

HOUSING MARKET MACROECONOMICS
WITHIN A MONETARY BUSINESS CYCLE MODEL FRAMEWORK
A Discussion of the Modeling Building Blocks
and a
Literature Review of the Recent Empirical Evidence

by
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ABSTRACT

This literature review will focus on the role of housing wealth effects in influencing aggregate demand within a monetary business cycle framework, with financial market imperfections at the household level. The introduction of a set of business cycle stylized facts related to housing markets will provide the basis for an analytical discussion of relevant theories and issues. Housing wealth effects have been recognized to be relatively small in nature to generate or influence business cycle dynamics in a significant way. The existence of financial frictions and the development of mortgage credit markets allow a growing cross-section of households to overcome borrowing constraints. These are shown to constitute pivotal links in explaining the amplifying macroeconomic effects resulting from short-term fluctuations in housing asset wealth. As well, since housing markets are recognized to be highly sensitive to interest rate changes, the paper provides a detailed discussion of issues related to the roles of housing markets and credit channels in the transmission mechanisms of monetary policy shocks, leading to amplified spillovers to the real economy. The theories discussed in this essay ultimately constitute important building blocks toward the study of short-term economic fluctuations within a housing market-monetary business cycle framework.

INTRODUCTION

Housing macroeconomics and business cycle fluctuations are two research topics that have gained considerable academic interest in recent decades. At the same time, the system of finance has experienced an unprecedented pace of development, particularly in industrialized economies since the early-1980's. This, in turn, has propelled economic activity to new heights and significantly improved the depth and scale of credit markets, coinciding with the so-called Great Moderation in economic volatility. Prominent among the consequences of such developments, we find record-high homeownership rates and unprecedented widespread increases in consumer expenditure, leading not only to welfare gains and improved lifestyles, but also to rising levels of household debt. While the issues of housing and cyclical fluctuations have for a long time constituted important research areas of finance and economic policy, the recent bursting of the American housing bubble and the outbreak of a global financial crisis have led these issues to rank prominently in both government agendas and in the minds of ordinary citizens the world over.

The purpose of this essay is to provide a wide-ranging literature review on the growing significance of housing markets during business cycles. The main topic of this essay is the role of housing market variables in the transmission of monetary policy shocks to the real economy within a business cycle model framework. The goal here is to survey a selection of recent papers dealing with a set of issues relevant to housing markets, monetary policy, and business cycles. However, in view of the fact that housing market economics has recently received considerable attention, some caveats need to be introduced. While the academic community has given considerable attention to such issues as housing price determination and forecasting, as well as housing market efficiency, this research piece will refrain from contributing to these ongoing debates. Also, while the paper will explore the role of monetary policy shocks in cyclical

fluctuations, it is not the goal here to analyze the effectiveness of monetary policy or to contribute to the debate concerning asset price targets for monetary policy. Finally, while most of the evidence will be related to the case of the United States, the essay will also include international comparative discussions of various relevant issues as they illuminate on cross-country heterogeneity.

ESSAY STRUCTURE

The paper will be structured as follows. Part I will be brief and introductory in nature. Section 1 will introduce housing in the macroeconomy and provide some preliminary evidence as to the importance of housing both to the macroeconomy and to business cycles. Section 2 will introduce a set of stylized business cycle facts related to housing market variables, thus laying the analytical foundation for the subsequent literature review.

Part II will explore the modeling literature on housing markets, the transmission mechanisms of monetary policy shocks to the real economy, and business cycles in an attempt to provide a rationale for these stylized facts. First, this part will introduce the Real Business Cycle (RBC) theory very briefly as an initial, but not quite successful, attempt at explaining sectoral cyclical dynamics. This will set the stage to the subsequent survey of the literature on the role of monetary policy shocks as an alternative to technology shocks in the generation and propagation of business cycles. Sections 3 and 4 will survey a selection of papers that discuss a variety of issues that will serve to develop some of the most important building blocks of the monetary business cycle framework. Section 3 will explore the elusive issue of housing wealth effects as the first building block, which will serve to elucidate the complex relationship between housing market activity and cyclical fluctuations, through spillovers to the real economy. Section 4 will introduce the second building block by providing an in-depth analytical survey of issues related

to credit market frictions and their effects on the role of housing markets for the transmission mechanisms of monetary policy disturbances to the macroeconomy. This will serve to further enrich the links between housing wealth effects and aggregate demand. This section will introduce such concepts as the credit transmission channels and the financial accelerator mechanism, as well as discuss some of the effects of financial market development on the cyclical dynamics of housing market variables.

Part III will review the recent literature in the search for empirical evidence. Section 5 will first use the analytical foundations discussed in Part II to survey the topics of housing markets, financial markets, monetary policy shocks, and business cycles from an international perspective. Subsequently, this section will review the recent empirical literature focusing on the housing market-monetary business cycle framework discussed throughout this essay. Finally, the paper will provide a summary and the main conclusions of this literature review, along with possible future research interests.

