Household Debt, Corporate Debt, and the Real Economy: Some Empirical Evidence

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Abstract
The rapid accumulation of private debt is widely viewed as a major risk to financial and economic stability. This article systematically and comprehensively assesses the effect of private debt buildup on economic growth. In the spirit of the existing study that separately examines the effects of two types of private debt—household debt and corporate debt—on growth in advanced economies, we specifically provide new evidence on the growth-private debt nexus in both advanced and emerging market economies (EMEs). Moreover, we construct financial peaks in terms of the speed of debt accumulation rather than crisis dates and find that in both advanced and EMEs, corporate debt buildups cause more financial peaks than household debt buildups. Furthermore, corporate debt-induced financial recessions inflict a bigger damage on output than household debt-induced financial recessions in EMEs. Overall, our evidence suggests that policymakers would do well to closely monitor not only household debt but also corporate debt.

1. Introduction
The rapid accumulation of private debt is widely viewed as a major risk to financial and economic stability. Before the global financial crisis (GFC), most advanced economies experienced a rapid accumulation of private debt, particularly household debt, which contributed to the severe economic downturn during the Great Recession. EMEs also experienced similar increases in private debt. However, the dynamics of private debt growth has diverged since then. While the GFC set in motion a deleveraging process that reduced the levels of private debt in advanced economies, EMEs continue to amass significant amounts of private debt, which has become a source of concern to policymakers.

Theoretically, private debt buildups do not necessarily lead to subsequent economic downturns. Mian, Sufi, and Verner (MSV 2017) survey the recent body of theoretical research that explores the links between private debt buildups and subsequent output growth. They show that, depending on the structure of models and the nature of shocks, either a positive or negative relationship is possible. MSV argue that rational expectations models with credit demand shocks imply a positive relationship between private debt buildups and subsequent output growth, since rational agents borrow against the expectation that future productivity or permanent income will increase. On the other hand, models based on credit supply shocks predict a negative relationship between private debt buildup during a boom and subsequent economic growth. As argued by MSV, if credit supply shocks are driven by irrationally exuberant expectations of lenders ignoring downside risks, accumulation of debt in high-risk sectors eventually brings about a reversal in investment sentiment and subsequent decline in growth. Cecchetti, Mohanty, and Zampolli (2011) also suggest that excess...
private debt not only constrains financing capacity to smooth economic cycles, but also causes large swings in asset prices, which tend to trigger recessions when the economy slows down.

Empirically, however, there are only a few studies that examine the impact of private debt on economic growth and stability, and these are largely confined to advanced economies. MSV investigate the impacts of both household and corporate debts, but their analyses are mostly confined to advanced economies. Cecchetti, Mohanty, and Zampolli (2011) examine the impact of public, corporate, and household debts on economic growth in Organization for Economic Co-operation and Development economies. They find that both corporate and household debts have a significant negative correlation with per capita GDP growth rate. Jordà, Schularick, and Taylor (JST 2013) focus on the speed of private debt accumulation and find that expansions with more rapid credit buildups lead to deeper recessions. Claessens, Kose, and Terrones (2012) find that recessions associated with financial disruptions tend to be longer and deeper. Bernardini and Forni (2017) further find that the exacerbation of private debt buildups on the duration and intensity of recessions is even more pronounced in EMEs.

The central objective of our article is to systematically assess the effect of private debt buildup on economic growth in both advanced and EMEs. Our research contributes to the existing empirical literature on the private debt-growth nexus in three important ways. First, while MSV (2017) examine the real impacts of both corporate debt and household debt in global economies, their focus is mostly on advanced economies. Given the structural differences between advanced and EMEs, it is worthwhile to comprehensively understand the debt-growth nexus in both groups of economies. We find that most advanced countries experienced rapid increase in private debt only before the GFC. Hence, there is a possibility that findings of studies which focus on advanced countries are driven mainly by the GFC episode. In contrast, EMEs experienced crises mostly before 2000. This study thus differs from the existing literature by providing more comprehensive evidence on the impacts on output, consumption, investment, and asset-price growth of the two different types of private debts in EMEs as well as in advanced economies. This extension is important because EMEs witnessed rapid debt buildup in the aftermath of GFC while the private debt level in advanced economies was largely stable.

Second, we define financial peaks, which are distinct from normal peaks, in terms of the speed of private debt accumulation rather than crisis episodes – i.e. actual banking or currency crisis dates. Then, we analyze financial peaks driven by either household or corporate debt to see whether there any differences in recession dynamics. Note that since Jordà, Schularick, and Taylor (2011), which also focuses on advanced countries, defines financial peaks as those that precede financial crises, they could not distinguish between financial booms induced by household and corporate debts.

Third, our main finding differs from MSV in the sense that it highlights the risk of corporate debt buildups in EMEs. They emphasize that an increase in the household debt to GDP ratio predicts lower GDP growth and higher unemployment in the medium run. However, we find that corporate debt-induced financial recessions inflict a bigger damage on output than household debt-induced financial recessions in EMEs. More broadly, our empirical analysis yields a number of interesting findings. The level of household debt is smaller than the level of corporate debt in both advanced economies and EMEs, but it increases slightly faster and is less volatile. We find that household debt accumulation is associated with higher output growth in the very short run, but lower output growth after 3 years. On the other hand, corporate debt buildup is not associated with higher output growth even in the short run and is associated with lower output growth in 1–3 years. Around half of the negative growth effect of private debt buildup can be explained by asset price inflation in advanced economies and much more in EMEs. Interestingly and significantly, we find that more financial peaks are driven by corporate debt rather than household debt in both advanced economies and EMEs. Further, the damage from corporate debt-induced financial recessions is similar to the damage from household debt-induced financial recessions in advanced economies and larger in EMEs. Finally, our evidence indicates that larger excess credit to both households and corporations during expansions entails more painful recessions after financial peaks.
The rest of the article is organized as follows. In Section II, we describe the data and their summary statistics. In Section III, we examine how buildups of household and corporate debts predict the future dynamics of output, consumption, investment, and asset prices. In Section IV, we take a closer look at the role of household and corporate debts in shaping recession paths. In the section, we identify normal versus financial peaks, and investigate whether the two types of peaks entail any differences in how household and corporate debts affect the post-peak recession path. Section V concludes the article.

2. Data

In this section, we describe the data used for our empirical analysis. We collect private debt of nonfinancial sector as share of GDP from the Bank for International Settlements Debt Securities database. Private debt of nonfinancial sector is then divided into household debt and nonfinancial corporate debt for 21 advanced economies and 17 EMEs. Appendix Table A1 lists all advanced economies and EMEs for which the data are available. Per capita real GDP data are collected from the Penn World Table 9.0 and calculated by dividing real GDP at constant 2011 national prices by population. We also collect per capita real consumption and investment from the same source. These are calculated by multiplying the share of consumption and investment in output-side real GDP at chained public–private partnerships (PPPs) in 2011 US dollar, and divided by population. Housing price index is collected from two sources: the Bank for International Settlements property price database and the Jordá-Schularick-Taylor Macrohistory database. Stock prices index is also collected from the Jordá-Schularick-Taylor Macrohistory database. The definition and sources of these variables and other control variables are listed in Appendix Table A2.

Figure 1 illustrates the dynamics of private debt, household debt, and corporate debt as shares of GDP (in %) for advanced economies and EMEs from 1990 to 2016. The figure in the upper left panel shows that advanced economies’ private debt increased quite rapidly before the GFC in 2008 and then stabilized. While both household and corporate debts increased before the GFC in advanced economies, the dynamics of household debt is more dramatic. Household debt increased more rapidly than corporate debt before the GFC. In the post-crisis period, while corporate debt has stabilized, household debt has decreased. The dynamics of private debt in the US, presented in the lower left panel, shows even more dramatic changes in private debt. Private debt increased rapidly before the GFC, and then decreased afterward. Such dynamics were mostly driven by household debt, which is consistent with the widely held view that rapid increase in household debt was one of the key causes of the GFC. Figure 1 presents the dynamics of private debt in EMEs in the upper right panel. Unlike advanced economies, EMEs continue to accumulate private debt even after the GFC. While corporate debt increased, household debt grew even more rapidly since the GFC. Looking only at Asian EMEs in the lower right panel, the increase in private debt is most pronounced before the Asian financial crisis in 1997, largely driven by corporate debt. Since 2000, private debt has been increasing, primarily due to household debt. However, unlike other EMEs, private debt as a share of GDP in the region did not peak in the post-GFC period. Instead, it peaked in the pre-Asian financial crisis period. Figure 1 suggests that the dynamics of household and corporate debts are quite different.

