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Sectoral Debt and Global Dollar Cycles in Developing Economies

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Sectoral Debt and Global Dollar Cycles in Developing Economies

Prepared by Bada Han,[†] Rashad Ahmed,[‡] Joshua Aizenman,[§] and Yothin Jinjarak[¶*]

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ABSTRACT: We explore the role of sectoral debt dynamics in shaping business cycles in a sample of 52 Emerging Market Economies (EMEs) and Frontier Market Economies (FMEs) from 2005 to 2021. Higher household debt levels and growth are associated with significantly slower GDP growth in more developed EMEs but not in less developed EMEs and FMEs. We also examine the relationship between US dollar cycles, sectoral debt levels and growth, and economic activity. Among developed EMEs, higher expected household debt growth magnifies the impact of US dollar fluctuations on economic activity, with significant but less persistent effects on consumption and more persistent effects on investment. Our empirical findings highlight the important role of household debt dynamics in relatively developed EMEs.

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WORKING PAPERS

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I. Introduction

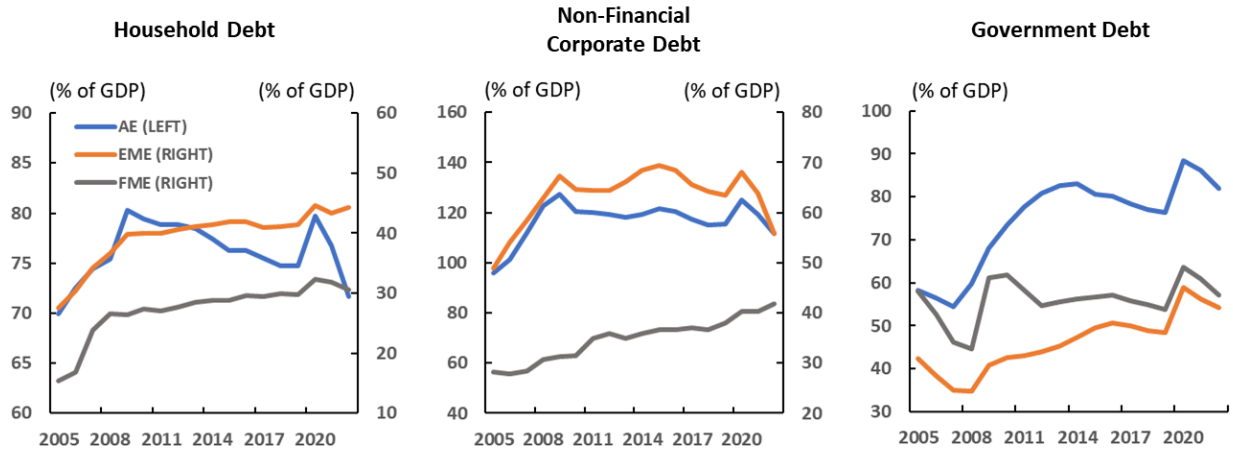
The causal effects of sectoral debt cycles—leveraging and the subsequent deleveraging of households or corporates—on economic growth and other macroeconomic variables have been of great interest in the literature and to policymakers. Furthermore, as observed in Figure 1, many countries experienced unexpected shifts from leveraging to deleveraging over the last several years. While debt levels in many of these countries reached historically high levels during the Covid-19 pandemic due to ultra-expansionary macro policies, aggressive monetary policy tightening by major central banks following the pandemic, in response to global inflation pressures, caused a turnaround of such debt cycles. Given the uncertainty over the global economy and historically high debt levels of the post-pandemic era, the extent to which debt dynamics matter for business cycles and financial stability remains an important and timely research agenda.

Since the Global Financial Crisis in 2008, the literature renewed its investigation of the effects of household debt cycles on economic growth. However, most empirical studies focused on Advanced Economies (AEs). The influential study of Mian et al. (2017) did conduct cross-country analysis covering some Emerging Market Economies (EMEs). However, the number of EMEs in the sample is limited. Thus, the macroeconomic effects of sectoral debt cycles in EMEs or Frontier Market Economies (FMEs) have not been extensively studied in the literature and we try to fill this gap. Furthermore, as in Figure 1, household debt and corporate debt in EMEs and FMEs had risen faster than that in Advanced Economies (AEs) before the pandemic. Since 2021, corporate debt in EMEs fell at a similar pace as AEs, while household debt growth in EMEs has been sluggish. Household and corporate debt growth in FMEs has not significantly slowed down since the pandemic. These elevated debt levels motivate the study of the effects of sectoral debt cycles on the real economy and financial conditions in EMEs and FME.

This paper deploys sectoral-level debt data from the Institute of International Finance (IIF) to empirically explore the association between sectoral debt cycles and economic growth in FMEs and EMEs. Differing from preceding studies such as Cecchetti et al. (2011) and Mian et al. (2017), we contribute along two key dimensions. First, we assess how the relationship between sectoral debt cycles and business cycles in FMEs and EMEs evolve across income-levels. Mian et al. (2017) documented the importance of household debt for economic growth relative to debt of other sectors, and we examine whether such dominance of household debt cycles holds in FMEs and EMEs as well. Second, we analyze how sectoral debt cycles shape economic vulnerability to external shocks. It is widely believed that FMEs or EMEs are more sensitive to global factors, e.g., US financial and dollar cycles. We estimate how the sensitivity of FMEs and EMEs to such global factors interacts with their position within sectoral debt cycles.

We begin by regressing medium-run GDP growth rates on sectoral debt levels and growth. First, we classify the 52 FMEs and EMEs into three groups based on 2011 GDP per capita in USD. The first group of countries contains those with the lowest income levels and the third group contains those with the highest income levels. We find that higher sectoral debt levels and sectoral debt growth over the past three years are negatively associated with lower GDP growth over the following three years. However, the influence of sectoral debt differs across income groups and sectoral debt types. For the highest-income countries, household debt levels and growth are strongly correlated with slower GDP growth, while other sectoral debt types are not. In contrast, there is no such dominance of household debt effects for the other groups. For relatively poor FMEs and EMEs, nonfinancial corporate debt appears to exert more influence on GDP growth than household debt. While prior research suggests that only household debt matters in AEs (Mian et al., 2017), our

Figure 1: Sectoral Debt Trends in the Global Economy



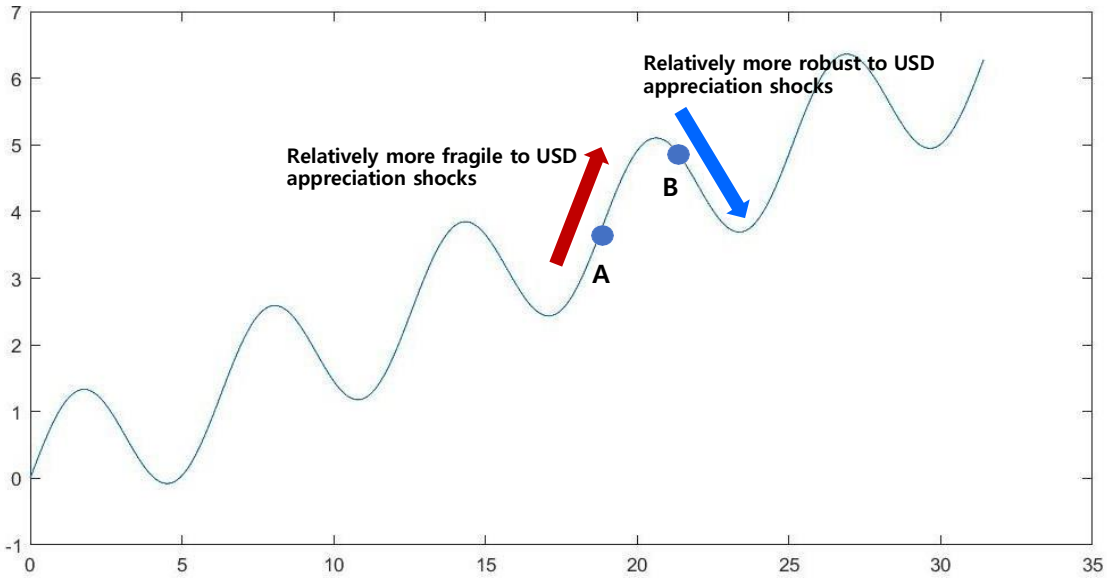
Notes: 1) The figure depicts the evolution of the simple average sectoral debt-to-GDP ratios of 24 Advanced Economies and 35 Emerging Market Economies (EMEs), and 22 Frontier Market Economies (FMEs). 2) The data source is Global Debt Database. 3) The sample AEs are Australia, Austria, Belgium, Canada, Finland, France, Germany, Greece, Hong Kong SAR, Iceland, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, United Kingdom, United States. The sample EMEs are Argentina, Brazil Bulgaria Chile China, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Estonia, Honduras, Hungary, Indonesia, Jordan, Kazakhstan, Korea, Latvia, Lithuania, Malaysia, Malta, Mexico, Nicaragua, Peru, Poland, Romania, Russia, Saudi Arabia, Slovak Republic, Slovenia, South Africa, Thailand, Türkiye, Ukraine, United Arab Emirates. The FMEs are the economies other than AEs or EMEs in Global Debt Database. Economies with corresponding sectoral debt-to-GDP ratios below 20% as of 2019 are also excluded.

findings indicate that such dominance of household debt cycles does not generally hold in FMEs and EMEs, but only in the highest income group.

We interpret the results as reflecting different financial and macroeconomic configurations that vary along income groups and bear different implications for economic growth. The highest-income countries exhibit patterns similar to AEs. As an economy matures, household financing grows more common and mortgage debt becomes a growing share of household debt. These households also take on more leverage and are more exposed to house prices, which makes household consumption and other economic decisions more sensitive to financial conditions. At the same time, the development of equity markets or other financial innovations may incentivize nonfinancial corporates to decrease their leverage or hold more liquid assets such as cash. These strategic adaptations can result in corporate investment decisions becoming less sensitive to fluctuations in financial conditions, as corporates with lower leverage or more cash rely less on debt financing when debt markets become tighten. However, these are our hypotheses, and we are open to different reasonable interpretations.

Next, we analyze how sectoral debt cycles shape economic vulnerability to external shocks. Among various external shocks, we are interested in changing global financial conditions and we choose the US dollar (USD) index as a key global factor since many studies such as Obstfeld and Zhou (2023) and Jiang et al. (2020) view the US dollar as a particularly important external risk factor for FMEs and EMEs. We first examine the relationship between sectoral debt levels and the sensitivity of economic growth to changes in the value of the US dollar (dollar shocks, hereafter). Surprisingly, we find that higher debt levels are associated with lower fragility to dollar shocks. When the US dollar appreciates, GDP growth of high-income EMEs with elevated household debt levels tends to contract less than that of high-income EMEs with low household debt levels. Similarly, results for the lowest-income FMEs show that higher household debt is associated with lower fragility to dollar shocks. We find no discernible relationship between debt levels and vulnerability to dollar shocks for the middle group (Group 2, or relatively poor EMEs).

Figure 2: Sectoral Debt Cycles and Vulnerability to USD Appreciation Shocks



Notes: The figure depicts the association between higher debt growth and fluctuations of the US dollar shocks for the emerging market economy. Economy A is more exposed to dollar fluctuations than Economy B, despite the higher debt level.

To the best of our knowledge, such results have not been reported in the literature. Moreover, the results are at odds with the prediction of standard macro-finance models where more leverage increases vulnerability to negative shocks. One possible explanation of our result is that higher debt levels are confounded with stronger credit demand amid good fundamentals. To investigate the mechanisms behind our result, we show that higher debt levels predict subsequent deleveraging (i.e., slower debt growth). Therefore, the seemingly puzzling result that higher debt levels imply less fragility to dollar shocks may reflect that slower debt growth is associated with lower fragility to dollar shocks.

We rigorously test this hypothesis by first regressing debt growth from year t to year t + 3 on the debt level and other control variables in year t. Then in a second stage regression of GDP growth, we replace the debt level with our measure of projected debt growth. The panel regression using projected debt growth confirms our hypothesis: projected accelerated debt growth (leveraging) is associated with higher fragility to dollar shocks and lower fragility to dollar shocks under slower projected debt growth (deleveraging).

We then estimate local projections to study the dynamics and persistence of such vulnerability to dollar shocks and debt cycles. For the high-income EMEs (Group 3), the combination of US dollar appreciation shocks and higher projected household debt growth persistently drags down GDP growth for several years. The negative impact peaks 2 years after the dollar shock. Given a dollar appreciation shock, each additional 1pp of projected household debt growth is associated with 1.5pp slower GDP growth in year t + 1 and the effect peaks in year t + 2 with a cumulative additional GDP slowdown of 1.7pp for every 1pp of projected household debt growth. Conversely, no clear relationship between expected debt growth and vulnerability to dollar shocks is observed for other groups of EMEs and FMEs, nor for nonfinancial corporate debt. We also examine whether these results using expected debt growth come from its association with other measures of external vulnerabilities such as foreign currency debt, and we confirm they do not.

These results suggest important implications about macro-financial stability and optimal economic policies in FMEs and EMEs. Our empirical analysis suggests that it is debt growth rather than debt levels that matter in shaping vulnerability to dollar shocks or external shocks more broadly. Consider two similar EMEs facing dollar appreciation shocks, but positioned at different phases of their debt cycles, as depicted in Figure 2. One usually thinks that economy B might be hit harder than A by the dollar shock. However, according to our results, economy A might experience more significant vulnerabilities than B as economy B is already deleveraging.

