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ABSTRACT

How Do Business and Financial Cycles Interact?*

This paper analyzes the interactions between business and financial cycles using an extensive database of over 200 business and 700 financial cycles in 44 countries for the period 1960:1-2007:4. Our results suggest that there are strong linkages between different phases of business and financial cycles. In particular, recessions associated with financial disruption episodes, notably house price busts, tend to be longer and deeper than other recessions. Conversely, recoveries associated with rapid growth in credit and house prices tend to be stronger. These findings emphasize the importance of developments in credit and housing markets for the real economy.

JEL Classification: E32, E44, E51 and F42
Keywords: asset busts, booms, credit crunches, financial crises, recessions and recoveries

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EXECUTIVE SUMMARY

Virtually all advanced economies and many emerging markets have experienced recessions during the past three years. A common feature of these recessions was that they were accompanied by various types of financial disruptions, including contractions in the supply of credit and sharp declines in asset prices. These developments have led to an intensive debate in the profession about the links between macroeconomics and finance, and have propelled the study of interactions between business cycles and financial cycles to the forefront of research.

Our knowledge about the interactions between real and financial sectors during different phases of business and financial cycles is rather limited. This is in large part as most studies have a small set of observations to work with, using a single country (often the United States) or a few advanced countries. The importance of studying the global dimensions of these interactions, however, can no longer be ignored as the dramatic cost of the global financial crisis has shown.

This paper aims to broaden our empirical understanding of these interactions using a rich database of a large number of countries over a long period. Our dataset includes 44 advanced and emerging economies over the period 1960:1–2007:4. We exclude from our analysis the years following the recent crisis because many episodes of business and financial cycles associated with the crisis are still ongoing. The main variable we use to characterize business cycles is output. To provide a broad perspective about financial cycles, we employ three measures: credit, house, and equity prices. In terms of methodology, we rely on the "classical" definition of a cycle, since it offers a simple but effective procedure to identify turning points in business and financial cycles.

The main question we ask is: ***"how does the nature of business cycles vary across different phases of financial cycles?"*** In addressing this question, we analyze the behavior of the major macroeconomic and financial variables over business and financial cycles. We report a rich set of results describing the interactions between business and financial cycles (see Figure A):

- ***Synchronization of business and financial cycles:*** Business cycles often display a higher degree of synchronization with credit and house price cycles than they do with cycles in equity prices.

- ***Interactions between business and financial cycles:*** Recessions accompanied with financial disruptions tend to be longer and deeper than other recessions. Similarly, recoveries associated with credit or house price booms are associated with stronger output growth.

- ***Determinants of duration and amplitude of business cycles:*** To analyze the role of financial cycles in determining the main features of business cycles, a number of regression models are employed. In addition to financial variables, these regressions control for a wide range of other potential factors. The results indicate that the duration and amplitude of recessions and recoveries tend to be influenced by the strength and intensity of financial cycles. When recessions are accompanied by house price busts, they tend to become longer and substantially deeper than other recessions, including those accompanied with other types of financial disruptions. While the strength of an economic recovery is significantly and positively associated with the depth of the prior recession, it is also influenced by financial factors. Recoveries coinciding with booms in credit and

housing markets are stronger, while if the prior recessions are associated with housing busts, recoveries are often weaker.

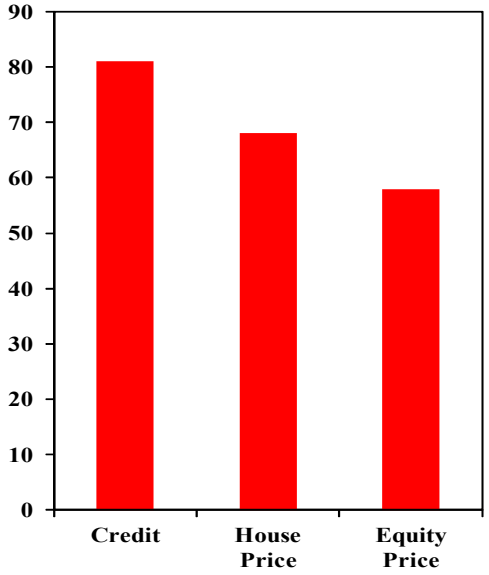
In light of the multidimensional interactions between financial and business cycles, the observations we document suggest that close monitoring of cycles in financial markets should be an integral part of macroeconomic surveillance and policy design. Since both business and financial cycles are often synchronized internationally, it is imperative to consider the global aspects of financial regulation and surveillance policies.

Our study also points to new challenges for future research. First, the empirical literature about the important roles played by countries' institutional structures and regulatory frameworks in shaping the interactions between business and financial cycles is still limited. Given the importance of these interactions, future research could examine these roles in a cross-country context using the regularities we document here as a baseline. Second, the theoretical literature appears still far from either being able to explain the fundamental linkages between the real economy and the financial sector or from capturing them in models directly useful for policymaking. In particular, models that can quantitatively match the main regularities about the interactions between business and financial cycles we document here are still lacking, suggesting another fruitful area for future research.

Figure A. Interactions between Business and Financial Cycles

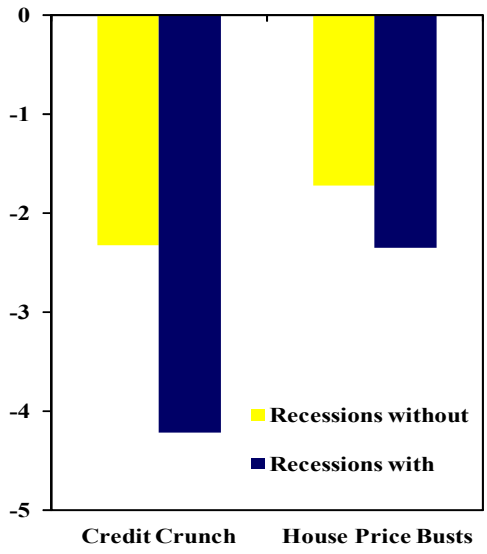
Business cycles have a higher degree of synchronization with credit and house price cycles

(concordance, percent, median)



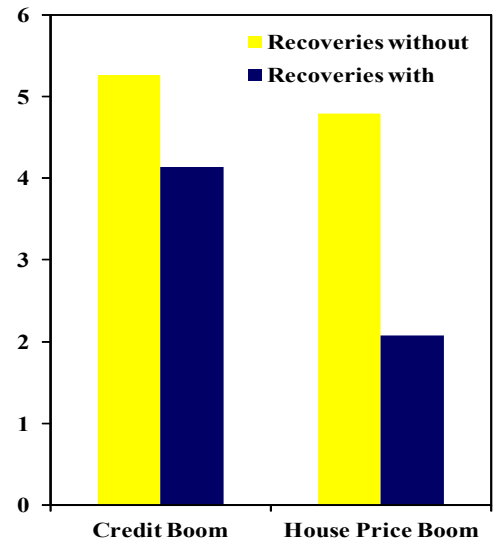
Recessions associated with financial disruptions are deeper

(amplitude, percent, median)



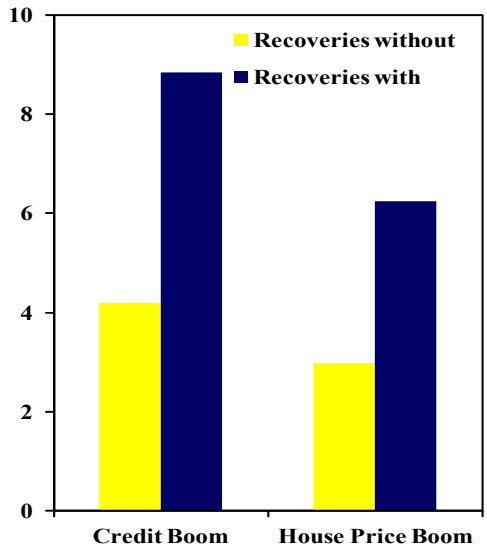
Recoveries associated with financial booms tend to be shorter than those without

(duration, number of quarters, average)



…and are also stronger

(amplitude, percent, median)



Notes: In the top left panel, each bar represents the concordance statistic for the corresponding business and financial cycles. Concordance is calculated as the fraction of time that the two cycles are in the same phase. In the top right panel, each bar represents the amplitude of output during recessions associated with respective financial crunch or bust. The bottom left panel shows the duration of recoveries associated with financial booms. In the bottom right panel, each bar represents the amplitude of output during recoveries associated with respective financial booms. The amplitude for recessions is defined as the output decline from peak to trough. The amplitude for recoveries is calculated based on the one year change in output after the trough in output. Duration of recoveries is defined as the time it takes to attain the level of output at the previous peak after the trough. Disruptions (booms) correspond to the bottom (top) 25 percent of downturns (upturns) in terms of amplitude.

"[Economists] will have to do their best to incorporate the realities of finance into macroeconomics…"

Paul Krugman (September 2, 2009)

I. INTRODUCTION

The past three years have seen recessions in virtually all advanced economies and many emerging markets. A common feature of these recessions was that they were accompanied by various types of financial disruptions, including contractions in the supply of credit and sharp declines in asset prices. These developments have led to an intensive debate in the profession about the links between macroeconomics and finance, and have propelled the study of interactions between business cycles and financial cycles to the forefront of research.

This paper aims to broaden our empirical understanding of these interactions using a rich database covering a large number of countries over a long period. The main question we ask is: "how does the nature of business cycles vary across different phases of financial cycles?" In addressing this question, we also analyze the behavior of the major macroeconomic and financial variables over business and financial cycles.

Our key finding is that interactions between business and financial cycles play an important role in shaping recessions and recoveries. Specifically, recessions associated with financial disruption episodes, notably house price busts, are often longer and deeper than other recessions. Conversely, recoveries associated with rapid growth of credit and house prices tend to be more robust.

Our work relates to an extensive literature studying the interactions between macroeconomic and financial developments.[2] Basic economic theory suggests that, in a world without financial frictions, macroeconomic developments and financial conditions interact closely through wealth and substitution effects (see Cochrane, 2006). When financial frictions are present, these linkages can be amplified through various channels, including the financial accelerator and related mechanisms. Many theoretical models indeed emphasize the roles played by movements in credit and asset (house and equity) prices in shaping the evolution of macroeconomic aggregates over the business cycle.[3]

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[2] The quote above has led to an intensive debate, but the literature has a long tradition of exploring the interactions between the financial sector and real economy. Fisher (1933) and Keynes (1936) were among the first to emphasize these interactions during the Great Depression. Gertler (1988), Sinai (1992, 2010), and Bernanke (1993) provide reviews of some of the early literature.

[3] See Bernanke and Gertler (1989), Bernanke, Gertler, and Gilchrist (1999), and Kiyotaki and Moore (1997) for models presenting channels of transmission between the financial sector and real economy. Gilchrist and Zakrajsek (2009) provide a short review of this literature.

Prior empirical research mostly explores the procyclical nature of the linkages between financial and macroeconomic variables. In particular, many empirical studies focus on the dynamic links between credit and output. Changes in house prices are also reported to have a close relationship with the business cycle. Related work has examined whether asset prices are leading, coincident, or lagging indicators for economic activity.[4] Some recent studies, notably Reinhart and Rogoff (2009), concentrate on the behavior of real and financial variables surrounding financial crises.

In spite of this rich research program, our knowledge of the interactions between real and financial sectors during various phases of business and financial cycles remains limited. The multiple phases of business cycles—recessions and recoveries—and financial cycles—downturns and upturns—have yet to be studied for a large sample of countries, including both advanced and emerging economies. While the literature on financial crises has used broader samples, the identification of crises has some drawbacks, and the focus is typically only on a single phase of the cycle, the aftermath of a crisis. In earlier work, we analyzed the implications of credit crunches and asset price busts for recessions (see Claessens, Kose and Terrones, 2009). We did not consider, however, the "up side" of business cycles (recoveries) and financial cycles (upturns), and only used data for advanced countries in our earlier paper. Moreover, we did not study the concordance between business and financial cycles and the interactions between their different phases using formal econometric methods.

This paper addresses some of these gaps in the literature. First, it is the first detailed, cross-country analysis exploring business and financial cycles and the interactions between their different phases for a large number of countries over a long period of time. Second, in parallel with the literature on business cycles, it uses a well established and reproducible methodology for the dating of financial disruptions and booms. Furthermore, since it uses quarterly data, rather than the annual data typically used in other studies, it is better able to identify and document the main features of these cycles. Third, taking advantage of the large data set and using regression models, it undertakes a rigorous analysis of financial variables and a wide range of other factors associated with the duration and depth of recessions and recoveries.

The paper is organized as follows. In section II, we introduce our database, explain our selection of variables, and present our methodology. The dataset includes 44 countries over the period 1960:1-2007:4. The main variable we use to characterize business cycles is output. To provide a broad perspective about financial cycles, we employ three measures: credit, house and equity prices. In terms of methodology, we rely on the "classical" definition of a cycle, since it provides a simple but effective procedure to identify cyclical turning points.

In section III, we document the main features of business and financial cycles. Specifically, we identify more than 200 episodes of business cycles and 700 episodes of financial cycles. We find that financial cycles are often longer, deeper, and more violent than business cycles. Our results also indicate that business and financial cycles tend to be more pronounced in emerging markets than in advanced countries.

[4] For the interactions between credit and output, see Helbling et al. (2010) and references therein. For the links between various asset prices and real aggregates, see Stock and Watson (2003) and Engel and West (2005).

We analyze the implications of the coincidence of business and financial cycles in Section IV. We document that cycles in output display a high degree of synchronization with credit and house price cycles whereas they do not feature much commonality with equity price cycles. We then examine how the nature of business cycles changes when they coincide with financial disruptions and booms. The results indicate that the duration and amplitude of recessions and recoveries tend to be influenced by the depth and intensity of financial cycles.

These stylized facts set the stage for the more formal empirical analysis in Section V, where we employ various regression models to examine the role of financial cycles in determining the main features of business cycles. We find that when recessions are accompanied by house price busts, they tend to become longer and substantially deeper than other recessions, including those accompanied with other types of financial disruptions. Regression results also show that, while the strength of an economic recovery is significantly and positively associated with the depth of the prior recession, it is also influenced by financial factors. Recoveries coinciding with booms in credit and housing markets are stronger, while if the prior recessions are associated with housing busts, they are often weaker. These findings collectively emphasize the importance of developments in housing and credit markets for the real economy. We conclude in Section VI with a brief summary of our main results and directions for future research.

II. DATABASE AND METHODOLOGY

A. Database

Our database comprises a total of 44 countries, 21 "advanced" OECD countries and 23 emerging market countries. These countries collectively account for more than 90 percent of global output. For the former group, the data coverage is 1960:1-2007:4 while for the latter it is the 1978:1-2007:4, since quarterly data series are less consistently available prior to 1978. We stop in 2007:4 to make sure that we have a complete set of business and financial cycles. To the best of our knowledge, our paper is the first one to utilize such a detailed database for the analysis of business and financial cycles.