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PART I: Introducing the Macroeconomics of Housing and the Business Cycle

1. Housing and the Business Cycle: Background

1.1. Introducing Housing

The importance of housing within the macroeconomics literature of both short-term business cycle fluctuations and long-term economic growth, would seem nowadays to need no further justification. This is especially true now as the American economy deals with the prospects of a severe recession which appears to be driven mainly by the financial consequences of a collapse in the housing market. In historical perspective, however, this has not always been the case, since, as some researchers have argued, the macroeconomics of housing and business cycles appears to have been the victim of considerable neglect among leading theorists in not a very distant past. For instance, Charles Leung (2004) interestingly points out that, out of all of Diamond's collection of seminal works on the "Origin of Macroeconomics", Klein's 40-paper selection for "Landmark Papers in Economic Fluctuations, Economic Policy and Related Subjects", Solow's choice of 11 papers for "Landmark Papers in Economic Growth", and Tobin's 32 papers in "Landmark Papers in Macroeconomics", only two research pieces included issues related to the housing market as part of their analysis.¹ For his part, Edward Leamer (2007) proves to be quite less subtle than his counterpart. He provides a more passionate complaint about the apparent widespread neglect of the role of housing markets in the analysis of business cycles within the mainstream academia. He expresses dismay about the outright omission or demotion to a secondary role of housing, for example, in popular university macroeconomic textbooks.

Nonetheless, the important role of consumer durables, and in particular housing, in both

¹ One of them, Irving Fisher's "The Debt-Deflation Theory of Great Depressions" (1933), advances the crucial importance, for macroeconomic fluctuations, of over-indebtedness leading to worsened financial positions and of deflation. These two issues are claimed to be at the source of a vicious cycle that amplifies and propagates fluctuations at cyclical frequencies. As will be discussed in greater detail in Section 4.3. in Part II, a similar idea has been formalized in the "financial accelerator" mechanism.

short-term fluctuations and long-term growth has in recent decades been convincingly underscored by a growing group of housing macroeconomists. Housing macroeconomics, it seems, has come out of its shell to claim a more prominent place in mainstream economic research. Among some of the major research sub-fields, growing interest in housing macroeconomics has ranged all the way from the financial economics of monetary policy transmission mechanisms and the microeconomic foundations of portfolio asset choices; to the explicit accounting of housing capital in models of long-term growth and life-cycle consumer welfare; to the spillovers and positive socio-economic externalities of homeownership; to the role of housing markets in the generation and propagation of business cycle fluctuations. While this essay will review the literature on housing and the business cycle, it will ultimately prove necessary to expand the scope of analysis to many of the aforementioned sub-fields. Such a selective and yet wide-ranging topical review will end up emphasizing the analytical richness of housing macroeconomics within the business cycle literature.

Broadly speaking, research of long-term economic trends tends to have a heavier influence from the behaviour of longer-term factors, such as demographics and structural and technological/industrial developments, affecting an economy's long term production capabilities frontier. In contrast, research focused on short term cyclical fluctuations tends to be influenced more heavily by shorter-term factors such as technology, monetary or fiscal policy shocks that tend to create temporary periods of market imbalances and deviations from equilibrium or steady state path. Such transition periods of adjustment toward a new equilibrium point can be broadly characterized by two features: 1) the arbitrage of opportunities arising from short term shocks and the reallocation of market capital among firms away from inefficient and toward more efficient uses; and 2) households' revision of various decision rules driving their consumption, savings, and investment choices, as they adjust to changing balance sheets and income prospects, which usually tend to involve both rationality as well as a fair degree of emotion. This essay will focus

mainly on the second feature involving the household sector and its role in affecting aggregate demand.

Our interest in this paper will thus focus predominantly on the household sector. The household, as the ultimate owner of all factors of production, owner and shareholder of firms, and benefactor from the fruits of its own production, is by and large the basic unit of analysis and subject of interest in most economic models. Household lifetime wealth, as will be explained, plays a major role in shaping households' inter-temporal consumption and financial decisions. Within the aggregate measure of household wealth, survey statistics point to a growing influence of housing in the average American family's consumption and financial decisions. Housing, in addition, is not only a component of household consumption, but also an investment choice. And since people live in their homes, and housing is by far the largest component of the average household's lifetime portfolio, it seems like an old cliché to say that housing choices are by and large the most important, and most emotional, decisions in a household's lifetime. This claim will prove crucial for our discussion of housing and business cycles.

