bar{\epsilon}_i = (\bar{\epsilon}_{it}^{AD}, \bar{\epsilon}_{it}^{AS})'$ and the corresponding idiosyncratic shocks $\tilde{\epsilon}_i = (\tilde{\epsilon}_{it}^{AD}, \tilde{\epsilon}_{it}^{AS})'$, becomes $\epsilon_{it} = \Lambda_i \bar{\epsilon}_t + \tilde{\epsilon}_{it}$ where Λ_i is the diagonal loading matrix. To put it simply, aggregate demand shocks load only into composite aggregate demand shocks, and not into composite aggregate supply shocks, and so forth, so that the contributions of idiosyncratic and common demand shocks sum to the contribution of the total composite demand shocks. Once the vectors ϵ_{it} and $\bar{\epsilon}_t$ have been structurally identified, the diagonality of Λ_i on the factor structure for the white noise shocks permits consistent estimation of the loadings by simple computation of the correlation between the corresponding elements of ϵ_{it} and $\bar{\epsilon}_t$, which allows for good small sample estimation properties even in relatively short panels.

By contrast, when the analysis is based on reduced form impulse shocks, as in the case of this paper, then it may be desirable to loosen this structural aspect, since the white noise impulse shocks are themselves unknown linear combinations of any underlying structural shocks. This in turn also allows the shapes of the responses to the reduced form common and idiosyncratic components to differ more substantially from one another, again presumably because the mix of underlying structural shocks is free to differ among the common and idiosyncratic components. The econometric cost to reducing these structural aspects of the estimation is of course an increased need for data, particularly in the time series dimension. For the application in this paper, the data are available with sufficient length to make the tradeoff worthwhile.

Thus, to implement this adaptation, in the absence of diagonality of the loading matrix, one of the simplest and most transparent approaches is to exploit directly the remaining orthogonality between the common and idiosyncratic shocks. This can be done by thinking of the panel SVAR as a common global block and a country-specific domestic block nested within the panel, with the orthogonality between the common and idiosyncratic shocks implemented through a set of Granger noncausal restrictions. In effect, the panel SVAR is estimated recursively in multiple tiers, in this case a global tier and a domestic tier, with the global tier estimated first, and then placed within the domestic tier in a manner such that the domestic tier has no impact on the global tier. The global variables can be represented by cross-sectional averages of the national-level variables, as in Pedroni (2013), by variables reported directly at the global level, or any combination of the two.

To see the details of this adapted approach as it relates to the specific setup, let $\Delta Z_{it} = \Delta(\text{Energy}_t, \text{Food}_t, \text{Core}_t, \text{food}_{it}, \text{core}_{it}, \text{neer}_{it})$ be the data vector, where ΔEnergy_t is global energy inflation, ΔFood_t is global food inflation, ΔCore_t is global average core inflation, Δfood_{it} is domestic food inflation instrumented by the rainfall data, Δcore_{it} is domestic core inflation, and Δneer_{it} is the nominal effective exchange rate (NEER) appreciation rate. In this case, the vector moving average form for the panel can be represented here as $\Delta Z_{it} = \text{A}_i(L)\epsilon_{it}$, $\text{A}_i(L) = \Sigma_{j=0}\,\text{A}_{ij}$, with the upper left 3 x 3 block representing the global time-series block, the lower right 3 x 3 block representing the local domestic block, and the lower left 3 x 3 block representing the interactions running from the global block to the domestic block. In precise terms, the Cholesky orthogonalization of the error terms combined with the remaining orthogonalization into common versus idiosyncratic shocks becomes equivalent to the following set of restrictions in this notational form, namely $[\text{A}(\text{k},\ell)_j] = 0\ \forall j, \forall \text{k} < \ell$ when $\text{k} \leq 3$, $A(\text{k},\ell)_j = 0$ for $j = 0, \forall \text{k} < \ell$ when $\text{k} > 3$. However, these restrictions can be implemented equivalently by implementing a recursive two-tiered estimation algorithm. The estimation algorithm for this adaptation, which implements these restrictions, can now be summarized as follows.

1. Construct the global variable block, by estimating cross-sectional averages $\Delta\bar{Z}_t = N_t^{-1}\sum_{i=1}^{N_t}\Delta Z_{it}$, where the notation N_t reflects that the panel need not be balanced, or use global variables directly, as desired.

2. Estimate the 3 x 3 global tier VAR $\bar{R}(L)\Delta\bar{Z}_t = \bar{\mu}_t, \bar{R}(L) = I - \sum_{j=1}^{p}\bar{R}_j, E[\bar{\mu}_t\bar{\mu}_t'] = \bar{\Omega}_\mu$ and fix this block.

3. Estimate 6x6 individual VARs as $R_i(\text{L})\Delta Z_{it} = \mu_{it}$, $\bar{R}(L)\Delta\bar{Z}_t = \bar{\mu}_t$, $\bar{R}(L) = I - \sum_{j=1}^{p_i} R_{i,j}, E[\mu_{i,t}\mu_{i,t}{}'] = \Omega_{i,\mu}\ \forall i$ with the global tier estimates imposed on the upper left 3 x 3 block and the lower right 3 x 3 block set to zero for all lags.

4. Use the Cholesky factorization $\Omega_i = \text{A}_i(0)\text{A}_i(0)'$ to orthogonalize the reduced form shocks such that $\epsilon_{it} = \text{A}_i(0)^{-1}\mu_{it}$, and compute the corresponding country-specific impulse responses and variance decompositions on the basis of $\text{A}_i(L) = R_i(\text{L})^{-1}\text{A}_i(0)$.[14]

5. Use the sample distributions for individual country specific impulse responses and variance decompositions to compute the quantile responses among countries, if desired.[15]

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[14] Estimation of the VAR model is done on the basis of reduced-form VAR representation and identification of the structural form, and representation of the results is based on the structural vector moving average form.

[15] Using a bootstrap method, we checked the statistical significance of the IRFs. The confidence intervals indicate that the results are significant at the 5 percent level across all country groups.

6. Project the sample distributions for the individual impulse responses and variance decompositions onto the sample distributions of individual country characteristics x_i to study the country-specific characteristics associated with the cross-sectional heterogeneity of the dynamics, such as $\bar{A}_{i,s}(k,l) = \alpha_s + \beta_s' x_i + \eta_{i,s}, \forall k, l, s, s = 0, \cdots Q$ forecast horizons.

References

Abuka, C., R. Alinda, C. Minoui, J. L. Peydro, and A. Presbitero. 2015. "The Bank Lending Channel in a Frontier Economy: Evidence from Loan-Level Data." https://www.rieti.go.jp/jp/events/15061501/pdf/7-2_presbitero.pdf.

Adam, C. 2011. "On the Macroeconomic Management of Food Price Shocks in Low-income Countries." *Journal of African Economies* 20 (1): i63-i99.

Adrian, T., D. Laxton, and M. Obstfeld, eds. 2018. *Advancing the Frontiers of Monetary Policy*. Washington, DC: International Monetary Fund.

Agénor, P. R., and L. P. da Silva, 2013. "Inflation Targeting and Financial Stability: A Perspective from the Developing World." Working Paper 324, Banco Central do Brasil, Brasília, Brazil.