Which variables to use to study business and financial cycles and their interactions? In the case of business cycles, the natural choice is output (GDP) since it is the best available measure to track economic activity. We study financial cycles in three distinct but interdependent market segments: credit, housing, and equity markets. Credit is a natural aggregate to analyze financial cycles as it constitutes the single most important link between savings and investment. Our measure of credit is aggregate claims on the private sector by deposit money banks. This measure is also often used in earlier cross-country studies on credit dynamics (see Mendoza and Terrones, 2008; and Claessens, Kose, and Terrones, 2011).[5]

[5] For a broader perspective on financial cycles, it could be useful to consider alternative measures of credit and asset prices. For example, some recent papers (e.g., Chari, Christiano, and Kehoe (2008) and Cohen-Cole et al., (2008)) highlight the importance of going beyond aggregate measures to study the dynamics of credit markets. Unfortunately, such disaggregated credit series are not available for a large number of countries over the sample period we analyze.

The two other financial variables we use are asset (house and equity) prices. House prices correspond to various measures of indices of house or land prices depending on the source country. Equity prices are share price indices weighted with the market value of outstanding shares. All macroeconomic and financial variables we use are of quarterly frequency, seasonally adjusted whenever necessary, and in constant prices. In addition to these variables, we use a number of other variables in the formal empirical analysis. We provide additional information about the country coverage, variables in the dataset, and their sources in Appendix A.

B. Methodology

A number of methodologies have been developed over the years to characterize business cycles. Our study is based on the "classical" definition of a business cycle which provides a simple but extremely effective procedure to identify cyclical turning points. The definition of classical cycles goes back to the pioneering work of Burns and Mitchell (1946) who laid the methodological foundation for the analysis of business cycles in the United States.[6]

The classical methodology focuses on changes in levels of economic activity. An alternative methodology would be to consider how economic activity fluctuates around a trend, and then to identify a "growth cycle" as a deviation from this trend (see Backus and Kehoe, 1992; Stock and Watson, 1999). There has been a rich research program using detrended series (and their second moments, such as volatility and correlations) to study various aspects of cycles. Our objective here is to produce a well-defined chronology of business and financial cycles, rather than studying the second moments of fluctuations. Another advantage of using the classical methodology is that the turning points identified are robust to the inclusion of newly available data: in other methodologies, new data can affect the estimated trend, and thus the identification of a growth cycle (see Canova, 1998).

We employ the algorithm introduced by Harding and Pagan (2002a), which extends the so-called BB algorithm developed by Bry and Boschan (1971), to identify the turning points in the log-level of a series.[7] We search for maxima and minima over a given period of time. Then, we select pairs of adjacent, locally absolute maxima and minima that meet certain censoring rules, requiring a minimal duration for cycles and phases. In particular, the algorithm requires the duration of a complete cycle and of each phase to be at least five quarters and two quarters, respectively. Specifically, a peak in a quarterly series y_t occurs at time t if:

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[6] Moreover, the classical approach constitutes the guiding principle of the Business Cycle Dating Committees of the National Bureau of Economic Research (NBER) and of the Center for Economic Policy Research (CEPR) in determining the turning points of U.S. and euro area business cycles.

[7] The algorithm we employ is known as the BBQ algorithm since it is applied to quarterly data. It has been widely used in earlier studies in the context of business cycles (King and Plosser, 1994; Watson, 1994; Artis, Kontolemis, and Osborn, 1997) as well as cycles in equity and commodity prices (Pagan and Sossounov, 2003; Hall, McDermott, and Tremewan, 2006). The algorithm is quite successful in replicating the well-known turning points of U.S. business cycles as determined by the NBER. It is possible to use alternative algorithms, such as a Markov Switching (MS) model (Hamilton, 2003). Harding and Pagan (2002b) compare the MS and BBQ algorithm and conclude that the BBQ is preferable because the MS model depends on the validity of the underlying statistical framework.

$$\{[(y_t - y_{t-2}) > 0,\ (y_t - y_{t-1}) > 0]\ \textit{and}\ [(y_{t+2} - y_t) < 0,\ (y_{t+1} - y_t) < 0]\}$$

Similarly, a cyclical trough occurs at time *t* if:

$$\{[(y_t - y_{t-2}) < 0,\ (y_t - y_{t-1}) < 0]\ \textit{and}\ [(y_{t+2} - y_t) > 0,\ (y_{t+1} - y_t) > 0]\}$$

A complete business cycle typically comprises of two phases, the recession phase (from peak to trough) and the expansion phase (from trough to the next peak). In addition to these two phases, the recovery phase from recessions has been widely studied for business cycles (see Eckstein and Sinai, 1986; Balke and Wynne, 1995; and Mussa, 2009). The recovery is the early part of the expansion phase and is usually defined as the time it takes for output to rebound from the trough to the peak level before the recession. Some others associate recovery with the growth achieved after a certain time period, such as four or six quarters, following the trough (see Sichel, 1994). Given the complementary nature of these two definitions of the recovery phase, we use both of them. We identify financial cycles using the same methodology as the one used to determine business cycles.[8] We use different terms though to describe the phases of financial cycles: we call the recovery phase of a financial cycle "upturn," and the contraction phase "downturn."

Our work relates to the several recent studies that date financial crises and analyze the evolution of macroeconomic aggregates around these episodes (see Reinhart and Rogoff, 2009). Our approach for identifying the dates of cycles has some obvious advantages over the methods used in this literature. First, in parallel with the business cycle literature, it uses a well-established and reproducible methodology for dating, whereas crisis dating is based on historical records and can be subjective, especially in the case of banking crises (in many cases the end date of a crisis is selected in an *ad hoc* manner).[9] Second, our approach allows us to consider financial downturns that were not necessarily crises, yet did create financial stress with possible adverse macroeconomic outcomes. Moreover, it considers three types of financial cycles, allowing us to investigate which of these is more important, whereas a crisis dummy often lumps them together.

Main features of business and financial cycles. The main characteristics of cyclical phases are their duration, amplitude, and slope. The duration of a recession/downturn, D_c, is the number of quarters, k, between a peak and the next trough of a variable. Likewise, the duration of a recovery/upturn, D_u, is the number of quarters it takes for a variable to reach its previous peak after the trough.

The amplitude of a recession/downturn, A_c, measures the change in y_t from a peak (y_0) to the next trough (y_k), i.e., $A_c = y_k - y_0$. The amplitude of a recovery/upturn, A_u, measures the change in y_t

[8] Since asset prices can show much greater intra-quarter variation, making for large differences between peaks and troughs for end-of-quarter data than when using higher frequency data, the constraint that the contraction phase must last at least two quarters is ignored if the quarterly decline exceeds 20 percent.

[9] In fact, even the dating of financial crises in the U.S. has been an issue of intense discussion. Lopez-Salido and Nelson (2010) arrive at a substantially different chronology of U.S. crises than Reinhart and Rogoff (2009) do.

from a trough (y_k) to the level reached in the first four quarters of an expansion (y_{k+4}), i.e., $A_u = y_{k+4} - y_k$. Lastly, the slope of a recession/downturn is the ratio of the amplitude to the duration of the recession/downturn. The slope of a recovery/upturn is the ratio of the change of a variable from the trough to the quarter at which it attains its last peak divided by the duration. Thus, the slope measures the violence (or speed) of a given cyclical phase.

For recessions only, we consider another widely used measure, cumulative loss, which combines information on duration and amplitude to proxy for the overall cost of a recession. The cumulative loss, F_c, of a recession, with duration k, is defined as:

$$F^c = \sum_{j=1}^{k} (y_j - y_0) - \frac{A_c}{2}$$

Synchronization of cycles. In order to examine the extent of synchronization between business and financial cycles, we use the concordance index developed by Harding and Pagan (2002b).[10] The index, CI_{xy} for variables x and y is defined as:

$$CI_{xy} = \frac{1}{T} \sum_{t=1}^{T} [C_t^x . C_t^y + (1 - C_t^x).(1 - C_t^y)]$$

where

$$C_t^x = \{0, \text{ if } x \text{ is in recession phase at time } t;\ 1, \text{ if } x \text{ is in expansion phase at time } t\}$$
$$C_t^y = \{0, \text{ if } y \text{ is in recession phase at time } t;\ 1, \text{ if } y \text{ is in expansion phase at time } t\}$$

In other words, C_t^x and C_t^y are binary variables whose values change depending on the phase of the cycle the underlying series are in. Given that T denotes the number of time periods in the sample, the concordance index provides a measure of the fraction of time the two series are in the same phase of their respective cycles. The series are perfectly procyclical (countercyclical) if the concordance index is equal to unity (zero).

III. Business and Financial Cycles: Basic Features

Understanding the main features of business and financial cycles is a necessary step before we analyze the interactions between the two. This section presents these main features and discusses how they vary across different cyclical phases and across our samples of advanced and emerging market countries.

[10] A number of other researchers employ the same index to analyze synchronization of various cycles (see Artis, Kontolemis, and Osborn, 1997; Edwards, Biscarri, and Garcia, 2003; and Hall, McDermottt, and Tremewan, 2006).

A. Business Cycles: Recessions and Recoveries

Frequency of business cycles. We identify 206 recessions and 208 recoveries in our sample (Table 1). The number of recessions and recoveries differs slightly because of the timing of the events. Of these, 122 recessions and 122 recoveries are in advanced countries, and 84 recessions and 86 recoveries are in emerging markets. Given that most of the earlier studies focuses on the U.S.—with only eight recession episodes since 1960, the breadth of our dataset provides substantial value added to the knowledge on various aspects of business cycles.

The number of business cycle episodes is smaller for emerging markets, primarily because we cover a shorter period for this group. A good metric to analyze the relative frequency of recessions and recoveries is the proportion of time a country is in a recession/ recovery. The typical country is in a recession for about 25 percent of the time, and in recovery for about 22 percent. Emerging market economies spend relatively more time in recessions (and recoveries) than advanced countries.

Duration and amplitude of business cycles. We next briefly analyze the main features of recessions and recoveries. Although we most often focus on medians because they are less affected by the presence of outliers, we also refer to means wherever relevant. A typical recession lasts close to 4 quarters while a recovery often takes about 5 quarters. There is no noticeable difference between advanced and emerging market countries in terms of duration of recessions, but it takes about 2 quarters longer for emerging economies to recover than for advanced countries.[11]

The typical decline in output from peak to trough, the recession's amplitude, is about 2.5 percent for the full sample, and the typical cumulative output loss is about 4 percent. The slope (violence) of a recession, the ratio of its amplitude to duration, tends to be about 0.7. The amplitude of a recovery, defined as the increase in the first four quarters following the trough, is typically about 4.5 percent. Although the majority of recessions (recoveries) are associated with moderate declines (increases) in output, these events can result in much larger changes as well. The absolute value of the slope of a typical recovery is larger than that of a recession, i.e., the pace of recoveries tends to exceed that of recessions.[12]

Business cycles in emerging markets are more pronounced than in advanced economies. In particular, the median decline in output during recessions is much smaller in advanced countries (1.9 percent) than in emerging markets (4.8 percent), and recoveries in advanced countries are

[11] Figure B1 in Appendix B presents the distributions of duration and amplitude of recessions and recoveries. Most recessions are 4 quarters or less, and a substantial fraction of recoveries take less than 4 quarters. However, recessions can be quite long. Altogether, roughly 30 (40) percent of all recessions (recoveries) last 2 quarters, 40 (30) percent last 3-4 quarters, and 30 (30) percent last 5 quarters or more.

[12] We also analyze the behavior of other macroeconomic aggregates, including consumption, investment, industrial production, and unemployment rate (see Appendix B, Table B1). Investment declines more than output during recessions, but it recovers at a slower pace than output during recoveries. Industrial production tends to register larger changes during recessions and recoveries than output. In a typical recession, unemployment rises by about 0.7 percentage points. Recoveries in advanced countries tend to be "jobless" ones in the sense that the unemployment rate continues to increase during these episodes.

twice weaker than those in emerging markets. In terms of cumulative loss, recessions in emerging market economies are almost three times more costly than those in advanced countries. Recessions in emerging economies are also more intense (slope of recessions is typically larger in emerging economies than in advanced countries, -1.2 versus -0.5). In a similar fashion, recoveries in emerging markets tend to feature a larger slope than those in advanced countries.[13] These results echo the findings of a number of earlier studies using second moments of detrended data that report business cycles in emerging markets are more volatile than in advanced countries (see Kose, Prasad, and Terrones, 2006).

Behavior of financial variables during business cycles. Although credit typically continues to grow, it does so at a slower rate during recessions (Table 1). In contrast, credit contracts in emerging markets during recessions, possibly as demand declines more and financial system often goes through a protracted period of stress, reflecting in part the latter group's dependence on external financial flows which often dry up during these periods. Both house and equity prices fall in recessions, with much sharper declines in emerging markets than in advanced countries. During recoveries, both credit and equity prices tend to grow, but house prices continue to decline, consistent with persistent nature of house price downturns. Growth in equity prices is typically three times higher in emerging markets than in advanced countries. The greater volatility in asset prices in emerging markets stems from the greater volatility of their economies along with often more incipient levels of financial development, e.g., weak banking systems and thin equity markets, and a greater sensitivity to developments in global financial markets, including being more exposed to the volatility in capital flows.

B. Financial Cycles: Upturns and Downturns

Frequency of financial cycles. We identify 743 financial downturns and 768 upturns. In particular, our full sample features 218 downturns in credit, 141 in house prices, and 384 equity prices, and 225, 145, and 398 upturns, respectively (Tables 2A-2B). Since equity prices are more volatile than credit and house prices, they feature more upturns and downturns. Advanced economies have more episodes than emerging markets since we have a longer period and more data series for the former group. In the case of house prices, for example, the number of upturns (downturns) in advanced countries is 114 (114) whereas it is only 27 (31) in emerging markets because of the scarce coverage of house prices for the latter group. The sample of equity cycles in emerging markets is roughly half that of advanced countries since active equity markets have only been in existence for the past two decades in many emerging economies.

Duration and amplitude of financial cycles. Downturns (upturns) of financial cycles tend to be longer than recessions (recoveries). Episodes of house price downturns, for instance, persist for about 8 quarters while other financial downturns last five to seven quarters. Upturns are often longer than downturns.

[13] Distributions of both duration and amplitude of recessions and recoveries are more skewed to the right for emerging markets than for advanced countries, confirming that the former group displays a much wider variation with respect to these statistics (see Appendix B, Figure B1).

Financial cycles are often more pronounced than business cycles, with downturns particularly deeper and more intense than recessions. A typical credit downturn episode corresponds to about a 6 percent decline, house price downturns 6-7 percent, and equity price downturns 28 percent. The strength of upturns differs across financial markets. Equity prices' upturns are the sharpest, some 25 percent. Also measured by slope, financial cycles are more violent than those business cycles, confirming that financial variables adjust much more quickly than real ones do.

The main features of financial downturns vary across advanced and emerging market countries. While not necessarily longer, downturns are much sharper in emerging markets than in advanced countries. Credit contractions, for example, last about the same, but are only one-third as deep in advanced countries compared to in emerging markets. Equity downturns in advanced countries last as long as those in emerging markets do, but upturns are much longer in the former group. Comparisons between mean and medians show that the distributions of duration and amplitude of the phases of financial cycles are also more skewed to the right for emerging markets than for advanced countries (see Appendix B, Figures B2-B4). These findings are consistent with many studies documenting that asset prices are more volatile than economic fundamentals (see Shiller, 2003; Campbell, 2003).