1.2. Evidence of the Importance of Housing in the Macroeconomy

The growing role of housing in influencing household behaviour has been clearly evidenced by the historical data. According to the latest U.S. Federal Reserve Board Survey of Consumer Finances², covering the period from 1989 to 2007, the value of non-financial assets of all families represented 65.9 per cent of total family assets in 2007, the highest share since 1992. Furthermore, family assets in the form of residential property accounted for a share of about 60 per cent of the value of family non-financial assets between 2004 and 2007, by far the highest share since at least 1989. On the debt side, borrowing secured by residential property reached a

² Data taken from the 2007 Survey of Consumer Finances, Tables Based on the Public Data, estimates inflation-adjusted to 2007 dollars. These can be found at the following link: <http://www.federalreserve.gov/pubs/oss/oss2/2007/scf2007home.html>

record-high of 84.8 per cent of total family debt by 2007. At the same time, total debt as a share of total assets reached a peak of about 15 per cent between 2004 and 2007. In addition, the latest data show that 82.1 per cent of the total value of family borrowing was used toward housing related expenses, by far the highest on record. Finally, a record 14.3 per cent of first-lien residential mortgage refinancing involved direct home equity extraction, referred to throughout this paper as mortgage equity withdrawal, or MEW. Interestingly, the magnitudes of these selected statistics have for the most part been growing from survey to survey at least since 1989, reaching their highest levels in 2007, implying that the role of residential housing in American families' consumption and financial decisions has been growing steadily over the years. Similarly, according to statistics from the U.S. Bureau of Economic Analysis, housing services have consistently represented the second largest component of personal consumption expenditure since 1994, slightly lower than medical care and more than consumption of all other durables combined³.

The relative importance of housing in the macroeconomy has in fact been studied by a multitude of researchers. Interestingly, housing investment represents a substantial share of total investment, with the total value of residential construction being comparable both to the combined value of private non-residential structures and equipment, as well as annual GDP. Furthermore, the value of residential construction is estimated to be approximately three times larger than the total stock of all other consumer durables (Davis and Heathcote, 2005). It has also been estimated that the average ratio of household to non-household capital stocks between 1954 and 1988 was 1.13 (Greenwood and Hercowitz, 1991). Such clear evidence has led to a growing interest on the subject. For instance, Di (2001) finds that housing wealth not only represents a substantial share of total household wealth, but also that it tends to be more evenly distributed than financial

³ U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts Table 2.3.5. Personal Consumption Expenditure by Major Type of Product, quarterly data available as of December 06, 2008.

wealth, with the bottom half of the population holding more than 20 per cent of all housing wealth, the top 90 per cent holding more than half of all housing wealth, and the top 1 per cent holding only about 10 per cent of the total. This is in sharp contrast to the relatively higher concentration of financial wealth among the richer segments of the population. This in turn conveys important implications for the study of the scope of household behaviour and its aggregate economic consequences both in the long and short term. Housing wealth, nonetheless, is more accurately represented by the value of net home equity in households' balance sheets, which by 1998 had fallen behind financial wealth due to the faster growth in household borrowing against housing collateral. Several issues related to housing wealth and the ability to access it, as will be explored in this essay, play a crucial role in explaining the links between housing market dynamics and business cycle fluctuations.

In the face of such strong evidence as to the crucial role of housing in influencing household behaviour, it would then seem imperative to deepen our knowledge of the short term economic effects of housing market activity on the wider macroeconomy.

1.3. Preliminary Evidence of the Importance of Housing in Business Cycles

Most academic research papers typically take a pragmatic modeling approach to focus on housing spillovers into the wider economy to explain their role in the generation and propagation of business cycles. Leamer (2007), on the other hand, takes a somewhat unorthodox approach by arguing that the so-called business cycle should in fact be referred to as being a 'consumer cycle'. The main link in his argument is the historically prominent role of housing and other consumer durables in past cyclical fluctuations. His evidence-based approach will therefore serve as a good starting point to introduce the significance of housing in our business cycle literature review.

Leamer's article "Housing Is the Business Cycle" is a provocative and insightful exposition of the significance of housing for business cycle fluctuations. By exposing the historical contribution of consumer durables to past recessions and recoveries, Leamer provides powerful evidence in favour of putting the housing market at the forefront of any business cycle research exercise. One of his main arguments can be explained as follows. There is substantial evidence that residential investment has strongly led the business cycle, with eight out of ten post-war recessions in the U.S. being preceded primarily by serious problems in housing and other consumer durables sectors. It follows that the best way to understand short term business cycles is to focus on the cyclical dynamics and factors affecting housing markets. Implicit in this basic premise is the generally agreed issue of the high interest rate sensitivity of housing variables, and therefore the pivotal role of monetary policy. Exploring what Leamer has to say about housing and business cycles will therefore provide a lead to the subsequent survey of the links between housing wealth effects, financial markets, and short-term aggregate demand.

In portraying the role of residential investment in leading cyclical fluctuations, Leamer calculates and graphs the sectoral 'cumulative abnormal contributions to GDP growth', both one year before and two years during recessions⁴. The resulting curves clearly show significant weakness in residential spending, with negative cumulative abnormal contributions of residential investment to GDP growth during the four quarters preceding the cyclical peaks. In addition, during recessions this component tends to bounce back and recover strongly and relatively fast, contributing to GDP growth after an average lag of about two to three quarters from the peaks. The story for other consumer durables is largely similar, however not as strong as with residential investment spending. Leamer contrasts such historical cyclical behaviour with that of the equipment and software sector, as a proxy for business investment. This sector tends to coincide

⁴ The purpose of his exercise is to show sectoral contributions to GDP growth beyond their long-term 'normal' trend as measured by their Kernel smoothing regression estimate.

with the cycle by contributing less negatively to GDP growth before recessions much less consistently, and with much longer lags in contributing to recovery during recessions, than residential investment.