Arusha, C., and M. Debdulal. 2013. "International Business Cycles and Remittance Flows." *B.E. Journal of Macroeconomics* 13 (1): 1-33.

Bashar, O. H. M. N. 2011. "The Role of Aggregate Demand and Supply Shocks in a Low-Income Country: Evidence from Bangladesh." *Journal of Developing Areas* 44 (2): 243-64.

Beck, T., A. Demirgüç-Kunt, and R. Levine. 2009. "Financial Institutions and Markets across Countries and over Time – Data and Analysis." Policy Research Working Paper 4943, World Bank, Washington, DC.

Berg, A., and Y. Miao. 2010. "The Real Exchange Rate and Growth Revisited: The Washington Consensus Strikes Back?" IMF Working Paper 10/58, International Monetary Fund, Washington, DC.

Berg, A., S. O'Connell, C. Pattillo, R. Portillo, and D. F. Unsal. 2015. "Monetary Policy Issues in Sub-Saharan Africa." In *The Oxford Handbook of Africa and Economics: Policies and Practices*, edited by C. Monga and J. Y. Lin. Oxford: Oxford University Press.

Bernanke, B., and M. Gertler 1999. "Monetary Policy and Asset Price Volatility." *Federal Reserve Bank of Kansas City Economic Review* Q (IV): 17-51.

Blanchard, O., and J. Galí. 2007. "Real Wage Rigidities and the New Keynesian Model." *Journal of Money, Credit and Banking* 39 (s1): 35-65.

Blinder, A., M. Ehrmann, M. Fratzscher, J. de Haan, and D. Jansen. 2008. "Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence." *Journal of Economic Literature* 46 (4): 910-45.

Bordo, M. D., and P. L. Siklos. 2017. "Central Bank Credibility before and after the Crisis." *Open Economies Review* 28 (1): 19-45.

Buffie, E., C. Adam, S. O'Connell, and C. Pattillo. 2004. "Exchange Rate Policy and the Management of Official and Private Capital Flows in Africa." *IMF Staff Papers* 51 (s1): 126-60.

Calvo, G., and C. Reinhart. 2002. "Fear of Floating." *Quarterly Journal of Economics* CXVII (2): 379-408.

Carstens, A. 2018. "Agustín Carstens interview with Börsen-Zeitung." Available at https://www.bis.org/speeches/sp180523.htm.

Chinn, M., and H. Ito. 2018. "The Chinn-Ito Index – A de jure Measure of Financial Openness." http://web.pdx.edu/~ito/Chinn-Ito_website.htm.

Cukierman, A. 2008. "Central Bank Independence and Monetary Policymaking Institutions: Past, Present, and Future." *European Journal of Political Economy* 24 (4): 722-36.

Dincer, N. N., and B. Eichengreen. 2014. "Central Bank Transparency and Independence: Updates and New

Measures." *International Journal of Central Banking* 10 (1): 189-259.

Di Bella, G., A. A. Selassie, B. Clements, J. K. Martijn, and S. Tareq. 2006. "Designing Monetary and Fiscal Policy in Low-Income Countries." IMF Occasional Papers 250, International Monetary Fund, Washington, DC.

Dreher, A., J. Sturm, and J. de Haan. 2010. "When Is a Central Bank Governor Replaced? Evidence Based on a New Data Set." *Journal of Macroeconomics* 32 (3): 766–81.

Frankel, J. A. 2011. "Monetary Policy in Emerging Markets: A Survey." In *Handbook of Monetary Economics 3B*, edited by B. M. Friedman and M. Woodford. New York: Elsevier.

Garriga, A. C. 2016. "Central Bank Independence in the World: A New Data Set." *International Interactions* 42 (5): 849-68.

Gemayel, E., S. Jahan, and A. Peter. 2011. "What Can Low-Income Countries Expect from Adopting Inflation Targeting?" IMF Working Paper 11/276, International Monetary Fund, Washington, DC.

Ha, J., M. Stocker, and H. Yilmazkuday. 2019. "Inflation and Exchange Rate Pass-Through." Policy Research Working Paper Series 8780, World Bank, Washington, DC.

Ha, J., A. Ivanova, F. L. Ohnsorge, and D. F. Unsal. 2019. "Inflation: Concepts, Evolution, and Correlates." Policy Research Working Paper Series 8738, World Bank, Washington, DC.

Hammond, G., R. Kanbur, and E. Prasad. 2009. "Monetary Policy Challenges for Emerging Market Economies." In *New Monetary Policy Frameworks for Emerging Markets: Coping with the Challenges of Financial Globalization*, edited by G. Hammond, R. Kanbur, and E. Prasad. Cheltenham, UK: Edward Elgar Publishing.

Huang, H., and S.-J. Wei. 2006. "Monetary Policies for Developing Countries: The Role of Institutional Quality." *Journal of International Economics* 70 (1): 239-52.

IMF (International Monetary Fund). 2015. "Evolving Monetary Policy Frameworks in Low-Income and Other Developing Countries." Staff Report, October, International Monetary Fund, Washington, DC.

———. 2016. *World Economic Outlook: Subdued Demand: Symptoms and Remedies.* October. Washington, DC: IMF.

Kasa, K. 2001. "Will Inflation Targeting Work in Developing Countries?" *FRBSF Economic Letter* 2001 (1), Federal Reserve Bank of San Francisco, San Francisco, CA.

Khan, M. S., and A. S. Senhadji. 2001. "Threshold Effects in the Relationship between Inflation and Growth." *IMF Staff Papers* 48 (1): 1-21.

Ley, E., and F. Misch. 2014. "Output Data Revisions in Low-Income Countries." Paper presented at the conference Macroeconomic Challenges Facing Low-Income Countries: New Perspectives, International Monetary Fund, Washington, DC.

Li, B. G., S. A. O'Connell, C. Adam, A. Berg, and P. Montiel. 2016. "VAR Meets DSGE: Uncovering the Monetary Transmission Mechanism in Low-Income Countries." International Monetary Fund, Washington, DC.

Mas, I. 1995. "Central Bank Independence: A Critical View from a Developing Country Perspective." *World Development* 23 (10): 1639-52.

Mishkin, F., and M. A. Savastano. 2001. "Monetary Policy Strategies for Latin America." Policy Research Working Paper 2685, World Bank, Washington, DC.

Mishra, P., and P. J. Montiel. 2013. “How Effective Is Monetary Transmission in Low-Income Countries? A Survey of the Empirical Evidence.” *Economic Systems* 37 (2): 187-216.

Mishra, P., P. J. Montiel, and A. Spilimbergo. 2012. “Monetary Transmission in Low-Income Countries: Effectiveness and Policy Implications.” *IMF Economic Review* 60 (2): 270-302.

Mishra, P., P. J. Montiel, P. Pedroni, and A. Spilimbergo. 2014. “Monetary Policy and Bank Lending Rates in Low-Income Countries: Heterogeneous Panel Estimates.” *Journal of Development Economics* 111 (November): 117-31.

Montiel, P., and P. Pedroni. 2018. “Trilemma-Dilemma: Constraint or Choice? Some Empirical Evidence from a Structurally Identified Heterogeneous Panel VAR.” *Open Economies Review* 29 (127): 1-18.