Not all financial variables move in the same way over a financial cycle (Tables 2A-2B). While during downturns of credit and house prices, most other financial variables also typically decline, during house price downturns credit continues to expand (probably because housing downturns last longer than credit ones). Downturns in equity prices, in contrast, are not associated with declines in other financial variables.[14]

IV. Implications of Coincidence of Business and Financial Cycles

In this section, we first examine the synchronization of business and financial cycles. Next, we analyze the features of intense episodes of financial cycles, i.e., disruptions and booms. This is followed by an analysis of the main features of the recessions and recoveries when they are accompanied by disruptions and booms, respectively.

A. Synchronization of Business and Financial Cycles

We study the degree of synchronization between business and financial cycles using the concordance statistic. We first compute the concordance between business and financial cycles for each country in our sample, and then calculate summary statistics for the whole sample (Table 3). Cycles in output and credit appear to be the most highly synchronized, with a median (mean) synchronization of 0.81 (0.78), i.e., cycles in output and credit are typically in the same phase about 80 percent of the time. The concordance statistic for cycles in output and house prices, 0.64

[14] We also examine changes in macroeconomic variables during financial cycles (see Appendix B, Table B2). Episodes of financial downturns are associated with a slightly slower real growth, but not necessarily with an outright contraction. This is in part because financial downturns typically lasting longer than recessions do, so that even if a recession overlaps with a financial downturn, the real economy registers an expansion over the course of the downturn. However, the labor market stays depressed during these episodes and some components of GDP also experience declines.

(0.68), is lower than that for output and credit, but still higher than that for output and equity prices, 0.58 (0.60).[15]

There are differences in concordance between advanced and emerging market countries. Advanced countries typically display a higher degree of synchronization between cycles in output and credit or house prices than emerging markets do. This may reflect that advanced countries have more developed financial markets where fluctuations in credit and house prices are more important for the real economy. The relative importance of housing for advanced countries is no surprise, since few emerging markets have well developed housing finance markets. In contrast, emerging markets feature a stronger degree of synchronization between cycles in output and equity prices. This may reflect the substantial impact of external financial markets (and capital flows) on the dynamics of equity prices in emerging countries, which in turn have a larger influence on their real economies (see Kose et al., 2009).

Although our study is the first one to present the concordance of business and financial cycles, results are broadly consistent with those based on different measures of synchronization.[16] For example, when we compute simple correlations between cycles using the growth rates of each series, we find that the correlations between output and credit (and output and house prices) exceed those between output and equity prices.

B. Intense Financial Cycles: Financial Disruptions and Booms

We now turn our attention to the more intense forms of financial cycles: disruptions and booms. We are interested in these episodes since our primary objective is to analyze the changes in the nature of recessions and recoveries during financial disruptions and booms. To identify these periods, we rank the changes in each variable during downturns and upturns. We then classify an episode as a financial disruption (boom) if the change in the variable during the downturn (upturn) falls into the bottom (top) quartile of all changes. We call disruptions crunches or busts depending on the variable (i.e., credit crunch, house or equity price bust). Similarly, we have credit, house, and equity price booms. Our sample of disruptions and booms combines episodes of disruptions and booms in advanced and emerging market countries.[17]

Table 4 summarizes the main features of financial disruptions. We identify 54 credit crunches, 34 house price busts, and 95 equity price busts. This finding is slightly different from the results

[15] Statistical significance tests of the concordance index at the country level show cycles in credit and output to be significantly concordant for 60 percent of the countries, cycles in output and house prices for 53 percent, and cycles in output and equity prices for less than 25 percent.

[16] While several studies analyze concordance of asset prices across or within countries (see Hall and McDermott, 2007; Cunnigham and Kolet, 2007; Edwards, Biscarri and Perez de Gracia, 2003), they do not document concordance between business and financial cycles.

[17] If we used the full sample to identify episodes of disruptions and booms, we would end up with a somewhat biased sample, since financial cycles in emerging markets are more pronounced than in advanced economies. The results presented here are preserved, however, in the subsamples of advanced and emerging market countries. We also experimented with alternative cut off points of 20 and 30 percent to identify disruptions and booms. Our main results remain robust to this change as well.

documented in the earlier literature focusing exclusively on booms and busts in housing and equity markets. For example, using a different methodology, Bordo and Jeanne (2002) report that boom-bust episodes tend to be much more prevalent in house than in equity prices.[18] Since our study considers a broader concept of cycles, we identify a larger number of busts in equity prices. Our result is also intuitively more appealing given that equity prices are much more volatile than house prices.

By design, compared with downturns, financial disruptions tend to last longer and result in much larger declines in financial variables. Disruptions in credit, house and equity prices, for example, are two to three times longer than other downturns. House price busts last the longest of all financial variables reflecting their protracted nature. The amplitude of disruptions is also significantly greater compared to other downturns. Credit crunches and house price busts, for example, lead to roughly seven times larger drops than other downturns. While less persistent than house price downturns, drops in equity prices are much larger. Moreover, disruption episodes are more violent, as evidenced by higher slope coefficients, with much faster declines per quarter. Although output growth per quarter often slows down during downturns, it does not necessarily contract, since these episodes do not always overlap with recessions and last much longer than recessions do.[19]

What happens to other financial variables when there is a disruption in one market? Results indicate that house prices register significant declines during credit crunch episodes and that in parallel, credit growth falls sharply during house price busts. In other words, cycles in credit and housing markets tend to accentuate each other. This might stem from the high sensitivity of housing activity to credit conditions (Kiyotaki and Moore, 1997; Mendoza and Terrones, 2008). Moreover, the strong linkages between credit and house price cycles documented here are consistent with the mechanisms described in a number of theoretical models. They also play important roles in shaping recessions and recoveries as we discuss in the next sub-section.

We next analyze the main features of financial booms (Table 4). Our sample includes 44 credit, 35 house price, and 99 equity price booms. As expected, episodes of booms feature much larger increases in financial variables over relatively shorter time periods than other upturns do, with increases over the course of a boom three to five times larger than those during other upturns. Similarly, the slope of a typical boom episode is three times higher than that of other upturns.

Of all booms, house prices take the longest time to reach their previous peak, while equity prices register the largest gain during boom periods (about 63 percent compared to 13-18 percent for the other financial variables). Importantly, the real economy tends to grow much faster during episodes of credit and house price booms than during other upturns. For example, output registers typically much higher growth rates during credit and house price booms than during typical

[18] Bordo and Jeanne (2002) identify episodes of booms-busts in asset prices by considering deviations of moving averages of growth rates in asset prices from their long-run averages.

[19] We analyze the behavior of macroeconomic variables during disruptions and booms (see Appendix B, Table B3). Both credit crunches and house price busts are associated with negative investment growth, but there is no decline in investment during equity downturns. The rate of unemployment rises during financial downturns, especially during house price busts.

upturns in these financial variables.[20] Booms in credit markets coincide with stronger house price growth, confirming our earlier result about the feedback effects between credit and housing markets.

C. Business Cycles Coinciding with Financial Disruptions and Booms

Before moving to our formal regressions, we briefly analyze the features of recessions (recoveries) that are associated with financial disruptions (booms). If a recession (recovery) episode starts at the same time or after the beginning of an ongoing disruption (boom) episode, we consider that recession (recovery) to be associated with the respective disruption (boom). These associations, by definition, imply coincidence of events, but do not imply causation. To provide a sense of distributions, we also examine those recessions (recoveries) coinciding with severe disruptions (strong booms). These severe disruption (strong boom) episodes consist of the bottom (top) 12.5 percent of all financial downturns (upturns), or, in other words, the bottom (top) half of all disruptions (booms).

Recessions associated with disruptions. A major advantage of our database is that we have a large number of recessions accompanied by various forms of financial disruptions (Table 5). Specifically, we identify 36, 40, and 72 recession episodes associated with credit crunches, house price busts, and equity price busts, respectively. In other words, in about one out of six recessions, there is also a credit crunch underway, and, in about one out of three recessions, also a house price bust.

Recessions accompanied with financial disruptions tend to be longer and deeper than other recessions. In particular, recessions associated with house price busts are significantly longer than recessions without such disruptions. Recessions with severe house price busts as well as credit crunches result in significantly larger drops in output, and correspondingly greater cumulative output losses relative to those without such episodes. Recessions accompanied with equity busts are neither significantly deeper nor longer than other recessions are.

A recession associated with one type of financial disruption is often accompanied with stress in other financial markets. For example, recessions accompanied with credit crunches mean not only a significant decline in credit, but also coincide with substantial drops in both house and equity prices. Our sample also includes recessions accompanied by combinations of credit crunches and asset busts at the same time. Although the number of such episodes is small, a recession associated with both a credit crunch and an asset price bust often results in a larger cumulative output loss than that with only a crunch or only a bust.[21]

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[20] For example, the average quarterly growth rate of output is about 1.1 (1.3) percent when there is an episode of credit (house price) boom whereas it is about 0.9 (0.8) percent for the full sample. There is also higher output growth per quarter during equity price booms than that during other equity upturns.

[21] There are 11 recessions in our sample associated with a credit crunch and an equity price bust at the same time and 6 with a credit crunch and a house price bust. Only 4 recessions are accompanied by the trilogy of a credit crunch, a house price, and an equity price bust.

Recoveries associated with booms. We have altogether 15, 13, and 43 recovery episodes associated with booms in credit, house prices, and equity prices, respectively. As financial disruptions are associated with longer and deeper recessions, recoveries associated with credit or house price booms are associated with stronger output growth.[22] With respect to duration, recoveries coinciding with house price booms tend to be significantly shorter. Recoveries with financial booms are not necessarily accompanied with rapid growth in every financial variable, possibly reflecting different degrees of persistence.

V. Interactions between Business and Financial Cycles: A Formal Analysis

The regularities we have reported suggest that financial cycles play key roles in affecting both the duration and strength of recessions and recoveries. In particular, recessions associated with financial disruptions, especially credit crunches and house price busts, tend to be longer and deeper, and recoveries are slightly shorter and stronger when combined with booms in financial markets, especially those in housing and credit markets. These findings do not, however, account for other factors that could influence the nature of business cycles. External factors, such as the strength of the global economy and changes in oil prices, and domestic structural factors, including openness to trade and financial flows, could all have important effects on the evolution of business cycles. In this section, we study the roles played by such factors in shaping business cycles using regressions. Since the regressions include country fixed effects, we focus on a core set of explanatory variables. Specifically, we use our financial cycle variables together with several other factors to examine the correlates of the duration and amplitude of recessions, and the strength of recoveries.

A. Duration and Amplitude of Recessions

Duration of recessions. A large body of literature studies the duration of business cycles motivated by the objective of predicting the dates of recessions. There is a great variety of parametric duration models, with the Weibull model the most commonly used one in analyzing the duration of recessions (see Diebold, Rudebusch and Sichel, 1993). Like most other studies in the literature, we employ the Weibull function, but our approach differs in that we employ panel regressions with fixed effects whereas most other studies, having only a limited number of observations per country, need to rule out the use of fixed effects. Although some studies consider additional controls to account for country specific features, it is hard to capture all of them in a parsimonious fashion which then leads to possible omitted variable bias.[23]

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[22] We also study the changes in macroeconomic variables during recessions and recoveries associated with disruptions and booms respectively (see Appendix B, Table B4). Only recoveries with house price booms see a significant decline in the rate of unemployment. We also examine whether the likelihood of having a recession and recovery changes conditional on an ongoing financial disruptions and booms. Our results indicate that if a financial disruption (or a boom) episode is ongoing, then the probability of having a recession (or a recovery) in a quarter increases substantially (see Appendix B, Table B5).

[23] For studies on the duration of recessions, see Diebold, Rudebusch, and Sichel (1993), Ohn, Taylor and Pagan (2004) and Castro (2008).

The first column of Table 6A reports the estimation results of the Weibull duration model with only country fixed-effects. In this model, country fixed-effects have a proportional impact on the baseline hazard function. We find evidence of positive duration dependence in recessions—that is, recessions are more likely to end, the longer they have gone on.[24] While this finding is consistent with the evidence in other studies on recessions in advanced countries, it is the first to confirm the duration dependence for recessions in emerging market countries.

We next examine the effect of financial disruptions on the duration of recessions. For this, we include three dummy variables—which take the value of one, if the recession coincides with a credit crunch or an asset (house and equity) price bust and zero otherwise—as explanatory variables. Of the three disruptions we examine, only house price busts have a negative and significant effect (columns 2-4). This confirms that recessions associated with house price busts tend to last longer than other recessions do, even after taking account of individual country circumstances (through fixed effects).[25]

In order to better understand the role of house price busts in influencing the duration of recessions, we next control for other, time-varying factors. These factors include global conditions—as proxied by the growth rate of world output in the first year of the recession and the growth rate of oil prices in the run-up to the recession. In addition, we control for two country-specific features: the extent of growth in house prices prior to the recession and the degree of the country's trade openness. Since data for some of these variables are not available for all years and countries, our sample size reduces to 108 observations. To be consistent across specifications, we (re-)estimate all regressions using this set of observations (columns 5-10).

We first rerun the model without any other explanatory variables (column 5). The estimate of the Weibull distribution parameter remains greater than one, implying that recessions in our sample are characterized by positive duration dependence. We next investigate whether recessions associated with a financial disruption—credit crunch, house price bust and equity price bust—last longer. We confirm that the simultaneous occurrence of a house price bust tends to reduce the hazard of ending of a recession (column 6), while the other financial disruption dummies are not statistically significantly related to the length of a recession (columns 7-8). When we consider all three dummies together (column 9), the housing bust dummy is again significantly negative. While the credit bust dummy is positive (and statistically significant), this likely reflects the strong feedback effects between housing and credit markets discussed before.

When we introduce both global and country factors (column 10), we find that buoyancy in world output helps countries emerge faster from recessions. There is also evidence that greater trade openness is associated with shorter recessions. While an increase in the world oil price in the run-up to the recession is associated with shorter recessions, this effect is fairly small economically.

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[24] The parameter p in the Weibull model defines the extent of duration dependence. When p=1, the hazard rate is constant; when p>(<)1 the hazard rate shows positive (negative) duration dependence.

[25] In other words, a house price bust reduces the hazard of ending a recession to almost 0.6 of what it would be otherwise (calculated as $e^{\widehat{\beta_1}}$, where $\widehat{\beta_1}$ is the house price bust coefficient reported in column (2) in Table 6A).

Robustness of results: duration of recessions. We check whether the results are robust to the introduction of other potential factors by augmenting our baseline specification with a wide range of factors. These regression results show that our baseline result (column 10 of Table 6A, repeated in Table 6B column 1) does not change with the inclusion of these factors. In terms of financial indicators, neither financial openness nor financial sector development has a statistically significant effect on the hazard function, either independently (columns 2-3) or jointly (column 4). Similar results obtain when we include two financial variables: the growth in equity prices and the increase in credit in the run-up to the recession. None of these variables is statistically significant, either on their own (columns 5-6) or jointly (column 7). We then include the current account balance in the run up to the recession to control for the possibility that countries with large current account deficits might be more vulnerable to reversals in capital flows. However, the current account balance does not have a significant impact on the duration either (column 8).

Finally, we consider whether either the occurrence of a banking crisis or a severe financial crisis makes a difference. Some recent studies, notably Reinhart and Rogoff (2009), argue that financial crises tend to be associated with protracted periods of output contraction implying that recessions accompanied with such events are longer than normal recessions. We find that recessions with banking crises indeed tend to be significantly longer (column 9). Severe financial crises (Big 5 episodes as identified by Reinhart and Rogoff (2009)) also reduce the hazard rate, but not in a significant way (column 10).