Table 1 presents dynamic correlations between increases in household and corporate debts as shares of GDP. We report mean correlations across the full sample as well as for advanced and EMEs. The standard deviations are in parentheses. The contemporaneous correlation for the full sample is 0.276, and the correlation generally decreases as time lags or leads increase. We observe the same pattern in advanced economies and EMEs, but correlations are higher in advanced economies. Interestingly, in all cases, correlations between increases in household debt and lead increases in corporate debt are higher than correlations between increases in household debt and lagged increases.
Figure 1. Dynamics of private debt, household debt, and corporate debt in advanced economies and emerging market economies (Debt as shares of GDP).

Notes: Debt are measured as shares of GDP. The list of advanced economies and emerging market economies is in Appendix Table 1. Four Asian emerging market economies include the Republic of Korea, Malaysia, Indonesia, and Thailand. GDP = gross domestic product.

Source: Authors’ calculations based on the Bank for International Settlements Debt Securities database.

Table 1. Dynamic correlations between increases in household and corporate debts.

|                  | \( \Delta \text{corp}_{t-3} \) | \( \Delta \text{corp}_{t-2} \) | \( \Delta \text{corp}_{t-1} \) | \( \Delta \text{corp}_{t} \) | \( \Delta \text{corp}_{t+1} \) | \( \Delta \text{corp}_{t+2} \) | \( \Delta \text{corp}_{t+3} \) |
|------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Whole economies   | -0.007                          | 0.036                           | 0.105                           | 0.276                           | 0.210                           | 0.228                           | 0.189                           |
|                  | (0.23)                          | (0.27)                          | (0.29)                          | (0.29)                          | (0.30)                          | (0.25)                          | (0.23)                          |
| Advanced economies | 0.047                           | 0.143                           | 0.213                           | 0.305                           | 0.235                           | 0.264                           | 0.237                           |
|                  | (0.19)                          | (0.19)                          | (0.24)                          | (0.26)                          | (0.25)                          | (0.24)                          | (0.20)                          |
| Emerging market economies | -0.074                         | -0.095                          | -0.028                          | 0.240                           | 0.179                           | 0.183                           | 0.130                           |
|                  | (0.25)                          | (0.30)                          | (0.31)                          | (0.33)                          | (0.36)                          | (0.26)                          | (0.25)                          |

Mean correlations across whole, advanced, and emerging market economies are reported. Household and corporate debts are measured as shares of gross domestic product. \( \Delta \) denotes 1-year change and numbers in parentheses are standard deviations.

Source: Authors’ calculation.

in corporate debt. This suggests that increases in household debt lead to increases in corporate debt, but not the other way around. This feature is more pronounced in EMEs.
Appendix Table A3 presents summary statistics of the variables considered in this study for advanced economies (Appendix Table A3.1) and EMEs (Appendix Table A3.2). The data set has an unbalanced panel structure with a sample period of 1952–2014. The means of private debt, household debt, and corporate debt as shares of GDP are higher in advanced economies (123.1, 55.5, and 83.7, respectively) than in EMEs (76.7, 26.0, and 55.3, respectively). In both groups, the level of household debt is smaller than corporate debt, but the former increases slightly faster than the latter. However, the standard deviation of percentage points per year (ppy) increases in corporate debt is much higher than that in household debt (2.8 versus 5.4 in advanced economies and 2.1 versus 5.3 in EMEs). Serial correlation is higher for household debt, and this feature is more pronounced in advanced economies.

3. Household and Corporate Debts, Asset Prices, and Growth

As noted in Section 1, private debt buildups are associated with lower output growth. In particular, MSV emphasize that household debt is much more closely related to booms and busts of the economy than corporate debt. Based on a sample of 30 economies, mostly advanced economies, they estimate the following equation:  \[ \Delta_3 y_{it+k} = \beta_0 + \beta_H \Delta_3 d_{it-H}^{HH} + \beta_C \Delta_3 d_{it-1}^{Corp} + u_{it+k} \] (1)

where the three-year change in logarithm of per capita GDP of country i from t + k to t + k – 3 is denoted by \( \Delta_3 y_{it+k} \) where \( \Delta_3 \) is the 3-year difference operator. The change of household and corporate debts as shares of GDP from t + k to t + k – 3 are similarly defined as \( \Delta_3 d_{it-H}^{HH} \) and \( \Delta_3 d_{it-1}^{Corp} \). Following the method in MSV (2017), k is set to be an integral ranging from –1 to +5. The upper panel of Table 2, which reports the results, confirms MSV’s results for advanced economies. While the coefficients of contemporaneous and 1-year lead variable are positive and statistically significant, those of 3-year and above leads are negative and statistically significant. These results suggest that, while buildups of household debt boost output growth in the very short run, they predict lower output growth after 3 years. In contrast, buildups of corporate debt never increase output growth even in the short run, and predict lower output growth in 1–3 years. While the estimated coefficients of corporate debt are smaller, their negative impact is comparable to household debt. For example, when the impact is largest, one standard deviation ppy increase in household (5-year lead) and corporate debt (3-year lead) lowers future output growth by 1.34% (=−0.48 × 2.80) and 1.08% (=−0.29 × 5.39), respectively.

The middle panel of Table 2 reports the same regression results for EMEs. While the coefficients of increase in household debt similarly predict lower medium-run output growth, for the positive short term, coefficients are never statistically significant. The coefficients of corporate debt also show a similar pattern – the harmful impact of corporate debt is more immediate. The largest impact of one standard deviation ppy increase in household and corporate debts on future output growth is −0.72% (=−0.35 × 2.05) and −.80% (=−.15 × 5.34), respectively, suggesting that the negative impact is larger for corporate debt, mainly due to a much larger standard deviation.

In the lower panel of Table 2, we also report the regression results for the whole economies for the following modified equation:

\[ \Delta_3 y_{it+k} = \beta_0 + \beta_{H1} \Delta_3 d_{it-H}^{HH} + \beta_{C1} \Delta_3 d_{it-1}^{Corp} + \beta_{H2} \Delta_3 d_{it-1}^{HH} \times d_{it-1}^{HH} \\
+ \beta_{C2} \Delta_3 d_{it-1}^{Corp} \times d_{it-1}^{Corp} + \beta_{H3} d_{it-1}^{HH} + \beta_{C3} d_{it-1}^{Corp} + u_{it+k} \] (2)

In equation (2), we include the level of each debt and its interaction with the change. The idea is that the impact of the change can differ across economies at different financial development stages that can be captured by the different levels of the debt. In the lower panel of Table 2, we find that the sign of the coefficient of the interaction terms, when statistically significant, is the opposite to that for the change, indicating that booms and busts of business cycles driven by the change in debts are mitigated as the
Table 2. Household and corporate debt expansion and future three-year GDP growth.