Consequently, Leamer concludes that residential investment led strongly in six out of ten post-war recessions in the percentage abnormal contribution to total GDP weakness four quarters before a recession, with the highest sectoral average abnormal contribution over all recessions of 22%. In addition, the other three components contributing the most to GDP weakness a year before the seven normal⁵ recessions were all, by temporal sequence, related to consumer spending: consumer durables, consumer services, and consumer non-durables. This constitutes the main evidence for his claim that the business cycle is in fact a consumer cycle. As well, the equipment and software component led in none of the recessions before peaks, with a lower negative average abnormal contribution of just 14%, while it led during four of the recessions in negative abnormal contribution to GDP weakness eight quarters after the peak, with the highest average of 19%, compared to just 9% for residential investment. These conclusions are further confirmed by a simple regression of GDP growth on lagged abnormal contributions to GDP growth, with the four consumer spending components of GDP being the only ones for which the exercise results in coefficients statistically significant at the 5% level. According to Leamer, then, although housing investment is a relatively small component of output, it has historically had proportionally larger effects on output fluctuations, and should therefore be given special importance in models analyzing business cycles.

Finally, Leamer focuses his analysis of the resale housing market mostly on sales volume fluctuations. He argues that the spillovers to labour markets are key to analyzing business cycles, while housing price changes do not generate output and therefore should not influence the

⁵ Excluding the 1953 Defence Downturn, the 2001 Internet dot-com crash, and the older 1948 recession.

economy in the short term. The main topic of this essay will discuss this issue extensively, in an attempt to provide a critique of Leamer's claim, and to argue in favour of alternative ways in which housing price fluctuations can in fact exert considerable influence on short term economic dynamics.

2. Business Cycles and Housing Markets: Introducing the Stylized Facts

The growing interest in the functioning of housing markets and its consequences on the macroeconomy have inspired researchers to ask questions like the following: Why, and in what way, is housing market activity important for the generation and propagation of business cycle fluctuations? What are the main business cycle stylized facts related to housing market economic variables? What are some of the most important channels and mechanisms through which housing market activity can spill over to the real economy? What theoretical framework should be used to model the links between housing markets and business cycle fluctuations? These are some of the fundamental questions that this literature review will address.

The study of business cycle fluctuations is in itself an important and yet difficult challenge. The existence of persistent and recurrent fluctuations in economic activity has puzzled economists for decades, and many important issues remain for the most part enigmatic even to this day. It is generally recognized that the existence of periods of strong economic growth can be caused by positive shocks, but researchers tend to disagree on which are the most important or relevant ones in any given cyclical expansion. It is also generally agreed that periods of strong economic growth can constitute important engines of rapid productivity gains, leading to long-lasting improvements in aggregate well-being. Such boom phases, however, tend to be subsequently followed by painful adjustment periods of economic downturns or recessions, as previous economic and financial imbalances are addressed and resources are redistributed among sectors, away from inefficient uses toward more profitable ventures. The depth of such downturns

largely depends on the degree of unsustainability of the previous economic boom, as well as on the nature of the causes of fluctuations and the sectors of the economy that have been more severely and directly affected. Therefore, the goal of furthering our understanding of cyclical fluctuations is to ultimately achieve a smoother and more sustainable path of economic growth. The theoretical modeling of the various underlying causes and propagation mechanisms characterizing cyclical fluctuations represents the ultimate aim of business cycle researchers. In the end, it is highly desirable to increase our understanding of cyclical economic dynamics so as to influence economic policy directions and achieve a more stable path toward a longer term steady state, without such sharp, and often painful, ups and downs.

As was already mentioned, there seems to be a widespread and growing consensus among economists about the importance of housing market dynamics for the broader macroeconomy. The main theoretical debate appears to be centered around the nature of the generation and propagation mechanisms of business cycles as they relate to the housing market. As will be discussed in part II, the prominence of technology shocks in generating and propagating business cycles has been challenged by other plausible theories. One such theory is the idea of monetary policy shocks, and since interest rates constitute a crucial factor in determining housing market activity, the focus of the second part of this paper will be to introduce and review the literature on housing and the monetary business cycle model framework.