These findings suggest that it is important to account for other potential factors before arriving at strong conclusions about the linkages between financial crises and the duration of recessions. While our results also indicate that recessions associated with financial crises tend to be longer, they emphasize the critical role played by disruptions in housing markets in explaining the length of recessions even after accounting for crises episodes. As our next set of regressions show, disruptions in housing markets also affect the amplitude of recessions, above and beyond the occurrence of financial crises.

Amplitude of recessions. We next study the determinants of the amplitude of recessions using the same set of explanatory variables above and again including country-fixed effects (Table 7A). The first set of regressions confirms our basic findings that recessions associated with financial disruptions are deeper than those without (columns 1-3). The three financial disruption dummies are positive, but not statistically significant. When we next use the sample with the richest set of explanatory variables, results change though (columns 4-6). In particular, we find that recessions associated with house and equity price busts are statistically significantly deeper, but those with credit crunches are not. This finding is preserved when all three disruption dummies are introduced together (column 7). When including the same additional explanatory variables used to explain the duration of recessions, the dummy for recessions associated with equity price busts becomes insignificant, but the growth in house prices is significantly associated with more and trade openness with less severe recessions (column 8).

Finally, we consider the importance of house prices along with our core set of controls (column 9). The presence of a house price bust during a recession and the growth of house prices prior to a recession are both significantly and positively associated with the amplitude of the recession. The results are economically large as well: the amplitude of a recession is on average 1.6 percentage

points larger when it coincides with a house price bust. Similarly, a 10 percent increase in house prices in the run-up to the recession implies a 1 percentage point increase in its amplitude. Being open to trade flows as well as higher growth in world output help reduce the severity of recessions, likely as external demand can offset some of the contraction in domestic demand. It is also consistent with earlier research which suggests that trade openness helps reduce the risk of crises and mitigate the negative impact of cyclical volatility on economic growth (see Cavallo and Frankel, 2008; Kose, Prasad, and Terrones, 2006).

These results suggest that changes in house prices tend to play a critical role in determining the duration and cost of recessions. What is the intuition behind this finding? As mentioned in the introduction, interactions between financial variables and the real economy can be amplified through the financial accelerator and related mechanisms operating through firms, households and countries' balance sheets. According to these mechanisms, an increase (decrease) in asset prices, including house prices, improves an entity's net worth, enhancing (reducing) its capacities to borrow, invest and spend. This process, in turn, can lead to further increases (decreases) in asset prices and thereby create general equilibrium effects (Bernanke, Gertler, and Gilchrist, 1999; Kiyotaki and Moore, 1997). Using these and similar amplification mechanisms in DSGE models, some recent studies (Aoki, Proudman and Vlieghe, 2004; and Iacoviello, 2005) analyze specifically how endogenous developments in housing markets can magnify and transmit various types of shocks to the real economy.

In addition to these theoretical studies, recent empirical work emphasizes the importance of house price dynamics in shaping business cycles (Cecchetti 2006, Leamer 2007 and Muellbauer 2007). However, this work neither accounts for the wide range of potential factors we consider here nor employs a rich database as we do. Nor has the existing literature run a horse race between the various financial cycles to see which might be more important for the business cycle.

Why is housing much more important than equity? First, housing represents a large share of wealth for most households and consequently price adjustments affect consumption and output more. In contrast, equity ownership is smaller and typically concentrated among wealthy households who likely make much smaller adjustments in their consumption during the phases of financial cycles (and consequent recessions and recoveries). Housing wealth has indeed been found to have a larger effect on consumption than equity wealth does (see Carrol, Otsuka and Slacalek, 2006). Second, equity prices are more volatile than house prices are, implying that changes in house prices are more likely to be permanent than those in equity prices (Cecchetti, 2006; Kishor, 2007).[26] With changes in wealth more permanent, households adjust their consumption more when house prices decline, leading to larger declines in output during recessions associated with house price busts.[27]

[26] For example, Carrol, Otsuka and Slacalek (2006) report that the propensity to consume from a $1 increase in housing wealth ranges between 2 (short-run) and 9 (long-run) cents, twice that for equity wealth. Kishor (2007) reports that while 98 percent of the change in housing wealth is permanent, only 55 percent of the change in financial wealth is.

[27] The importance of housing extends to changes in the main components of output as well. Consumption and investment usually register sharp declines during recessions coinciding with house price busts, in turn accompanied by more pronounced drops in employment (see Table B4 of Appendix B). The larger decline in consumption likely reflects the effects on households of the substantial loss of housing wealth.

Robustness of results: amplitude of recessions. We examine the robustness of our main finding that recessions associated with house price busts are significantly deeper than other types of recessions by controlling for other variables that potentially affect the amplitude of recessions (Table 7B, with column 1 to repeat the baseline regression result). Since we focus on the role of financial variables, we first study how the growth rates of credit and equity prices prior to recessions affect the severity of these events. Surprising perhaps, none of these financial variables is significant in explaining the amplitude of recessions (columns 2-3). Important for our main result, however, the coefficients of the dummy representing recessions associated with house price busts and of house price growth prior to the recession remain positive and significant.

Why is credit growth not a significant correlate of the depth of a recession? First, as we mentioned earlier, there are strong feedback effects between credit and housing markets (for example, as house purchases are financed with mortgages which account for a sizeable share of activity in credit markets). This may mean that the housing bust dummy and housing price growth variable pick up most of the credit growth effects. Second, evidence suggests that indicators of credit standards more than the volume of credit are negatively correlated with economic activity (Lown and Morgan, 2006). Moreover, credit spreads, also related to lending standards, appear to play an important role in explaining business cycles, more than the volume of credit (see Meeks, 2009; Helbling et. al, 2010).[28] It is thus likely that the volume of credit starts to decline only after banks tighten their lending standards, which happens after the onset of the recession.

We next consider whether structural characteristics, such as financial openness and financial development, change our main results (columns 4-5). While none of these explanatory variables is significant, our main findings are preserved. When we assess the extent to which the pre-recession current account balance is associated with the severity of a recession, we find a negative and statistically significant coefficient (column 6), implying that countries with better external balances face less severe recessions. This finding echoes those reported by Lane and Milesi-Ferreti (2011) in their analysis of the amplitude of recessions associated with the global financial crisis. We also examine whether controlling for recessions associated with banking or severe financial crises changes any of our findings (columns 7-8). While these recessions appear to be deeper than others, the crises coefficients are not statistically significant.

We conclude our robustness tests by controlling for the role of policies. We measure fiscal policy by the change in the growth rate of government expenditures following the beginning of the recession, and monetary policy by the change in the short-term nominal rate during the same period. These measures are not significantly associated with the amplitude of recessions, but our benchmark findings are robust to their inclusion, alone or jointly (columns 9-11). The fact that these economic policies are insignificant in our regressions may be due to several reasons. First, the measures of policies we use might be rather rough approximations. Second, we cover only two aspects of a larger spectrum of possible policy choices, including financial and regulatory policies.

[28] Bordo and Haubrich (2010) analyze cycles in money, credit and output between 1875 and 2007 in the U.S. They argue that credit disruptions tend to exacerbate cyclical downturns, but their study is limited to a small number of recessions (27 recession episodes with only 7 observations in some regressions). Our study with a much larger sample and with fixed effects panel regressions shows that housing market dynamics, rather than credit, play an important role in understanding the amplitude of recessions.

Third, the impact of policies on output takes time to materialize, implying that there are lags between the implementation of policy and its outcome.

B. Amplitude of Recoveries

We next study the factors correlated with the amplitude of recoveries, that is, the increase in output within the first four quarters after the trough (Table 8A).[29] The core set of explanatory variables is very similar to the ones we employed in our earlier models, but we now also include the depth of the preceding recession to allow us to test whether economies tend to bounce-back faster from deeper recessions as argued by some earlier studies.[30] Results indicate that the deeper the preceding recession, the strongest the recovery (column 1), consistent with results reported in other studies for the U.S. (Friedman and Kuttner, 1993; Wynne and Balke, 1992; and Mussa, 2009). The nature of this relation does not change when we include other controls (columns 2-8). In addition, the regression results highlight the importance of external demand to help lift the economy from a recession as the growth of world output is statistically significantly positive in all specifications (columns 2-8).

Since our earlier results suggest that recessions accompanied with house price busts are significantly deeper than other recessions are, it is logical to ask whether recoveries following recessions with house price busts are different from other recoveries. To address this question, we include a dummy variable that takes the value of 1, if the preceding recession is associated with a house price bust and zero otherwise (column 3). The coefficient associated with this dummy variable is significantly negative and economically sizeable. In particular, the amplitude of recoveries following recessions with house price busts is on average 1.4 percentage points lower than that of other recoveries.

We next introduce dummy variables capturing recoveries associated with financial booms to examine whether these booms are positively correlated with the strength of recoveries (columns 4-7). The presence of a simultaneous house price boom or a credit boom tends to have a statistically significant and positive impact on the amplitude of a recovery. Simultaneous booms in equity prices, however, do not appear to influence the strength of recoveries. This is consistent with our earlier findings regarding the weak linkages between equity market developments and the real economy. When we use all three financial boom dummies together, only the presence of credit and house price booms during a recovery are significant, along with the amplitude of the preceding recession and the strength of global recovery (column 7).

The last specification (column 8) excludes booms in equity prices and focuses only on the set of controls that are statistically significantly correlated with the amplitude of recoveries. This result confirms that recoveries from recessions are characterized by a bounce-back effect and that

[29] We do not study the duration of recoveries in the same way since the amplitude of a recovery is measured over a fixed period of four quarters.

[30] There could be many factors leading an economy to bounce back faster from a deeper recession, such as rapid productivity growth possibly because of the "cleansing" effects of recessions (see Sichel, 1994; and Wynne and Balke, 1992).

recoveries from recessions associated with housing price busts are relatively weak. Global growth also helps strengthen recoveries, as do the presence of booms in credit and house prices.

We study the sensitivity of our findings to the addition of other variables that affect the amplitude of recoveries (Table 8B). Our main results are broadly robust to the inclusion of these additional controls. Neither openness to trade or financial flows nor financial development appears to be important in shaping recoveries (columns 2-4). A dummy for rapid exchange rate depreciation during a recovery is, however, positive and statistically significant, suggesting that a weaker currency might help recovery through stronger net exports (column 5). We find that countries with better external balances tend recover more strongly (column 6), perhaps as they are less vulnerable to adverse developments abroad. If the preceding recession is associated with a banking or severe financial crisis, then the recovery tends to be weaker but this is not statistically significant (columns 7-8). The effect of a house price boom on the strength of the recovery is always positive (albeit in some specifications not statistically significant).[31]

VI. CONCLUSION

Our empirical knowledge about the interactions between real and financial sectors during different phases of business and financial cycles is still rather limited. This is in large part as most studies have a limited set of observations to work with, using a single (often the U.S.) or a small set of countries. Although the literature focusing on the macroeconomic implications of financial crises has used a broader sample of cases that approach has some clear disadvantages as well. The importance of studying these interactions though can no longer be ignored as the dramatic cost of the global financial crisis shows.

Our paper addresses some of these important gaps in the literature. Our extensive database of business and financial cycles covers a large number of countries over a long period of time. Our chronology of cycles is based on a well established methodology, so we avoid the subjective dating common to the literature on financial crises. Using this chronology, we then document that there are strong interactions between business and financial cycles. We start with an analysis of various dimensions of business and financial cycles and uncover many differences. First, financial cycles tend to be longer, deeper, and sharper than business cycles. Second, both business and financial cycles tend to be more pronounced in emerging markets than those in advanced countries. We also analyze the behavior of macroeconomic variables over financial cycles. We report that episodes of financial downturns are associated with slower output growth than average, whereas upturns in financial markets usually correspond to faster economic expansions.

We then examine the implications of the coincidence of business and financial cycles. We document that cycles in output tend to display a high degree of synchronization with cycles in credit and house prices whereas they do not feature much commonality with cycles in equity prices. We also study the main features of recessions and recoveries that are associated with

[31] We also check the robustness of our results when recovery is measured by the amplitude over 6 quarters after the trough (instead of four quarters in our baseline regressions). Although all of our headline results are preserved, the presence of a credit boom during the recovery is no longer statistically significant (results are available upon request).

financial disruptions and booms, respectively. Next, we examine the interactions between business and financial cycles using various panel regressions with fixed effects. We find that recessions accompanied with financial disruption episodes, notably house price busts, tend to be longer and deeper while recoveries combined with rapid growth in credit and house prices tend to be stronger.

Our study also points to new challenges for future research. First, the empirical literature about the important roles played by countries' institutional structures and regulatory frameworks in shaping the interactions between business and financial cycles is still limited. Given the importance of these interactions, future research could examine this issue in a cross-country context using the regularities we document here as a baseline. Second, the current theoretical literature appears still far from either being able to explain the linkages between the real economy and financial sector or from capturing them in models useful for policy making. In particular, models that can quantitatively match the main regularities about the interactions between business and financial cycles we document here are still lacking. This suggests another fruitful area for future research.

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Table 1. Business Cycles: Basic Features

		Output					Financial Variables		
	Number of Events	Time in Event	Duration [1/]	Amplitude	Cumulative Loss	Slope	Credit	House Price	Equity Price
Recessions									
Full Sample	206	0.25	3.75	-2.48	-3.91	-0.71	0.33	-2.93	-9.21
		[0.21]	*[3.00]*	*[-4.22]*	*[-10.75]*	*[-1.15]*	*[-1.18]*	*[-4.96]*	*[-0.23]*
Advanced Countries	122	0.20**	3.64	-1.87***	-3.04***	-0.50***	0.75***	-2.31***	-5.93***
		*[0.17***]*	*[3.00]*	*[-2.63***]*	*[-6.40***]*	*[-0.78***]*	*[1.07**]*	*[-3.57**]*	*[-4.43]*
Emerging Markets	84	0.33	3.92	-4.81	-8.93	-1.24	-2.07	-9.22	-17.21
		[0.29]	*[3.00]*	*[-6.53]*	*[-17.08]*	*[-1.69]*	*[-4.39]*	*[-12.32]*	*[6.39]*
Recoveries									
Full Sample	208	0.22	5.16	4.39	…	1.13	2.37	-1.09	10.07
		[0.21]	*[3.00]*	*[5.23]*	…	*[1.65]*	*[2.40]*	*[-0.16]*	*[20.77]*
Advanced Countries	122	0.15**	4.28**	3.09***	…	0.78***	2.97	-1.09	5.39**
		[0.13]*	*[3.00**]*	*[4.04***]*	…	*[1.40**]*	*[3.20]*	*[-0.34]*	*[9.01**]*
Emerging Markets	86	0.25	6.43	6.41	…	1.56	1.97	-0.47	15.89
		[0.27]	*[4.00]*	*[6.93]*	…	*[2.02]*	*[1.28]*	*[0.82]*	*[38.82]*

Notes: All statistics except "Duration" and "Time in Event" correspond to sample medians. Means are in brackets. For the statistics "Time in Event" and "Duration" means are shown with medians in brackets. Time in Event refers to the ratio of the number of quarters in which the economy is in recession or recovery over the full sample period. Duration for recessions is the number of quarters between peak and trough. Duration for recoveries is the time it takes to attain the level of output at the previous peak after the trough. The amplitude for the recessions is calculated based on the decline in each respective variable during the peak to trough decline in output. The amplitude for the recoveries is calculated based on the one year change in each respective variable after the trough in output. Cumulative loss combines information about the duration and amplitude to measure the overall cost of a recession and is expressed in percent. The slope of the recession is the amplitude from peak to trough divided by the duration. The slope of the recoveries is the amplitude from the trough to the period when output has reached the level at its last peak, divided by the duration. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.
1/ Number of quarters.