Nguyen, A. D. M., J. Dridi, F. Unsal, and O. H. Williams. 2017. “On the Drivers of Inflation in Sub-Saharan Africa.” *International Economics* 151 (C): 71-84.

Ostry, J. D., A. R. Ghosh, and M. Chamon. 2012. “Two Targets, Two Instruments: Monetary and Exchange Rate Policies in Emerging Economies.” IMF Staff Discussion Note 12/01, International Monetary Fund, Washington, DC.

Pedroni, P. 2013. “Structural Panel VARs.” *Econometrics* 1(2): 180-206.

Pesaran, M. H. 2006. “Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure.” *Econometrica* 74 (4): 967-1012.

Prasad, E. S. 2010. “Financial Sector Regulation and Reforms in Emerging Markets: An Overview.” NBER Working Paper 16428, National Bureau of Economic Research, Cambridge, MA.

Rodrik, D. 2007. “The Real Exchange Rate and Economic Growth: Theory and Evidence.” John F. Kennedy School of Government, Cambridge, MA.

Saborowski, C., and S. Weber. 2013. “Assessing the Determinants of Interest Rate Transmission through Conditional Impulse Response Functions.” IMF Working Paper 13/23, International Monetary Fund, Washington, DC.

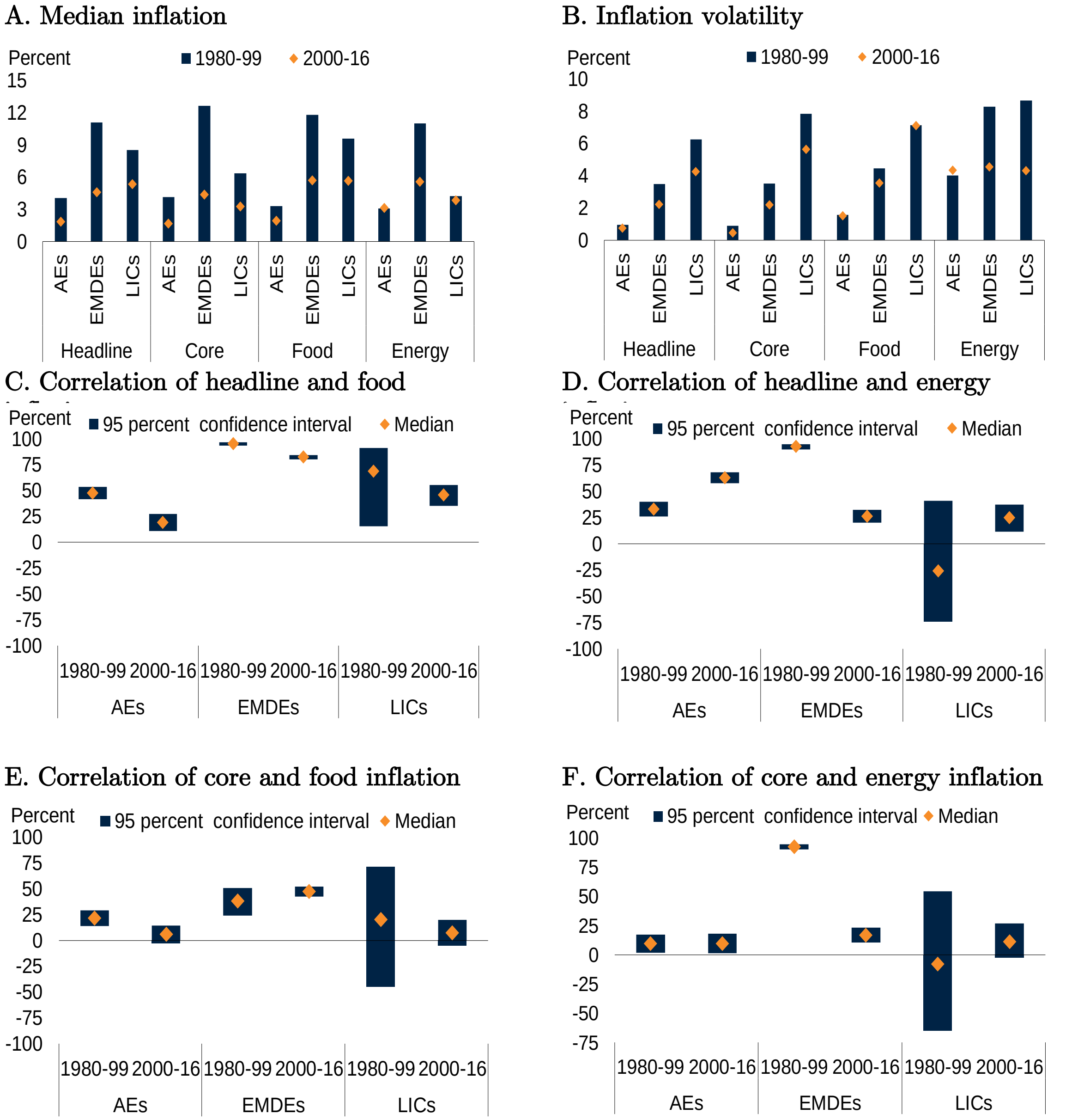
Shambaugh, J. 2004. “The Effect of Fixed Exchange Rates on Monetary Policy.” *Quarterly Journal of Economics* 119 (1): 301-52.

Stock, J. H., and M. W. Watson. 2012. “Disentangling the Channels of the 2007-2009 Recession.” NBER Working Paper 18094, National Bureau of Economic Research, Cambridge, MA.

Taylor, J. 2001. “The Roles of Exchange Rates in Monetary-Policy Rules.” *American Economic Review* 91 (2): 263-67.