We also estimate local projections on consumption and investment to decompose the channels through which sectoral debt and dollar shocks transmit to economic activity. Higher projected household debt growth is associated with substantial declines in consumption following dollar appreciation shocks and the effects peak two years after the shock, mirroring the responses observed in GDP growth. Additionally, higher projected debt growth is associated with more significant declines in investment following US dollar appreciations with effects peaking 4 to 6 years after the shock. The impact on investment is delayed relative to the impact on consumption but aligns more closely with the dynamics of debt growth. One plausible interpretation of these results is that when facing global dollar appreciation shocks, households intending to raise more debt initially respond by reducing their consumption instead of immediately reducing debt. However, over time, they adjust their debt levels in response to the shock, leading to slower investment by households. However, it is important to note that while this interpretation is consistent with our results, it does not necessarily rule out alternative explanations. Identifying mechanisms more precisely requires further investigation and more detailed data.

Related Literature

This paper is closely connected to the literature on sectoral debt, primarily that on household debt cycles and global financial cycles. These two fields have mostly evolved separately, while our work lies in their intersection.

First, this paper contributes to the literature studying the importance of debt cycles for real economic fluctuations.[1] After the Global Financial Crisis in 2008, there were great efforts to understand the economic consequences of debt deleveraging. Cecchetti et al. (2011) uses cross-country panel regressions to show that higher sectoral debt levels predict slower growth in the medium-run. Similarly, Mian et al. (2017) presented empirical evidence that faster debt growth predicts slower GDP growth in the medium-run and it is household-sector debt that matters most for GDP growth. In a subsequent paper, Mian et al. (2020), the authors documented that economic booms driven by household debt are associated with nondurable consumption goods and therefore concluded that household debt cycles have the causal effect of amplifying business cycles. Other noteworthy papers are Bahadir and Gumus (2016), Lombardi et al. (2017) and Jordà et al. (2022). In particular, Bahadir and Gumus (2016) present empirical evidence on the causal impact of household debt on GDP growth in EMEs. Our contribution to the literature are therefore two-fold. First, we extend the analysis of Mian et al. (2017) to EMEs and FMEs and report that household debt cycles are more influential for GDP growth than corporate debt cycles or government debt cycles, but only for relatively high-income EMEs. Hence, the dominance of household debt in Mian et al. (2017) does not generally hold in EMEs and FMEs but does hold in EMEs that are socioeconomically closest to AEs. Second, we extend the analysis to investigate the relationship between sectoral debt cycles and the transmission of dollar shocks, connecting our work to that on global financial cycles.

[1] 1Discussions in this paragraph are limited to empirical papers in the literature. Another group of papers study credit cycles using structural models include Kiyotaki and Moore (1997) and Geanakoplos (2010).

Second, this paper contributes to the literature on global financial cycles. Rey (2013) and Miranda-Agrippino and Rey (2020) document co-movement among risky asset prices around the world seemingly driven by US monetary policy.[2] Subsequent studies have tried to understand the channels through which shocks from center economies are transmitted to peripheral economies via the global financial cycle. Bruno and Shin (2015) emphasized the interconnectedness between global banks and local banks. Kalemli-Özcan (2019) provided evidence that US monetary policy shocks have larger impacts on EMEs than AEs. Some papers observed that the global financial cycle is closely linked to the US dollar, and thus, global financial cycles are to some extent global dollar cycles. Jiang et al. (2020) and Kekre and Lenel (2021) presented DSGE models where negative (positive) shocks from center economies result in depreciation (appreciation) of the currency of the center economy which resembles the US dollar, and the shocks are subsequently propagated to other economies. More recently, Obstfeld and Zhou (2023) empirically showed that US dollar appreciation (depreciation) dampens (boosts) the growth of EMEs and FMEs, echoing the need for policy coordination among central banks. We contribute to this literature by uncovering how sectoral debt cycles, especially household debt cycles in relatively richer EMEs, interact with the US dollar cycle. To the best of our knowledge, there is no preceding study documenting the moderating role of sectoral debt in the global transmission of dollar shocks.

Roadmap

The remainder of this paper is organized as follows: Section 2 presents the empirical analysis of the relationship between sectoral debt cycles and business cycles in FMEs and EMEs. Section 3 extends the analysis to the relationship between sectoral debt cycles and vulnerability to US dollar shocks. Finally, Section 4 concludes and discusses policy implications.

[2] Another important finding in their papers is that exchange rate flexibility does not significantly insulate an economy from external shocks and thus, the traditional ‘international trilemma’ seems to have been replaced by a dilemma. Our work does not speak on this issue.

II. Sectoral Debt Cycles and Economic Growth

This section examines the relationship between sectoral debt cycles and economic growth in FMEs and EMEs. In particular, we examine whether the effect of household debt on economic growth documented in Mian et al. (2017) holds for FMEs and EMEs.

To see how the relationship between sectoral debt cycles and economic growth varies along income levels (our proxy for economic development), we divide the sample of countries into three different groups according to income levels and separately examine the association of sectoral debt with economic growth for each income-level group.

Data and Sample

The most important data in our empirical analysis is sectoral debt data from the Global Debt Monitor database provided by the Institute of International Finance (IIF). IIF collects information about sectoral debt from national and international sources such as the BIS credit statistics database. The Global Debt Monitor database provides debt-to-GDP ratios of four different sectors: households, nonfinancial corporations, financial corporations, and government from 2005 to 2021. IIF data, such as their capital flow data, are widely used in the international finance literature. We compare the Global Debt Monitor database against national sources for selected EMEs and confirm that the IIF data match reasonably well with national data sources.

We also collect data on economic fundamentals from the World Economic Outlook (WEO) database.[3] Data on trade openness and institutional quality are from the World Bank. The institutional quality indicator is the average of the six World Governance Indicators.[4] Summary statistics for the whole sample and each of the income groups are reported in Table 1.

The Global Debt Monitor database covers 31 EMEs and 28 FMEs. Our sample excludes the highest-income countries whose GDP per capita (purchasing power parity-adjusted in 2017 international dollars) is over 40,000. For the remaining 27 EMEs and 28 FMEs, we exclude 2 FMEs and an EME as there is no data on control variables for these countries.[5] As noted earlier, we divide the EMEs and FMEs into three different groups according to income level. The group of the lowest income is composed of economies with GDP per capita in 2010 international dollars below 7,000. The second group, the median group, contains countries with an income between 7,000 and 15,000. The highest income group contains countries with an income between 15,000 and 40,000. These income thresholds achieve balance across the groups in terms of the number of economies. Hereafter, we call the lowest income group Group 1, and accordingly call the median group and the highest income group Group 2 and Group 3, respectively.[6] The list of the economies in each of the groups is reported in Appendix A. There are 18 economies in Group 1 and 17 economies in Groups 2 and 3.

[3] The database we used is the version of the WEO in October 2022.

[4] Ma and Wei (2020) also took the average of the six indicators as a measure of institutional quality. The six indicators are Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption.

[5] For Papua New Guinea, Grenada, and Trinidad and Tobago, the WEO database does not provide fiscal deficit data.

[6] Group 3 EMEs are composed of mid or high-income EMEs such as Chile, Hungary, and Malaysia. Group 2 EMEs are composed of lower-income EMEs such as Brazil and South Africa.

Table 1: Summary Statistics

	Obs.	Mean	Std.Dev.	Min	p25	p75	Max
Full Sample							
GDP per capita growth	820	2.11	2.75	-9.91	0.32	3.94	12.17
Real GDP per capita	941	13.48	10.35	0.76	4.42	20.00	44.29
Household Debt (% of GDP)	941	19.45	17.60	0.00	6.41	28.58	105.79
Nonfinancial Corp. Debt (% of GDP)	941	33.86	28.51	0.00	12.80	47.04	160.28
Government Debt (% of GDP)	868	50.05	28.21	3.20	31.74	64.45	319.09
Household Debt Growth	773	1.52	3.87	-14.14	-0.28	3.09	21.53
Nonfinan. Corp. Debt Growth	773	2.72	8.18	-23.72	-1.49	6.09	73.37
Government Debt Growth	700	6.10	16.04	-56.56	-0.51	11.37	185.48
Inflation	938	100.28	2231.64	-2.25	2.10	7.87	65374.08
Population Growth	941	0.01	0.01	-0.05	0.01	0.02	0.10
Institutional Quality	924	-0.21	0.57	-1.85	-0.59	0.14	1.21
Fiscal Balance (% of GDP)	941	-3.10	4.17	-30.28	-5.29	-1.04	28.21
Trade Openness (% of GDP)	852	72.92	33.05	20.72	48.38	90.21	203.85
Group 1							
GDP per-capita growth	294	2.97	2.44	-2.46	1.15	4.86	9.03
Real GDP per-capita	334	3.61	1.71	0.76	2.60	4.67	8.51
Household Debt (% of GDP)	334	8.00	8.01	0.37	3.72	7.89	43.70
Nonfinancial Corp. Debt (% of GDP)	334	16.93	15.03	0.04	8.81	19.54	78.25
Government Debt (% of GDP)	330	45.53	22.62	7.28	29.93	57.80	140.21
Household Debt Growth	274	0.51	1.82	-6.41	-0.29	1.20	9.27
Nonfinan. Corp. Debt Growth	274	1.79	4.91	-18.97	-0.87	3.98	17.48
Government Debt Growth	270	5.00	15.77	-56.56	-0.87	10.64	76.05
Group 2							
GDP per-capita growth	266	1.57	3.10	-5.48	-0.46	3.56	11.59
Real GDP per-capita	303	11.65	2.83	5.30	9.97	13.69	19.70
Household Debt (% of GDP)	303	23.96	15.96	1.42	13.21	30.57	90.98
Nonfinancial Corp. Debt (% of GDP)	303	36.06	29.90	0.00	17.06	41.86	160.28
Government Debt (% of GDP)	274	60.05	27.00	18.06	38.24	74.72	146.68
Household Debt Growth	249	2.10	4.85	-14.14	-0.16	3.93	21.53
Nonfinan. Corp. Debt Growth	249	2.92	8.68	-23.72	-1.19	6.71	35.21
Government Debt Growth	220	5.91	14.27	-37.28	-0.65	12.89	67.22
Group 3							
GDP per-capita growth	260	1.67	2.45	-9.91	0.25	3.41	12.17
Real GDP per-capita	296	26.50	6.73	13.72	21.11	31.07	44.29
Household Debt (% of GDP)	296	28.26	19.92	3.11	13.87	37.21	105.79
Nonfinancial Corp. Debt (% of GDP)	296	51.24	27.86	2.64	27.15	73.10	113.69
Government Debt (% of GDP)	256	41.77	23.12	3.20	25.61	55.02	154.39
Household Debt Growth	245	2.07	4.23	-11.83	-0.19	4.43	15.03
Nonfinan. Corp. Debt Growth	245	3.44	10.25	-14.04	-2.73	7.00	73.37
Government Debt Growth	205	5.99	11.51	-14.79	-0.42	9.63	89.83

Notes: 1) Annual data from 2005 to 2021. The list of the countries in each of the groups is relegated to appendix A. 2) GDP per capita growth is a three-year average. 3) Real GDP per capita is the real GDP per capita based on 2017 US dollars computed by the IMF (WEO database, 2022 Oct.). 4) Debt growth is the 3-year change in debt-to-GDP ratio. 5) Institutional quality is the average of the six indices in the World Governance Index from The World Bank.

To test the robustness of the country groups, we also considered grouping the countries according to average income levels. It turns out that the list of the countries in each of the groups is nearly the same as our original group. Among the three groups, it is hard to compare Group 1 FMEs against Group 2 and 3 EMEs as some of the FMEs are very underdeveloped and the level of sectoral debt is too low such that it is difficult to expect that sectoral debt dynamics play an important role in those economies. However, it is meaningful to include Group 1 FMEs in the empirical analysis to provide a frame of reference across income groups.

Empirical Strategy

The econometric analysis in this section builds on Mian et al. (2017) and Cecchetti et al. (2011), which analyze the relationship between sectoral debt and economic growth using parsimonious empirical frameworks. The regression equation illustrated below is a minor modification of the panel regressions in Mian et al. (2017). Thus, following Mian et al. (2017), we investigate the relationship between sectoral debt growth and economic growth by regressing three-year average GDP growth rates on debt growth over the past three years. More specifically, we estimate equation (1) below:

$$\Delta_3 y_{it+3} = \alpha_i + \alpha_t + \beta_{HH}\Delta_3 d_{it}^{HH} + \beta_{NFC}\Delta_3 d_{it}^{NFC} + \gamma Y_{it} + X_{it}'\Gamma + \varepsilon_{it}, \quad (1)$$

where Δy_{it+3} is the average growth rate of GDP per capita from year t to year t +3 of country i and $\Delta_3 d_{it}$ is the growth of each type of sectoral debt (household, nonfinancial corporate) measured as the change in the debt-to-GDP ratio from year t − 3 to year t. Throughout this paper, $\Delta_k x_{t+j}$ indicates $x_{t+j} - x_{t+j-k}$. The vector X_{it} includes control variables commonly used in the literature, such as trade openness (trade volume as a percent of GDP), annual CPI inflation, population growth, fiscal balance as a percent of GDP, and institutional quality. We also include the GDP per capita level in year t, Y_{it}, as neoclassical growth theory predicts a negative relationship between income levels and growth rates. While we follow various preceding papers, we particularly refer to Bergant et al. (2020), Bornhorst and Arranz (2014), and Obstfeld and Zhou (2023). Parameters α_i and α_t are country and year fixed effects. Our specification differs from Mian et al. (2017) which did not include year fixed effects but unlike Mian et al. (2017), our sample is composed of FMEs and EMEs whose business cycles are relatively sensitive to global conditions. We obtain similar results without year-fixed effects so long as the regression is augmented with time-varying global factors.