Table 2A. Financial Downturns: Basic Features

	Number	Time in Downturn	Duration [1/]	Amplitude	Slope	Other Financial Variables: Credit	Other Financial Variables: House Price	Other Financial Variables: Equity Price
Credit								
Full Sample	218	0.35	6.03	-6.00	-1.37	-6.00	-3.13	-2.79
		[0.36]	*[4.00]*	*[-13.38]*	*[-2.16]*	*[-13.38]*	*[-4.40]*	*[7.57]*
Advanced Countries	114	0.30	5.50	-4.03***	-0.93***	-4.03***	-2.76	-3.60
		[0.30]	*[4.00**]*	*[-6.68***]*	*[-1.25***]*	*[-6.68***]*	*[-3.73]*	*[-1.49**]*
Emerging Markets	104	0.37	6.61	-11.83	-1.94	-11.83	-4.98	1.09
		[0.38]	*[5.00]*	*[-20.73]*	*[-3.15]*	*[-20.73]*	*[-6.64]*	*[18.82]*
House Price								
Full Sample	141	0.45	8.37	-6.22	-1.12	4.05	-6.22	-0.54
		[0.43]	*[6.00]*	*[-11.73]*	*[-1.39]*	*[5.47]*	*[-11.73]*	*[4.92]*
Advanced Countries	114	0.41**	8.47	-5.99	-1.06***	3.53	-5.99	-0.29
		*[0.40***]*	*[6.00]*	*[-10.85]*	*[-1.22**]*	*[4.00*]*	*[-10.85]*	*[6.82]*
Emerging Markets	27	0.61	7.93	-8.27	-1.30	5.10	-8.27	-4.58
		[0.57]	*[6.00]*	*[-15.49]*	*[-2.10]*	*[11.70]*	*[-15.49]*	*[-3.12]*
Equity Price								
Full Sample	384	0.44	6.38	-28.42	-4.78	6.18	0.81	-28.42
		[0.44]	*[5.00]*	*[-31.23]*	*[-5.66]*	*[8.99]*	*[0.77]*	*[-31.23]*
Advanced Countries	245	0.45	6.64	-23.70***	-4.07***	5.51	1.31***	-23.70***
		[0.44]	*[5.00]*	*[-27.38***]*	*[-4.70***]*	*[9.62]*	*[2.19**]*	*[-27.38***]*
Emerging Markets	139	0.43	5.93	-36.63	-6.29	8.20	-3.82	-36.63
		[0.43]	*[5.00]*	*[-38.03]*	*[-7.33]*	*[7.93]*	*[-6.38]*	*[-38.03]*

Notes: All statistics except "Duration" and "Time in Downturn" correspond to sample medians. Means are in brackets. For the statistics "Time in Downturn" and "Duration," means are shown with medians in brackets. Time in Downturn refers to the ratio of the number of quarters in which the economy is in a downturn over the full sample period. Duration for downturns is the number of quarters between peak and trough. The amplitude for the downturns is calculated based on the decline in each respective variable during the peak to trough decline in the financial variable The slope of the downturn is the amplitude from peak to trough divided by the duration.*** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

1/ Numbers of quarters.

Table 2B. Financial Upturns: Basic Features

	Number	Time in Upturn	Duration [1/]	Amplitude	Slope	Other Financial Variables: Credit	Other Financial Variables: House Price	Other Financial Variables: Equity Price
Credit								
Full Sample	225	0.25	10.10	5.81	1.64	5.81	-0.50	7.20
		[0.26]	*[4.00]*	*[9.54]*	*[2.81]*	*[9.54]*	*[0.99]*	*[16.49]*
Advanced Countries	115	0.20	8.00**	4.36***	1.23***	4.36***	-0.55	5.78
		[0.23]	*[4.00*]*	*[6.44***]*	*[2.01***]*	*[6.44***]*	*[0.52]*	*[8.57*]*
Emerging Markets	110	0.22	12.66	9.73	2.29	9.73	-0.44	14.56
		[0.19]	*[5.50]*	*[12.76]*	*[3.79]*	*[12.76]*	*[2.57]*	*[25.61]*
House Price								
Full Sample	145	0.32	13.25	3.95	1.25	5.18	3.95	9.21
		[0.33]	*[6.00]*	*[6.31]*	*[1.72]*	*[5.82]*	*[6.31]*	*[15.61]*
Advanced Countries	114	0.31*	14.25**	3.62**	1.19**	4.87	3.62**	7.76**
		[0.32]*	*[6.50]*	*[5.64*]*	*[1.54*]*	*[5.72]*	*[5.64*]*	*[12.27*]*
Emerging Markets	31	0.19	8.24	7.29	2.13	6.65	7.29	25.21
		[0.26]	*[5.00]*	*[8.86]*	*[2.60]*	*[6.18]*	*[8.86]*	*[28.28]*
Equity Price								
Full Sample	398	0.39	18.61	24.53	6.10	5.64	1.34	24.53
		[0.38]	*[7.00]*	*[38.64]*	*[8.42]*	*[6.29]*	*[2.59]*	*[38.64]*
Advanced Countries	251	0.38	21.93***	20.09***	4.75***	5.22	1.39	20.09***
		[0.39]	*[7.00]*	*[24.08***]*	*[5.99***]*	*[5.68]*	*[2.44]*	*[24.08***]*
Emerging Markets	147	0.34	12.32	38.48	8.54	6.55	1.29	38.48
		[0.37]	*[7.00]*	*[63.67]*	*[13.02]*	*[7.30]*	*[3.33]*	*[63.67]*

Notes: All statistics except "Duration" and "Time in Upturn" correspond to sample medians. Means are in brackets. For the statistics "Time in Upturn" and "Duration," means are shown with medians in brackets. “Time in Upturn” refers to the ratio of the number of quarters in which the economy is in an upturn over the full sample period. Duration for recoveries is the time it takes to attain the level at the previous peak after the trough. The amplitude for the recoveries is calculated based on the one year change in each respective variable after the trough in each respective financial variable. The slope of the upturns is the amplitude from the trough to the period where the financial variable has reached the level at its last peak, divided by the duration. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

1/ Number of quarters.

Table 3. Synchronization of Business and Financial Cycles

	All Countries	Advanced Countries	Emerging Markets
Output and Credit Cycles			
Mean	0.78	0.82 **	0.74
Median	0.81	0.83	0.76
Max	0.94	0.91	0.94
Min	0.45	0.70	0.45
Standard Deviation	0.10	0.06	0.13
Output and House Price Cycles			
Mean	0.64	0.69 **	0.54
Median	0.68	0.70	0.50
Max	0.84	0.84	0.74
Min	0.30	0.46	0.30
Standard Deviation	0.13	0.10	0.15
Output and Equity Price Cycles			
Mean	0.60	0.57 ***	0.63
Median	0.58	0.57 ***	0.64
Max	0.81	0.64	0.81
Min	0.45	0.48	0.45
Standard Deviation	0.07	0.04	0.08

Notes: Each cell represents the concordance statistic for the corresponding two cycles. Concordance is calculated as the fraction of time that the two cycles are in the same phase. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

Table 4. Financial Disruptions and Booms: Basic Features

	Financial Downturns				Other Variables			
	Number of Events	Duration [1/]	Amplitude	Slope	Output	Credit	House Price	Equity Price
A. Credit Downturns	218	6.03	-6.00	-1.37	1.58	-6.00	-3.13	-2.79
Credit Crunch	54	11.00***	-28.67***	-3.02***	2.30	-28.67***	-12.47***	-1.44
Other Credit Downturns	164	4.39	-4.10	-1.06	1.41	-4.10	-2.07	-2.98
B. House Price Downturns	141	8.37	-6.22	-1.12	3.17	4.05	-6.22	-0.54
House Price Busts	34	17.56***	-30.44***	-1.90***	5.97***	1.94	-30.44***	-11.61
Other House Price Downturns	107	5.45	-4.37	-0.93	2.80	4.50	-4.37	-0.29
C. Equity Price Downturns	384	6.38	-28.42	-4.78	3.47	6.18	0.81	-28.42
Equity Price Busts	95	10.95***	-57.72***	-5.56***	4.40**	10.34*	2.25	-57.72***
Other Equity Price Downturns	289	4.88	-21.50	-4.33	3.41	5.77	0.76	-21.50

	Financial Upturns				Other Variables			
	Number of Events	Duration [1/]	Amplitude	Slope	Output	Credit	House Price	Equity Price
A. Credit Upturns	186	10.85	5.59	1.61	3.58	5.59	-0.92	6.91
Credit Booms	44	8.03	18.74***	3.99***	5.02**	18.74***	2.55**	7.49
Other Credit Upturns	142	11.68	3.99	1.24	3.15	3.99	-1.95	6.91
B. House Price Upturns	137	13.81	4.40	1.23	3.92	5.06	4.40	8.65
House Price Booms	35	12.15	13.25***	2.67***	4.75***	4.72	13.25***	12.66
Other House Price Upturns	102	14.44	2.50	0.98	3.59	5.10	2.50	7.40
C. Equity Price Upturns	396	18.68	24.27	6.10	3.59	5.64	1.34	24.27
Equity Price Booms	99	8.66***	62.29***	11.42***	2.93**	4.06***	0.52*	62.29***
Other Equity Price Upturns	297	21.98	17.92	4.59	3.75	6.06	2.05	17.92

Notes: All statistics except "Duration" correspond to sample medians. For "Duration" means are shown. For downturns, duration is the number of quarters between peak and trough. Duration for upturns is the time it takes to attain the level at the previous peak after the trough. The amplitude for downturns is calculated based on the decline in each respective variable during the downturn. The amplitude for the upturns is calculated based on the one year change in each respective variable after the trough in the financial variable. The slope of the downturn is the amplitude from peak to trough divided by the duration. The slope of the upturns is the amplitude from the trough to the period where the financial variable has reached the level at its last peak, divided by the duration. Disruptions (Crunches, Busts, and Collapses) are the worst 25% of downturns calculated by the amplitude. Booms are the top 25% of upturns calculated by the amplitude. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between financial disruptions (booms) and other financial downturns (upturns).
1/ Number of quarters.

Table 5. Business Cycles with Intense Financial Cycles

Recessions associated with Financial Disruptions	Output					Financial Variables		
	Number of Events	Duration [1/]	Amplitude	Cumulative Loss	Slope	Credit	House Price	Equity Price
A. Recessions without Credit Crunches	168	3.77	-2.32	-3.54	-0.67	0.93	-2.36	-9.10
Recessions with Credit Crunches	36	3.75	-4.22**	-7.80**	-1.05**	-8.35***	-4.76	-7.34
Recessions with Severe Credit Crunches	19	3.74	-4.38**	-9.78*	-1.21**	-14.19***	-5.95	-1.76
B. Recessions without House Price Busts	73	3.27	-1.72	-2.43	-0.51	1.26	-1.22	-10.61
Recessions with House Price Busts	40	4.28**	-2.35	-3.57**	-0.52	-0.57***	-8.72***	-5.30
Recessions with Severe House Price Busts	24	4.38*	-2.64**	-5.23***	-0.72	-2.06***	-10.60***	-9.10
C. Recessions without Equity Price Busts	111	3.55	-2.18	-3.49	-0.57	0.76	-2.36	-0.74
Recessions with Equity Price Busts	72	3.88	-2.18	-3.35	-0.67	-0.31**	-4.30	-18.14***
Recessions with Severe Equity Price Busts	40	3.95	-2.55	-5.09	-0.79	0.32	-6.21*	-16.71***

Recoveries associated with Financial Booms	Output				Financial Variables		
	Number of Events	Duration [1/]	Amplitude	Slope	Credit	House Price	Equity Price
A. Recoveries without Credit Booms	191	5.26	4.20	1.08	2.10	-1.48	10.06
Recoveries with Credit Booms	15	4.14	8.84***	1.67***	8.86***	4.53*	23.02
Recoveries with Strong Credit Booms	8	4.38	7.90***	1.67*	16.58***	4.76	40.61**
B. Recoveries without House Price Booms	102	4.79	2.97	0.75	1.52	-2.05	10.06
Recoveries with House Price Booms	13	2.08***	6.25***	1.45***	6.05**	8.02***	12.67
Recoveries with Strong House Price Booms	8	2.13***	7.36***	1.59***	6.39	6.96***	20.55
C. Recoveries without Equity Price Booms	142	4.95	4.18	1.09	3.00	-0.89	1.01
Recoveries with Equity Price Booms	43	4.67	4.49**	1.13	0.65	-1.77	42.75***
Recoveries with Strong Equity Price Booms	25	5.32	4.49*	1.24	0.48	-1.77	49.79***

Notes: All statistics except "Duration" correspond to sample medians. For "Duration," means are shown. Duration for recessions is the number of quarters between peak and trough. Duration for recoveries is the time it takes to attain the level of output at the previous peak after the trough. The amplitude for the recessions is calculated based on the decline in each respective variable during the peak to trough decline in output. The amplitude for the recoveries is calculated based on the one year change in each respective variable after the trough in output. Cumulative loss combines information about the duration and amplitude to measure the overall cost of a recession and is expressed in percent. The slope of the recession is the amplitude from peak to trough divided by the duration. The slope of the recoveries is the amplitude from the trough to the period where output has reached the level at its last peak, divided by the duration. Booms are the top 25% of upturns calculated by the amplitude. Disruptions (Crunches, Busts, and Collapses) are the worst 25% of downturns calculated by the amplitude. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between recessions (recoveries) with and without financial disruptions (booms).
1/ Number of quarters.

Table 6A: Determinants of the Duration of Recessions

(*Percent change in real variables unless otherwise indicated*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Recession with a House Price Bust		-0.513*				-0.888***			-1.085***	-1.268***
		[0.283]				[0.315]			[0.324]	[0.415]
Recession with an Equity Price Bust			-0.033				-0.352		-0.404	
			[0.186]				[0.271]		[0.291]	
Recession with a Credit Crunch				-0.186				0.446	0.765*	
				[0.237]				[0.348]	[0.400]	
World output growth (1-year average following the peak)										0.559***
										[0.165]
Oil price growth (3-year average before the peak)										0.015**
										[0.007]
Trade Openness (at the peak)										0.041***
										[0.009]
House price growth (3-year average before the peak)										-0.063***
										[0.023]
Constant	-3.201***	-3.220***	-3.191***	-3.168***	-3.238***	-3.350***	-3.111***	-3.465***	-3.695***	-5.064***
	[0.324]	[0.327]	[0.325]	[0.341]	[0.456]	[0.470]	[0.417]	[0.480]	[0.526]	[0.703]
P (Weibull distribution parameter)	2.444	2.457	2.444	2.449	2.575	2.655	2.598	2.602	2.745	3.371
	[0.101]	[1.103]	[0.101]	[0.100]	[0.165]	[0.171]	[0.166]	[0.174]	[0.185]	[0.379]
Number of Observations	217	217	217	217	108	108	108	108	108	108
Log Likelihood	-141	-139	-141	-141	-66	-62	-65	-66	-59	-42

Notes: All regressions include country fixed effects. The coefficients are shown along with robust standard errors in brackets. The dependent variable is the duration of a recession. The dummy variable representing a recession associated with a financial disruption (credit crunch, equity price bust, house price bust) is equal to 1 if the recession begins after a disruption does; or if the recession begins one period after the end of a disruption. The world output growth is the PPP weighted annualized quarterly output growth of the OECD countries. Growth is the annualized quarterly growth rate. Trade openness is defined as (exports+import) as percent of GDP. *** implies coefficient is significant at 1% level, ** implies coefficient is significant at 5% level, * implies coefficient is significant at 10% level.