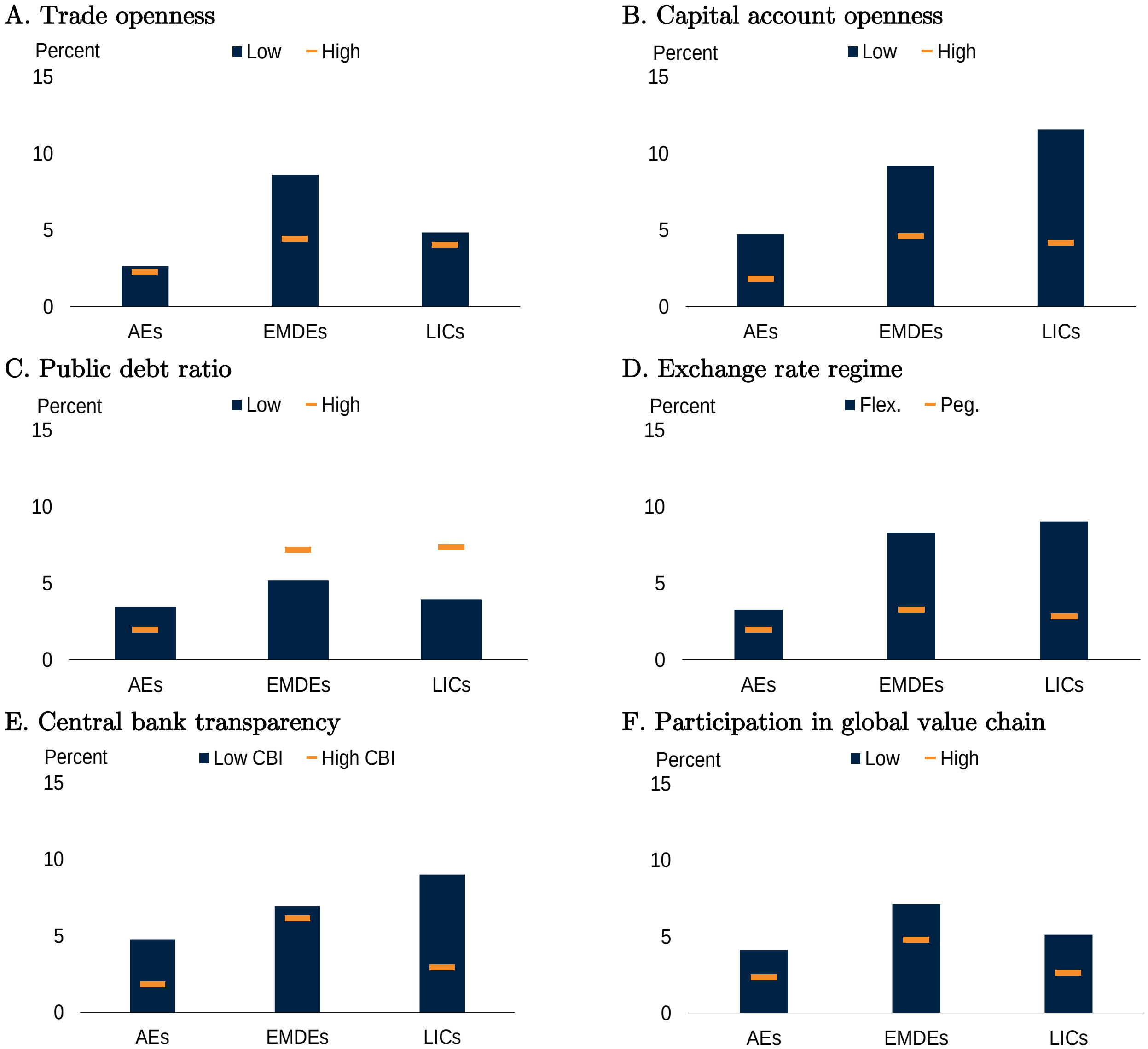
———. 2005. “Monetary Policy in Emerging Market Countries with Implications for Egypt.” ECES (The Egypt Center for Economic Studies) Distinguished Lecture 23, Cairo, Egypt.

FIGURE 1 Inflation levels and volatility, by country group



Source: Haver Analytics; International Monetary Fund International Financial Statistics; World Bank.
Note: All inflation rates are annual. Headline inflation uses a balanced panel for 1980-2016, including 154 countries (29 advanced economies, 98 EMDEs, and 27 LICs). Core inflation uses a balanced panel for 1980-2016, including 54 countries (27 advanced economies, 24 EMDEs, and 3 LICs). Food inflation uses a balanced panel for 1980-2016, including 104 countries (29 advanced economies, 61 EMDEs, and 14 LICs). Energy inflation uses a balanced panel for 1980-2016, including 55 countries (27 advanced economies, 25 EMDEs, and 3 LICs). EMDEs here exclude LICs. AEs = advanced economies; EMDEs = emerging market and developing economies; LICs = low-income countries.
A.B. Simple averages of median annual inflation or inflation volatility.
B. Inflation volatility is measured as the standard deviation of annual inflation rates for the past 10 years.
C.-F. The non-stationary part of each series is eliminated using the methodology by Stock and Watson (2012).

FIGURE 2 Median core inflation, by country characteristics



Source: Dincer and Eichengreen 2014; Haver Analytics; International Monetary Fund International Financial Statistics; Chinn and Ito 2018; Shambaugh 2004; World Bank; World Integrated Trade Solution.

Note: Based on median annual core inflation across 145 countries (34 advanced economies, 91 EMDEs, and 20 LICs) from 1980 to 2016. Countries with "high" are defined as those with values above the median; all others are considered "low." EMDEs here exclude LICs. AEs = advanced economies; CBI = central bank transparency index; EMDEs = emerging market and developing economies; GDP = gross domestic product; GVC = global value chain; LICs = low-income countries.

A.B. Trade and capital account openness are based on trade-to-GDP (percent) and the Chinn and Ito (2018) index, respectively.

C. Percent of GDP. D. The exchange rate regime is based on the classification by Shambaugh (2004).

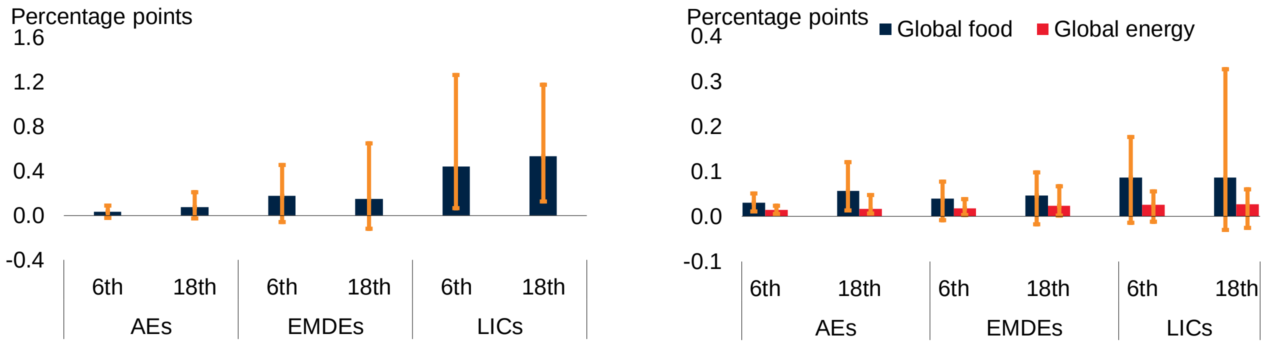
E. Based on the CBI by Dincer and Eichengreen (2014). The higher the index is, the more transparent and independent the central bank is.

F. A country is classified as well integrated into the GVC if one of the following two conditions is met: the sum of backward and forward participation in GVCs is greater than the median of the sample in a particular year, or the sum of intermediate exports and imports as a percent of GDP is greater than the median of the sample in a particular year. All other countries are defined as having "low" GVC participation.