| Variables | $Δ_1d_{R,t-1}$ | $Δ_1d_{R,t}$ | $Δ_1d_{R,t+1}$ | $Δ_1d_{R,t+2}$ | $Δ_1d_{R,t+3}$ | $Δ_1d_{R,t+4}$ | $Δ_1d_{R,t+5}$ |
|-----------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| **Advanced Economies** | | | | | | | |
| $Δ_1d_{H,t-1}$ | 0.20** | 0.17** | 0.03 | −0.19* | −0.39** | −0.48** | −0.46** |
| (0.06) | (0.06) | (0.07) | (0.08) | (0.10) | (0.11) | (0.12) | |
| $Δ_1d_{H,t-1}$ | −0.10+ | −0.19** | −0.20** | −0.13** | −0.05 | 0.03 | 0.09* |
| (0.06) | (0.06) | (0.05) | (0.04) | (0.04) | (0.04) | (0.04) | |
| Observations | 671 | 650 | 629 | 608 | 587 | 566 | 545 |
| $R^2$ | 0.05 | 0.11 | 0.12 | 0.13 | 0.18 | 0.19 | 0.17 |
| Countries | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| p-value (HHD vs. Corp) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Emerging Market Economies** | | | | | | | |
| $Δ_1d_{H,t-1}$ | 0.26 | 0.08 | −0.11 | −0.26** | −0.35** | −0.35** | −0.30+ |
| (0.23) | (0.20) | (0.13) | (0.06) | (0.07) | (0.11) | (0.16) | |
| $Δ_1d_{H,t-1}$ | −0.04 | −0.12+ | −0.15* | −0.12* | −0.08 | −0.04 | 0.01 |
| (0.08) | (0.07) | (0.06) | (0.06) | (0.06) | (0.07) | (0.07) | |
| Observations | 330 | 313 | 296 | 279 | 262 | 244 | 228 |
| $R^2$ | 0.03 | 0.03 | 0.07 | 0.09 | 0.09 | 0.07 | 0.05 |
| Countries | 17 | 17 | 17 | 17 | 16 | 16 | 16 |
| p-value (HHD vs. Corp) | 0.32 | 0.43 | 0.84 | 0.06 | 0.01 | 0.04 | 0.17 |
| **Whole Economies** | | | | | | | |
| $Δ_1d_{H,t-1}$ | 0.64** | 0.49** | 0.23+ | −0.11 | −0.35** | −0.49** | −0.49** |
| (0.17) | (0.15) | (0.14) | (0.12) | (0.11) | (0.10) | (0.12) | |
| $Δ_1d_{H,t-1}$ | −0.06 | −0.20** | −0.28** | −0.26** | −0.19** | −0.04 | 0.08 |
| (0.10) | (0.06) | (0.04) | (0.06) | (0.07) | (0.07) | (0.08) | |
| $d_{H,t-1} - Δ_3d_{H,t-1}$ | −0.0058** | −0.0043** | −0.0019 | 0.0014 | 0.0032+ | 0.0048** | 0.0056** |
| (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | |
| $d_{H,t-1} * Δ_3d_{H,t-1}$ | 0.0004 | 0.0008 | 0.0014+ | 0.0017** | 0.0015+ | 0.0006 | −0.0002 |
| (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | |
| $d_{H,t-1}$ | −0.12** | −0.12** | −0.14** | −0.16** | −0.18** | −0.20** | −0.21** |
| (0.04) | (0.04) | (0.04) | (0.04) | (0.04) | (0.04) | (0.04) | |
| $d_{H,t}$, $d_{corporate}$ | −0.05+ | −0.05+ | −0.04 | −0.02 | 0.00 | 0.01 | 0.02 |
| (0.03) | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) | |
| Observations | 1,001 | 963 | 925 | 887 | 849 | 810 | 773 |
| $R^2$ | 0.25 | 0.28 | 0.29 | 0.28 | 0.28 | 0.27 | 0.25 |
| Countries | 38 | 38 | 38 | 38 | 37 | 37 | 37 |
| p-value (HHD vs. Corp) | 0.24 | 0.18 | 0.07 | 0.01 | 0.00 | 0.00 | 0.00 |

We report panel regression results with fixed effects. $Δ_1$ denotes 3-year change (for ratios) or log difference (for levels). The first row in each panel presents the dependent variable, which is 3-year log difference of per capita real gross domestic product (GDP) for country $i$ at $t−1$, $t$, ..., $t+5$. The explanatory variables are 3-year change of the debt to GDP ratio of households ($Δ_1d_{H,t-1}$) and the debt to GDP ratio of nonfinancial corporations ($Δ_1d_{H,t-1}$) for country $i$ at time $t−1$. Reported $R^2$ values are based on within-country variation. The reported $p$-value is for the test for equality of coefficients of $Δ_1d_{H,t-1}$ and $Δ_1d_{H,t-1}$. Numbers in parenthesis are standard errors dually clustered on country and year, and **, *, and + denote the significance levels of 1%, 5%, and 10%, respectively.

Source: Authors’ calculation.

economy is financially more developed, i.e., the level is higher. Since buildups of corporate debt have only negative impacts, these results suggest that these negative impacts are larger in EMEs where the debt level is generally lower.

Appendix Table A4.1 presents the same regression results for per capita real investment growth. In advanced economies, the impacts of household and corporate debts are opposite of each other. Household debt boosts investment immediately, and then predicts lower investment growth in the medium term. In contrast, corporate debt has a negative effect on investment immediately and in the short term, but boosts investment in the medium run. The maximum negative impact of one standard deviation ppy increases in household debt and corporate debt occur respectively at 5-year lead −3.39% (−1.21 × 2.80) – and at 1-year lead −3.77% (−0.70 × 5.39). The results for EMEs are presented in the lower panel. The positive immediate impact of household debt and medium-run impact of corporate debt disappear, and only their negative impacts remain. In EMEs, the maximum
negative impact of corporate debt – 3.61% (=−0.67 × 5.39) – is larger than that of household debt – 2.44% (=−0.87 × 2.80). Our results suggest that corporate debt has a more negative impact on investment growth than household debt, and this feature is more pronounced in EMEs. The sign of the coefficient of the interaction terms, when statistically significant, is again the opposite of that for the change, especially in the case of corporate debt.

In Appendix Table A4.2, to investigate if asset prices may be one channel through which private debt impacts the real economy, we modify Equation (1) as follows:

$$ \Delta_3 y_{lt+k} = \beta_0 + \beta_{H3} \Delta_3 \hat{d}^{HH}_{lt-1} + \beta_{C3} \Delta_3 \hat{d}^{Corp}_{lt} + \beta_{hp} \Delta_3 \hat{p}_{lt+k} + \beta_{st} \Delta_3 \hat{s}_{lt+k} + u_{lt+k} \quad (3) $$

In the above equation, we add changes in asset prices, i.e., housing prices ($hp$) and stock prices ($st$), as additional regressors. The timing of differencing housing and stock prices is in line with that of output growth so that we control the impacts of changes in housing and stock prices over the same time horizon. If output changes are mainly associated with simultaneous changes in housing or stock prices, we expect only $\beta_{hp}$ and $\beta_{st}$ to be statistically significant. Indeed, the estimates of $\beta_{hp}$ and $\beta_{st}$ are highly significant with the expected sign. However, while the estimated coefficients of household and corporate debts are lowered approximately by one half, they are still statistically significant and show the same pattern as in Table 1. This suggests that their effects are not solely due to changes in asset prices. Interestingly, however, in lower panel presenting the results for EMEs, all coefficients of household and corporate debts except for one are statistically insignificant, suggesting that, in EMEs, the impacts of private debt are more associated with asset price changes in EMEs.

4. Normal Peaks versus Financial Peaks

While the results in previous sections suggest that debt buildups of both household and corporates debt are related to lowered future output growth, an endogeneity problem still remains because the output growth of a country will also affect the debt level of the private sector. For example, economic booms are often accompanied by the relaxation of credit controls that give individuals easier access to credit resources, resulting in an increase in the level of private-sector debt. These endogeneity problems are alleviated by zooming in on the roles of debt buildups in recessions. In particular, JST; Claessens, Kose, and Terrones (2012); and Bernardini and Forni (2017) take this approach and point out that recessions associated with financial expansions and disruptions tend to be more damaging to the real economy than normal business-cycle recessions. In this section, we will empirically investigate if there are differences between financial recessions associated with household debt and corporate debt buildups.

In JST and most other previous studies, business cycle upswings and downswings are dated by using the Bry and Boschan (1971) algorithm, which defines downswings as negative GDP growth. Since the average GDP growth rate is higher in EMEs than in advanced economies, the Bry-Boschan algorithm tends to detect fewer downswings in EMEs. To avoid this bias, we use the Hodrick-Prescott filter to identify business cycles. As a robustness check, we also repeat the analysis using the Bry-Boschan algorithm which generates qualitatively similar results. We identify peaks and troughs of business cycles by calculating local maxima and minima of cyclical parts derived from the Hodrick-Prescott filter. We find a total of 195 peaks in advanced economies and 140 peaks in EMEs.

The next step is to distinguish financial peaks from normal peaks. JST (2011) define financial peaks, more precisely financial crisis peaks (FCPs), as those that precede financial crises. We follow their methodology and collect crisis dates from two sources: banking crisis from Reinhart and Rogoff (2009) and the financial crisis from Leaven and Valencia (2013). Alternatively, we define financial peaks solely based on buildup speed of private debt. We calculate the annual change in private debt in the preceding boom, and if it exceeds the sample median, the corresponding peak is defined as a financial peak and otherwise as a normal peak. Then, we classify FCPs (or financial peaks) into household-debt driven and corporate-debt driven peaks by comparing annual changes in household
debt and corporate debt in the preceding boom. More precisely, if the annual change in household
debt is greater than that for corporate debt, we define it as a household debt-driven FCP (or financial
peak) and otherwise as a corporate debt-driven FCP (or financial peak). In Appendix Table A5.1, we
report dates of FCPs, household-debt-driven FCPs (household FCPs, hereafter) and corporate debt-
driven FCPs (corporate FCPs). Note that classification of FCPs into household and corporate FCPs is
possible only when both household and corporate debts data are available. Appendix Table A5.1 shows
that while most advanced countries experienced crises only during the GFC, EMEs experienced crises
in 2000 and before. Appendix Table A5.2 also reports dates of financial peaks, household financial
peaks and corporate financial peaks. Most years of FCPs are also identified as financial peaks, but there
were some cases where FCPs in Appendix Table A5.1 are classified as normal peaks in Appendix Table
A5.2, which are marked by * in Appendix Table A5.1. FCPs marked with ** in Appendix Table A5.1
are not classified as financial peaks in Appendix Table A5.2 due to lack of private debt data.