The dynamics between the macroeconomics of housing and the business cycle are usually characterized by a set of stylized business cycle facts. Before analyzing what the modeling literature has to say about the macroeconomic mechanisms leading to such stylized facts, we begin here by stating them explicitly. All of the papers discussed in parts II and III will be related, in one way or another, to one or more of these stylized facts, and throughout this literature review, I will refer to them in relation to the research papers being discussed. In no particular order of

importance, the following are some of the most popular stylized business cycle facts related to the housing market:

Fact #1: Gross domestic product, household consumption, and both residential and non-residential investment are positively correlated (i.e. comovement)⁶;

Fact #2: Residential investment leads, while non-residential investment lags, the business cycle⁷;

Fact #3: While investment is many times more volatile over the business cycle than GDP, the volatility of residential investment is more than twice as large as that of non-residential investment⁸;

Fact #4: Employment and output in most industries are positively correlated, and total hours worked in the construction sector shows one of the strongest comovement and volatility relative to output⁹;

Fact #5: Real house price fluctuations are highly correlated to the business cycle and tend to lag cyclical peaks and troughs¹⁰;

Fact #6: Residential investment is one of the most interest rate sensitive components of GDP; as well, housing demand is very sensitive to interest rate fluctuations¹¹;

Fact #7: The main channel through which fluctuations in house prices affect real economic activity occurs via the housing wealth effect influencing household aggregate consumption¹².

⁶ See Davis and Heathcote (2005, pp. 751 and 770), and Sørensen and Whitta-Jacobsen (2005, pp. 411-417)

⁷ See Davis and Heathcote (2005, pp. 751 and 770), Greenwood and Hercowitz (1991, page 1189), Fisher (2001, pp. 1 and 26), Fisher (2007) and Leamer (2007, pp. 8-19). Leamer also offers one of the clearest and most persuasive proofs of this stylized fact in two graphs depicting the sectoral cumulative abnormal contributions to GDP growth at cyclical frequencies. These graphs are shown in the Appendix B, figures 1 and 2.

⁸ See Davis and Heathcote (2005, pp. 751 and 770)

⁹ See Christiano and Fitzgerald (1998, pp. 56-61)

¹⁰ See Borio and McGuire (2004, pp. 80-83), Cate, Girouard, Price, and André (2004, pp. 6-10), and IMF World Economic Outlook (May 2000, Chapter 3, pp. 91-112)

¹¹ See, among others, Bernanke and Gertler (1995, pp. 29-33), IMF World Economic Outlook (May 2000, Chapter 3, pp. 91-112) and Berger-Thomson and Ellis (2004, page 1)

¹² See Cate, Girouard, Price, and André (2004, page 11), Girouard, Kennedy, Van Den Noord, and André

PART II: The Housing Market-Monetary Business Cycle Model Framework:

A Literature Review of the Theoretical Building Blocks

Introduction: The Theory of Real Business Cycles and the Need for Alternative Models

Since the seminal work of Kydland and Prescott (1982), the theory of Real Business Cycles (RBC) emerged as an important modeling strand that has spurred a large body of research during the past couple of decades. The main feature of standard RBC models is the assumption that the main drivers of business cycle fluctuations are exogenous real shocks, particularly shocks to firms' production technology. The apparent dependence of RBC models in explaining cyclical ups and downs in economic activity upon the existence of exogenous technology shocks has been among the main sources of controversy in addressing the causes behind business cycles¹³. Although a more detailed explanation of the RBC modeling literature lies largely beyond the scope of this paper, a large portion of the research studies in the more recent literature have proposed or used economic models that have originated partly as responses or natural extensions addressing certain weaknesses or failures of standard RBC models. This is especially true in relation to conforming to the empirical data with regards to the stylized facts associated with sectoral comovement (Fact #1), cyclical dynamics, and propagation mechanisms.

The interest in the study of sectoral comovement stems from the failure of RBC theory to conform to the observed comovement among sectors in the data. Christiano and Fitzgerald (1998) provide a comprehensive survey of the issue of sectoral comovement in the business cycle literature, as well as a broad review of model extensions and alternatives. By measuring sectoral economic activity at business cycle frequencies, in terms of the number of private hours worked

(2006, pp. 29-32), and IMF World Economic Outlook (May 2000, Chapter 3, pp. 91-112). It is interesting to note, however, that the former study is, to my knowledge, one of the only ones to explicitly refer to the statement in Fact #7 as a stylized fact.

¹³ See, for example, Rebelo (2005, pp. 7-9)

in each industrial sector, they estimate that while only 5.6 per cent of total hours worked are in the construction sector, hours worked in this sector are 6.75 more volatile than total hours worked (Fact #4). As well, this sector's business cycle co-movement coefficient is highly positive at 0.88. In fact, with very few exceptions, they estimate substantial and positive coefficients of cross-sectoral comovement of hours worked in most industries with total private hours worked at business cycle frequencies.

Standard RBC theory features some simplifying assumptions that have received considerable attention in this regard. For instance, it assumes that the net effect of positive and negative exogenous shocks affecting firms' production technologies ultimately determines the direction and magnitude of the shift in the supply curve of firms. Therefore, this implies that expansions and recessions are determined largely by supply factors, caused mainly by exogenous shocks to total factor productivity, which is usually measured as a residual. Christiano and Fitzgerald (1998) point out that the problem with standard RBC models in explaining sectoral comovement is the assumption that all firms share the same technology within a single industry for the production of a single good, and are thus all affected by the same exogenous shock. Comovement under such simplifying assumptions is therefore achieved at the expense of realism. The implications of the model remain largely counterfactual even after assuming the basic industrial structure with two firms in different production sectors, one producing consumption goods and the other producing new productive capital investment, to be added to the economy's capital stock. Since both industries still share the same production technology, a positive shock would increase output of the investment goods industry relatively more than that of the consumption goods sector, as the returns to investment become relatively higher. This in turn implies a shift of capital and labour, as input factors of production, away from the consumption goods industry and towards the investment goods industry, thus failing to achieve sectoral comovement.