Please note that the coefficient on debt growth, β, is expected to be negative as the positive debt growth in the past—leveraging in the past—predicts negative GDP growth—deleveraging—in the future. We estimate equation (1) for the whole sample and for each of the groups. We use Driscoll-Kraay standard errors to account for the presence of heteroskedasticity and correlated errors across countries and over time.

Results

The results from regressions of GDP growth on sectoral debt growth are reported in Table 2. For the whole sample, both nonfinancial and household debt cycles matter although the size of the coefficient is much larger for household debt. The dominance of the household debt cycle mostly appears in Group 3, the highest income group. The coefficient on household debt growth is negative and significant only for Group 3 and nonfinancial corporate debt growth turns out to be significant only for Group 3 as well (column (4)). However, the significance of nonfinancial corporate debt growth is lost once year-fixed effects are removed (column (6)).

The channels through which debt cycles matter for economic growth in FMEs and EMEs might be different from AEs. Some FMEs and EMEs face much higher risk of economic crisis and thus the tail risk reflected in debt levels may affect economic growth even during non-crisis periods. More importantly, the cyclicality of sectoral debt in FMEs and EMEs may differ from that in AEs. That is, positive (negative) debt growth in the past three years may not significantly predict deleveraging (leveraging) in the future. This motivates the following estimation.

$$\Delta_3 y_{it+3} = \alpha_i + \alpha_t + \beta_{HH} D_{it}^{HH} + \beta_{NFC} D_{it}^{NFC} + \beta_{Govt} D_{it}^{Govt} + \gamma Y_{it} + X_{it}' \Gamma + \varepsilon_{it}, \quad (2)$$

where D_{it} is the level of the debt-to-GDP ratio in year t. Hence, we replace debt growth with debt levels. We include the government debt-to-GDP ratio as well to account for sovereign risk. Estimates from equation 2 are reported in Table 3.

The results are similar to those from the regressions using debt growth (Table 2). Household debt is dominant in terms of its importance for business cycles in Group 3 EMEs, whereas such dominance is not clearly observed in Group 2 EMEs and FMEs. High household debt levels predict lower growth rates in Group 1 FMEs, similar to Group 3 EMEs, and high nonfinancial corporate debt levels predict slower growth in Group 2 and Group 3 EMEs.

The significance of household debt levels for Group 1 and nonfinancial corporate debt for Group 2 might reflect some tail risk in the debt level or differential debt cyclicality, e.g., high debt levels predict slower growth in the future, whereas high debt growth in the past does not. Overall, the results suggest that the predictive power of household debt for economic growth in Mian et al. (2017) is present in relatively high-income EMEs, but not in low-income FMEs or EMEs.

Interpretation of the results

Among the three different groups of countries, only the highest income group shows empirical patterns consistent with household debt shaping economic growth as documented in Mian et al. (2017). The results for the lowest income group are not fully consistent with household debt dominance because of the insignificance of household debt growth in Table 2 (and local projections that we present in subsequent sections). Furthermore, the average household debt-to-GDP ratio in Group 1 economies is quite low at 8% and therefore it is less likely that household debt dynamics play an important role in business cycles for those economies.[7]

[7] The average household debt-to-GDP ratio in Group 2 is 24.0% and the average of Group 3 economies is 27.8%.

Table 2: Sectoral Debt Cycles and GDP Growth

	(1)	(2)	(3)	(4)	(5)	(6)
Group	All	# 1	# 2	# 3	# 2	# 3
Household debt growth	-0.056***	0.041	0.057**	-0.165***	0.022	-0.175***
	(0.011)	(0.108)	(0.020)	(0.021)	(0.017)	(0.021)
Nonfin. corp. debt growth	-0.015***	-0.007	-0.015	-0.018*	-0.012	-0.013
	(0.004)	(0.032)	(0.014)	(0.010)	(0.017)	(0.008)
GDP per-capita	-0.319**	-2.119***	-0.751***	-0.319**	-0.783***	-0.172*
	(0.125)	(0.492)	(0.183)	(0.120)	(0.156)	(0.086)
Inflation	-0.006	0.010	-0.020	-0.059	-0.027	-0.116***
	(0.014)	(0.026)	(0.020)	(0.037)	(0.024)	(0.027)
Population growth	-16.612	30.026	-24.949	5.912	-20.047	-0.344
	(10.488)	(24.215)	(18.455)	(7.137)	(14.925)	(9.890)
Institutional quality	0.966	4.311***	-1.123	2.900***	-0.025	4.015***
	(0.892)	(0.879)	(1.991)	(0.856)	(1.584)	(0.375)
Fiscal balance	0.091**	0.165*	0.112***	-0.030	0.128***	-0.063
	(0.038)	(0.082)	(0.018)	(0.077)	(0.019)	(0.064)
Trade openness	0.024***	-0.030***	0.044***	0.043***	0.038***	0.048***
	(0.005)	(0.008)	(0.012)	(0.002)	(0.004)	(0.004)
Dollar shock					-4.270***	-4.596***
					(0.881)	(0.897)
World GDP shock					1.188***	1.139***
					(0.062)	(0.226)
Observations	590	202	199	189	184	172
R-squared	0.112	0.258	0.306	0.366	0.572	0.533
Country FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	NO	NO

Notes: 1) The debt growth is the change of debt-to-GDP ratio between year t and t – 3. All other variables are as in year t . The dependent variable is the GDP per capita growth from year t to year t+3 . 2) 3) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 4) Reported in brackets are Driscoll-Kraay standard errors.

Table 3: Sectoral Debt Levels and GDP Growth

	(1)	(2)	(3)	(4)	(5)	(6)
Group	All	# 1	# 2	# 3	# 2	# 3
Household debt level	-0.013*	-0.139***	0.040*	-0.068***	0.030	-0.085***
	(0.007)	(0.042)	(0.020)	(0.011)	(0.021)	(0.011)
Nonfin. corp. debt level	-0.024***	0.084***	-0.053***	-0.023***	-0.050***	-0.020***
	(0.004)	(0.018)	(0.014)	(0.005)	(0.014)	(0.006)
Government debt level	-0.023	-0.066***	-0.015*	0.036***	-0.006	0.073***
	(0.013)	(0.011)	(0.007)	(0.008)	(0.009)	(0.012)
GDP per-capita	-0.347***	-1.979***	-0.408*	-0.311**	-0.390	-0.123
	(0.056)	(0.288)	(0.209)	(0.115)	(0.232)	(0.072)
Inflation	-0.026	0.026*	0.001	-0.070***	-0.011	-0.112***
	(0.019)	(0.013)	(0.017)	(0.020)	(0.015)	(0.030)
Population growth	-18.226**	26.532	-35.991*	-17.369**	-27.762	-19.772**
	(7.324)	(30.689)	(17.533)	(6.044)	(15.830)	(8.074)
Institutional quality	-0.298	0.840**	-0.572	0.307	-0.328	0.493
	(0.585)	(0.349)	(0.751)	(1.172)	(0.806)	(1.641)
Fiscal balance	0.062***	0.081***	0.121***	0.141**	0.138***	0.106**
	(0.016)	(0.014)	(0.021)	(0.064)	(0.019)	(0.048)
Trade openness	0.012*	-0.024**	0.042***	0.020*	0.036***	0.019
	(0.006)	(0.009)	(0.004)	(0.010)	(0.003)	(0.011)
Dollar shock					-5.115***	-1.992
					(0.738)	(1.484)
World GDP shock					1.272***	1.312***
					(0.045)	(0.079)
Observations	736	253	249	234	234	217
R-squared	0.225	0.349	0.305	0.291	0.580	0.521
Country FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	NO	NO

Notes: 1) The debt levels and all other variables are as in year t . The dependent variable is the GDP per capita growth from year t to t+3 . 2) 3) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 4) Reported in brackets are Driscoll-Kraay standard errors.

Why do we see the dominance of household debt in the richest group? Perhaps the tight link between household debt cycles and business cycles reflects "financialization" of these economies. As incomes grow, the desire for homeownership may grow along with mortgage lending. As the share of mortgage lending in bank assets grows and as household debt-to-income rises, the economic activity of households and financial intermediation activities both become more dependent on house prices, which in turn depends on the dynamics of household leverage.

In a similar context, why do nonfinancial corporate debt dynamics in Group 3 become insignificant for business cycles, while nonfinancial corporate debt dynamics seem to matter for Group 2 economies? As an economy matures, firm managers may become conservative and hold more liquid assets like cash. Consistent with this, Bruno and Shin (2020) document that nonfinancial corporates in EMEs behave like financial corporates, and are therefore exposed to various macroeconomic risks. Our results can be reconciled with the findings of these preceding papers if the significance of nonfinancial corporate debt dynamics implies relatively risky behavior of corporations. In contrast, the loss of significance of nonfinancial corporate debt for the relatively richer EMEs might suggest that such risky behaviors disappear as an economy matures and as corporate behavior becomes more conservative as it is in AEs.[8] As illustrated in Jorda et al. (2022), it is also probable that the development of corporate debt restructuring processes dampen the effects of corporate debt cycles on business cycles in relatively developed EMEs since these economies might have developed better institutions.[9]

III. Sectoral Debt and Vulnerability to the Global Dollar Cycle

This section extends the last section's analysis to the relationship between sectoral debt cycles and vulnerability to external shocks. FMEs and EMEs are commonly regarded as vulnerable to external shocks, in particular global dollar cycles. Understanding the channels through which global shocks affect financial markets and the real economy in FMEs and EMEs is an active area of research in the international finance and macroeconomics literature. Furthermore, the information on how sectoral debt cycles relate to transmission channels of global shocks should be useful in designing optimal macroprudential policies in FMEs and EMEs.

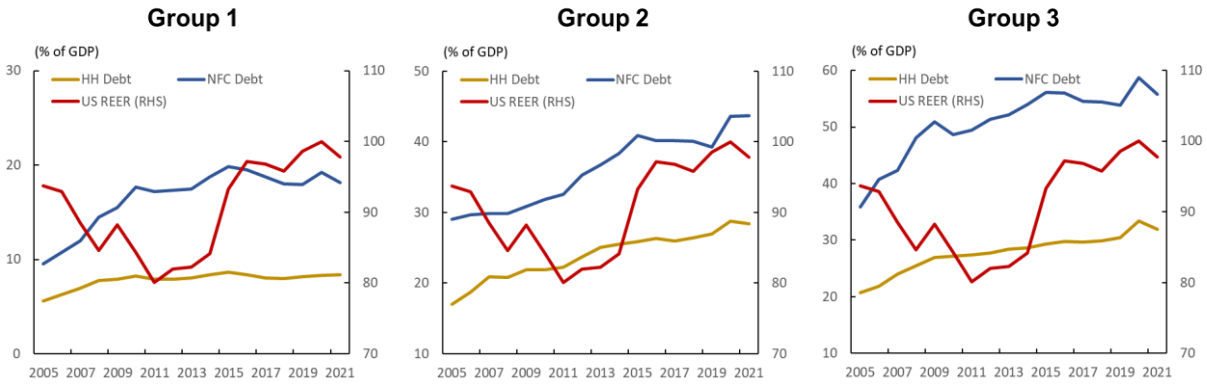
For this purpose, we first examine the relationship between debt levels and the impact of dollar fluctuations on economic activity in FMEs and EMEs. Figure 3 traces the evolution of the US dollar index and household and nonfinancial corporate debt in the three groups of FMEs and EMEs. Then, we adopt a two-stage least square estimation approach to explain the first set of empirical results as it reveals some novel insights. Lastly, we deploy local projections following Jordà (2005) to better understand the dynamics of the interaction between sectoral debt and dollar cycles.

Before proceeding with our analysis, we note that our study differs from previous studies in that we examine the impact of dollar cycles on the economic growth of FMEs and EMEs in medium-run. As such, we use annual frequency data. Therefore, the results from previous studies that use quarterly data do not necessarily apply to our analysis.

[8] In fact, a vast literature in corporate finance documents that many large firms in US have increasingly held cash since the 1980s. See Chen et al. (2017).

[9] If the debt restructuring process dampens corporate debt cycle effects on growth in the short-run or medium-run, the negative effects of high corporate debt would be realized over a longer horizon.

Figure 3: US dollar Index and Private Sectoral Debts in FMEs and EMEs



Notes: The figure shows the movements of US dollar index and private sectoral debt—household and nonfinancial corporate debt—in the three groups of FMEs and EMEs. The US dollar index is the real US dollar index in December of each year. The value of 2005 is the value of January 2006, as the dollar index series begins from 2006 at monthly frequency. Sectoral debt levels are the simple averages of country debt levels within each group.