FIGURE 3 Response of core inflation to global price shocks

A. Response to global core price shocks

B. Response to global food and energy price shocks

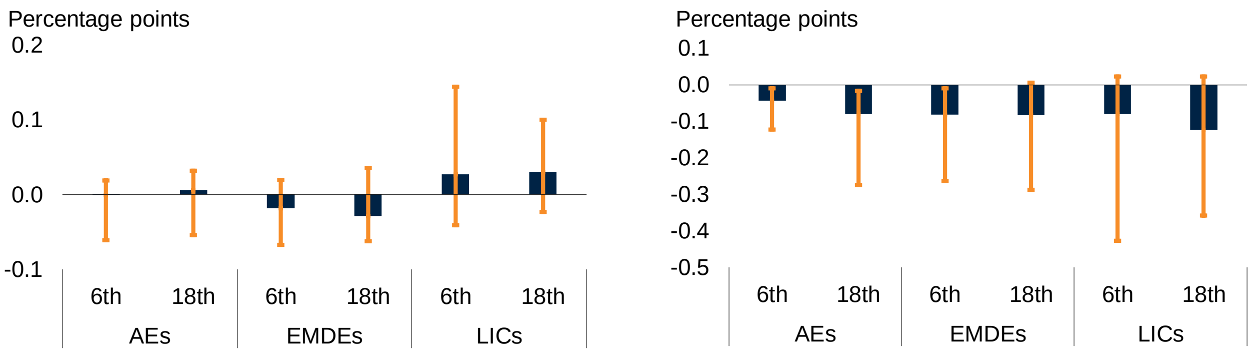


Source: World Bank.
Note: Cumulative IRFs after 6 and 18 months of domestic core inflation following a 1 percentage point increase in inflation measures. Medians and interquartile ranges (25th and 75th percentiles) of IRF distributions are shown for each country group. The results are based on a heterogeneous panel SVAR model with 104 countries (25 advanced economies, 61 EMDEs, and 18 LICs) between 1970m2 and 2016m12. EMDEs here exclude LICs. See Appendix for details.
AEs = advanced economies; EMDEs = emerging market and developing economies; LICs = low-income countries.

FIGURE 4 Response of core inflation to shocks to food prices and exchange rates

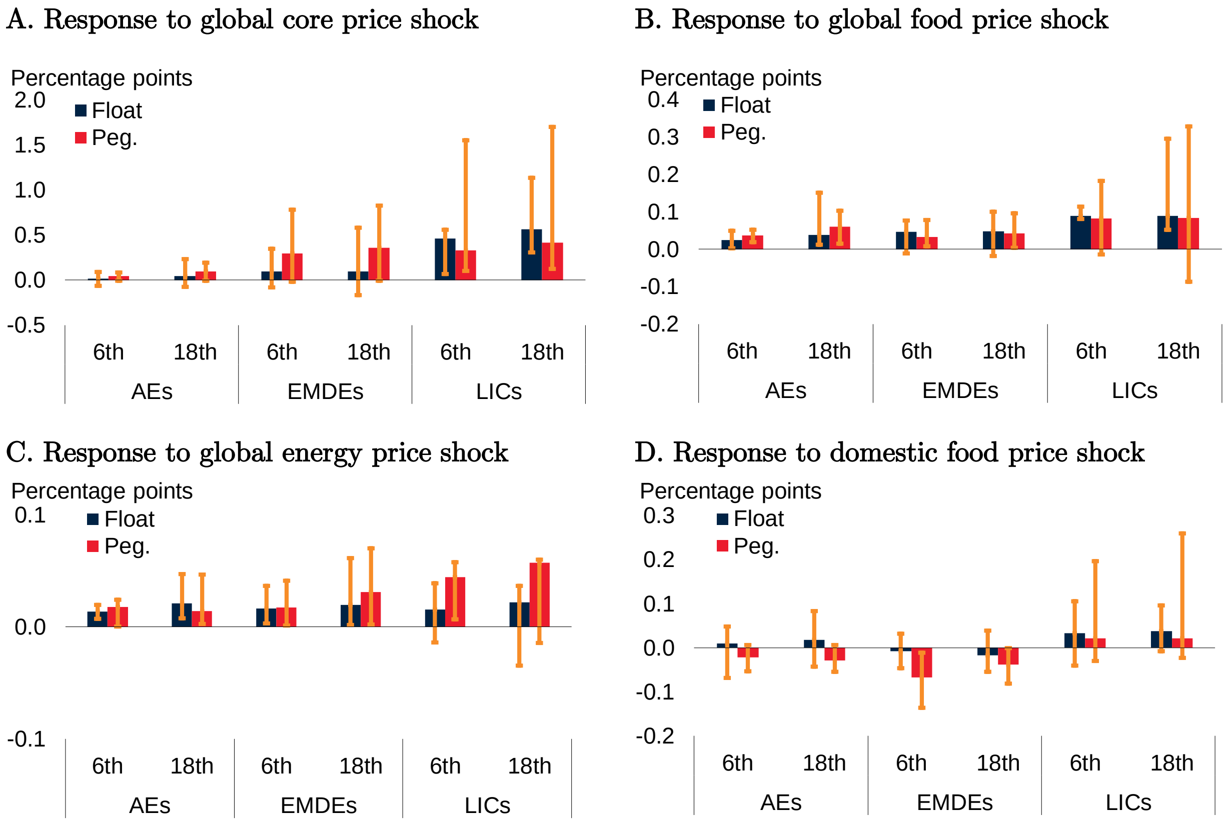
A. Response to domestic food price shocks

B. Response to exchange rate shocks



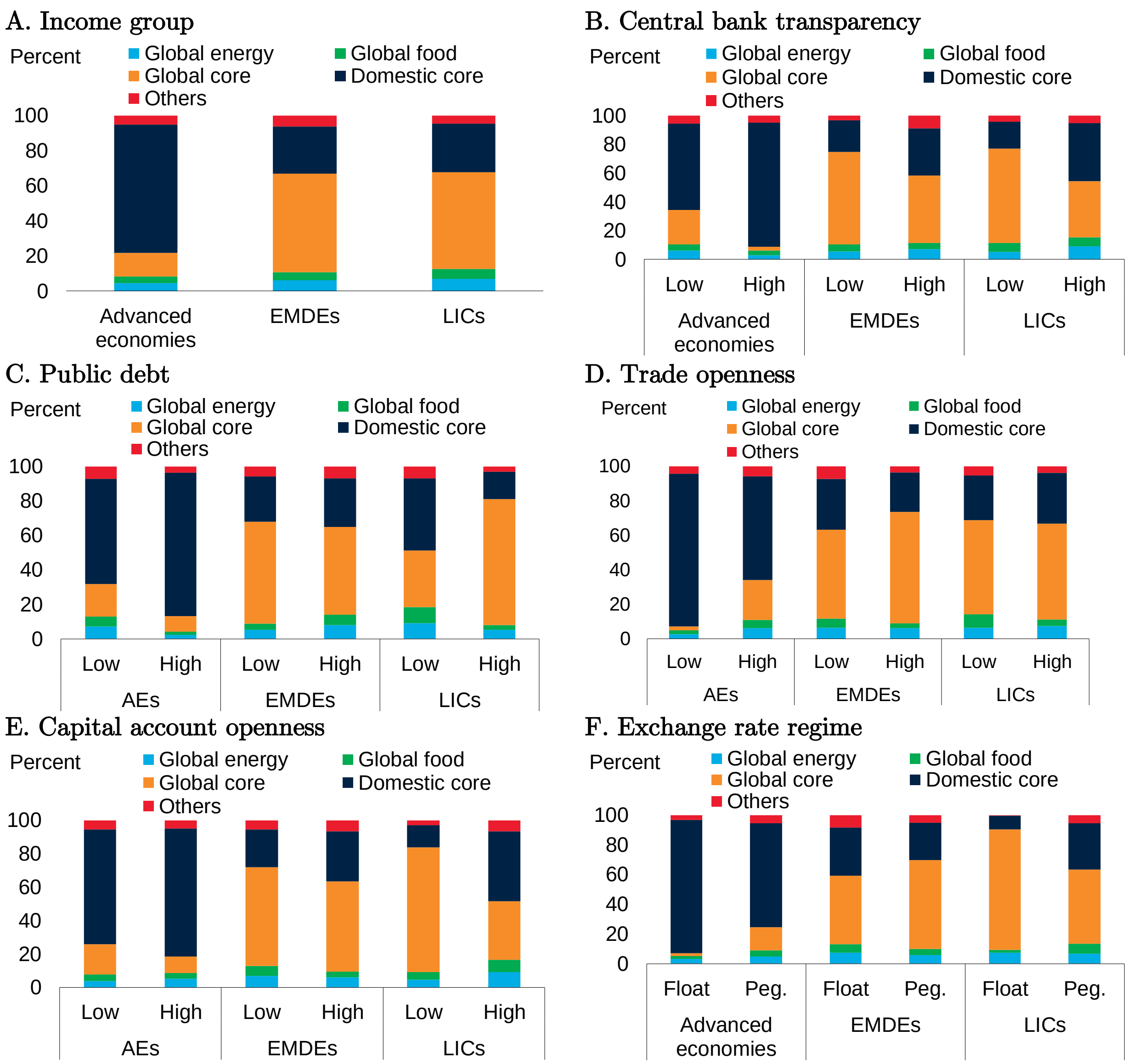
Source: World Bank.
Note: Cumulative IRFs after 6 and 18 months of domestic core inflation following a 1 percentage point increase in domestic food inflation or exchange rate change. Medians and interquartile ranges (25th and 75th percentiles) of IRF distributions are shown for each country group. The results are based on a heterogeneous panel SVAR model with 104 countries (25 advanced economies, 61 EMDEs, and 18 LICs) between 1970m2 and 2016m12. See Appendix for details.
AEs = advanced economies; EMDEs = emerging market and developing economies; IRF = impulse response function; LICs = low-income countries; NEER = nominal effective exchange rate; SVAR = structural vector autoregression.