Appendix Table A6 presents summary statistics during expansions and recessions in advanced
economies and EMEs. In Appendix Table A6.1, as explained, FCPs are distinguished from normal
peaks by utilizing crisis dates. Since crisis dates are available only after 1970, we also restrict our sample
to normal peaks which occur after 1970. Out of 26 FCPs, we identify 10 household FCPs and 12
corporate FCPs. That is, financial crises are more associated with rapid increase in corporate debt than
in household debt. This is a bit surprising since recent studies emphasize recessions associated with
household debt buildups. In Appendix Table A6.2, we classify peaks using the second methodology
based on debt buildup speed during booms. Due to the methodology that separates normal peaks and
financial peaks by the median, there is approximately the same number of normal peaks (59) and
financial peaks (65). Out of 65 financial peaks, we have both household and corporate debts data in 46
cases, and they are divided into 20 household financial peaks and 24 corporate financial peaks. Again,
there are more financial peaks driven by corporate debt than household debt.

In advanced economies, average growth rates of output, consumption, and investment are higher
during expansions before normal peaks than before FCPs. However, during recessions, the growth
rates are much lower after FCPs than after normal peaks. Comparing household FCPs with corporate
FCPs, we find that the average output growth rate related to corporate FCP is slightly lower during
expansions and substantially lower during recessions. This further suggests that corporate debt
buildups can be at least as damaging as household debt buildups. The same pattern emerges in
Appendix Table A6.2 where we use financial peaks instead of FCPs.

In both Appendix Tables A6.1 and A6.2, the speed of buildups of private debt, household debt, and
corporate debt does not slow down after normal peaks, FCPs, and household and corporate FCPs,
indicating that debt deleveraging during recessions is a difficult process. However, there is strong
evidence that price increases of assets, such as housing and equities decline substantially after FCPs or
financial peaks, but not normal peaks, irrespective of whether FCPs or financial peaks are driven by the
household or corporate debt.

In EMEs, the growth rates of output, consumption, and investment during expansions are comparable across normal peaks and FCPs, but those for FCPs are much lower during recessions in
both Appendix Tables A6.1 and A6.2. Again, there is no evidence of debt deleveraging during
recessions. In Appendix Table A6.1, out of 17 FCPs, there are only six cases where both household
and corporate debts data are available, and they are divided into an equal number of household and
corporate FCPs. In Appendix Table A6.2, we observe relatively more financial peaks and they are
divided into seven household financial peaks and 14 corporate financial peaks. Even in EMEs, there are
more financial peaks where corporate debt increased more rapidly than household debt. The growth
rate of output related to corporate financial peaks is slightly lower both during expansions and
recessions. The growth rates of consumption and investment are also lower during corporate financial
peak recessions than household financial peak recession. Again, our evidence suggests that corporate
debt buildups are at least as damaging as household debt buildups in EMEs.

From now on, we will focus on financial peaks rather than FCPs. In other words, by investigating the
impacts of financial booms that did not necessarily result in crises, we want to investigate the impact of
Table 3. Recession paths of gross domestic product, consumption, and investment after normal and financial peaks: Advanced Economies.

| Variables | $\Delta_1 y_{it,1}$ | $\Delta_2 y_{it,2}$ | $\Delta_3 y_{it,3}$ | $\Delta_4 y_{it,4}$ | $\Delta_5 y_{it,5}$ |
|-----------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Normal peak | 0.48+                | 1.4**                | 3.0**                | 5.3**                | 7.8**                |
| ($\Delta d_{med} < median(\Delta d_{peri})$ | [0.26]               | [0.51]               | [0.68]               | [0.87]               | [1.02]               |
| Financial peak | −0.18               | −0.85+               | 0.32                | 1.8*                 | 2.9**                |
| ($\Delta d_{med} > median(\Delta d_{peri})$ | [0.23]               | [0.46]               | [0.61]               | [0.78]               | [0.92]               |
| $R^2$ | 0.04                | 0.09                | 0.15                | 0.27                | 0.38                |
| p-value (normal vs. financial) | 0.06                | 0.00                | 0.00                | 0.00                | 0.00                |
| N normal peaks | 51                  | 51                  | 51                  | 51                  | 51                  |
| N financial peaks | 63                  | 63                  | 63                  | 63                  | 63                  |

| Variables | $\Delta_1 c_{it,1}$ | $\Delta_2 c_{it,2}$ | $\Delta_3 c_{it,3}$ | $\Delta_4 c_{it,4}$ | $\Delta_5 c_{it,5}$ |
|-----------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Normal peak | 0.83+                | 1.6*                 | 2.8**                | 5.0**                | 7.5**                |
| ($\Delta d_{med} < median(\Delta d_{peri})$ | [0.43]               | [0.62]               | [0.89]               | [1.09]               | [1.21]               |
| Financial peak | 1.7**               | 1.7**                | 2.6**                | 4.5**                | 6.8**                |
| ($\Delta d_{med} > median(\Delta d_{peri})$ | [0.39]               | [0.56]               | [0.80]               | [0.98]               | [1.08]               |
| $R^2$ | 0.17                | 0.12                | 0.16                | 0.27                | 0.41                |
| p-value (normal vs. financial) | 0.13                | 0.93                | 0.89                | 0.75                | 0.67                |
| Observations, normal peaks | 51                  | 51                  | 51                  | 51                  | 51                  |
| Observations, financial peaks | 63                  | 63                  | 63                  | 63                  | 63                  |

| Variables | $\Delta_1 l_{it,1}$ | $\Delta_2 l_{it,2}$ | $\Delta_3 l_{it,3}$ | $\Delta_4 l_{it,4}$ | $\Delta_5 l_{it,5}$ |
|-----------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Normal peak | −3.1**               | −5.1**               | −4.3*                | −1.5                | 2.1                 |
| ($\Delta d_{med} < median(\Delta d_{peri})$ | [1.15]               | [1.88]               | [2.16]               | [2.66]               | [2.89]               |
| Financial peak | −4.2**              | −11.1**              | −8.5**               | −5.3*               | −3.4               |
| ($\Delta d_{med} > median(\Delta d_{peri})$ | [1.04]               | [1.69]               | [1.94]               | [2.39]               | [2.60]               |
| $R^2$ | 0.17                | 0.31                | 0.17                | 0.04                | 0.02                |
| p-value (normal vs. financial) | 0.46                | 0.02                | 0.15                | 0.29                | 0.16                |
| Observations, normal peaks | 51                  | 51                  | 51                  | 51                  | 51                  |
| Observations, financial peaks | 63                  | 63                  | 63                  | 63                  | 63                  |

The sample includes 21 advanced economies listed in Appendix Table A1. The dependent variables $y_{it}, c_{it}, l_{it}$ denote per capita real gross domestic product (GDP), real consumption, and investment for country $i$, and $\Delta_1$ denotes $r$-year log difference. For example, $\Delta_1 y_{it,1}, \tau = 1, 2, \ldots, 5$ is $i$-year growth rate of per capita GDP from the peak. The explanatory variables are dummy variables that take one if the year corresponds to normal and financial peaks, respectively. Financial peaks are listed in Appendix Table A5.1. We do not include a constant term in the regression. The three panels show unconditional paths of per capita GDP, real consumption, and investment, respectively, after normal and financial peaks. The reported $p$-value is for the test for equality of coefficients of normal and financial peaks. Numbers in brackets are standard errors, and ***, *, and + denote the significance levels of 1%, 5%, and 10%, respectively.

Source: Authors' calculation.