Debt Levels and the Impact of Dollar Cycles on FMEs and EMEs

To examine the relationship between sectoral debt and fragility to global shocks, we first need to choose a global factor that is an important driver of economic and financial conditions in FMEs and EMEs. Among various options, we consider the log difference of the US dollar index (which we refer to as 'dollar shocks') to capture changes in the "global dollar cycle".[10] It is well known that the US dollar index reflects global financial conditions (Jiang et al., 2020)[11] and US dollar appreciation shocks predict economic downturns in FMEs and EMEs (Obstfeld and Zhou, 2023). Here, it is important to note that the transmission of dollar shocks is not limited to the balance sheet channel and thus, the presence of net US dollar debt in FMEs and EMEs is not a necessary condition for dollar shocks to significantly impact the rest of the world. The dollar index moves in tandem with global risk appetite and thus may affect FMEs and EMEs through various channels; e.g., capital outflows or wider spreads on external debt.[12] We include year-fixed effects in our baseline regression equations for the reasons we discussed in the last section. However, the main results introduced below are not substantially altered when year-fixed effects are excluded so long as additional global factors such as world GDP growth or commodity prices are included.

[10] Other possible global financial factors include the Cboe VIX as in Rey (2013). However, we find that the annual-frequency VIX loses much of its most important variation outside the 2008 global financial crisis. Similar issues arise when considering measures of US monetary policy shocks as the global factor.

[11] Thus, we use the dollar index as a proxy of the global financial cycle.

[12] Several recent papers documented that changes in global financial conditions, i.e., global financial shocks, significantly influence EMEs through equity and local currency bond flows. See Bertaut et al. (2021), Hofmann et al. (2022), Cavallino and Hofmann (2022), and Han (2023).

Table 4: Sectoral Debt Levels and Vulnerability to Dollar Cycles

	(1)	(2)	(3)	(4)	(5)	(6)
Group	# 1	# 2	# 3	# 1	# 2	# 3
Household debt level	-0.148***	0.023	-0.081***			
	(0.041)	(0.027)	(0.011)			
Household debt level · dollar shock	0.127**	0.138	0.245***			
	(0.050)	(0.095)	(0.056)			
Nonfin corp debt				0.015	-0.054***	-0.015
				(0.017)	(0.016)	(0.009)
Nonfin corp debt level · dollar shock				0.218***	-0.015	0.105***
				(0.029)	(0.025)	(0.023)
GDP per-capita	-1.988***	-0.626**	-0.439**	-2.100***	-0.236	-0.456***
	(0.242)	(0.213)	(0.152)	(0.292)	(0.235)	(0.145)
Inflation	0.012	-0.011	-0.097***	-0.000	0.001	-0.095***
	(0.018)	(0.018)	(0.031)	(0.023)	(0.017)	(0.025)
Population growth	3.897	-22.236	-19.726**	0.736	-29.854*	-23.531***
	(31.995)	(15.125)	(6.643)	(31.267)	(14.048)	(5.956)
Institutional quality	3.500***	-0.108	0.074	3.638***	-0.540	-0.278
	(0.505)	(0.811)	(1.502)	(0.470)	(0.802)	(1.302)
Fiscal balance	0.090***	0.132***	0.162**	0.088**	0.139***	0.175**
	(0.027)	(0.011)	(0.059)	(0.034)	(0.018)	(0.066)
Trade openness	-0.029***	0.045***	0.023***	-0.033***	0.041***	0.022*
	(0.006)	(0.004)	(0.006)	(0.007)	(0.004)	(0.012)
Observations	236	235	226	236	235	226
R-squared	0.267	0.265	0.319	0.279	0.287	0.282
Country FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Notes: 1) The dependent variable is the GDP per capita growth between year t + 3 and t . 2) Dollar shock is the log-difference between year t and t + 3. 3) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 4) Reported in brackets are Driscoll-Kraay standard errors.

We build our specification by revising equation (2) to include an interaction term of dollar cycles with debt levels:

$$\Delta_3 y_{it+3} = \alpha_i + \alpha_t + \delta_\tau D_{it}^\tau + \beta_\tau D_{it}^\tau \Delta_3 USD_{t+3} + \gamma Y_{it} + X_{it}'\Gamma + \varepsilon_{it}, \quad (3)$$

where $\tau \in \{HH,\ NFC\}$ and $\Delta_3 USD_{t+3}$ indicates the log-difference of US dollar index from year t to year t + 3.

The results are reported in Table 4. The interaction terms are significant for Group 1 and Group 3. Interestingly, the sign of the coefficients of the interaction terms is positive. That is, the negative effects of US dollar appreciation are weaker in EMEs with high household debt levels. This contrasts the usual perception that higher debt levels are associated with greater fragility to external shocks. Furthermore, this result contrasts theoretical predictions as well. Most macro-finance models predict that higher leverage raises vulnerability to external shocks.

Two-Stage Least Square Estimation

Somewhat puzzling is the result from Table 4 showing that US dollar appreciations predict stronger GDP growth under higher debt levels than under lower debt levels. One possible explanation to reconcile this result is that higher debt levels today predict slower future debt growth. In the last section, we observed that the debt growth regressions (equation (1)) and debt level regressions (equation 2)) show that higher debt levels predict slower (or negative) GDP growth in the future, which might indicate that higher debt levels predict slower debt growth in the future. Then, it might be that US dollar appreciations are predicting stronger (weaker) GDP growth under slower (faster) future debt growth that happens to be confounded with current high (low) debt levels.

To examine this hypothesis, we conduct a form of two-stage least square estimation. We first regress future debt growth on contemporaneous debt levels and other control variables. That is,

$$\Delta_3 d_{it}^\tau = \alpha_i + \alpha_t + \delta_\tau D_{it}^\tau + \beta_\tau D_{it}^\tau + \gamma Y_{it} + X_{it}'\Gamma + \varepsilon_{it}, \quad (4)$$

where $\tau \in \{HH,\ NFC\}$.

Please note that the dependent variable is debt growth from year t to year t + 3. Fitted values from equation (4) give us the predicted debt growth from year t to year t + 3. Denoting the predicted value by $\Delta_3 \hat{d}^\tau{}_{it}$, we estimate the following equation.

$$\Delta_3 y_{it+3} = \alpha_i + \alpha_t + \delta_\tau \Delta_3 \hat{d}_{it}^\tau + \beta_\tau \Delta_3 \hat{d}_{it}^\tau \Delta_3 USD_{t+3} + \gamma Y_{it} + X_{it}'\Gamma + \varepsilon_{it}, \quad (5)$$

where $\tau \in \{HH,\ NFC\}$.

In such an estimation procedure, we treat the debt level as an instrument for debt growth. However, it does not satisfy the conditions required of a valid instrument because debt levels are unlikely to satisfy the exclusion restriction. This approach, however, can still help us distinguish between different mechanisms at play, which we cannot separate in estimations using current debt growth. For instance, this approach can shut down much of the influence of GDP growth on debt growth, thereby reducing estimation bias arising from reverse causality. More importantly, the use of predicted debt growth can mute the effects of contemporaneous shocks in the future that can affect both GDP growth and demand, e.g., positive TFP shocks that raise both productivity and demand for debt.

Table 5: Sectoral Debt Cycles and Vulnerability to Dollar Cycles_2SLS Estimation

	(1)	(2)	(3)	(4)	(5)	(6)
Group	# 1	# 2	# 3	# 1	# 2	# 3
Projected HH debt growth	0.183***	-0.046	0.219***			
	(0.050)	(0.076)	(0.026)			
Projected HH debt growth	-0.169**	-0.657**	-0.656***			
· dollar cycle	(0.074)	(0.266)	(0.079)			
Projected NFC debt growth				-0.023	0.086***	0.024
				(0.024)	(0.026)	(0.015)
Projected NFC debt growth				-0.271***	0.003	-0.175***
· dollar cycle				(0.057)	(0.033)	(0.020)
GDP per-capita	-2.016***	-0.544***	-0.500***	-2.300***	-0.451**	-0.461***
	(0.251)	(0.139)	(0.151)	(0.323)	(0.177)	(0.143)
Inflation	0.023	-0.010	-0.071**	-0.006	0.032*	-0.096***
	(0.018)	(0.019)	(0.033)	(0.021)	(0.016)	(0.027)
Population growth	-1.456	-27.166	-21.708***	2.169	-28.453*	-22.389***
	(31.976)	(18.556)	(6.601)	(30.856)	(13.860)	(5.818)
Institutional quality	3.224***	0.093	0.027	3.825***	-0.751	-0.019
	(0.521)	(0.862)	(1.404)	(0.437)	(0.905)	(1.401)
Fiscal balance	0.086***	0.131***	0.180***	0.091**	0.114***	0.185***
	(0.026)	(0.010)	(0.057)	(0.034)	(0.020)	(0.058)
Trade openness	-0.029***	0.047***	0.051***	-0.030***	0.053***	0.024*
	(0.006)	(0.004)	(0.008)	(0.007)	(0.003)	(0.013)
Observations	236	235	226	236	235	226
R-squared	0.267	0.280	0.332	0.286	0.287	0.295
Country FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Notes: 1) The dependent variable is the GDP per capita growth between year t + 3 and t Projected HH debt growth is projected household debt growth between year t and year t+3 based on information in year t, and similarly for Projected NFC debt growth. All other variables are as in year t. 2) Dollar shock is the log-difference between year t and t + 3. 3) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 4) Reported in brackets are Driscoll-Kraay standard errors.

The results are reported in Table 5. In the text, we only introduce the second-stage regression results, and the first-stage regression results are relegated to Appendix B. We expect that projected debt growth has positive effects on GDP growth, while the interaction terms of projected debt growth with dollar shocks have negative signs: dollar appreciation shocks when debt is projected to grow faster have a larger negative impact on GDP growth.

The results for household debt for Group 1 and 3 in columns (1) and (3) are consistent with our predictions. In particular, the results of Group 3 help us reconcile the results from the debt level regressions in Table 4 which imply that higher debt levels are associated with weaker transmission of global dollar appreciation in relatively developed EMEs. This is because higher debt levels may reflect slower or negative debt growth (deleveraging) in the future, which we capture with our projected debt growth variable. In other words, higher debt levels may appear to insulate EMEs from dollar shocks because higher debt levels today are confounded with slower debt growth tomorrow. And it is slower expected debt growth that helps insulate EMEs from dollar shocks. Below we estimate local projections in a similar fashion to equation (5) to better understand the time profile of these effects.[13][14]

Local Projection

This subsection extends the analysis by estimating local projections to uncover the dynamic responses of EMEs to dollar shocks and how they interact with debt growth projections. We focus our results on Group 2 and Group 3 for illustrative purposes as these groups have relatively larger debt.[15]

We estimate the following equation for the type τ sectoral debt for each of Group 2 and Group 3:

$$\Delta_h y_{it+h} = \alpha_i + \delta_\tau \Delta_3 \hat{d}_{it}^{\tau} + \beta_\tau \Delta_3 \hat{d}_{it}^{\tau} \Delta_1 USD_{t+1} + \mu_0 IR_{it} \Delta_1 USD_{t+1} + \mu_1 1_{com} \Delta_1 Com_{t+1} + \gamma Y_{it} + X_{it}' \Gamma + \theta_0 \Delta_1 USD_{t+2} + \theta_1 \Delta_1 USD_{t+1} + \theta_2 \Delta_1 y_{t+1}^{World} + \theta_3 \Delta_1 Com_{t+1} + \varepsilon_{it+h}, \quad (6)$$

where $\tau \in \{HH,\ NFC\}$ and we augment the regressions with additional global factor variables and remove the the year-fixed effects as follows: $\Delta_1 y_{t+1}^{World}$ is the world GDP growth from year t to t +1, Com_{t+1} is the log-difference of the commodity price index from year t to t + 1,[16] and 1_{com} is the indicator function of commodity exporters.[17] We also include international reserves-to-GDP ratios and its interaction with dollar shocks because international reserves serve an important role in absorbing external shocks in EMEs.[18] Since we are only interested in the dynamic response of GDP per capita growth to dollar "shocks", we estimate equation (6) using changes in the dollar index between year t + 1 and year t ($\Delta_1 USD_{t+1}$) instead of longer-term changes which may capture persistent trends in the dollar.

[13] The correlation between debt levels and predicted debt growth is low (around -0.2). Thus, the results do not merely reflect the correlation between economic growth and debt levels.

[14] In the table, we present the results with time-fixed effects. However, we have similar results after replacing year-fixed effects with world GDP growth.

[15] In unreported results, we estimated local projections for Group 1 FMEs. However, no sensible relationship between the expected debt growth and the impact of dollar shocks is found.

[16] We use the commodity price index provided by IMF.

[17] Exporters in Group 2 are South Africa, Brazil, Colombia, Ecuador, El Salvador, Dominica, Jamaica, Jordan, Sri Lanka, Angola, Tunisia, Ukraine, Mongolia. Exporters in Group 2 are Argentina, Chile, Costa Rica, Oman, Kazakhstan, Russia.

[18] See the empirical results in Han (2023) and Devereux and Wu (2022).

Our baseline estimation does not include year-fixed effects as it makes it difficult to interpret local projection results. Instead, we include global factors to help absorb common variation across countries, and we also control for future dollar shocks as our dollar shocks are autocorrelated.[19] However, the results do not change significantly when we use year-fixed effects in place of the global factors.