Table 6B. Determinants of the Duration of Recessions: Robustness

(*Percent change in real variables unless otherwise indicated*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Recession with a House Price Bust	-1.268***	-1.294***	-1.317***	-1.387***	-1.355***	-1.281***	-1.387***	-1.229**	-1.169***	-1.139***
	[0.415]	[0.441]	[0.412]	[0.436]	[0.429]	[0.400]	[0.420]	[0.500]	[0.420]	[0.432]
World output growth (1-year average following the peak)	0.559***	0.564***	0.544***	0.553***	0.522***	0.556***	0.514***	0.556***	0.589***	0.549***
	[0.165]	[0.172]	[0.168]	[0.174]	[0.176]	[0.170]	[0.183]	[0.193]	[0.175]	[0.166]
Oil price growth-3 year average (3-year average before the peak)	0.015**	0.015**	0.018***	0.017**	0.013*	0.016**	0.013*	0.013	0.006	0.012*
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.008]	[0.007]	[0.007]
Trade Openness (at the peak)	0.041***	0.046**	0.033***	0.044**	0.043***	0.041***	0.042***	0.031***	0.038***	0.041***
	[0.009]	[0.020]	[0.011]	[0.019]	[0.009]	[0.009]	[0.009]	[0.011]	[0.008]	[0.009]
House price growth (3-year average before the peak)	-0.063***	-0.061***	-0.073***	-0.070***	-0.063***	-0.066**	-0.071**	-0.070**	-0.036	-0.055**
	[0.023]	[0.024]	[0.027]	[0.027]	[0.023]	[0.031]	[0.032]	[0.030]	[0.024]	[0.022]
Financial Openness (at the peak)		0.000		-0.001						
		[0.001]		[0.001]						
Financial Development (at the peak)			0.008	0.009						
			[0.006]	[0.006]						
Equity price growth (3-year average before the peak)					-0.010		-0.011			
					[0.010]		[0.011]			
Credit growth (3-year average before the peak)						0.005	0.011			
						[0.031]	[0.033]			
Current account balance level (3-year average before the peak)								0.049		
								[0.051]		
Recession with a banking crisis									-1.278***	
									[0.398]	
Recession with a severe financial crisis										-0.872
										[0.703]
Constant	-5.064***	-5.134***	-5.905***	-6.189***	-5.059***	-5.073***	-5.078***	-4.891***	-5.073***	-5.053***
	[0.703]	[0.791]	[0.954]	[1.001]	[0.703]	[0.696]	[0.697]	[0.763]	[0.741]	[0.706]
P (Weibull distribution parameter)	3.371	3.377	3.388	3.404	3.377	3.37	3.375	3.456	3.537	3.404
	[0.379]	[0.387]	[0.372]	[0.384]	[0.376]	[0.380]	[0.376]	[0.424]	[0.048]	[0.050]
Number of Observations	108	108	108	108	108	108	108	100	108	108
Log Likelihood	-42	-42	-42	-41	-42	-42	-42	-37	-38	-42

Notes: All regressions include country fixed effects. The coefficients are shown along with robust standard errors in brackets. The dependent variable is the duration of a recession. The dummy variable representing a recession associated with a financial disruption (credit crunch, equity price bust, house price bust) is equal to 1 if the recession begins after a disruption does; or if the recession begins one period after the end of a disruption. The world output growth is the PPP weighted annualized quarterly output growth of the OECD countries. Growth is the annualized quarterly growth rate. Trade openness is defined as (exports+import) as percent of GDP. Financial development is defined as credit as percent of GDP. Financial Openness is defined as (Total Assets+Total Liabilities)/GDP. Banking crises are those crises as defined by Reinhart and Rogoff (2009). Severe financial crises are the big five crises defined by Reinhart and Rogoff (2009). *** implies coefficient is significant at 1% level, ** implies coefficient is significant at 5% level, * implies coefficient is significant at 10% level.

Table 7A. Determinants of the Amplitude of Recessions

(*Percent change in real variables unless other indicated*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Recession with a House Price Bust	0.670			1.516**			1.728***	1.647**	1.609**
	[0.675]			[0.602]			[0.516]	[0.618]	[0.621]
Recession with an Equity Price Bust		1.045			1.406**		1.567**	0.626	
		[0.799]			[0.678]		[0.616]	[0.525]	
Recession with a Credit Crunch			2.130			0.47	-0.296		
			[1.394]			[0.513]	[0.575]		
World Output growth (1-year average following the peak)								-0.324	-0.363*
								[0.229]	[0.212]
Oil price growth (3-year average before the peak)								0.015	0.019
								[0.015]	[0.017]
Trade Openness (at the peak)								-0.049**	-0.052**
								[0.022]	[0.020]
House price growth (3-year average before the peak)								0.099**	0.107**
								[0.040]	[0.040]
Constant	4.542***	4.356***	4.301***	2.185***	2.201***	2.700***	1.519***	5.526**	5.993***
	[0.134]	[0.243]	[0.244]	[0.228]	[0.270]	[0.066]	[0.425]	[2.112]	[1.879]
Number of Observations	217	217	217	108	108	108	108	108	108
Number of Countries	42	42	42	30	30	30	30	30	30
Adjusted R-Squared	-0.003	0.002	0.014	0.064	0.072	-0.005	0.147	0.302	0.296

Notes: All regressions include country fixed effects. The coefficients are shown along with robust standard errors in brackets. The dependent variable is the duration of a recession. The dummy variable representing a recession associated with a financial disruption (credit crunch, equity price bust, house price bust) is equal to 1 if the recession begins after a disruption does; or if the recession begins one period after the end of a disruption. The world output growth is the PPP weighted annualized quarterly output growth of the OECD countries. Growth is the annualized quarterly growth rate. Trade openness is defined as (exports+import) as percent of GDP. *** implies coefficient is significant at 1% level, ** implies coefficient is significant at 5% level, * implies coefficient is significant at 10% level.

Table 7B. Determinants of the Amplitude of Recessions: Robustness

(*Percent change in real variables unless otherwise indicated*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Recession with a House Price Bust	1.609**	1.593**	1.725**	1.604**	1.687**	1.729**	1.517**	1.303*	1.617**	1.656**	1.664**
	[0.621]	[0.632]	[0.659]	[0.623]	[0.621]	[0.676]	[0.619]	[0.648]	[0.639]	[0.653]	[0.668]
World Output growth (1-year average following the peak)	-0.363*	-0.373	-0.354	-0.363*	-0.347	-0.315*	-0.357*	-0.356*	-0.371*	-0.376*	-0.384*
	[0.212]	[0.238]	[0.213]	[0.213]	[0.216]	[0.180]	[0.210]	[0.198]	[0.210]	[0.204]	[0.203]
Oil price growth-3 year average (3-year average before the peak)	0.019	0.018	0.018	0.019	0.015	0.022	0.023	0.026*	0.016	0.020	0.017
	[0.017]	[0.019]	[0.017]	[0.018]	[0.015]	[0.018]	[0.017]	[0.015]	[0.017]	[0.018]	[0.018]
Trade Openness (at the peak)	-0.052**	-0.051**	-0.049**	-0.051	-0.039	-0.030**	-0.050**	-0.050**	-0.054***	-0.053**	-0.055***
	[0.020]	[0.019]	[0.020]	[0.039]	[0.029]	[0.014]	[0.019]	[0.019]	[0.020]	[0.020]	[0.020]
House price growth (3-year average before the peak)	0.107**	0.108**	0.134**	0.108**	0.121***	0.119**	0.093**	0.086**	0.116**	0.107**	0.115**
	[0.040]	[0.041]	[0.053]	[0.041]	[0.042]	[0.053]	[0.038]	[0.032]	[0.044]	[0.039]	[0.044]
Equity price growth (3-year average before the peak)		-0.003									
		[0.011]									
Credit growth (3-year average before the peak)			-0.041								
			[0.057]								
Financial Openness (at the peak)				-0.013							
				[0.226]							
Financial Development (at the peak)					-0.012						
					[0.013]						
Current account balance level (3-year average before the peak)						-0.114**					
						[0.044]					
Recession with a banking crisis							0.747				
							[0.788]				
Recession with a severe financial crisis								2.481			
								[1.814]			
Government expenditure growth (1-year average following the peak)									0.051		0.050
									[0.032]		[0.032]
Short term nominal interest rate change (1-year average following the peak)										0.009	0.010
										[0.123]	[0.125]
Constant	5.993***	5.967***	5.841***	5.906**	5.986***	4.136***	5.676***	5.744***	5.865***	5.860***	5.885***
	[1.879]	[1.844]	[1.901]	[2.745]	[1.877]	[1.467]	[1.838]	[1.723]	[1.854]	[1.885]	[1.857]
Number of Observations	108	108	108	108	108	100	108	108	107	106	106
Number of Countries	30	30	30	30	30	30	30	30	29	29	29
Adjusted R-Squared	0.296	0.289	0.293	0.289	0.304	0.323	0.296	0.33	0.301	0.294	0.3

Notes: All regressions include country fixed effects. The coefficients are shown along with robust standard errors in brackets. The dependent variable is the duration of a recession. The dummy variable representing a recession associated with a financial disruption (credit crunch, equity price bust, house price bust) is equal to 1 if the recession begins after a disruption does; or if the recession begins one period after the end of a disruption. The world output growth is the PPP weighted annualized quarterly output growth of the OECD countries. Growth is the annualized quarterly growth rate. Trade openness is defined as (exports+import) as percent of GDP. Financial development is defined as credit as percent of GDP. Financial Openness is defined as (Total Assets+Total Liabilities)/GDP. Banking crises are those crises as defined by Reinhart and Rogoff (2009). Severe financial crises are the big five crises defined by Reinhart and Rogoff (2009). *** implies coefficient is significant at 1% level, ** implies coefficient is significant at 5% level, * implies coefficient is significant at 10% level.

Table 8A. Determinants of the Amplitude of Recoveries

(*Percent change in real variables unless otherwise indicated*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Amplitude of Preceeding Recession	0.738***	0.741**	0.745**	0.746**	0.736**	0.745**	0.738**	0.737**
	[0.267]	[0.279]	[0.279]	[0.279]	[0.285]	[0.285]	[0.290]	[0.285]
Amplitude of Recovery in World Output		0.669**	0.672**	0.670**	0.628*	0.672*	0.637*	0.630*
		[0.307]	[0.307]	[0.306]	[0.320]	[0.337]	[0.345]	[0.319]
Preceeding Recession with a House Price Bust			-1.374*	-1.358*	-1.270*	-1.377*	-1.226	-1.266*
			[0.716]	[0.725]	[0.712]	[0.767]	[0.760]	[0.717]
Recovery with a House Price Boom				1.505***			1.038*	1.040*
				[0.496]			[0.604]	[0.606]
Recovery with a Credit Boom					2.383**		2.254**	2.220**
					[1.003]		[1.012]	[1.063]
Recovery with an Equity Price Boom						0.014	-0.202	
						[1.018]	[0.896]	
Constant	2.851**	0.803	1.049	0.958	0.984	1.048	0.93	0.926
	[1.246]	[2.175]	[2.148]	[2.152]	[2.152]	[2.137]	[2.153]	[2.164]
Number of Observations	217	217	217	217	217	217	217	217
Number of Countries	42	42	42	42	42	42	42	42
Adjusted R-Squared	0.217	0.227	0.227	0.225	0.229	0.223	0.222	0.226

Notes: All regressions include country fixed effects. The coefficients are shown along with robust standard errors in brackets. The dependent variable is the amplitude of output for four quarters after the trough. The dummy variable representing a recession associated with a financial disruption (credit crunch, equity price bust, house price bust) is equal to 1 if the recession begins after a disruption does; or if the recession begins one period after the end of a disruption. The world output growth is the PPP weighted annualized quarterly output growth from OECD countries. A recovery is said to be associated with a boom if the boom is ongoing as the recovery begins (and started at most four quarters before the recovery) or starts at most two quarters after the recovery begins. A boom occurs if the 4 quarter change in the variable from the trough is in the top 25% percentile. World output growth is the PPP weighted annualized quarterly output growth from OECD countries. *** implies coefficient is significant at 1% level, ** implies coefficient is significant at 5% level, * implies coefficient is significant at 10% level.

Table 8B. Determinants of the Amplitude of Recoveries: Robustness

(*Percent change in real variables unless otherwise indicated*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Amplitude of Preceeding Recession	0.737**	0.753**	0.757***	0.725**	0.730**	0.337*	0.764**	0.739**
	[0.285]	[0.281]	[0.278]	[0.274]	[0.276]	[0.198]	[0.289]	[0.287]
Amplitude of Recovery in World Output	0.630*	0.572*	0.502	0.404	0.590*	0.191	0.618*	0.636*
	[0.319]	[0.306]	[0.372]	[0.272]	[0.309]	[0.145]	[0.318]	[0.323]
Preceeding Recession with a House Price Bust	-1.266*	-1.397*	-1.236	-0.995	-1.276*	-0.858	-1.025	-1.137
	[0.717]	[0.748]	[0.882]	[0.930]	[0.729]	[0.659]	[0.744]	[0.724]
Recovery with a House Price Boom	1.040*	1.255	1.287**	1.250	0.931	0.732	0.842	0.956
	[0.606]	[0.957]	[0.607]	[0.852]	[0.726]	[1.012]	[0.581]	[0.584]
Recovery with a Credit Boom	2.220**	2.182*	2.506**	1.797	2.116*	3.331*	1.8	2.233**
	[1.063]	[1.174]	[1.099]	[1.143]	[1.067]	[1.664]	[1.209]	[1.057]
Trade Openness (at the trough)		-0.010						
		[0.021]						
Financial Openness (at the trough)			-0.014					
			[0.217]					
Financial Development (at the trough)				-0.052				
				[0.032]				
Recovery with an Exchange Rate Depreciation					1.311*			
					[0.711]			
Current Account Balance Level (at the trough)						0.139*		
						[0.078]		
Preceeding Recession with a banking crisis							-2.117	
							[1.510]	
Preceeding Recession a severe financial crisis								-1.566
								[1.366]
Constant	0.926	1.594	1.104	4.745***	0.444	2.792***	1.235	0.911
	[2.164]	[1.777]	[2.192]	[1.593]	[2.304]	[0.853]	[2.007]	[2.174]
Number of Observations	217	208	205	209	217	170	217	217
Number of Countries	42	41	42	41	42	39	42	42
Adjusted R-Squared	0.226	0.23	0.231	0.234	0.228	0.228	0.23	0.223

Notes: All regressions include country fixed effects. The coefficients are shown along with robust standard errors in brackets. The dependent variable is the amplitude of output for four quarters after the trough. The dummy variable representing a recession associated with a financial disruption (credit crunch, equity price bust, house price bust) is equal to 1 if the recession begins after a disruption does; or if the recession begins one period after the end of a disruption. The world output growth is the PPP weighted annualized quarterly output growth from OECD countries. A recovery is said to be associated with a boom if the boom is ongoing as the recovery begins (and started at most four quarters before the recovery) or starts at most two quarters after the recovery begins. A boom occurs if the 4 quarter change in the variable from the trough is in the top 25% percentile. Trade openness is defined as (exports+import) as percent of GDP. Financial development is defined as credit as a percent of GDP. Financial Openness is defined as (Total Assets+Total Liabilities)/GDP. Banking crises are those crises as defined by Reinhart and Rogoff (2009). Severe financial crises are the big five crises defined by Reinhart and Rogoff (2009). *** implies coefficient is significant at 1% level, ** implies coefficient is significant at 5% level, * implies coefficient is significant at 10% level.