Debt buildups themselves. In Table 3, we compare normal peak recessions with financial peak recessions more systematically by regressing future growth rates at various lead intervals on normal peak and financial peak dummies. The same methodology was used by JST to compare normal peaks with FCPs for 14 advanced economies for a much longer period, from 1870 to 2008. Note that we cover more economies, including a substantial number of EMEs, and define financial peaks based on the speed of debt buildups rather than crisis dates. Most importantly, we distinguish between household and corporate financial peaks, unlike JST.

JST estimate the following unconditional path of the cumulative response of the variable $y$ to a treatment $x$ at time $t(r)$:

$$ CR(\Delta_1 y_{it(r)+h}, \delta) = E_{it(r)}(\Delta_{h} y_{it(r)+h}|x_{it(r)} = \bar{x} + \delta) $$

$$ - E_{it(r)}(\Delta_{h} y_{it(r)+h}|x_{it(r)} = \bar{x}), h = 1, \ldots, H $$

(4)

where $CR(\Delta_{h} y_{it(r)+h}, \delta)$ denotes the average cumulated response of $y$ across economies and recessions, $h$ periods in the future, with the treatment variable $x$ of a given size $\delta$ change. Following JST, $x$ could be a discrete treatment for normal recessions, i.e., recessions following normal peaks, and financial recessions, i.e., recessions following financial peaks. At various times, we introduce controls for
recessions following peaks (normal peak [NP], financial peak [FP]) into x as a discrete treatment, and also “excess credit” variable in a continuous form.

Tables 3 and 4 compare the recession paths of cumulative changes in output, consumption, and investment at different horizons, of 1–5 years, by treating x as a binary indicator for normal or financial recession. By normalizing the peak year reference level of log real per capita GDP set equal to zero, we report log deviations of cumulative changes in output (upper panel), consumption (middle panel), and investment (lower panel) from the reference multiplied by 100 in Table 3 for advanced economies and Table 4 for all economies. The reported p-value of the F-test is for the test for equality of cumulative changes in normal and financial recessions at different horizons.

In advanced economies, in the upper panel, we observe a clear difference in cumulative output changes between normal and financial recessions. At every horizon, the p-value is close to 0, except for h = 1, at which it is .06. Hence, we conclude that cumulative changes in output are lower after financial peaks than after normal peaks at high levels of statistical significance. However, in the middle and lower panels, while cumulative changes in consumption and investment are lower in financial recessions, the difference is mostly insignificant. When we extend the sample to include EMEs in Table 4, the p-value for the test for equality of cumulative output changes in normal and financial recessions suggests more statistical significance. While the p-value for cumulative changes in consumption is still not low, the p-value for cumulative changes in investment is even lower than that for cumulative changes in output. This implies that financial recessions are especially damaging for investment.

Tables 5 and 6 reports cumulative changes in output, consumption, and investment in normal, household financial, and corporate financial recessions when we extend the discrete treatment to distinguish

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**Table 4.** Recession paths of gross domestic product, consumption, and investment after normal and financial peaks: Whole Economies.

| Variables                                                                 | $\Delta_1y_{t+1}$ | $\Delta_2y_{t+2}$ | $\Delta_3y_{t+3}$ | $\Delta_4y_{t+4}$ | $\Delta_5y_{t+5}$ |
|--------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Normal peak                                                              | 0.35                | 1.7**               | 4.5**               | 7.2**               | 10.2**              |
| ($\Delta d_{priv} < median(\Delta d_{priv})$)                           | [0.33]              | [0.51]              | [0.69]              | [0.88]              | [1.01]              |
| Financial peak                                                           | -0.56+              | -1.1*               | 0.80                | 2.6**               | 4.5**               |
| ($\Delta d_{priv} > median(\Delta d_{priv})$)                           | [0.31]              | [0.48]              | [0.65]              | [0.83]              | [0.96]              |
| $R^2$                                                                    | 0.03                | 0.09                | 0.21                | 0.32                | 0.43                |
| p-value (normal vs. financial)                                           | 0.05                | 0.00                | 0.00                | 0.00                | 0.00                |
| Observations, normal peaks                                              | 80                  | 80                  | 80                  | 80                  | 80                  |
| Observations, financial peaks                                            | 90                  | 90                  | 90                  | 90                  | 90                  |

| Variables                                                                 | $\Delta_1c_{t+1}$ | $\Delta_2c_{t+2}$ | $\Delta_3c_{t+3}$ | $\Delta_4c_{t+4}$ | $\Delta_5c_{t+5}$ |
|--------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Normal peak                                                              | 1.7**               | 2.9**               | 5.5**               | 8.0**               | 11.3**              |
| ($\Delta d_{priv} < median(\Delta d_{priv})$)                           | [0.52]              | [0.78]              | [1.02]              | [1.29]              | [1.45]              |
| Financial peak                                                           | 1.1*                | 1.1                 | 3.4**               | 6.3**               | 9.4**               |
| ($\Delta d_{priv} > median(\Delta d_{priv})$)                           | [0.49]              | [0.73]              | [0.96]              | [1.21]              | [1.37]              |
| $R^2$                                                                    | 0.09                | 0.09                | 0.20                | 0.28                | 0.39                |
| p-value (normal vs. financial)                                           | 0.38                | 0.09                | 0.14                | 0.32                | 0.34                |
| Observations, normal peaks                                              | 80                  | 80                  | 80                  | 80                  | 80                  |
| Observations, financial peaks                                            | 90                  | 90                  | 90                  | 90                  | 90                  |

| Variables                                                                 | $\Delta_1i_{t+1}$ | $\Delta_2i_{t+2}$ | $\Delta_3i_{t+3}$ | $\Delta_4i_{t+4}$ | $\Delta_5i_{t+5}$ |
|--------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Normal peak                                                              | -2.1                | -3.3                | -0.5                | 3.6                 | 7.5**               |
| ($\Delta d_{priv} < median(\Delta d_{priv})$)                           | [1.53]              | [2.01]              | [2.29]              | [2.67]              | [2.89]              |
| Financial peak                                                           | -6.6**              | -13.8**             | -10.0**             | -7.3**              | -3.8                |
| ($\Delta d_{priv} > median(\Delta d_{priv})$)                           | [1.45]              | [1.90]              | [2.16]              | [2.52]              | [2.72]              |
| $R^2$                                                                    | 0.12                | 0.25                | 0.11                | 0.05                | 0.05                |
| p-value (normal vs. financial)                                           | 0.03                | 0.00                | 0.00                | 0.00                | 0.00                |
| Observations, normal peaks                                              | 80                  | 80                  | 80                  | 80                  | 80                  |
| Observations, financial peaks                                            | 90                  | 90                  | 90                  | 90                  | 90                  |

The sample includes 17 emerging market economies listed in Appendix Table A1. The dependent variables $y_{it}$, $c_{it}$, $i_{it}$ denote per capita real gross domestic product, real consumption, and investment for country $i$ and $t$, denotes $t$-year log difference. The explanatory variables are dummy variables that take one if the year corresponds to normal and financial peaks, respectively. For other, see notes for Table 3.1.

Source: Authors’ calculation.
Table 5. Recession paths after household and corporate debt-driven financial peaks: Advanced Economies.

| Variables                                      | \(\Delta y_{t+1}\) | \(\Delta y_{t+2}\) | \(\Delta y_{t+3}\) | \(\Delta y_{t+4}\) | \(\Delta y_{t+5}\) |
|------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Normal peak                                    | 0.48+                | 1.4**                | 3.0**                | 5.3**                | 7.8**                |
| \((\Delta d_{priv} < \text{median}(\Delta d_{priv}))\) | [0.25]               | [0.50]               | [0.66]               | [0.86]               | [1.03]               |
| Household financial peak                       | 0.15                 | -1.2                 | -1.0                 | -0.0                 | 1.4                  |
| \((\Delta d_{cor} < \text{median}(\Delta d_{cor}))\) | [0.41]               | [0.82]               | [1.08]               | [1.41]               | [1.68]               |
| Corporation financial peak                     | -0.83*               | -1.4+                | 0.5                  | 2.1                  | 2.9+                 |
| \((\Delta d_{cor} < \text{median}(\Delta d_{cor}))\) | [0.37]               | [0.75]               | [0.99]               | [1.28]               | [1.53]               |
| p-value (normal vs. household)                 | 0.50                 | 0.01                 | 0.00                 | 0.00                 | 0.00                 |
| p-value (normal vs. corporate)                 | 0.00                 | 0.00                 | 0.04                 | 0.04                 | 0.01                 |
| p-value (household vs. corporate)              | 0.08                 | 0.88                 | 0.31                 | 0.27                 | 0.52                 |
| Observations, normal peaks                     | 51                   | 51                   | 51                   | 51                   | 51                   |
| Observations, household financial peaks        | 19                   | 19                   | 19                   | 19                   | 19                   |
| Observations, corporate financial peaks        | 23                   | 23                   | 23                   | 23                   | 23                   |