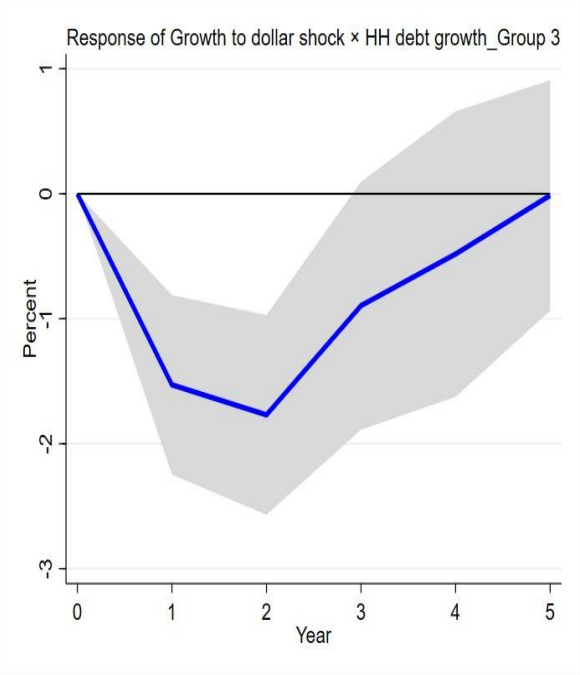
The key result of interest from the local projections are the coefficients on the interaction of the dollar shock with projected debt growth. These can be interpreted as cumulative impulse response functions, presented in Figure 4. Overall, the results correspond well to our hypothesis and previous results. The first two panels at the top in Figure 4 describe how the medium-run impact of dollar shocks on GDP growth varies with expected household and NFC debt growth for countries in the set of Group 3 EMEs. In subfigure (a) in the top-left panel, every 1pp increase in expected household debt growth among Group 3 EMEs implies 1.5pp slower GDP growth in year t + 1 following a dollar appreciation shock in the same year, and this effect peaks in year t + 2 at 1.7pp slower GDP growth. In the subfigure (b) in the top-right panel, we can see that expected nonfinancial corporate debt growth also significantly affects the transmission of dollar shocks in year t + 1. For each additional 1pp of expected nonfinancial corporate debt growth, GDP growth is expected to slow by 0.3pp more in year t + 1 following a dollar appreciation shock in the same year but the effect of nonfinancial corporate debt on dollar shock transmission becomes insignificant by year t+2. Therefore for Group 3 EMEs, an increase in projected household debt growth amplifies the transmission of dollar shocks to a larger extent than an increase in projected nonfinancial debt growth, and these effects are also more persistent with respect to projected household debt growth.

The two panels at the bottom of Figure 4 describe the same local projections but for Group 2 EMEs. In the subfigure (c) at the bottom-left, no significant relationship is observed for the role of expected household debt growth in the transmission of dollar shocks. In the subfigure (d) at the bottom-right, we find positive effects of higher expected nonfinancial corporate debt growth on the transmission of dollar shocks in year t + 1. However, these effects are short-lived. We report the full results of the local projections in Appendix B.

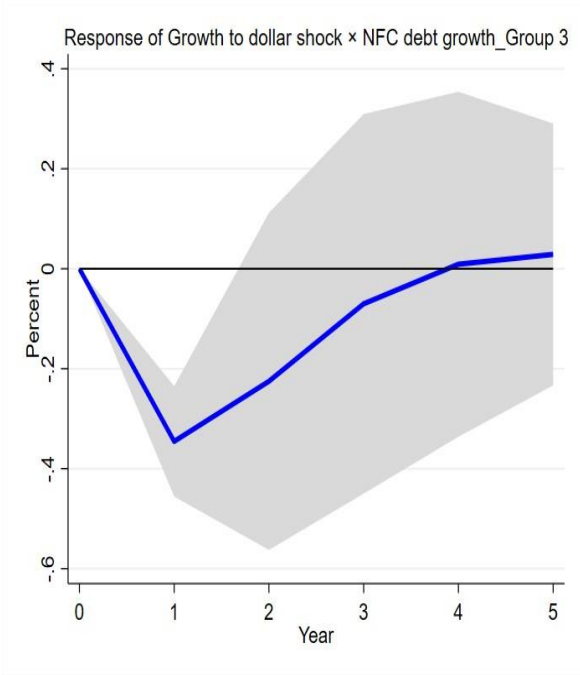
[19] We followed this recommendation from lecture notes by Oscar Jorda.

Figure 4: Impulse Response Functions of GDP to Expected Debt Growth × Dollar Appreciation Shocks

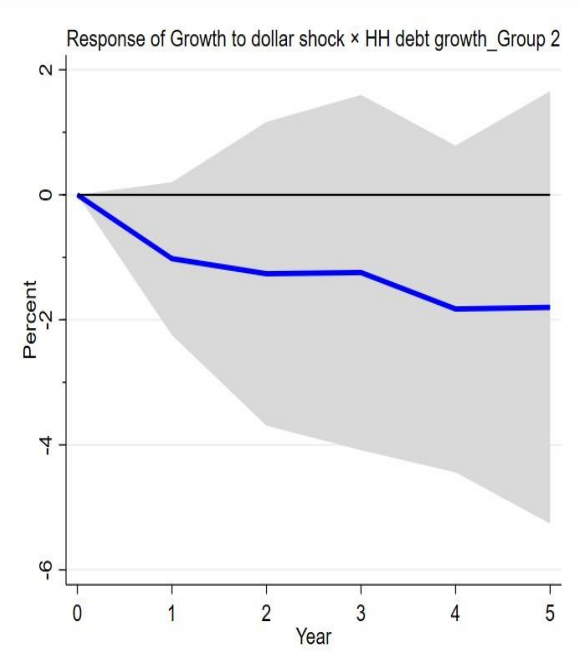
(a) Household Debt in Group 3



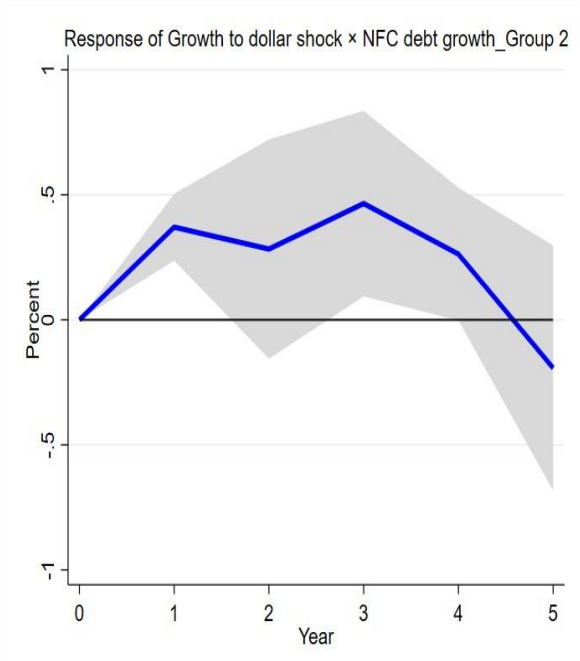
(b) Nonfin. Corp. Debt in Group 3



(c) HH Debt in Group 2



(d) Nonfin. Corp. Debt in Group 2



Notes: The figures describe the cumulative responses of GDP per capita growth to the interaction term of dollar shocks and expected debt growth. The gray area shows the 90% confidence interval.

Further Investigation of the Role of Sectoral Debt in the Transmission of Dollar Shocks

In this subsection, we explore further channels through which expected debt growth affects the transmission of dollar shocks. Specifically, we examine how macroeconomic aggregates such as realized debt growth, consumption and investment growth react to the dollar shocks and how this reaction is affected by projected debt growth.

We then suggest potential mechanisms based on the empirical findings. However, we abstain from claiming a specific causal channel as that would require more granular data than the aggregates we consider in this analysis. We focus our analysis on Group 3 EMEs as the role of expected debt growth in the transmission of dollar shocks is most prominent for this group of economies. We report the impulse responses and relegate detailed results to Appendix B.

The impact on the realized debt growth

One of the plausible explanations for the role of expected debt growth in the transmission of dollar shocks to GDP growth is that dollar shocks lead to stronger debt deleveraging under the expectation of faster debt growth. For instance, US dollar appreciation shocks may lead to slower household debt growth, and the magnitude of the slowdown is larger when households are planning to raise more debt *ex-ante*. To examine this hypothesis, we estimate the equation below where the dependent variable is realized household debt growth. Despite the limited number of observations, we set h to be up to 8 years to estimate more persistent effects as credit cycles tend to be long-lived:

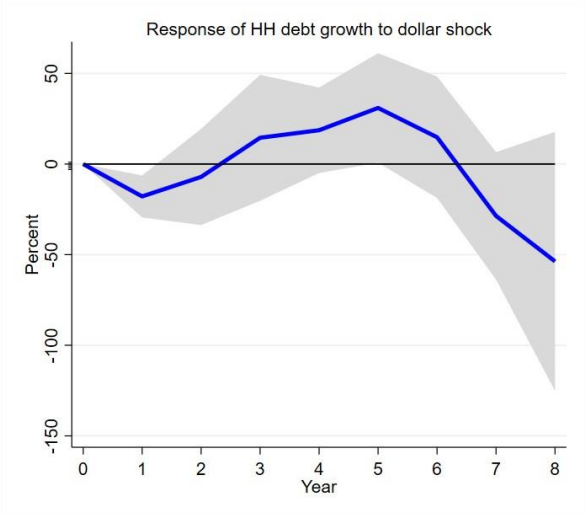
$$\Delta_h d_{it+h} = \alpha_i + \delta_\tau \Delta_3 \hat{d}^{\tau}_{it} + \beta_\tau \Delta_3 \hat{d}^{\tau}_{it} \Delta_1 USD_{t+1} + \mu_0 IR_{it} \Delta_1 USD_{t+1} + \mu_1 1_{com} \Delta_1 Com_{t+1} + \gamma Y_{it} + X'_{it}\Gamma + \theta_0 \Delta_1 USD_{t+2} + \theta_1 \Delta_1 USD_{t+1} + \theta_2 \Delta_1 y^{World}_{t+1} + \theta_3 \Delta_1 Com_{t+1} + \varepsilon_{it+h}. \quad (7)$$

The coefficient of interest is the estimate of the interaction term between dollar shocks and expected debt growth. The results of the estimation are reported in Figure 5. Higher expected debt growth significantly amplifies the negative transmission of dollar shocks to realized debt growth. On the left panel in Figure 4, we can see dollar shocks themselves have no significant effects on realized debt growth. However, the right panel shows that EMEs with higher expected household debt growth realized significantly slower future household debt growth following a dollar appreciation shock.[20] What is interesting is that the effects peak at h = 6 years later. Therefore, the effects of dollar shocks on debt growth are much more persistent than the effects on GDP growth.

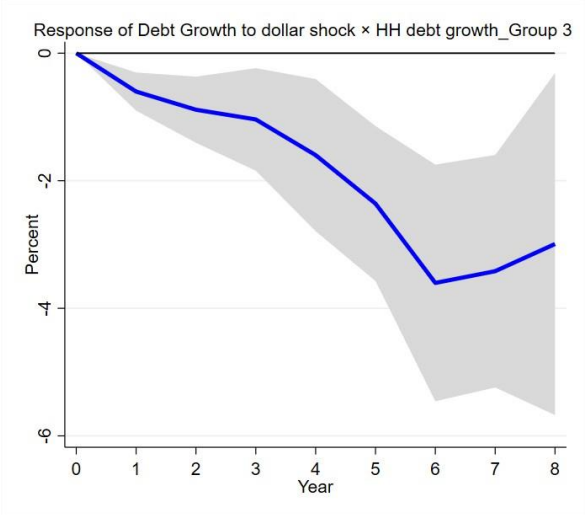
[20] For every 1pp increase in expected debt growth, dollar shocks slowed future realized debt growth by an additional 3-4pp over 6 years.

Figure 5: Impulse Response Functions of Debt Growth to Expected Debt Growth × Dollar Shocks

(a) Responses to Dollar Shocks



(b) Responses to Expected Debt Growth × Dollar Shocks



Notes: The figures describe the cumulative responses of GDP per capita growth to the interaction term of dollar shocks and expected debt growth for Group 3 EMEs. The gray area shows the 90% confidence interval.

The impacts on consumption and investment

We observe that the effects of dollar shocks on household debt growth are realized more slowly and peak later than the effects on GDP growth. A plausible explanation that resolves such a discrepancy is that households adjust consumption rather than their debt for the first 2 to 3 years. That is, households respond to negative shocks by consuming less at first instead of immediately lowering their debt levels compared to their projections.