FIGURE 5 Response of core inflation to global core price shocks



Source: Shambaugh (2004); World Bank.
Note: Cumulative IRFs after 6 and 18 months of domestic core inflation following a 1 percentage point increase in inflation measures. Medians and interquartile ranges (25th and 75th percentiles) of IRF distributions are shown for each country group. The results are based on a heterogeneous panel SVAR model with 104 countries (25 advanced economies, 61 EMDEs, and 18 LICs). Exchange rate regimes are based on the classification by Shambaugh (2004) between 1970m2 and 2016m12. EMDEs here exclude LICs. AEs = advanced economies; EMDEs = emerging market and developing economies; IRFs = impulse response functions; LICs = low-income countries; SVAR = structural vector autoregression.

FIGURE 6 Contribution of inflation shocks to core inflation variation



Source: Dincer and Eichengreen 2014; Haver Analytics; International Monetary Fund International Financial Statistics; Shambaugh 2004; World Bank.

Note: Forecast error variance decompositions (forecasting horizon: 18 months) based on medians across countries within each group. The results are based on a heterogeneous panel SVAR model with 104 countries (25 advanced economies, 61 EMDEs, and 18 LICs). EMDEs here exclude LICs. AEs = advanced economies; EMDEs = emerging market and developing economies; GDP = gross domestic product; LICs = low-income countries; SVAR = structural vector autoregression.

B.-E. Countries with "high" characteristics are defined as those with values above the median; all others are considered "low."

B. Based on the central bank transparency index by Dincer and Eichengreen (2014).

C. Classification of countries is "high" and "low" based on government debt as a percent of GDP.

D.E. Measures of trade and capital account openness are based on trade (exports plus imports)-to-GDP ratios and the Chinn and Ito (2018) index, respectively.

F. The exchange rate regime is based on Shambaugh (2004).

TABLE 1 Regression of the response of core inflation

Response of domestic core to	Global energy		Global food		Global core	
Time horizon (months)	6	18	6	18	6	18
LIC dummy	0.01	0.02	0.08**	0.07	0.25	0.22
Level of headline inflation (LIC dummy in the inclusion of each level of the headline inflation variable)	0.00	0.01	0.07*	0.05	0.62**	0.59
	[0.14]	[0.25]	[1.85]	[0.58]	[2.53]	[1.51]
Commodity importer	0.05**	0.09**	0.06	-0.05	0.55	0.35
	[2.30]	[2.34]	[1.38]	[-0.48]	[1.27]	[0.63]
GDP	0.00	0.01	0.07*	0.05	0.61**	0.62
	[-0.01]	[0.14]	[1.75]	[0.52]	[2.39]	[1.53]
Inflation target	0.00	0.00	0.07*	0.06	0.59**	0.65
	[-0.1]	[0.09]	[1.86]	[0.69]	[2.31]	[1.62]
Pegged exchange rate regime	0.00	0.00	0.066*	0.07	0.53**	0.58
	[-0.07]	[0.12]	[1.76]	[0.8]	[2.09]	[1.43]
Central bank transparency	0.01	0.02	0.05	0.01	0.48*	0.53
	[0.66]	[0.44]	[1.13]	[0.07]	[1.75]	[1.21]
Public debt	0.00	0.00	0.07*	0.07	0.61**	0.60
	[-0.12]	[0.02]	[1.91]	[0.78]	[2.42]	[1.53]
Population growth	0.02	0.02	0.04	0.02	0.39	0.30
	[0.77]	[0.58]	[0.89]	[0.15]	[1.4]	[0.67]
Labor market flexibility	0.01	0.02	0.06	0.05	0.391*	0.37
	[0.51]	[0.51]	[1.61]	[0.54]	[1.86]	[1.03]
Capital account openness	0.01	0.01	0.04	-0.06	0.90***	0.86*
	[0.36]	[0.31]	[0.91]	[-0.59]	[3.01]	[1.8]
Trade openness	0.01	0.01	0.06	0.06	0.67***	0.51
	[0.3]	[0.25]	[1.63]	[0.6]	[2.62]	[1.28]

Source: Chinn and Ito 2018; Dincer and Eichengreen 2014; International Monetary Fund; World Bank.
Note: Each row corresponds to a different regression, where the coefficients and significances (t-values) are those of the variable indicated in the row title. The dependent variables are based on a country-specific heterogeneous panel SVAR estimation for 104 countries (25 advanced economies, 61 EMDEs, and 18 LICs). EMDEs here exclude LICs. GDP is national GDP measured in U.S. dollars using purchasing power parity (not market) exchange rates. Inflation targeting regimes are defined as in IMF (2016). Central bank transparency data are based on Dincer and Eichengreen (2014). Exchange rate regimes are based on Shambaugh (2004). Labor market flexibility is based on the estimates compiled by the Fraser Institute, with a higher value representing a more flexible labor market. The measures of trade and capital account openness are, respectively, trade (exports plus imports)-to-GDP ratios (in percent) and the index compiled by Chinn and Ito (2018). Dependent variables are based on mean values over the country-specific sample periods. The numbers in brackets refer to t-statistics. EMDEs = emerging market and developing economies; GDP = gross domestic product; LIC = low-income country; SVAR = structural vector autoregression.
*** $p < 0.01$, ** $p < 0.05$, *$p < 0.1$ significance levels.