Appendix A: Country List and Database

Country List

Advanced Countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Switzerland, Sweden, the United Kingdom, and the United States

Emerging Market Countries: Argentina, Brazil, Chile, China,Colombia, Costa Rica, Ecuador, Hong Kong SAR, India, Indonesia, Israel, Korea, Malaysia, Mexico, Peru, Philippines, Singapore, South Africa, Taiwan, Thailand, Turkey, Uruguay, and Venezuela

Database

Variable	Variable Definition	Source
Output	Gross domestic product, volume	OECD (Advanced) Haver Analytics, GDS, IFS, dXtime (Emerging)
Government Expenditure	Government final consumption expenditure, volume Real Government Expenditure	OECD (Advanced) Haver Analytics, GDS, IFS, dXtime (Emerging)
Real Credit	Nominal credit deflated using Consumer Price Index	IFS, Datastream and Haver
House Prices	Nominal house prices deflated using CPI	OECD (Advanced) National Sources (Emerging)
Equity Prices	Share Price (Index) deflated using Consumer Price Index	IFS
Short-term Nominal Interest Rate	Treasury bill rate	IFS (Advanced) IFS,GDS, Datastream (Emerging)
Trade Openness	(Exports+Imports)/Output, Exports of goods and services (% of GDP)-Imports of goods and services (% of GDP)	World Development Indicators
Financial Openness	Absolute Value of Total Assets+ Absolute Value of Total Liabilities (% of GDP)	External Wealth of Nations Dataset (Lane and Milesi Ferreti (2007))
Financial Development	Domestic credit to private sector (% of GDP)	World Development Indicators
Oil Price	Petroleum: Average Crude Price (US Dollars) Deflated By US CPI, 1960:1-2009:4	IFS
Current Account Balance	Current account balance, percent of GDP	OECD (Advanced) GDS (Emerging)

Appendix B: Supplementary Results

How Do Business and Financial Cycles Interact?

Table B1. Business Cycles: Basic Features

	Macroeconomic Variables				
	Output	Consumption	Investment	Industrial Production	Unemployment Rate [1/]
Recessions					
Full Sample	-2.48	-0.37	-6.12	-5.22	0.71
	[-4.22]	*[-1.13]*	*[-10.10]*	*[-5.14]*	*[1.22]*
Advanced Countries	-1.87***	-0.07***	-4.15***	-4.14***	0.57
	*[-2.63***]*	*[-0.16]*	*[-5.93***]*	*[-3.99**]*	*[1.09]*
Emerging Markets	-4.81	-2.78	-13.13	-8.11	1.01
	[-6.53]	*[-2.80]*	*[-17.09]*	*[-6.93]*	*[1.51]*
Recoveries					
Full Sample	4.39	3.21	3.53	5.38	0.26
	[5.23]	*[4.24]*	*[5.31]*	*[6.26]*	*[0.27]*
Advanced Countries	3.09***	2.26***	2.80***	4.57***	0.40***
	*[4.04***]*	*[2.76***]*	*[2.65***]*	*[4.67***]*	*[0.48***]*
Emerging Markets	6.41	5.49	7.33	8.36	-0.31
	[6.93]	*[6.76]*	*[9.63]*	*[8.64]*	*[-0.16]*

Notes: All statistics correspond to sample medians. Means are in brackets. The statistics refer to changes in each respective variable during recessions and recoveries. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

Table B2. Financial Cycles: Macroeconomic Variables

	Downturns					Upturns				
	Output	Consumption	Investment	Industrial Production	Unemployment Rate [1/]	Output	Consumption	Investment	Industrial Production	Unemployment Rate [1/]
Credit										
Full Sample	1.58	1.26	-1.24	1.48	0.32	3.67	3.86	5.60	4.42	-0.02
	[2.08]	*[2.27]*	*[-3.60]*	*[1.75]*	*[0.80]*	*[3.89]*	*[4.12]*	*[6.24]*	*[5.04]*	*[0.05]*
Advanced Countries	1.46	1.09*	-0.79	0.68	0.48*	2.49***	2.69***	3.72***	2.94***	0.10***
	[1.87]	*[1.36]*	*[-2.30]*	*[0.92]*	*[0.94]*	*[2.70***]*	*[2.90***]*	*[3.96***]*	*[3.36***]*	*[0.25***]*
Emerging Markets	2.22	2.66	-5.79	2.30	0.19	5.48	5.60	7.97	6.72	-0.28
	[2.40]	*[3.76]*	*[-5.66]*	*[2.87]*	*[0.52]*	*[5.44]*	*[5.96]*	*[9.50]*	*[7.16]*	*[-0.26]*
House Price										
Full Sample	3.17	2.46	1.01	2.27	0.47	3.93	3.62	5.73	4.15	-0.15
	[4.16]	*[3.66]*	*[-0.08]*	*[3.38]*	*[1.09]*	*[4.07]*	*[3.82]*	*[4.98]*	*[4.28]*	*[-0.07]*
Advanced Countries	2.78***	2.34**	0.72	2.33	0.53	3.41***	3.14***	5.73	3.87*	-0.09*
	*[3.24**]*	*[2.79*]*	*[-0.58]*	*[2.63]*	*[1.13]*	*[3.52***]*	*[3.28**]*	*[4.91]*	*[3.78]*	*[0.00*]*
Emerging Markets	4.81	4.04	2.42	1.64	0.20	5.80	5.71	5.53	5.16	-0.25
	[8.18]	*[7.47]*	*[2.15]*	*[6.78]*	*[0.90]*	*[6.14]*	*[5.88]*	*[5.23]*	*[6.24]*	*[-0.34]*
Equity Price										
Full Sample	3.47	3.02	3.68	2.88	0.10	3.60	3.66	4.29	3.63	0.09
	[4.57]	*[5.07]*	*[3.67]*	*[4.25]*	*[0.42]*	*[3.72]*	*[3.86]*	*[4.01]*	*[3.87]*	*[0.18]*
Advanced Countries	3.46	2.82	3.68	3.10	0.05*	2.96***	3.16***	3.39***	3.02***	0.10
	[4.83]	*[4.59]*	*[4.08]*	*[4.60]*	*[0.30**]*	*[3.04***]*	*[3.21***]*	*[3.17**]*	*[3.03***]*	*[0.25*]*
Emerging Markets	3.47	3.86	3.38	2.63	0.15	5.23	4.79	6.62	5.11	0.02
	[4.05]	*[6.13]*	*[2.80]*	*[3.56]*	*[0.72]*	*[5.01]*	*[5.20]*	*[5.72]*	*[5.45]*	*[0.01]*

Notes: All statistics correspond to sample medians. Means are in brackets. The statistics refer to changes in each respective variable during downturns and upturns. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

Table B3. Financial Disruptions and Booms: Macroeconomic Variables

	Financial Downturns				
	Output	Consumption	Investment	Industrial Production	Unemployment Rate [1/]
A. Credit Downturns	1.58	1.26	-1.24	1.48	0.32
Credit Crunch	2.30	1.19	-9.30***	1.37	1.02***
Other Credit Downturns	1.41	1.30	-0.30	1.48	0.23
B. House Price Downturns	3.17	2.46	1.01	2.27	0.47
House Price Busts	5.97***	3.47	-6.23***	2.33	2.80***
Other House Price Downturns	2.80	2.36	2.13	2.22	0.21
C. Equity Price Downturns	3.47	3.02	3.68	2.88	0.10
Equity Price Busts	4.40**	3.92*	0.04***	1.98	0.65***
Other Equity Price Downturns	3.41	2.92	4.06	3.10	0.00

	Financial Upturns				
	Output	Consumption	Investment	Industrial Production	Unemployment Rate [1/]
A. Credit Upturns	3.58	3.85	5.31	4.16	-0.02
Credit Booms	5.02**	5.01***	6.48	4.41	-0.07
Other Credit Upturns	3.15	3.21	5.07	4.02	0.00
B. House Price Upturns	3.92	3.62	6.06	4.33	-0.11
House Price Booms	4.75***	4.37**	6.97	4.59	-0.18
Other House Price Upturns	3.59	3.19	5.73	4.15	-0.07
C. Equity Price Upturns	3.59	3.66	4.29	3.59	0.09
Equity Price Booms	2.93**	2.89**	3.36*	3.39	0.22
Other Equity Price Upturns	3.75	3.88	4.75	3.64	0.03

Notes: All statistics correspond to sample medians. The statistics refer to changes in each respective variable during downturns and upturns. Disruptions (Crunches, Busts, and Collapses) are the worst 25% of downturns calculated by the amplitude. Booms are the top 25% of upturns calculated by the amplitude. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between financial disruptions (booms) and other financial downturns (upturns).

Table B4: Business Cycles with Intense Financial Cycles: Macroeconomic Variables

	Recessions associated with Financial Disruptions				
	Output	Consumption	Investment	Industrial Production	Unemployment Rate [1/]
A. Recessions without Credit Crunches	-2.32	-0.20	-5.70	-4.93	0.63
Recessions with Credit Crunches	-4.22**	-1.32***	-8.67*	-6.21	0.94
Recessions with Severe Credit Crunches	-4.38**	-1.03**	-7.77	-7.75*	0.94
B. Recessions without House Price Busts	-1.72	0.00	-4.15	-5.22	0.46
Recessions with House Price Busts	-2.35	-0.88***	-8.75	-4.58	1.25***
Recessions with Severe House Price Busts	-2.64**	-1.16***	-9.82*	-4.99	1.16***
C. Recessions without Equity Price Busts	-2.18	-0.35	-4.92	-4.49	0.50
Recessions with Equity Price Busts	-2.18	-0.22	-9.57***	-5.34*	0.81*
Recessions with Severe Equity Price Busts	-2.55	-0.57	-7.46**	-5.54*	0.78
	Recoveries associated with Financial Booms				
	Output	Consumption	Investment	Industrial Production	Unemployment Rate [1/]
A. Recoveries without Credit Booms	4.20	2.99	3.32	5.20	0.24
Recoveries with Credit Booms	8.84***	7.14***	15.78**	10.65***	0.30
Recoveries with Strong Credit Booms	7.90***	8.41**	19.97***	9.01**	0.52
B. Recoveries without House Price Booms	2.97	2.02	2.76	3.62	0.41
Recoveries with House Price Booms	6.25***	4.82***	6.81	5.49*	-0.15**
Recoveries with Strong House Price Booms	7.36***	5.70**	10.31***	7.64**	-0.25**
C. Recoveries without Equity Price Booms	4.18	3.01	3.23	4.28	0.30
Recoveries with Equity Price Booms	4.49**	3.74	5.34	8.00***	0.19
Recoveries with Strong Equity Price Booms	4.49*	2.65	4.35	9.34***	0.19

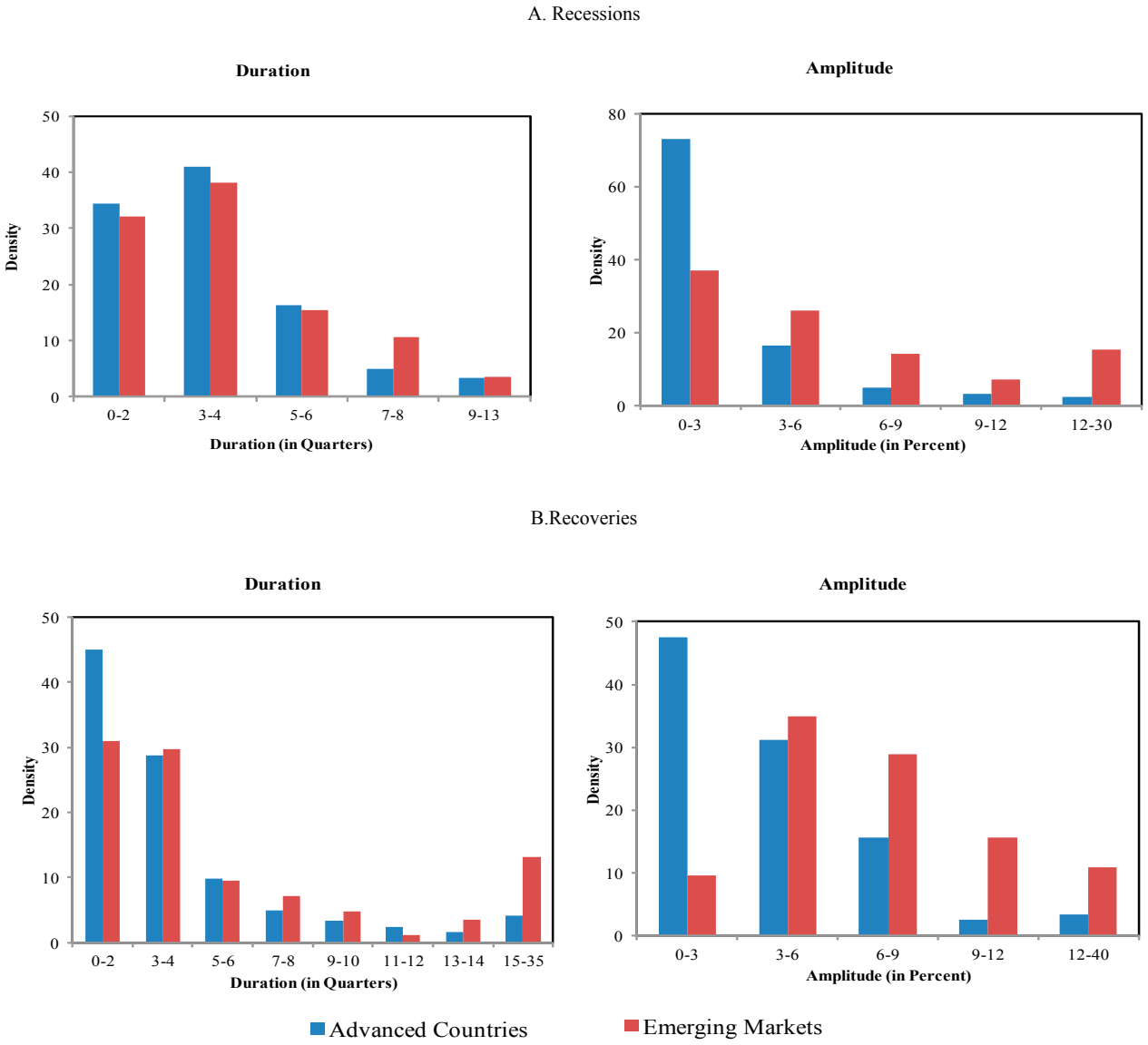
Notes: All statistics correspond to sample medians. The amplitude for the recessions is the decline in each respective variable during the peak to trough decline in output. The amplitude for the recoveries is the one year change in each respective variable after the trough in output. Disruptions (Crunches, Busts, and Collapses) are the worst 25% of downturns calculated by the amplitude. Booms are the top 25% of upturns calculated by the amplitude. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between financial disruptions (booms) and other financial downturns (upturns).