To examine this hypothesis further, we estimate the following local projection where the dependent variable is consumption growth:

$$\Delta_h c_{it+h} = \alpha_i + \delta_\tau \Delta_3 \hat{d}^\tau_{it} + \beta_\tau \Delta_3 \hat{d}^\tau_{it} \Delta_1 USD_{t+1} + \mu_0 IR_{it} \Delta_1 USD_{t+1} + \mu_1 1_{com} \Delta_1 Com_{t+1} + \gamma Y_{it} + X'_{it}\Gamma + \theta_0 \Delta_1 USD_{t+2} + \theta_1 \Delta_1 USD_{t+1} + \theta_2 \Delta_1 y^{World}_{t+1} + \theta_3 \Delta_1 Com_{t+1} + \varepsilon_{it+h} \quad (8)$$

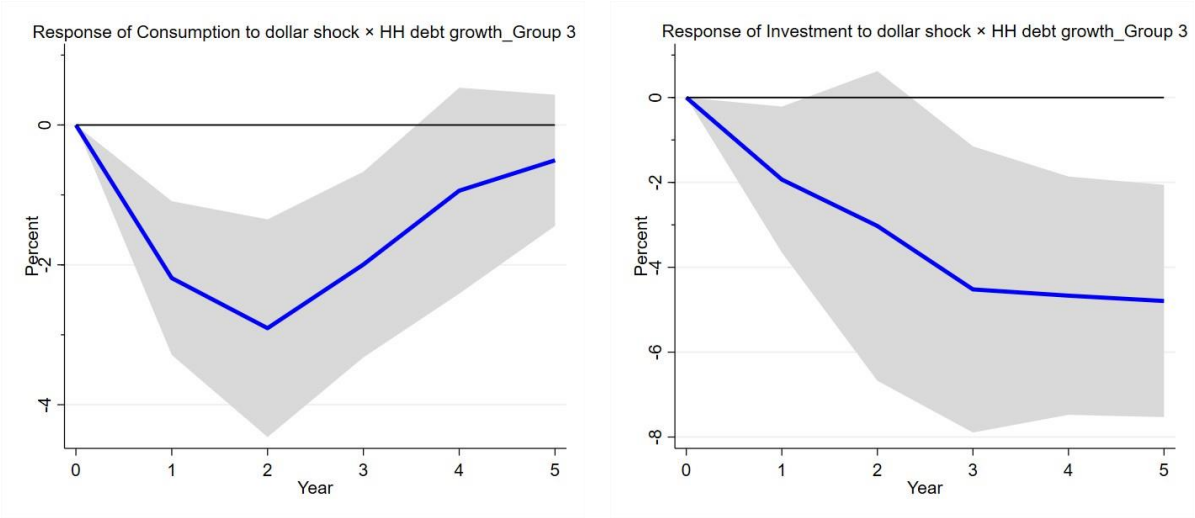
where the control variables X'_{it} now include one-year and two-year lags of the log-difference of investment.[21]

On the left panel in Figure 6, higher expected household debt growth strengthens the transmission of US dollar shocks to consumption. While the association between expected debt growth and the transmission of dollar shocks to consumption is statistically significant for the first 3 years, the effect is not persistent as the association becomes statistically insignificant in the 4th year following the dollar shock. Thus, the persistence in the consumption local projections is similar to the persistence reported in the local projections with GDP as the dependent variable.

[21] More precisely, our measure of investment is gross capital formation from national accounts.

Figure 6: Impulse Response Functions of Consumption and Investment to Expected Debt Growth × Dollar Shocks

(a) Response of Consumption (b) Response of Investments



Notes: The figures describe the cumulative responses of GDP per capita growth to the interaction term of dollar shocks and expected debt growth for Group 3 EMEs. The gray area shows the 90% confidence interval.

The persistent effects of dollar shocks on realized debt growth could also rise out of investment dynamics rather than consumption. To examine this hypothesis, we replace consumption growth in equation (8) with investment growth and control for one-year and two-year lags of the log-difference of consumption, similar to the consumption local projections. The cumulative responses of investment growth to the interaction between expected debt growth and dollar shocks are reported in subfigure (b), the right panel in Figure 5. The role of expected debt growth in the transmission of dollar shocks to investment is substantially more persistent than it is for consumption growth. In other words, the effects of expected debt growth on the transmission of dollar shocks peak much later with respect to investment than consumption.

One plausible explanation reconciling these results is that households react to dollar appreciation shocks by initially reducing consumption, but later they switch to reducing debt (or raising less debt). These dynamic decisions by households directly impact investment dynamics in real estate assets, for example, which is a large component of total investment in many EMEs. These decisions by households could also indirectly impact corporate investment over the medium-run through the contraction of financial intermediation following a drop in real estate asset prices, if real estate assets serve as collateral held by intermediaries. It is also possible that slower GDP growth driven by slower consumption suppresses investment several years after the dollar shock, driven by more pessimistic expectations of corporations, conservative attitudes of financial institutions toward new lending, etc. However, explicit identification of the mechanisms at play requires more granular data.

Robustness Check: Foreign Currency External Debt and Alternative Grouping

The core result in this section is the finding that higher expected household debt growth is positively associated with the transmission of US dollar cycles in EMEs and FMEs. Although the main finding is interesting and provides a novel insight, a fair question is whether expected debt growth is confounded with other characteristics of the economy. While we can think of many different candidates, we focus on the most commonly used variable in the literature: external debt or foreign currency external debt.

It is easy to control external debt in the estimations as we only need to add one interaction term between dollar shocks and external debt. However, how to measure external debt, especially foreign currency external debt, is slightly tricky. A common approach in the literature is to take all the external debt of an EME from the international investment position database or similar databases. However, as discussed in Han (2023), a substantial share of external debt in many EMEs is direct investment debt. Direct investment debt is similar to intercompany lending and therefore direct investment debt cannot be a source of fragility or at least cannot be regarded as similar to other forms of external debt. In view of this consideration, we use external debt excluding direct investment debt.[22]

In addition to direct investment debt, we also exclude local currency-denominated external debt, following usual approaches in the literature in which foreign currency debt-related risk is extensively investigated.[23] However, the results introduced below do not substantially change when we use external debt measures that include local currency debt. We use the data from Han (2023), in which the author disentangles local currency debt from total external debt after excluding direct investment debt.[24][25] An issue following the use of the data is that the data does not include all EMEs in Group 3. Thus, we adjust the composition of Group 3 EMEs to accommodate the EMEs in Han (2023), except for India whose PPP-adjusted GDP per capita is substantially lower than other EMEs. The adjusted Group 3 EMEs are composed of 17 median-income EMEs,[26] which excludes small EMEs such as Croatia and Oman, but instead includes more substantial EMEs such as Brazil or Thailand. By adjusting the Group 3 composition, we can also examine whether the main results are robust to a different composition of Group 3 EMEs.

We estimate the following local projection:

$$\Delta_h y_{it+h} = \alpha_i + \delta_\tau \Delta_3 \hat{d}_{it}^{\tau} + \beta_\tau \Delta_3 \hat{d}_{it}^{\tau} \Delta_1 USD_{t+1} + \mu_0 IR_{it} \Delta_1 USD_{t+1} + \mu_1 FCD_{it} \Delta_1 USD_{t+1} + \mu_{21} 1_{com} \Delta_1 Com_{t+1} + \gamma Y_{it} + X_{it}' \Gamma + \theta_0 \Delta_1 USD_{t+2} + \theta_1 \Delta_1 USD_{t+1} + \theta_2 \Delta_1 y_{t+1}^{World} + \theta_3 \Delta_1 Com_{t+1} + \varepsilon_{it+h}, \quad (9)$$

where FCD_{it} denotes the foreign currency external debt-to-GDP ratio of country *i* in year *t*.

[22] Regarding direct investment debt, we refer interested readers to Han (2023), in which direct investment debt is discussed in depth.

[23] However, we note that the nascent literature on local currency external debt in emerging markets such as Han (2023), Bertaut et al. (2021), or Hofmann et al. (2022) document that the risk from local currency debt is significant and even comparable to that from foreign currency debt.

[24] The sample period in Han (2023) does not go back to 2005 for some EMEs. We extended the dataset to 2005, using the sovereign debt data from Arslanalp and Tsuda (2014).

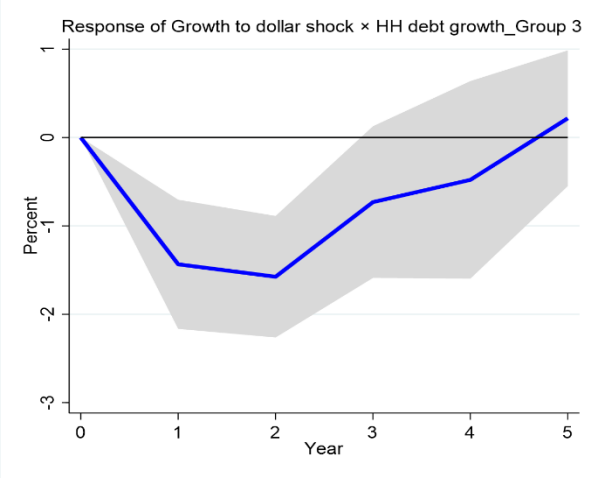
[25] An alternative to Han (2023) is the dataset from Benetrix et al. (2020). However, the data does not differentiate direct investment debt from total external debt, and more importantly the series ends in 2017 which loses a significant number of observations.

[26] Argentina, Brazil, Chile, Colombia, Czech Republic, Indonesia, Hungary, Malaysia, Mexico, Korea, Philippines, Poland, Romania, Russia, South Africa, Thailand, and Turkiye.

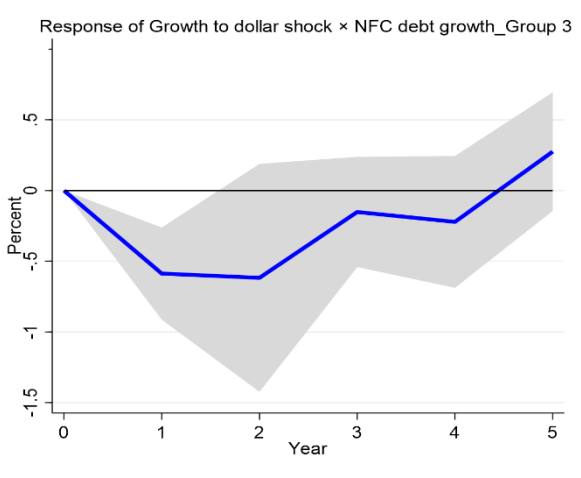
Figure 7 traces the local projections of the interaction terms between dollar shocks and expected sectoral debt growth for Group 3.

Figure 7: Impulse Response Functions of GDP to Expected Debt Growth × Dollar Appreciation Shocks after Controlling for Foreign Currency External Debt

(a) Household Debt in Group 3



(b) Nonfin. Corp. Debt in Group 3



Notes: The figures describe the cumulative responses of GDP per capita growth to the interaction term of dollar shocks and expected debt growth for Group 3 EMEs. The gray area shows the 90% confidence interval.

Figure 7 is qualitatively and quantitatively similar to the upper panels in Figure 4: similar shapes of impulse response functions albeit slightly weaker results of household debt and slightly stronger results of nonfinancial corporate debt. That is, the main results that (i) larger expected debt growth is associated with a stronger transmission of dollar shocks and (ii) this association is stronger for projected household debt growth than projected corporate debt growth in relatively developed EMEs are robust to controlling for foreign currency debt and under different groupings. In unreported analysis, we also implement the two-stage least estimation procedure (equation 4) controlling for foreign currency debt for the adjusted Group 3, and confirm that the main results overall hold.

IV. Concluding Remarks

In this paper, we explore the role of sectoral debt dynamics in shaping business cycles in emerging markets. Utilizing sectoral debt data, we examine the relationship between US dollar cycles, sectoral debt levels and growth, and economic activity. We find that the dominance of household debt documented in Mian et al. (2017) holds for relatively rich EMEs, but not for less-developed EMEs and FMEs, suggesting the dominance of household debt in shaping business cycles rises out of increasing financial development. We also document the role of sectoral debt in the transmission of US dollar cycles to EMEs. Faster expected debt growth is associated with significantly stronger transmission of dollar shocks to economic activity. This finding is especially pronounced with respect to household debt in relatively rich EMEs. We find a less prominent role for nonfinancial corporate debt in shaping business cycle dynamics in EMEs.

We also find that household debt growth plays an important role in the transmission of dollar shocks to the growth rates of consumption, investment, and household debt. The magnifying role of household debt in the transmission of dollar shocks results in a less persistent manifestation of slower consumption growth within the first two years but a more persistent manifestation of slower investment after 4 years. The magnifying role of household debt in the transmission of dollar shocks to future household debt is most persistent and manifests as slower household debt growth over roughly 6 years. These temporal differences suggests a possible sequence of responses: households intending to raise more debt initially respond to dollar shocks by reducing their consumption rather than reducing their debt. Subsequently, they reduce their debt, leading to less investment in real estate assets.

We believe that our findings have important policy implications. In debates over financial stability or assessment of macro-financial prudence in FMEs and EMEs, many policymakers, commentators, and academic researchers often focus on the debt level, especially when it comes to which economies are more fragile than others. However, our findings suggest that debt growth might be as important as debt levels, and cross-country comparisons based on debt levels without consideration of the surrounding economic environment may be incomplete.