TABLE 2 **Regression of variance decompositions of core inflation**

Variance share for domestic core	Global energy		Global food		Global core	
Forecasting horizon (months)	6	18	6	18	6	18
LIC dummy	0.01 [0.36]	0.03 [1.40]	0.03** [2.04]	0.02 [1.59]	0.37*** [3.83]	0.39** [4.19]
Level of headline inflation (LIC dummy in the inclusion of each level of the headline inflation variable)	0.00 [0.2]	0.02 [1.21]	0.02* [1.88]	0.02 [1.35]	0.40*** [4.02]	0.42** [4.38]
Commodity importer	0.01 [0.56]	0.02 [1.03]	0.01 [0.81]	0.00 [0.08]	0.34*** [2.96]	0.38*** [3.39]
GDP	0.00 [0.05]	0.02 [1.01]	0.02* [1.83]	0.02 [1.23]	0.35*** [3.51]	0.38*** [3.87]
Inflation target	0.01 [0.42]	0.03 [1.33]	0.02* [1.74]	0.02 [1.28]	0.32*** [3.29]	0.34*** [3.66]
Pegged exchange rate regime	0.01 [0.29]	0.02 [1.21]	0.02* [1.65]	0.02 [1.39]	0.38*** [3.73]	0.40*** [4.08]
Central bank transparency	0.01 [0.29]	0.03 [1.3]	0.02 [1.42]	0.02 [1.04]	0.25*** [2.36]	0.29*** [2.74]
Public debt	0.01 [0.5]	0.03 [1.5]	0.02* [1.74]	0.02 [1.46]	0.40*** [3.95]	0.42*** [4.31]
Population growth	0.02 [0.87]	0.04* [1.82]	0.02 [1.53]	0.03 [1.48]	0.24*** [2.21]	0.26*** [2.53]
Labor market flexibility	0.01 [0.5]	0.03 [1.58]	0.03*** [2.23]	0.025* [1.71]	0.36*** [3.62]	0.38*** [3.99]
Capital account openness	-0.01 [-0.28]	0.02 [0.85]	0.01 [0.32]	0.00 [0.02]	0.42*** [3.44]	0.42*** [3.57]
Trade openness	0.01 [0.55]	0.03 [1.46]	0.02 [1.33]	0.01 [0.87]	0.48*** [4.88]	0.49*** [5.26]

Note: Each row corresponds to a different regression, where the regression includes an LIC dummy, an EMDE dummy, a constant, and the variable indicated in the row title. The numeric values and significance levels (t-values) are not those of the additional included variable, but rather those of the LIC dummy when the variable indicated in the row title was included in the regression. Thus, it is cases where row 1 shows significance, and some other row in the table shows insignificance, that are indicative of a country characteristic that rendered an otherwise significant LIC dummy insignificant through its inclusion in the regression. The dependent variables are based on country-specific heterogeneous panel SVAR estimations for 104 countries (25 advanced economies, 61 EMDEs, and 18 LICs). EMDEs here exclude LICs. The LIC dummy equals 1 for any LIC, and 0 for any other country. GDP refers to national GDP measured in US dollars using purchasing power parity exchange rates. Inflation targeting regimes are defined as in IMF (2016). Central bank transparency data are based on Dincer and Eichengreen (2014). Exchange rate regimes are based on Shambaugh (2004). Labor market flexibility is based on the estimates compiled by the Fraser Institute, with a higher value representing a more flexible labor market. The measures of trade and capital account openness are, respectively, trade (exports plus imports)-to-GDP ratios (in percent) and the index compiled by Chinn and Ito (2018). Dependent variables are based on mean values over the country-specific sample period. The numbers in brackets refer to t-statistics. EMDEs = emerging market and developing economies; LIC = low-income country; SVAR = structural vector autoregression. *** $p < 0.01$, ** $p < 0.05$, *$p < 0.1$ significance levels.

TABLE 3 **LICs: Regression of the response of core inflation on country characteristics**

Response of domestic core to	Global energy			Global food			Global core		
Time horizon (months)	1	6	18	1	6	18	1	6	18
Level of headline inflation	0.00	0.01	0.03	0.00	0.01	0.04	-0.02	-0.37	-0.22
	[0.99]	[0.32]	[1.08]	[0.02]	[0.12]	[0.4]	[-0.75]	[-0.91]	[-0.46]
Commodity importer	-0.01	-0.05	-0.06	-0.01	0.03	0.01	-0.01	2.20***	2.23**
	[-0.7]	[-1.5]	[-1]	[-0.54]	[0.32]	[0.07]	[-0.29]	[3.21]	[2.55]
GDP	0.00	0.00	0.003**	0.00	0.00	0.01	0.00	0.02	0.04*
	[1.08]	[1.56]	[2.42]	[1.02]	[1.49]	[1.58]	[-0.8]	[0.87]	[1.65]
Pegged exchange rate regime	-0.01	0.00	-0.04	0.00	-0.01	-0.06	0.04	0.87	0.63
	[-0.89]	[-0.1]	[-0.79]	[-0.07]	[-0.14]	[-0.35]	[1.05]	[1.1]	[0.65]
Central bank transparency	-0.010**	0.01	-0.01	-0.02*	-0.07	-0.15	0.03	-0.03	-0.16
	[-1.98]	[0.56]	[-0.36]	[-1.89]	[-1.14]	[-1.36]	[0.95]	[-0.05]	[-0.27]
Public debt	0.00	0.00	-0.05	-0.01	0.01	-0.06	0.03	0.84	0.26
	[-0.63]	[0.1]	[-1.14]	[-0.66]	[0.16]	[-0.38]	[0.75]	[1.34]	[0.34]
Population growth	0.01	-0.02	-0.01	0.01	0.09	0.09	0.01	0.51	0.73
	[1.07]	[-0.57]	[-0.09]	[0.75]	[0.79]	[0.44]	[0.23]	[0.56]	[0.68]
Labor market flexibility	0.01	0.01	0.08	0.01	-0.08	-0.15	-0.05	1.26*	2.39***
	[0.59]	[0.35]	[1.41]	[0.35]	[-0.66]	[-0.68]	[-1.03]	[1.72]	[3.02]
Capital account openness	0.01	0.06	-0.02	0.00	-0.31*	-0.68**	-0.01	1.42	0.48
	[0.38]	[0.94]	[-0.18]	[-0.03]	[-1.82]	[-2.2]	[-0.17]	[0.92]	[0.25]
Trade openness	-0.01	0.01	-0.09**	-0.02	-0.10	-0.25	0.06*	0.72	-0.18
	[-0.94]	[0.21]	[-2.1]	[-1.08]	[-1.14]	[-1.63]	[1.83]	[1.02]	[-0.2]

Source: Chinn and Ito 2018; Dincer and Eichengreen 2014; International Monetary Fund; Shambaugh 2004; World Bank.
Note: Each row corresponds to a different regression, where the coefficients and significances (t-values) are those of the variable indicated in the row title. The dependent variables are based on a country-specific heterogeneous panel SVAR estimation for 104 countries (25 advanced economies, 61 EMDEs, and 18 LICs). EMDEs here exclude LICs. GDP refers to national GDP measured in U.S. dollars using purchasing power parity (not market) exchange rates. Inflation targeting regimes are defined as in IMF (2016). Central bank transparency data are based on Dincer and Eichengreen (2014). Exchange rate regimes are based on Shambaugh (2004). Labor market flexibility is based on the estimates compiled by the Fraser Institute, with a higher value representing a more flexible labor market. The measures of trade and capital account openness are, respectively, trade (exports plus imports)-to-GDP ratios (in percent) and the index compiled by Chinn and Ito (2018). Dependent variables are based on mean values over the country-specific sample periods. The numbers in brackets refer to t-statistics. EMDEs = emerging market and developing economies; GDP = gross domestic product; LICs = low-income countries; SVAR = structural vector autoregression. *** $p < 0.01$, ** $p < 0.05$, *$p < 0.1$ significance levels.