| Variables                                      | \(\Delta c_{t+1}\) | \(\Delta c_{t+2}\) | \(\Delta c_{t+3}\) | \(\Delta c_{t+4}\) | \(\Delta c_{t+5}\) |
|------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Normal peak                                    | 0.83+                | 1.6**                | 2.8**                | 5.0**                | 7.5**                |
| \((\Delta d_{priv} < \text{median}(\Delta d_{priv}))\) | [0.43]               | [0.58]               | [0.85]               | [1.06]               | [1.19]               |
| Household financial peak                       | 1.6*                 | 0.88                 | 0.75                 | 2.2                  | 5.5**                |
| \((\Delta d_{cor} < \text{median}(\Delta d_{cor}))\) | [0.71]               | [0.95]               | [1.39]               | [1.73]               | [1.94]               |
| Corporation financial peak                     | 1.7***               | 1.8*                 | 3.8**                | 5.7**                | 8.7**                |
| \((\Delta d_{cor} < \text{median}(\Delta d_{cor}))\) | [0.65]               | [0.86]               | [1.26]               | [1.57]               | [1.76]               |
| p-value (normal vs. household)                 | 0.37                 | 0.51                 | 0.21                 | 0.17                 | 0.40                 |
| p-value (Normal vs. corporate)                 | 0.27                 | 0.88                 | 0.53                 | 0.71                 | 0.56                 |
| p-value (Household vs. corporate)              | 0.90                 | 0.49                 | 0.11                 | 0.14                 | 0.23                 |
| Observations, normal peaks                     | 51                   | 51                   | 51                   | 51                   | 51                   |
| Observations, household financial peaks        | 19                   | 19                   | 19                   | 19                   | 19                   |
| Observations, corporate financial peaks        | 23                   | 23                   | 23                   | 23                   | 23                   |

| Variables                                      | \(\Delta l_{t+1}\) | \(\Delta l_{t+2}\) | \(\Delta l_{t+3}\) | \(\Delta l_{t+4}\) | \(\Delta l_{t+5}\) |
|------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Normal peak                                    | -3.1**               | -5.1**               | -4.3**               | -1.5                 | 2.1                  |
| \((\Delta d_{priv} < \text{median}(\Delta d_{priv}))\) | [1.12]               | [1.72]               | [2.06]               | [2.58]               | [2.98]               |
| Household financial peak                       | -3.6+                | -12.8**              | -12.8**              | -11.0*               | -7.5                 |
| \((\Delta d_{cor} < \text{median}(\Delta d_{cor}))\) | [1.84]               | [2.82]               | [3.38]               | [4.23]               | [4.89]               |
| Corporation financial peak                     | -4.9**               | -11.1**              | -5.7+                | -1.1                 | -0.2                 |
| \((\Delta d_{cor} < \text{median}(\Delta d_{cor}))\) | [1.67]               | [2.57]               | [3.07]               | [3.84]               | [4.44]               |
| R²                                             | 0.18                 | 0.35                 | 0.20                 | 0.07                 | 0.03                 |
| p-value (normal vs. household)                 | 0.79                 | 0.02                 | 0.03                 | 0.06                 | 0.10                 |
| p-value (normal vs. corporate)                 | 0.36                 | 0.06                 | 0.71                 | 0.94                 | 0.67                 |
| p-value (household vs. corporate)              | 0.61                 | 0.65                 | 0.12                 | 0.09                 | 0.27                 |
| Observations, normal peaks                     | 51                   | 51                   | 51                   | 51                   | 51                   |
| Observations, household financial peaks        | 19                   | 19                   | 19                   | 19                   | 19                   |
| Observations, corporate financial peaks        | 23                   | 23                   | 23                   | 23                   | 23                   |

The sample includes 21 advanced economies listed in Appendix Table A1. The dependent variables \(y_{it}, c_{it}, l_{it}\) denote per capita real gross domestic product, real consumption, and investment for country \(i\), and \(\Delta y\) denotes \(t\)-year log difference. We do not include a constant term in the regression. The reported three \(p\)-values are for the test for equality of coefficients of normal vs. household financial peaks, normal vs. corporate financial peaks, and household vs. corporate financial peaks, respectively. For others, see notes for Table 3.1.

Source: Authors’ calculation.

between household and corporate financial peaks. We report the results for advanced economies in Table 5 for all economies in Table 6. In Table 5, the number of normal peaks, household financial peaks, and corporate financial peaks is 51, 19, and 23, respectively. We observe that cumulative changes in output are substantially lower in both household and corporate financial recessions than in normal recessions. However, there is no statistically significant difference between cumulative output changes of household and corporate financial recessions at any horizon. Hence, our results reconfirm that the impact of corporate financial recessions on output is as damaging as that of household financial recessions. However, in the middle panel for cumulative changes in consumption, the \(p\)-value is generally high. For both household and corporate financial recessions, cumulative consumption changes are not statistically different from...
Table 6. Recession paths after household and corporate debt-driven financial peaks: Whole Economies.

| Variables | $\Delta y_{t+1}$ | $\Delta y_{t+2}$ | $\Delta y_{t+3}$ | $\Delta y_{t+4}$ | $\Delta y_{t+5}$ |
|-----------|------------------|------------------|------------------|------------------|------------------|
| Normal peak | 0.35 | 1.7** | 4.5** | 7.2** | 10.3** |
| ($\Delta d_{priv} < \text{median}(\Delta d_{priv})$) | [0.28] | [0.48] | [0.65] | [0.85] | [1.01] |
| Household financial peak | 0.38 | −0.79 | 0.05 | 1.6 | 3.1 |
| ($\Delta d_{corp} < \Delta d_{hhd}$) | [0.53] | [0.91] | [1.23] | [1.62] | [1.92] |
| Corporation financial peak | −0.47 | −0.89 | 1.6 | 3.3** | 4.7** |
| ($\Delta d_{hhd} < \Delta d_{corp}$) | [0.43] | [0.74] | [0.99] | [1.30] | [1.55] |
| $R^2$ | 0.02 | 0.10 | 0.28 | 0.38 | 0.46 |
| p-value (normal vs. household) | 0.95 | 0.02 | 0.00 | 0.00 | 0.00 |
| p-value (normal vs. corporate) | 0.11 | 0.00 | 0.02 | 0.01 | 0.00 |
| p-value (household vs. corporate) | 0.22 | 0.94 | 0.33 | 0.42 | 0.54 |
| Observations, normal peaks | 80 | 80 | 80 | 80 | 80 |
| Observations, household financial peaks | 22 | 22 | 22 | 22 | 22 |
| Observations, corporate financial peaks | 34 | 34 | 34 | 34 | 34 |

| Variables | $\Delta c_{t+1}$ | $\Delta c_{t+2}$ | $\Delta c_{t+3}$ | $\Delta c_{t+4}$ | $\Delta c_{t+5}$ |
|-----------|------------------|------------------|------------------|------------------|------------------|
| Normal peak | 1.7** | 2.9** | 5.5** | 8.0** | 11.3** |
| ($\Delta d_{priv} < \text{median}(\Delta d_{priv})$) | [0.48] | [0.74] | [1.01] | [1.27] | [1.45] |
| Household financial peak | 2.0* | 1.5 | 2.3 | 4.5+ | 7.9** |
| ($\Delta d_{corp} < \Delta d_{hhd}$) | [0.91] | [1.40] | [1.92] | [2.42] | [2.76] |
| Corporation financial peak | 2.0** | 2.8* | 6.5** | 9.8** | 13.4** |
| ($\Delta d_{hhd} < \Delta d_{corp}$) | [0.73] | [1.13] | [1.54] | [1.95] | [2.22] |
| $R^2$ | 0.16 | 0.15 | 0.27 | 0.34 | 0.44 |
| p-value (normal vs. household) | 0.78 | 0.36 | 0.15 | 0.19 | 0.27 |
| p-value (normal vs. corporate) | 0.78 | 0.89 | 0.59 | 0.46 | 0.44 |
| p-value (household vs. corporate) | 0.97 | 0.48 | 0.10 | 0.09 | 0.12 |
| Observations, normal peaks | 80 | 80 | 80 | 80 | 80 |
| Observations, household financial peaks | 22 | 22 | 22 | 22 | 22 |
| Observations, corporate financial peaks | 34 | 34 | 34 | 34 | 34 |