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Annex A. Data

List of the countries in each of the groups

Group 1	Group 2	Group 3
Benin	Angola	Argentina
Cameroon	Brazil	Chile
Congo	China	Costa Rica
Cote d'Ivoire	Colombia	Croatia
Ethiopia	Dominica	Czech Republic
Ghana	Ecuador	Hungary
India	El Salvador	Israel
Kenya	Indonesia	Kazakhstan
Lao P.D.R.	Jamaica	Korea
Morocco	Jordan	Malaysia
Mozambique	Mongolia	Maldives
Nigeria	Serbia	Mexico
Pakistan	South Africa	Oman
Rwanda	Sri Lanka	Poland
Senegal	Thailand	Romania
Tajikistan	Tunisia	Russia
Tanzania	Ukraine	Turkiye
Zambia		

Annex B. Additional Tables

Table A.1: 1st Stage Estimations in 2SLS Estimations

	Household Debt Growth			Nonfin. Corp. Debt Growth		
	(1)	(2)	(3)	(4)	(5)	(6)
Household debt level	-0.805***	-0.338**	-0.364***			
	(0.053)	(0.120)	(0.092)			
Nonfin. corp. debt level				-0.688***	-0.625***	-0.630***
				(0.075)	(0.146)	(0.083)
GDP per-capita	0.112	1.241***	0.410**	-4.240***	2.335	0.536**
	(0.353)	(0.234)	(0.155)	(0.798)	(1.606)	(0.241)
Inflation	-0.058**	-0.020	-0.114	0.021	-0.367***	0.065
	(0.020)	(0.068)	(0.071)	(0.061)	(0.100)	(0.132)
Population growth	28.487	19.965	23.856	38.278	-12.918	38.136
	(19.203)	(35.324)	(23.862)	(129.500)	(112.521)	(32.171)
Institutional quality	1.563***	-1.840	1.066	7.738***	3.702*	-13.407**
	(0.351)	(2.224)	(1.875)	(1.444)	(1.923)	(4.685)
Fiscal balance	0.022	0.077**	-0.162	-0.065	0.280	-0.600**
	(0.022)	(0.029)	(0.125)	(0.063)	(0.187)	(0.258)
Trade openness	0.001	-0.042*	-0.104***	0.032***	-0.140*	-0.098
	(0.007)	(0.023)	(0.019)	(0.007)	(0.071)	(0.056)
Observations	236	235	226	236	235	226
R-squared	0.498	0.188	0.286	0.417	0.335	0.465
F-statistic	302.1	8.761	47.198	81.787	97.892	68.033
Group	#1	#2	#3	#1	#2	#3
Country FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Notes:: 1) The debt levels and all other variables are as in year t . The dependent variable is the debt growth between year t + 3 and t . 2) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 3) Reported in brackets are Driscoll-Kraay standard errors

Table A.2: 1st Stage Estimations in Local Projection Estimations

	Household Debt Growth		Nonfin. Corp. Debt Growth	
	(1)	(2)	(3)	(4)
Household debt level	-0.353**	-0.443***		
	(0.118)	(0.105)		
Nonfin. corp. debt level			-0.651***	-0.692***
			(0.131)	(0.078)
GDP per-capita	0.889**	0.145	2.229*	0.158
	(0.343)	(0.093)	(1.134)	(0.096)
Inflation	-0.023	-0.019	-0.344***	0.109
	(0.063)	(0.069)	(0.073)	(0.135)
Population growth	16.785	6.965	-9.287	41.668
	(35.980)	(25.295)	(104.521)	(38.293)
Institutional quality	-1.250	1.148	3.975**	-13.306**
	(2.310)	(1.127)	(1.512)	(4.556)
Fiscal balance	0.124*	0.002	0.242	-0.374*
	(0.061)	(0.080)	(0.169)	(0.200)
Trade openness	-0.032*	-0.114***	-0.113*	-0.093*
	(0.016)	(0.018)	(0.056)	(0.048)
Observations	235	226	235	226
R-squared	0.192	0.327	0.337	0.531
F-statistic	15.231	118.827	90.800	90.205
Group	#2	#3	#2	#3
Country FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Notes:: 1) The debt levels and all other variables are as in year t . The dependent variable is the debt growth between year t + 3 and t . 2) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 3) Reported in brackets are Driscoll-Kraay standard errors.

Table A.3: Cumulative Responses to Expected Debt Growth × Dollar Shocks_Household Debt_Group 3

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Year 1	Year 2	Year 3	Year 4	Year 5
Projected HH debt growth	0.255***	0.370***	0.409***	0.110	-0.138
	(0.063)	(0.099)	(0.119)	(0.209)	(0.281)
Projected HH debt growth	-1.529***	-1.769***	-0.895	-0.482	-0.013
· Dollar shock	(0.437)	(0.486)	(0.603)	(0.694)	(0.560)
GDP per-capita	-0.180	-0.434**	-0.376	-0.991***	-1.562**
	(0.114)	(0.167)	(0.255)	(0.320)	(0.571)
Institutional quality	-1.179	-3.172	-3.770	-4.527	-2.217
	(1.599)	(3.231)	(5.484)	(6.849)	(4.350)
Inflation	-0.197***	-0.402***	-0.218*	-0.469***	-0.552***
	(0.052)	(0.063)	(0.105)	(0.115)	(0.116)
Fiscal balance	0.235***	0.263*	0.401**	0.115	0.462**
	(0.072)	(0.123)	(0.157)	(0.193)	(0.160)
Trade openness	0.034**	0.062*	0.097*	0.089	0.069
	(0.015)	(0.031)	(0.049)	(0.050)	(0.053)
Dollar shock	35.823*	31.215	25.676	-33.059	-144.399***
	(16.759)	(45.632)	(27.029)	(34.019)	(32.079)
F.Dollar shock	-0.257	-21.034	-11.695**	13.020*	22.983***
	(5.589)	(18.136)	(4.539)	(6.457)	(4.590)
World GDP shock	0.146	1.533	3.473***	0.854	3.804***
	(0.188)	(0.897)	(0.317)	(0.830)	(0.671)
Commodity price shock	16.903***	13.726	9.076***	1.442	-17.266**
	(3.978)	(7.784)	(2.324)	(5.844)	(6.510)
Commodity price shock _1Y	19.149***	17.120*	15.206**	5.651	-14.012*
· Commodity exporter dummy	(2.954)	(9.349)	(5.335)	(7.128)	(6.861)
International reserve	0.056	0.110	0.123	0.259*	0.381**
	(0.033)	(0.063)	(0.079)	(0.132)	(0.142)
International reserve	-0.559	-0.508	0.693	2.820***	4.181***
· Dollar shock	(0.339)	(0.963)	(0.516)	(0.665)	(0.659)
Observations	207	207	207	192	177
R-squared	0.552	0.479	0.567	0.399	0.533
Group	#3	#3	#3	#3	#3
Country FE	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO

Notes: 1) Each column shows the cumulative response of GDP per capita in year t+h relative to year t for h = 1 - 5. 2) Projected HH debt growth is projected household debt growth between year t and year t+3 based on information in year t. 3) All other variables are as in year t . 4) Dollar shock is the log-difference between year t and t + 1. 5) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 6) Reported in brackets are Driscoll-Kraay standard errors. 7) Fewer observation numbers than Table 5 are due to the drop of Maldives as the data of international reserves are missing for Maldives

Table A.4: Cumulative Responses to Expected Debt Growth × Dollar Shocks_Corporate Debt_Group 3

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Year 1	Year 2	Year 3	Year 4	Year 5
Projected NFC debt growth	0.038	0.041	0.033	-0.013	-0.083**
	(0.028)	(0.037)	(0.040)	(0.044)	(0.029)
Projected NFC debt growth	-0.345***	-0.225	-0.070	0.009	0.029
· Dollar shock	(0.067)	(0.205)	(0.231)	(0.210)	(0.159)
GDP per-capita	-0.230**	-0.518***	-0.480*	-1.041***	-1.575***
	(0.106)	(0.141)	(0.254)	(0.292)	(0.489)
Institutional quality	-1.490	-3.782	-4.461	-4.693	-1.967
	(1.567)	(3.309)	(5.471)	(6.829)	(4.542)
Inflation	-0.216***	-0.428***	-0.244*	-0.477***	-0.534***
	(0.056)	(0.071)	(0.116)	(0.126)	(0.105)
Trade openness	0.009	0.027	0.061	0.075*	0.071*
	(0.018)	(0.031)	(0.050)	(0.040)	(0.034)
Fiscal balance	0.237***	0.270*	0.413**	0.135	0.526**
	(0.072)	(0.138)	(0.171)	(0.195)	(0.188)
Dollar shock	39.071**	38.959	34.227	-30.030	-148.023***
	(15.628)	(43.309)	(28.306)	(34.178)	(30.312)
F.Dollar shock	-1.866	-23.523	-14.338**	11.941*	23.171***
	(6.045)	(18.834)	(4.835)	(6.487)	(5.341)
World GDP shock	0.046	1.379	3.291***	0.796	3.932***
	(0.181)	(0.857)	(0.259)	(0.888)	(0.557)
Commodity price shock	17.077***	14.129*	10.230***	1.700	-17.719**
	(3.861)	(7.745)	(2.564)	(5.993)	(6.392)
Commodity price shock	19.748***	18.260*	16.544***	6.284	-13.747*
· Commodity exporter dummy	(2.980)	(8.911)	(4.973)	(7.105)	(6.927)
International reserve	0.049	0.100	0.107	0.254*	0.366**
	(0.032)	(0.065)	(0.081)	(0.139)	(0.164)
International reserve	0.057	0.454	1.250	3.210***	4.258***
· Dollar shock	(0.332)	(1.169)	(0.765)	(0.655)	(0.524)
Observations	207	207	207	192	177
R-squared	0.527	0.458	0.552	0.397	0.539
Group	#3	#3	#3	#3	#3
Country FE	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO

Notes: 1) Each column shows the cumulative response of GDP per capita in year t+h relative to year t for h = 1 - 5. 2) Projected HH debt growth is projected household debt growth between year t and year t+3 based on information in year t. 3) All other variables are as in year t . 4) Dollar shock is the log-difference between year t and t + 1. 5) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 6) Reported in brackets are Driscoll-Kraay standard errors. 7) Fewer observation numbers than Table 5 are due to the drop of Maldives as the data of international reserves are missing for Maldives.

Table A.5: Cumulative Responses to Expected Debt Growth × Dollar Shocks_Household Debt_Group 2

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Year 1	Year 2	Year 3	Year 4	Year 5
Projected HH debt growth	-0.030	-0.362	-0.644**	-1.069***	-0.981***
	(0.127)	(0.221)	(0.279)	(0.249)	(0.233)
Projected HH debt growth	-1.021	-1.263	-1.243	-1.827	-1.801
· Dollar shock	(0.744)	(1.478)	(1.728)	(1.589)	(2.104)
GDP per-capita	-0.890***	-1.797***	-2.254***	-3.503***	-4.674***
	(0.282)	(0.411)	(0.686)	(0.726)	(0.768)
Institutional quality	3.193	3.394	-0.007	0.216	1.144
	(2.600)	(3.650)	(4.833)	(2.923)	(3.033)
Inflation	-0.104	-0.076	-0.053	-0.081	-0.059
	(0.081)	(0.098)	(0.106)	(0.133)	(0.152)
Trade openness	0.068***	0.105***	0.148***	0.181***	0.221***
	(0.014)	(0.020)	(0.011)	(0.043)	(0.058)
Fiscal balance	0.147**	0.419***	0.579***	0.615***	0.510***
	(0.067)	(0.075)	(0.088)	(0.076)	(0.140)
Dollar shock	13.595	14.172	15.937	-4.362	-84.936**
	(12.483)	(23.879)	(16.207)	(33.948)	(34.071)
F.Dollar shock	2.494	-11.285	-12.157**	5.945	22.133**
	(6.072)	(11.897)	(4.507)	(5.906)	(7.385)
World GDP shock	-0.036	1.267*	3.127***	1.453	3.140***
	(0.131)	(0.678)	(0.213)	(0.874)	(0.792)
Commodity price shock	7.158**	5.477	2.956	-4.600	-20.055***
	(3.201)	(7.795)	(5.745)	(8.288)	(5.707)
Commodity price shock	10.919***	12.789*	9.959**	1.828	-10.666*
· Commodity exporter dummy	(2.926)	(6.242)	(4.030)	(6.047)	(5.017)
International reserve	0.034	-0.032	-0.160	-0.232*	-0.312**
	(0.037)	(0.064)	(0.093)	(0.120)	(0.112)
International reserve	0.294	0.093	-0.289	-0.447	0.148
· Dollar shock	(0.329)	(0.528)	(0.611)	(0.564)	(0.669)
Observations	216	216	216	199	182
R-squared	0.445	0.490	0.617	0.577	0.642
Group	#2	#2	#2	#2	#2
Country FE	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO

Notes: 1) Each column shows the cumulative response of GDP per capita in year t+h relative to year t for h = 1 - 5. 2) Projected HH debt growth is projected household debt growth between year t and year t+3 based on information in year t. 3) All other variables are as in year t . 4) Dollar shock is the log-difference between year t and t + 1. 5) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 6) Reported in brackets are Driscoll-Kraay standard errors. 7) Fewer observation numbers than Table 5 are due to the drop of Sri Lanka as the data of international reserves are missing for Sri Lanka.