TABLE 4 **LICs: Regression of the variance decompositions of core inflation on country characteristics**

Variance share of	Global energy			Global food			Global core		
Forecasting horizon (months)	1	6	18	1	6	18	1	6	18
Level of headline inflation	0.00	0.00	0.00	0.00	0.01*	0.00	-0.02	0.06	0.02
	[0.99]	[0.35]	[-0.46]	[0.02]	[1.69]	[-0.2]	[-0.75]	[0.63]	[.1.14]
Commodity importer	0.00	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.24	-0.01
	[-0.71]	[-0.06]	[0.15]	[-0.54]	[-0.75]	[-0.41]	[-0.29]	[1.32]	[-0.25]
GDP	0.00	0.00	0.00	0.00	0.001***	0.00	0.00	0.01**	0.00
	[1.08]	[0.50]	[0.72]	[1.02]	[2.61]	[0.95]	[-0.8]	[2.47]	[0.76]
Pegged exchange rate regime	-0.01	0.00	0.00	0.00	-0.02	0.00	0.04	0.01	-0.04
	[-0.89]	[-0.17]	[0.11]	[-0.07]	[-1.27]	[0.53]	[1.05]	[0.04]	[-1.27]
Central bank transparency	-0.006**	0.00	0.00	-0.02*	-0.01	0.00	0.02	-0.23**	-0.01
	[-1.98]	[-0.06]	[-0.78]	[-1.89]	[-1.38]	[-0.54]	[0.95]	[-2.41]	[-0.63]
Public debt	0.00	-0.01	0.00	-0.01	0.00	0.00	0.02	-0.12	-0.01
	[-0.63]	[-1.3]	[-1.44]	[-0.66]	[-0.21]	[0.78]	[0.74]	[-0.86]	[-0.26]
Population growth	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.28	0.02
	[1.07]	[-0.19]	[-1.09]	[0.75]	[0.71]	[1.41]	[0.24]	[1.5]	[0.42]
Labor market flexibility	0.00	-0.01	0.00	0.01	0.00	0.00	-0.05	0.46***	0.08**
	[0.58]	[-0.86]	[0.23]	[0.34]	[-0.11]	[-0.14]	[-1.03]	[2.64]	[2.38]
Capital account openness	0.00	-0.06***	-0.01**	0.00	-0.03	0.02	-0.01	0.12	0.11*
	[0.37]	[-3.59]	[-2.04]	[-0.03]	[-0.75]	[1.33]	[-0.17]	[0.34]	[1.84]
Trade openness	0.00	-0.01	-0.01**	-0.01	-0.03**	0.01	0.06*	-0.22	-0.02
	[-0.92]	[-1.31]	[-2.23]	[-1.08]	[-2.15]	[0.96]	[1.83]	[-1.44]	[-0.84]

Source: Chinn and Ito 2018; Dincer and Eichengreen 2014; International Monetary Fund; Shambaugh 2004; World Bank.

Note: Each row corresponds to a different regression, where the coefficients and significances (t-values) are those of the variable indicated in the row title. The dependent variables are based on a country-specific heterogeneous panel SVAR estimation for 104 countries (25 advanced economies, 61 EMDEs, and 18 LICs). EMDEs here exclude LICs. GDP refers to national GDP measured in U.S. dollars using purchasing power parity (not market) exchange rates. Inflation targeting regimes are defined as in IMF (2016). Central bank transparency data are based on Dincer and Eichengreen (2014). Exchange rate regimes are based on Shambaugh (2004). Labor market flexibility is based on the estimates compiled by the Fraser Institute, with a higher value representing a more flexible labor market. The measures of trade and capital account openness are, respectively, trade (exports plus imports)-to-GDP ratios (in percent) and the index compiled by Chinn and Ito (2018). Dependent variables are based on mean values over the country-specific sample periods. The numbers in brackets refer to t-statistics. EMDEs = emerging market and developing economies; GDP = gross domestic product; LICs = low-income countries; SVAR = structural vector autoregression. *** $p < 0.01$, ** $p < 0.05$, *$p < 0.1$ significance levels.

TABLE 5 **Regression of the variance of core inflation explained by global core price shocks on country characteristics**

Variables	1	2	3	4	5	6	7
EMDE dummy	0.49***	0.50***	0.49***	0.49***	0.49***	0.39***	0.39***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
LIC dummy	0.38***	0.39***	0.38***	0.38***	0.38***	0.67***	0.80***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Trade openness		0.001			0.001	0.0002	0.0001
		[0.28]			[0.34]	[0.73]	[0.86]
Capital account openness			-0.004		-0.03	-0.09	-0.07
			[0.97]		[0.78]	[0.47]	[0.48]
Pegged exchange rate regime (Pegged XR)				0.04	0.03		
				[0.61]	[0.71]		
Pegged XR*EMDE						0.20**	0.20***
						[0.04]	[0.04]
Pegged XR*LIC						-0.63***	-0.76***
						[0.00]	[0.00]
CB turnover*(1-Pegged XR)*LIC							-0.81
							[0.26]
R square	0.36	0.37	0.36	0.36	0.37	0.46	0.46

Source: Chinn and Ito 2018; Dreher, Sturm, and de Haan 2010; International Monetary Fund; Shambaugh 2004; World Bank.

Note: Each column corresponds to a different regression. The dependent variables (the variance share of global core shocks for domestic core inflation at the 18-month forecasting horizon) are based on a country-specific heterogeneous panel SVAR estimation for 104 countries (24 advanced economies, 61 EMDEs, and 18 LICs). EMDEs here exclude LICs. The LIC dummy equals 1 for any LIC and 0 for any other country. The EMDE dummy equals 1 for any EMDE and 0 for any other country. CB turnover refers to the number of changes in the head of a central bank before the end of a legal term of office, based on Dreher, Sturm, and de Haan (2010). Because of the wider availability of data for this variable, it is used instead of central bank transparency. Exchange rate regimes are based on Shambaugh (2004). The measures of trade and capital account openness are, respectively, trade (exports plus imports)-to-GDP ratios (in percent) and the index compiled by Chinn and Ito (2018). Dependent variables are based on mean values over the country-specific sample periods. The numbers in brackets refer to p-values. CB = central bank; EMDEs = emerging market and developing economies; GDP = gross domestic product; LICs = low-income countries; SVAR = structural vector autoregression; XR = exchange rate. *** $p < 0.01$, ** $p < 0.05$, *$p < 0.1$ significance levels.