Table B5: Likelihood of Recessions and Recoveries

Recessions	Probability
Unconditional	21.32
Conditional on a credit crunch	39.82
Conditional on a house price bust	35.17
Conditional on an equity price bust	34.62
Recoveries	
Unconditional	21.15
Conditional on a credit boom	55.84
Conditional on a house price boom	40.82
Conditional on an equity price boom	18.03

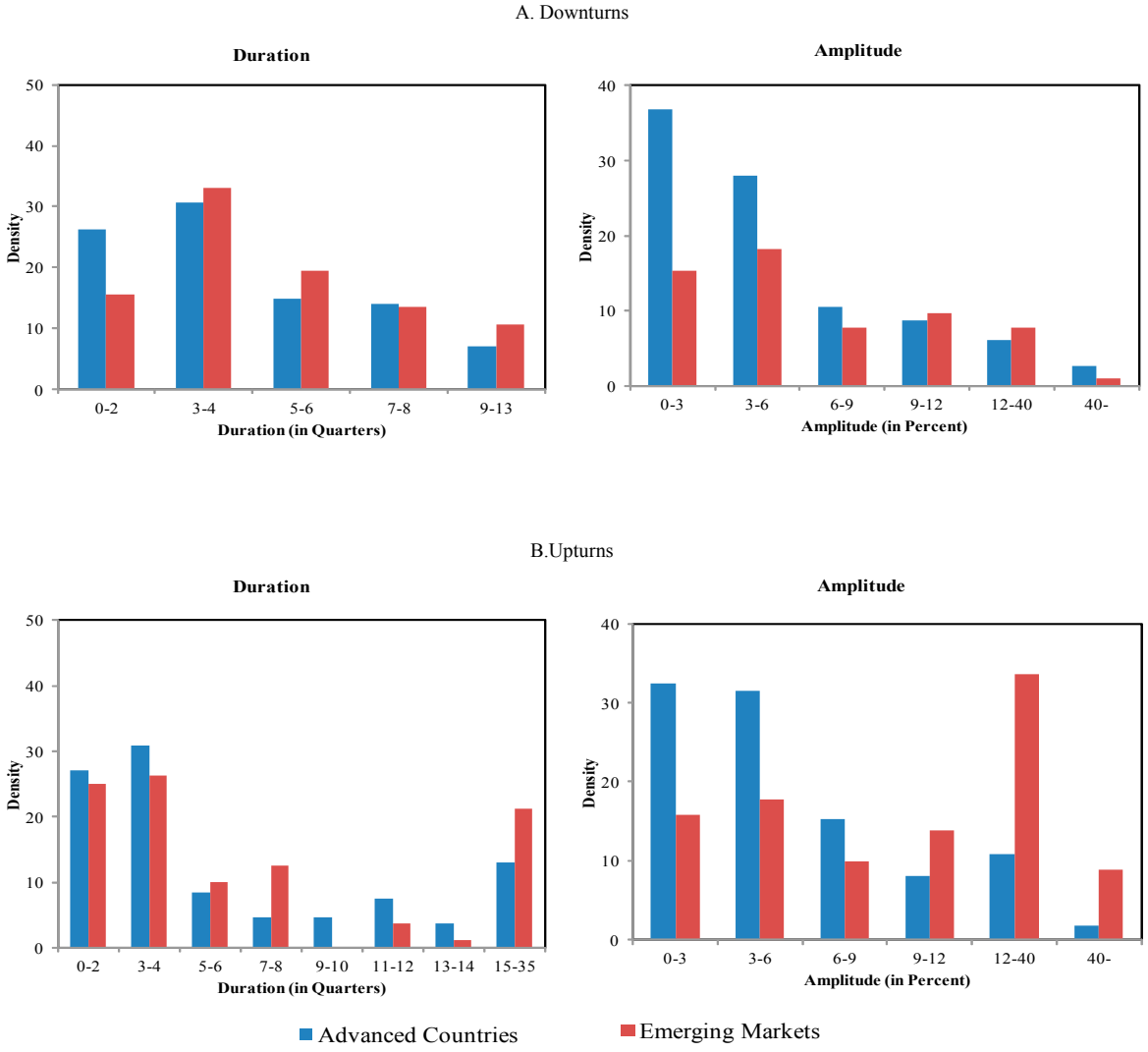
Notes: The unconditional probability of a recession (recovery) is based on the percentage of time that a recession (recovery) occurred during the sample. The conditional probabilities are the percentage of time that there is a recession (recovery) given a financial disruption (boom) in a particular variable.

Figure B1. Distribution of Duration and Amplitude: Business Cycles



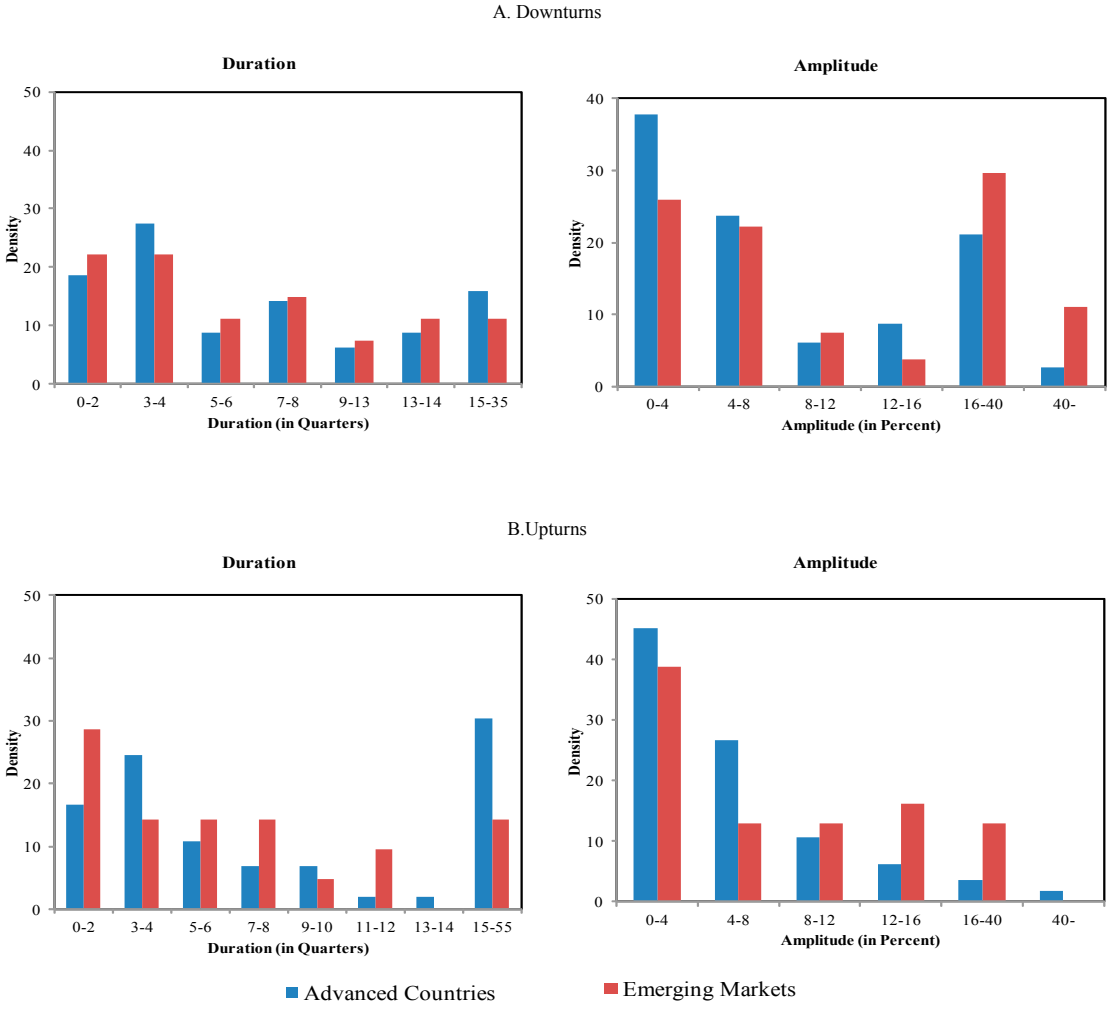
Notes: Duration of recessions is the time from peak to trough in output. For recoveries, the duration is the time it takes for output to attain the level it reached at the previous peak. The amplitude for recessions is the peak to trough percentage decline in output. The amplitude of a recovery is calculated as the percentage change in output during the four quarters after the trough in output. The x-axis for each graph provides the ranges of values for duration and amplitude, respectively. The y-axis is the density of each range as a part of the total, i.e. the height of the bar represents the percentage of observations for which the duration or amplitude falls within the range specified on the x-axis. The last of the sample subsets on the x-axis is larger than the rest and shows the percentage of all extreme values.

Figure B2. Distribution of Duration and Amplitude: Credit Cycles



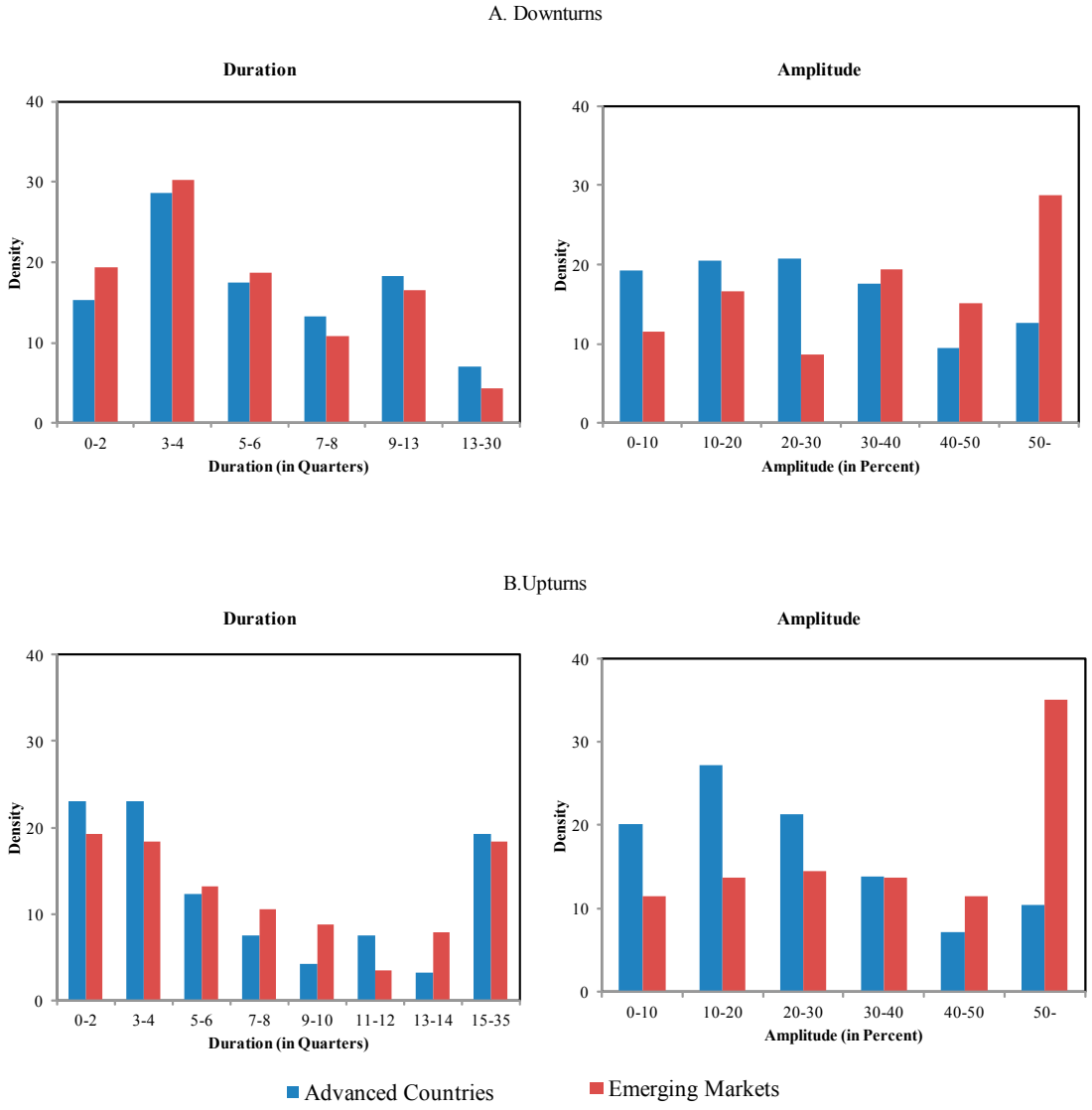
Notes: Duration of downturns is the time from peak to trough in credit. For upturns, the duration is the time it takes for credit to attain the level it reached at the previous peak. The amplitude for downturns is the peak to trough percentage decline in credit. The amplitude of an upturn is calculated as the percentage change in credit during the four quarters after the trough in credit. The x-axis for each graph provides the ranges of values for duration and amplitude, respectively. The y-axis is the density of each range as a part of the total, i.e. the height of the bar represents the percentage of observations for which the duration or amplitude falls within the range specified on the x-axis. The last of the sample subsets on the x-axis is larger than the rest and shows the percentage of all extreme values.

Figure B3. Distribution of Duration and Amplitude: House Price Cycles



Notes: Duration of downturns is the time from peak to trough in house price. For upturns, the duration is the time it takes for house price to attain the level it reached at the previous peak. The amplitude for downturns is the peak to trough percentage decline in house price. The amplitude of an upturn is calculated as the percentage change in house price during the four quarters after the trough in house price. The x-axis for each graph provides the ranges of values for duration and amplitude, respectively. The y-axis is the density of each range as a part of the total, i.e. the height of the bar represents the percentage of observations for which the duration or amplitude falls within the range specified on the x-axis. The last of the sample subsets on the x-axis is larger than the rest and shows the percentage of all extreme values.

Figure B4. Distribution of Duration and Amplitude: Equity Price Cycles



Notes: Duration for the downturns is the time from peak to trough in equity price. For upturns, the duration is the time it takes for equity price to attain the level it reached at the previous peak. The amplitude for downturns is the peak to trough percentage decline in equity price. The amplitude of an upturn is calculated as the percentage change in equity price during the four quarters after the trough in equity price. The x-axis for each graph provides the ranges of values for duration and amplitude, respectively. The y-axis is the density of each range as a part of the total, i.e. the height of the bar represents the percentage of observations for which the duration or amplitude falls within the range specified on the x-axis. The last of the sample subsets on the x-axis is larger than the rest and shows the percentage of all extreme values.