As evidenced in the National Bureau of Economic Analysis (NBER) definition of business cycles¹⁴, the sectoral comovement stylized fact is so important that its successful theoretical simulation could nowadays be considered as a technical pre-condition to success of any business cycle model. In addition, RBC models appear to fail not only in accounting for the sectoral comovement phenomenon, but they also tend to be blamed for having weak propagation mechanisms of cyclical fluctuations. Where models based on standard RBC theory have shown weaknesses, however, a multitude of alternatives and extensions have originated to provide for a more plausible explanation of cyclical dynamics. The basic questions then become: What other economic forces or shocks are important in leading to sectoral dynamics at business cycle frequencies? What theoretical framework is able to provide an explanation for not only the generation mechanisms, but also for the propagation mechanisms needed to simulate the persistence feature of cyclical dynamics? What framework is able to put housing market dynamics at the center of business cycle analysis?

In what follows, the paper will provide a detailed literature review that introduces and discusses issues related to two key topics: 1) the relevance of the study of monetary policy shocks for the generation and propagation of business cycle fluctuations; and 2) the growing role of housing market variables and dynamics for the transmission of monetary policy shocks to the real economy during business cycles. Sections 3 and 4 will serve to introduce a variety of theoretical building blocks of the housing market-monetary business cycle model framework.

¹⁴ Comovement has been recognized as a key issue in the analysis of cyclical fluctuations, and is therefore at the heart of the definition of business cycles according to the National Bureau of Economic Research (NBER): *“The NBER does not define a recession in terms of two consecutive quarters of decline in real GDP. Rather a recession is a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales...Because a recession is a broad contraction of the economy, not confined to one sector, the committee emphasizes economy-wide measures of economic activity.”* (<http://www.nber.org/cycles.html>)

3. Building Blocks of the Housing Market-Monetary Business Cycle Framework

3.1. Introducing Monetary Policy Shocks: A Review of the Links between Housing and Aggregate Demand

An increasingly popular theoretical framework puts monetary policy shocks at the center-stage as one of the single most decisive economic forces in business cycle fluctuations. As will be explained, not only can a monetary policy shocks framework help explain sectoral comovement, but it is at the same time able to address many of the other stylized facts. As well, since monetary policy deals with interest rates, it not only affects businesses but also households and household credit, especially as it relates to housing. In what follows, the literature review will focus on developing the theoretical building blocks needed to achieve a better understanding of the monetary business cycle model framework, from the perspective of the household sector and the housing market.

As a first step in analyzing the relationship between housing wealth and macroeconomic fluctuations, we explore the subject of housing wealth effects as the crucial link between housing market activity and aggregate demand (Fact #7). This step is important because, as will be explained, there seems to exist ample historical evidence in the literature of the close links between real house prices dynamics and business cycle fluctuations (Fact #5). Cyclical expansions and contractions are usually the consequences of both supply and demand factors, both of which are closely related and mutually reinforcing. Since firm production and labour market issues fall largely outside the scope of this paper, the analysis here will focus on demand side factors, with strong emphasis on the household sector and housing market dynamics. Insofar as we can characterize the relationship between housing price dynamics and business cycles, and if there is evidence that housing price dynamics can have significant effects on household consumption and aggregate demand, then housing markets are important in analyzing business cycle fluctuations.

Why is this important within a monetary business cycle framework? Monetary policy happens to be a decisive factor in housing market dynamics. This is so because it is widely recognized that both the demand for mortgage loans and equity refinancing, as well as the supply of new residential construction, are both highly sensitive to interest rate fluctuations (Fact #6). Control over short-term interest rates, in turn, could be broadly seen as a tool used by central bankers to control the temperature of the economy through different stages of the business cycle. The monetary policy transmission mechanisms through the housing market will therefore prove to be of pivotal importance for our analysis. In fact, as is mentioned in Leamer (2007), this issue has sparked a lively policy debate about whether monetary policy rules aiming at macroeconomic stabilization (i.e. full employment and low inflation, and therefore less pronounced economic cycles) could be improved by taking explicit account of house price inflation. This issue can be seen as gaining relevance if there is evidence that increasing house prices in an environment of flexible financial markets and with an expansionary monetary policy could cause, among other things, periods of both real estate market speculative bubbles and excessive aggregate demand. Of course, we are all too familiar by now with the dangerous cyclical consequences of such a positive feedback loop, as is painfully evident in the current U.S. housing market meltdown, financial market crisis, and economic recession.