| Variables | $\Delta l_{t+1}$ | $\Delta l_{t+2}$ | $\Delta l_{t+3}$ | $\Delta l_{t+4}$ | $\Delta l_{t+5}$ |
|-----------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Normal peak | −2.1 | −3.3+ | −0.52 | 3.6 | 7.5** |
| ($\Delta d_{priv} < \text{median}(\Delta d_{priv})$) | [1.37] | [1.72] | [2.08] | [2.41] | [2.77] |
| Household financial peak | −2.6 | −12.9** | −10.1* | −6.9 | −4.1 |
| ($\Delta d_{corp} < \Delta d_{hhd}$) | [2.60] | [3.28] | [3.97] | [4.59] | [5.28] |
| Corporation financial peak | −5.5** | −10.0** | −3.9 | −1.1 | 0.98 |
| ($\Delta d_{hhd} < \Delta d_{corp}$) | [2.09] | [2.64] | [3.19] | [3.69] | [4.25] |
| $R^2$ | 0.07 | 0.20 | 0.06 | 0.03 | 0.06 |
| p-value (normal vs. household) | 0.86 | 0.01 | 0.03 | 0.04 | 0.05 |
| p-value (normal vs. corporate) | 0.17 | 0.04 | 0.37 | 0.29 | 0.20 |
| p-value (household vs. corporate) | 0.39 | 0.50 | 0.22 | 0.32 | 0.45 |
| Observations, normal peaks | 80 | 80 | 80 | 80 | 80 |
| Observations, household financial peaks | 22 | 22 | 22 | 22 | 22 |
| Observations, corporate financial peaks | 34 | 34 | 34 | 34 | 34 |

The sample includes both advanced and emerging economies listed in Appendix Table A.1. The dependent variables $y_{it}$, $c_{it}$, $l_{it}$ denote per capita real GDP, consumption, and investment, and $\Delta$, denotes $t$-year log difference. We do not include a constant term in the regression. The reported three $p$-values are for the test for equality of coefficients of normal vs. household financial peaks, normal vs. corporate financial peaks, and household vs. corporate financial peaks, respectively. For others, see notes for Table 3. Source: Authors’ calculations.

Note: the results in normal recessions. In the lower panel, only cumulative investment changes in household, but not corporate. Financial recessions are statistically different from those in normal recession. In Table 6, which reports the results of extending the sample to include EMEs, the number of normal peaks, household financial peaks, and corporate financial peaks increases to 80, 22, and 34, respectively. Note that, when EMEs are included, the number of corporate financial peaks increases more than the household financial peaks. Hence, the likelihood of corporate financial peaks, rather than household financial peaks, is even higher in EMEs. Further, all the results are preserved except that the cumulative investment changes in both household and corporate financial recessions are statistically different from those in normal recession. Hence, including EMEs in the sample further
reinforces our conclusion that corporate financial recessions are equally damaging as household financial recessions.

In Appendix Figure A1, we present cumulative changes graphically before as well as after peaks. Appendix Figure A1.1 shows the cumulative changes in output, consumption, and investment for advanced economies. In the left panel, which shows cumulative changes in output, the expansion path looks similar, but cumulative changes in both household and corporate financial recessions are substantially lower than those in normal recessions. In the middle panel, which shows cumulative changes in consumption, the recession path after household financial peaks is lowest but, as reported in Table 5, the difference is not statistically significant. In the right panel, the recession paths of investment after household and corporate financial peaks are close at earlier horizons, but only those in household recessions are statistically different from those in normal recession at longer horizons.

In Appendix Figure A1.2, we present the same graphs for EMEs. Note that, since Table 6 is for all economies, Appendix Figure A1.2 and Table 6 do not contain the same information. Appendix Figure A1.2 can help us understand why the results in Table 6 differ from those in Table 5. Appendix Figure A1.2 shows that, in EMEs, corporate recessions inflict bigger damage on output and investment than household recession. In the left panel, which shows cumulative changes in output, the recession path after corporate financial peaks is substantially lower than those after either normal peaks or household financial peaks. In the right panel, which shows cumulative changes in investment, we observe that the recession path after corporate financial peaks is much lower at longer horizons than after either normal peaks or household financial peaks. Appendix Figure A1.2 shows more directly that corporate financial recessions can have even more adverse impact on the economy than household financial recessions in EMEs.

While the results in Tables 5 and 6 are suggestive, we do not distinguish financial peaks by the extent of private debt buildup. However, as noted, the treatment can be continuous in Equation (4). Therefore, we can test if more rapid buildups of private debt during expansions can be more damaging among financial recessions. Following JST, in addition to discrete treatments for normal peak and financial peak to capture average treatment response at each horizon, we include interaction terms to capture marginal treatment responses due to deviations of excess credit from its specific recession-type mean ($\xi - \hat{\xi}$) and report the results in Appendix Table A7. We define excess credit in two ways: as deviations from the mean increase in household and corporate debts, respectively. For example, the interactions terms with excess credits to households and corporations in the expansion before normal peaks are defined as $\left(\text{NP} \times \left(\xi^H - \xi^H_{\text{NP}}\right)\right)$ and $\left(\text{NP} \times \left(\xi^C - \xi^C_{\text{NP}}\right)\right)$, respectively, where $\xi^H - \xi^H_{\text{NP}}$ and $\xi^C - \xi^C_{\text{NP}}$ measure excess credit to households and corporations. Likewise, we can define the interactions terms with excess credit before financial peaks as $\left(\text{FP} \times \left(\xi^H - \xi^H_{\text{FP}}\right)\right)$ and $\left(\text{FP} \times \left(\xi^C - \xi^C_{\text{FP}}\right)\right)$.

In Appendix Table A7, we report estimates of the marginal treatments associated with excess credit in advanced economies (Appendix Table A7.1-A7.3) and in all economies (Appendix Table A7.4-A7.6). In each table, we report the results for output, consumption, and investment, respectively. In Appendix Table A7.1, we find that the interaction terms with excess credit are not statistically significant for normal peaks. However, both excess credit to households and corporations are statistically significant for financial peaks. In addition, as underlined in Tables 5 and 6, recession paths after financial peaks are lower than after normal peaks. These results suggest that financial recessions not only inflict greater damage on output, but also higher excess credit to both households and corporations from the previous expansion entails more painful recession trajectories of output after financial peaks. However, in Appendix Table A7.4, the results for all economies show that, while financial recessions inflict more damage on output than normal recession, the interaction terms with excess credit to households and corporation are not statistically significant.

Appendix Figures A2.1 and A2.2 show the recession paths of output, consumption, and investment for advanced economies and all economies, respectively. In addition to the average paths after normal peaks and financial peaks denoted by solid lines in black and red, respectively, each figure shows the
recession paths when the excess credit treatment is perturbed by one standard deviation ppy increases in household and corporation debt, respectively. The left panel in Appendix Figure A2.1 shows clearly that the recession path after financial peaks is lower than that after normal peaks. While the perturbation of excess credit to either households or corporations does not significantly affect the recession trajectory after normal peaks, it creates significant changes in the recession trajectory after financial peaks. In particular, one standard deviation perturbation of corporate debt moves the trajectory even lower than the same shock of household debt. In the left panel of Appendix Figure A2.2, one standard deviation perturbation of corporate debt, while not statistically significant, creates a more painful trajectory in EMEs as well.

Appendix Tables A7.2 and A7.3 present estimates of the marginal treatments associated with excess credit for consumption and investment trajectories, respectively, in advanced economies. Interestingly, for the consumption trajectory, the interaction terms with excess credit are statistically significant only after normal peaks but not after financial peaks. However, for the investment trajectory, the interaction terms with excess credit to both households and corporations are statistically significant only after financial peaks. Appendix Tables A7.5 and A7.6 present the same regression results for consumption and investment trajectories, respectively, in all economies. For the consumption trajectory, the interaction terms with excess credit are generally not statistically significant for both normal peaks and financial peaks. However, for the investment trajectory, the interaction terms with excess credit are statistically significant at the 10% level for corporate debt only after financial peaks.