Table A.6: Cumulative Responses to Expected Debt Growth × Dollar Shocks_Corporate Debt_Group 2

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Year 1	Year 2	Year 3	Year 4	Year 5
Projected NFC debt growth	0.087*	0.116	0.211	0.136	0.227*
	(0.046)	(0.106)	(0.129)	(0.111)	(0.115)
Projected NFC debt growth	0.371***	0.283	0.465*	0.263	-0.193
· Dollar shock	(0.081)	(0.266)	(0.226)	(0.161)	(0.298)
GDP per-capita	-0.713**	-1.448***	-1.645**	-2.701***	-3.877***
	(0.261)	(0.370)	(0.623)	(0.770)	(0.906)
Institutional quality	2.160	2.304	-1.723	-1.555	-0.240
	(2.322)	(3.077)	(4.729)	(3.601)	(2.366)
Inflation	-0.059	-0.010	0.064	0.005	0.061
	(0.078)	(0.097)	(0.093)	(0.120)	(0.120)
Trade openness	0.072***	0.116***	0.169***	0.208***	0.262***
	(0.017)	(0.023)	(0.016)	(0.036)	(0.047)
Fiscal balance	0.138	0.366***	0.477***	0.501***	0.397**
	(0.084)	(0.108)	(0.109)	(0.086)	(0.151)
Dollar shock	6.953	3.856	2.287	-24.056	-99.185**
	(11.316)	(26.705)	(18.809)	(37.374)	(36.087)
F.Dollar shock	1.925	-12.028	-13.607**	4.223	20.204***
	(6.141)	(11.871)	(5.093)	(5.847)	(6.502)
World GDP shock	0.054	1.418*	3.386***	1.690*	3.424***
	(0.132)	(0.689)	(0.217)	(0.921)	(0.745)
Commodity price shock	6.934**	5.430	2.898	-4.639	-18.498***
	(3.091)	(7.270)	(4.686)	(6.921)	(5.242)
Commodity price shock	11.060***	12.914*	10.246**	1.960	-10.120*
· Commodity exporter dummy	(2.685)	(6.418)	(4.323)	(6.173)	(5.191)
International reserve	0.023	-0.035	-0.167	-0.211	-0.308**
	(0.039)	(0.068)	(0.107)	(0.144)	(0.134)
International reserve	0.847***	0.768	0.627	0.673*	0.852
· Dollar shock	(0.183)	(0.532)	(0.414)	(0.353)	(0.603)
Observations	216	216	216	199	182
R-squared	0.462	0.490	0.621	0.547	0.629
Group	#2	#2	#2	#2	#2
Country FE	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO

Notes: 1) Each column shows the cumulative response of GDP per capita in year t+h relative to year t for h = 1 - 5. 2) Projected NFC debt growth is projected household debt growth between year t and year t+3 based on information in year t. 3) All other variables are as in year t . 4) Dollar shock is the log-difference between year t and t + 1. 5) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 6) Driscoll-Kraay standard errors. 7) Fewer observation numbers than Table 5 are due to the drop of Sri Lanka as the data of international reserves are missing for Sri Lanka.

Table A.7: Cumulative Responses of Debt Growth to Expected Debt Growth × Dollar Shocks_Corporate Debt_Group 3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Projected HH debt growth	0.217**	0.583***	0.951***	1.337***	1.757***	2.171***	2.393***	2.430***
	(0.092)	(0.156)	(0.237)	(0.349)	(0.345)	(0.164)	(0.130)	(0.181)
Projected HH debt growth	-0.602***	-0.886**	-1.039*	-1.598**	-2.358***	-3.602***	-3.418**	-2.992
· Dollar shock	(0.182)	(0.315)	(0.489)	(0.725)	(0.738)	(1.128)	(1.108)	(1.630)
GDP per-capita	-0.098	-0.022	0.002	0.216	0.435*	0.552***	0.651***	0.734***
	(0.064)	(0.102)	(0.127)	(0.154)	(0.208)	(0.172)	(0.143)	(0.130)
Institutional quality	0.046	1.371	2.033*	2.391*	1.441	-0.489	-2.852	-2.632*
	(0.845)	(0.993)	(0.952)	(1.221)	(1.338)	(1.462)	(1.608)	(1.173)
Inflation	-0.007	-0.030	-0.054	-0.009	0.101	0.082	-0.025	-0.210***
	(0.027)	(0.044)	(0.074)	(0.087)	(0.068)	(0.113)	(0.056)	(0.033)
Trade openness	-0.022***	-0.014	0.010	0.074	0.146**	0.234***	0.303***	0.343***
	(0.006)	(0.017)	(0.038)	(0.059)	(0.055)	(0.024)	(0.013)	(0.019)
Fiscal balance	0.089**	0.068	-0.069	-0.168	-0.351***	-0.331***	-0.181	0.041
	(0.035)	(0.087)	(0.128)	(0.141)	(0.103)	(0.085)	(0.105)	(0.074)
Dollar shock	-17.869**	-7.109	14.500	18.649	30.955	14.795	-28.608	-53.717
	(7.045)	(16.127)	(21.120)	(14.340)	(18.372)	(20.373)	(21.368)	(43.452)
F.Dollar shock	-1.486	-6.537	-9.550	-13.832**	-15.292***	8.954**	-1.656	-3.710
	(1.667)	(4.399)	(6.738)	(5.114)	(4.551)	(3.460)	(9.118)	(4.101)
World GDP shock	-0.294**	-0.639**	-1.101***	-0.417	-1.210**	-0.879**	0.095	0.859
	(0.123)	(0.283)	(0.274)	(0.356)	(0.414)	(0.389)	(0.280)	(0.481)
Commodity price shock	-1.354	0.168	3.851	6.150	11.682**	11.370**	4.654	0.052
	(1.767)	(4.949)	(5.068)	(4.246)	(4.342)	(4.055)	(2.574)	(4.239)
Commodity price shock	-0.608	0.995	-0.434	-3.346**	-4.220***	-5.231***	-4.957***	-3.847*
· Commodity exporter dummy	(0.715)	(1.108)	(1.177)	(1.520)	(1.336)	(0.897)	(0.702)	(1.970)
International reserve	-0.032	-0.072	-0.073	-0.117	-0.166	-0.179**	-0.168***	-0.128**
	(0.032)	(0.058)	(0.078)	(0.096)	(0.098)	(0.071)	(0.040)	(0.049)
International reserve	-0.095	-0.520	-1.189	-1.827**	-1.751**	-2.031*	-1.516	-0.816
· Dollar shock	(0.586)	(0.821)	(0.797)	(0.708)	(0.757)	(0.957)	(1.073)	(0.951)
Observations	207	207	207	192	177	163	149	135
R-squared	0.269	0.330	0.418	0.487	0.569	0.643	0.672	0.689
Group	#2	#2	#2	#2	#2	#2	#2	#2
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO	NO	NO

Notes: 1) Each column shows the cumulative response of GDP per capita in year t+h relative to year t for h = 1 - 5. 2) Projected NFC debt growth is projected household debt growth between year t and year t+3 based on information in year t. 3) All other variables are as in year t . 4) Dollar shock is the log-difference between year t and t + 1. 5) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 6) Reported in brackets are Driscoll-Kraay standard errors. 7) Fewer observation numbers than Table 5 are due to the drop of Maldives as the data of international reserves are missing for Maldives.

Table A.8: Cumulative Responses of Consumption Growth to Expected Household Growth × Dollar Shocks_Household Debt_Group 3

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Year 1	Year 2	Year 3	Year 4	Year 5
Projected HH debt growth	0.323***	0.863***	1.132***	1.300***	1.417***
	(0.065)	(0.231)	(0.334)	(0.330)	(0.297)
Projected HH debt growth	-1.736***	-2.902***	-2.413*	-1.692	-1.942**
· Dollar shock	(0.436)	(0.787)	(1.140)	(1.472)	(0.819)
GDP per-capita	-0.012	-0.354*	-0.306	-1.143**	-1.721**
	(0.045)	(0.187)	(0.291)	(0.395)	(0.644)
Institutional quality	1.597	0.857	-1.185	3.533	10.888
	(1.181)	(2.970)	(6.327)	(7.444)	(8.683)
Inflation	-0.259***	-0.518***	-0.385**	-0.592***	-0.449***
	(0.047)	(0.114)	(0.131)	(0.158)	(0.127)
Trade openness	0.072***	0.213***	0.311***	0.427***	0.503***
	(0.023)	(0.051)	(0.093)	(0.105)	(0.085)
Fiscal balance	0.087	0.202	0.529***	0.502	0.873***
	(0.079)	(0.119)	(0.173)	(0.292)	(0.263)
Inv. Growth	0.133***	0.157***	0.111*	0.090	0.046
	(0.012)	(0.047)	(0.060)	(0.100)	(0.075)
L.Inv. Growth	0.049***	0.033	-0.015	-0.145***	-0.175***
	(0.014)	(0.021)	(0.044)	(0.044)	(0.023)
L2.Inv. Growth	0.020**	-0.034	-0.047	-0.093***	-0.068***
	(0.009)	(0.027)	(0.033)	(0.019)	(0.013)
Dollar shock	-7.742	1.113	-16.709	-47.528	-95.301*
	(12.848)	(65.325)	(47.519)	(49.944)	(44.953)
F.Dollar shock	-7.704***	-35.786**	-29.758***	-1.349	16.721**
	(1.960)	(13.772)	(8.284)	(10.422)	(5.915)
World GDP shock	0.040	1.509*	3.886***	0.182	1.126
	(0.108)	(0.802)	(0.654)	(0.317)	(0.888)
Commodity price shock	4.305	2.002	-2.839	-8.224	-12.837
	(2.536)	(10.006)	(4.434)	(7.920)	(7.330)
Commodity price shock	7.360**	4.240	3.881	-1.204	-6.967
· Commodity exporter dummy	(3.320)	(17.051)	(9.783)	(9.564)	(8.868)
International reserve	0.051	0.124*	0.127	0.277	0.599
	(0.038)	(0.070)	(0.113)	(0.249)	(0.369)
International reserve	-1.021*	-2.483	-0.868	1.546	1.921
· Dollar shock	(0.559)	(1.446)	(0.921)	(1.169)	(1.526)
Observations	180	180	179	164	151
R-squared	0.674	0.578	0.609	0.536	0.623
Group	#3	#3	#3	#3	#3
Country FE	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO

Notes: 1) Each column shows the cumulative response of investment growth in year t+h relative to year t for h = 1 - 5. 2) Projected NFC debt growth is projected household debt growth between year t and year t+3 based on information in year t. 3) All other variables are as in year t . 4) Dollar shock is the log-difference between year t and t + 1. 5) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 6) Reported in brackets are Driscoll-Kraay standard errors. 7) Fewer observation numbers than Table A_4 are due to the drop of Oman and Kazakhstan as the data of consumption are missing for EMEs.

Table A.9: Cumulative Responses of Investment Growth to Expected Household Growth × Dollar Shocks_Household Debt_Group 3

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Year 1	Year 2	Year 3	Year 4	Year 5
Projected HH debt growth	0.776**	2.000***	2.566***	2.396***	2.373***
	(0.273)	(0.463)	(0.457)	(0.486)	(0.469)
Projected HH debt growth	-1.933*	-3.027	-4.522**	-4.669**	-4.795**
· Dollar shock	(1.046)	(2.218)	(2.049)	(1.706)	(1.664)
GDP per-capita	-0.526	-0.315	0.107	-0.855	-1.984
	(0.409)	(0.611)	(0.649)	(0.974)	(1.508)
Institutional quality	-8.089*	-12.424*	-10.964**	-10.859	1.532
	(3.825)	(6.235)	(4.298)	(7.502)	(13.683)
Inflation	-0.231	-0.538	-0.096	-0.947***	-0.997**
	(0.160)	(0.393)	(0.477)	(0.283)	(0.409)
Trade openness	0.044	0.310*	0.436**	0.535***	0.441***
	(0.097)	(0.168)	(0.184)	(0.130)	(0.115)
Fiscal balance	0.138	-0.059	0.339	0.111	1.848*
	(0.449)	(0.837)	(0.772)	(0.677)	(0.889)
Con. Growth`	1.461***	1.562**	0.535*	0.576	0.282
	(0.276)	(0.590)	(0.267)	(0.337)	(0.284)
L.L.Inv. Growth	-0.593***	-0.892***	-0.713**	-1.304***	-1.343***
	(0.146)	(0.279)	(0.251)	(0.190)	(0.329)
L2.L.Inv. Growth	0.136	-0.037	0.023	-0.107	-0.372
	(0.102)	(0.197)	(0.266)	(0.262)	(0.231)
Dollar shock	125.535	-1.424	130.282*	-66.320	-360.840*
	(74.510)	(118.874)	(69.136)	(121.341)	(182.355)
F.Dollar shock	24.241	-65.006	-43.664	23.316*	40.756**
	(13.711)	(71.589)	(24.856)	(10.959)	(15.259)
World GDP shock	-0.268	3.956	7.431***	0.424	8.712***
	(0.654)	(2.610)	(2.343)	(2.025)	(1.833)
Commodity price shock	38.628***	18.740	42.349**	13.162	-21.229
	(9.424)	(17.666)	(17.732)	(12.801)	(20.544)
Commodity price shock	50.068***	11.322	51.406**	13.763	-25.218
· Commodity exporter dummy	(13.313)	(24.856)	(20.241)	(19.399)	(24.867)
International reserve	0.114	0.315	0.388	0.719	1.066**
	(0.087)	(0.184)	(0.237)	(0.427)	(0.459)
International reserve	-1.135	0.767	0.336	3.922	9.109**
· Dollar shock	(1.761)	(4.838)	(2.798)	(3.929)	(3.968)
Observations	180	180	179	164	151
R-squared	0.619	0.488	0.496	0.401	0.493
Group	#2	#2	#2	#2	#2
Country FE	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO

Notes: 1) Each column shows the cumulative response of investment growth in year t+h relative to year t for h = 1 - 5. 2) Projected HH debt growth is projected household debt growth between year t and year t+3 based on information in year t. 3) All other variables are as in year t . 4) Dollar shock is the log-difference between year t and t +1. 5) *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels. 6) Reported in brackets are Driscoll-Kraay standard errors. 7) Fewer observation numbers than Table A_4 are due to the drop of Oman and Kazakhstan as the data of investments are missing for EMEs

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