Without contributing to this debate, in what follows I will review some of the links between house price changes and aggregate consumption (Fact #7). Two possible channels through which households can benefit from the appreciation in asset values (both stocks and housing) in order to increase consumption possibilities are either by direct liquidation (i.e. sale) of the asset or by increasing their borrowing capacity (i.e. reducing borrowing constraint). Hence, the pass-through from house price fluctuations to changes in aggregate consumption depends strongly on households' access to credit, which in turn depends directly on the state of

development of financial markets. Furthermore, it has been widely recognized that the various financial market innovations starting from the early 1980's, especially in the U.S., represent a possible structural break, in that financing opportunities have become considerably more flexible and accessible than before¹⁵. As will be discussed later on, such increased financial flexibility is seen to have had the potential to significantly alter the marginal propensity to consume out of housing wealth and to reduce the share of households that are liquidity constrained. This, in turn, enables households to adjust current consumption and smooth their intertemporal consumption decisions. Such financial innovations have also allowed increasing housing wealth to have a stabilizing effect during recent economic cycles, due to the fact that households can now in principle compensate for reductions in income (or income prospects) by borrowing more heavily against their home equity. The logic implication of this argument is that such increased flexibility to access collateralized credit was not as readily available during earlier economic cycles, meaning that previous cyclical downturns may have been more severe, at least in part, because households were faced with relatively fewer possibilities to smooth intertemporal consumption choices. However, their ability to smooth consumption through an economic downturn will be strongly dependent on the healthy functioning of both the housing and the credit markets, and therefore on the cyclical dynamics of housing prices. In order to discuss this important issue further, however, we need to introduce the Overlapping Generations model framework.

3.2. Housing Wealth Effects: The Overlapping Generations Model

Within the basic Overlapping Generations (OLG) model (Friedman, 1957, Ando and Modigliani, 1963), households are assumed to spread out consumption decisions evenly through time, as they face an intertemporal budget constraint. This defines the basic permanent income

¹⁵ See, among others, Muellbauer (2007), Calza, Monacelli, and Stracca (2007), McCarthy and Peach (2002), Aoki, Proudman, and Vlieghe (2004), and Boone and Girouard (2002). Also, a detailed discussion on recent developments in financial markets and the economy can be found in Bernanke's Speech at the Federal Reserve Bank of Kansas City's Economic Symposium, Jackson Hole (2007).

hypothesis, where the net present value of consumption choices through time are constrained by the sum of the initial wealth endowment plus the net present value of lifetime human wealth (i.e. stream of labour earnings) and lifetime non-human wealth. The basic structure of the model leads the household to smooth out consumption through time, thus implying different consumption patterns at different stages in a household's life, since wealth and income potential tend to differ by age. It also assumes, implicitly, that households have access to financial markets to borrow as needed in order to smooth intertemporal consumption choices and adjust, in the short term, to changes in permanent income. Therefore, an unexpected increase in any component of wealth would in theory result in an equal and proportional increase in consumption to be spread out for the remaining years of life. Non-human wealth could be further disaggregated into financial (e.g. stocks and bonds) and non-financial (e.g. housing) wealth. Since housing wealth tends to be measured as the net market value of housing stock owned by the household, an increase in the price of housing could be seen as expanding the household's lifetime consumption possibilities (i.e. permanent income is perceived to have increased). However, this premise stands true in itself only as long as we are willing to assume that changes in housing wealth can in themselves influence consumption decisions; or, in other words, as long as, when faced with an increase in housing prices, households would perceive that their permanent income has increased.

This seemingly simple relationship is crucial to understanding some of the links between housing and short term economic cycles. It has consequently attracted significant academic attention from researchers attempting to measure the relative housing wealth effects, or the marginal propensity to consume out of changes in the value of housing compared to that of financial assets. However, as hinted above, one important caveat is explored by Buiters (2008) in his paper "Housing Wealth Isn't Wealth". He argues that, within an OLG framework, movements in housing prices do not result in pure wealth effects, since the only impact one should observe is a simple redistribution in the ownership of the total value of the economy's housing stock,

between households 'long' housing and 'short' housing. Household heterogeneity is therefore needed to analyze the net effects¹⁶. And since the consumption and holding of the housing stock tends to follow very marked life-cycle patterns, such heterogeneity is usually modeled by dividing households by age cohort, ranging from young renters and potential first-time homebuyers, to middle-aged owners and repeat- or move-up buyers, to old owners trading down. Buiter defines 'long' and 'short' housing consumer types as results from the net of the imbalance between the present discounted value of all current and future rental costs (actual for tenants, or imputed for owners), exceeding or falling short of the present discounted value of future planned consumption of housing services. Therefore, an increase in housing prices may very well have the effects of raising the consumption possibilities of (older) owners at the expense of (younger) renters, who must now save more money early in life to afford a higher downpayment.