We also illustrate the recession paths of consumption and investment in advanced economies and in all economies in the middle and right panels of Appendix Figures A2.1 and A2.2, respectively. As noted above, in both advanced economies and all economies, we do not see significant difference between recession trajectories of consumption after normal peaks and financial peaks. However, for investment, we observe clear differences between trajectories after normal peaks and financial peaks. Further, estimates of the marginal treatments associated with excess credit further weaken the recession recovery, particularly after financial peaks. While the investment trajectory perturbed by one standard deviation ppy increase in household debt is lower than that perturbed by the same shock of corporate debt in advanced economies (right panel in Appendix Figure A2.1), the opposite is true for all economies (right panel in Appendix Figure A2.2). This finding reconfirms that corporate debt is especially harmful for investment recovery after financial peaks in EMEs.

5. Concluding Observations

In this article, we try to systematically and comprehensively explore the impact of both household and corporate debts buildups on the real economy in both advanced economies and EMEs. This extensive empirical analysis adds to the literature by providing a better understanding of the economic effects of private debt accumulation. We find that, in both advanced economies and EMEs, the level of household debt is smaller than that of corporate debt, but the former increases slightly faster than the latter. However, the standard deviation of percentage point per year increase is much higher for corporate debt than for household debt. We confirm MSV’s results that, while buildups of household debt boost output growth in the very short run, they predict lower output growth after 3 years. In contrast, buildups of corporate debt do not increase output growth even in the short run, and predict lower output growth in 1–3 years. However, we find that, while the size of the estimated coefficients of corporate debt is smaller, its negative impact on output growth, as measured by one standard deviation shock, is comparable with that of household debt buildups. Our results also suggest that corporate debt has a larger negative effect on investment growth than household debt, and this feature is more pronounced in EMEs.

We also investigate the impact of household and corporate debts buildups on housing and stock price growth rates. In advanced economies, household debt leads to comparable booms and busts of housing prices, but corporate debt only has a negative impact. In EMEs, household debt has only
negative effect on housing prices in the medium run, and corporate debt has almost no effect. On the other hand, in advanced economies household debt has only negative effect on stock prices in the medium run, but corporate debt has more immediate negative effect, which turns to positive over a longer horizon. In EMEs, both household and corporate debts predict lower stock prices, with corporate debt having a more immediate impact. We find that, in advanced economies, approximately half of the impact of private debt buildup on the real economy is explained by changes in asset prices. However, in EMEs, the asset-price channel plays a much larger role.

Finally, we take a closer look at recessions and investigate if there are differences between financial recessions associated with household debt versus corporate debt. After identifying the peaks and troughs of business cycles, we define financial peaks based solely on the buildup speed of private debt. Then, we divide financial peaks into household debt-driven and corporate debt-driven financial peaks. We find that more financial peaks are driven by corporate rather than household debt buildups in both advanced economies and EMEs. We compare the recession paths of cumulative changes in output, consumption, and investment at different horizons, and find that cumulative changes in output and investment are lower after financial peaks than after normal peaks. Those results are statistically highly significant in both advanced economies and EMEs. If we differentiate between household financial peaks and corporate financial peaks, in advanced economies we find that corporate financial recessions are as damaging to output as household financial recessions. This result becomes even stronger if we include EMEs in the sample. We also find that higher excess credit to either households or corporations from the previous expansion entails more painful recession trajectories of output after financial peaks. In advanced economies, the effect of excess credit is slightly larger for corporations and, in EMEs, corporate debt is particularly damaging to investment recovery after financial peaks. Overall, our findings suggest that corporate debt buildups are at least as damaging as household debt buildups, and this is especially true in EMEs.

Notes

1. For example, see Glick and Lansing (2010) and Mian and Sufi (2014), and the literature reviewed in the next section.
2. Household debt has received more attention than corporate debt. For example, Glick and Lansing (2010) shows that many advanced economies experienced rapid increases in household leverage and countries with the largest increase in household leverage experienced the fastest rise in house prices and the largest decline in subsequent household consumption. Based on United States county data, Mian and Sufi (2014) also find that the increase in household debt before the GFC predicts the severity of the downturn during the Great Recession.
3. See Bernardini and Forni (2017) and Figure 1 therein. See also Section II.
4. Mian, Sufi, and Verner (2017) also show that, if the underlying credit shock is demand-driven, even models of agents with flawed expectations are not consistent with empirical facts because these models imply increases in the interest rate, which is counterfactual.
5. See Mian, Sufi, and Verner (2017) for the references that explain sources of credit supply shocks. For example, as argued by Justiniano, Primiceri, and Tambalotti (2015) and Schmitt-Grohé and Uribe (2016), credit supply expansion may originate from foreign capital inflows as well.
6. The nonlinear nexus between public debt and economic growth is well established in the literature. Relevant studies include Baum, Checherita, and Rother (2013), Checherita and Rother (2012), Egert (2015), Kumar and Woo (2010), and Reinhart and Rogoff (2010). However, less is known about the impact of private debt accumulation on growth.
7. While Mian, Sufi, and Verner (2017) also report some differences between the experiences of advanced and EMEs, the comparison was not a main objective of their paper.
8. In Section 3, we find that most advanced countries reached financial peaks only around GFC. See Section 3 for details.
9. In Section 3, we find that only two EMEs experienced rapid increase in private debts before the GFC.
10. We follow the approach by Jordà, Schularick, and Taylor (2013) in defining financial peaks solely based on actual financial crisis dates and compare these results with ours.
11. This different timings of the effects of household and corporate debts is also highlighted by Mian, Sufi, and Verner (2017).
12. Following Mian, Sufi, and Verner (2017), we exclude the People’s Republic of China, India, and South Africa, for which the data for private debt start from 2006 to 2007, as well as Luxembourg, for which the private debt data are too volatile. For most countries, the amount of private debt of nonfinancial sector is exactly the same as the sum of household debt and nonfinancial corporate debt, but there are small discrepancies in some cases.

13. We calculate real consumption by multiplying consumption share to output-side real GDP at chained PPPs because consumption share is reported using current PPPs. However, our findings seldom change if we use GDP at constant national prices instead.

14. Asian EMEs refer to the four countries hit hardest during the Asian financial crisis, namely Indonesia, the Republic of Korea, Malaysia, and Thailand.

15. While Mian, Sufi, and Verner (2017) adopted a proxy VAR where the mortgage sovereign spread is used as an instrument, we cannot do so because the data are not available for many EMEs. Mian, Sufi, and Verner (2017) also report figures based on VAR for which Cholesky decomposition is used to identify shocks. However, we believe that estimating Equation (1) generates essentially the same dynamics as VAR identified from Cholesky decomposition since it essentially imposes restrictions between current variables only. In Equation (1), the dependent variables are mostly future values relative to the explanatory variables which can thus be considered as exogenous. In this sense, both methods show the same dynamic relation between three variables – real GDP, household debt and corporate debt. Further, the dependent variable is the three-year change in logarithm as in Mian, Sufi, and Verner (2017) since household debt increases for three to four years after a shock (p. 1765 in Mian, Sufi, and Verner (2017)). Hence, it is difficult to apply GMM methods of Arellano and Bond.

16. We thank an anonymous referee for pointing out the problem.

17. Results are not reported for brevity purpose but are available upon request.

18. In fact, the average duration of expansions before FCPs is much longer than that before normal peaks. Hence, the amplitude of the variables of the FCPs is higher than that of normal peaks. However, as reported in Appendix Table 6, the annual growth rate, the amplitude divided by duration, is actually lower during expansions before FCPs than before normal peaks.

19. The results, based on FCPs, are quite similar and are available upon request.

20. We gratefully appreciate JST for sharing their Stata program for generating the regression results. Stata is a general-purpose statistical software package created in 1985 by StataCorp.

21. The number of FCPs and household and corporate FCPs is small for EMEs. So, instead of reporting the estimates separately, we combine advanced economies and EMEs together to generate estimates for the full sample.

22. This finding is also emphasized by JST.

23. The interactions terms with household excess credit are generally more statistically significant.

Acknowledgments

This article was initially prepared for the Asian Development Bank Institute’s 21st Annual Conference: Managing Private and Local Government Debt in Asia, 30 November–1 December 2017. This was also used as a background article for the Asian Development Outlook 2018 and a preliminary version was published as ADB working paper No. 567. We thank Jaeyoung Yoo for his excellent research assistance, Hyein Han and Cynthia Castillejos-Petalcorin for their superb editorial work, and the Asian Development Bank for its financial support.

Funding

This work was supported by the Asian Development Bank.

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