The issue of distributional effects and the net impacts on aggregate consumption of house price changes, within an OLG life cycle model framework, has been studied, among others, by Fernández-Villaverde and Krueger (2001), Li and Yao (2005), and Yang (2006). What is of interest to us here, though, is to address how to circumvent the short term distributional effects of house price changes so that they do indeed affect aggregate consumption. Among others, issues such as the introduction of age cohort-specific (i.e. asymmetric) marginal propensities to consume out of housing wealth¹⁷, could lead to non-neutral effects on aggregate demand. As well, economic theory would suggest that richer households may experience a lower marginal propensity to consume out of wealth. This would then imply that the effects of housing price fluctuations would affect older, housing equity rich households very differently than younger renters and equity poor first time homebuyers. However, and more relevant to our interest here, a

¹⁶ For a detailed discussion on introducing agent heterogeneity into macroeconomic models, please refer to Jeske (2005).

¹⁷ A related study analyzing age cohort-specific marginal propensities to consume is developed by Lehnert (2004).

natural and very popular approach to dealing with this issue is mentioned by Buiter himself, as well as by a multitude of other research studies (including those mentioned above), who underline the crucial importance of introducing financial markets into the framework. Research on issues related to financing channels has greatly increased in popularity in the literature, especially after the innovations in financial markets since the 1980's and the widespread use of such innovations. Indeed, some interesting insights can be gained from a brief review of the links between wealth, financial markets, and consumption.

Simply put, the basic OLG model describes the intertemporal rule for consumption decisions of rational households in the absence of liquidity constraints. Consumption decisions can also be viewed more broadly as saving and dis-saving decisions, which make use of the possibility of borrowing from financial markets. In principle, some households may perceive that their wealth has increased when the market value of their home is higher, and might therefore decide to increase their spending out of current household income. In most cases, however, access to newly gained non-human wealth is strongly dependent on the existence of developed credit markets. The degree of financial market flexibility needed for households to gain access to credit is indeed far from the theoretical premise of the unconstrained basic OLG model. It is therefore possible, in principle, for some households who, as a rational reaction to a real or perceived change in permanent income, would choose to increase consumption at any point in time, to end up finding themselves to be liquidity constrained by having only limited or no access to credit facilities. Borrowing from financial markets, in addition, tends to be more flexible and accessible if households are able to supply assets as collateral for loans, and by far the most widely accepted form of collateral is real estate. Therefore, an unexpected increase in house prices would, in principle, increase the size of the collateral and the ability of households to borrow against their newly gained home equity.

Indeed, if borrowing constraints are relaxed, for instance either by a lower downpayment requirement (i.e. higher loan-to-value ratio) or by an increase in the maximum loan amortization period, then the housing wealth effect can be said to be activated. Even though such loans will eventually have to be serviced in the future, empirical studies have revealed evidence (not without significant debate as to the magnitude, as will be explained) of both long term and short term fluctuations in aggregate consumption in response to house price fluctuations. Therefore, when average house prices increase, liquidity constrained owner households are now better able to refinance their mortgages or apply for a MEW at a lower interest rate than that for unsecured debt. This allows them in principle to escape the 'liquidity trap' and increase their short term consumption of both durable and non-durable goods in response to a change in wealth, and therefore in permanent income. One could claim, however, that this would be true, for example, only as long as their expectation of future price increases and income is strong enough, and/or their elasticity of intertemporal substitution of consumption makes them impatient enough, so as to compensate for the fact that, as long as they do not sell their house, their permanent income has not actually increased, since the debt must eventually be repaid back to the bank¹⁸. However, if mortgage loans can be renegotiated at a low or no penalty cost to the homeowner, then a gain in equity could be extracted directly from the house.

On the other hand, a rise in housing prices implies that young renters must decrease consumption and increase savings in order to accumulate enough funds for a downpayment. Furthermore, households might not perceive an increase in housing prices as a rise in their housing wealth if their implicit imputed rental costs go up as well (i.e. their cost to consume housing services rises). Intricate and far from unambiguous relationships such as these have, not surprisingly, led researchers to study the wealth effects of housing versus other financial assets,

¹⁸ This is true for most countries; however, Feldstein (2007) discusses one special feature of the American mortgage finance system, namely the ability to refinance at any time at no cost, implying that equity withdrawals can actually become net cash withdrawals and not debt.

such as stocks, in considerably more detail. In what follows, I review only a selection of recent studies on this subject and discuss some of the issues raised along the way. As well, since the link between house price changes, housing wealth, and consumption depends directly on the availability of credit, and since the price of credit is reflected in the rate of interest charged in financial markets, I will subsequently explore more in detail the role of monetary policy transmission mechanisms into the real economy via housing markets.

3.3. Housing Wealth Effects: A Discussion of Relevant Theoretical Issues

The measurement of household behaviour in response to changes in the value of different components of wealth has gained growing interest in recent decades, especially in view of the unprecedented appreciation in value of both financial and non-financial wealth. More relevant to our interest here, it has been widely documented that the recent growth in house prices in the U.S., as well as in other developed economies, has been accompanied by a marked decrease in the savings rate¹⁹ and a widespread explosion in the use of collateralized borrowing in order to finance household consumption. The measurement of disaggregated wealth effects, however, has proven to be an elusive, ambiguous, and yet challenging task, and ultimately remains an empirical issue beyond the scope of this paper²⁰.

Measurement and technical problems aside, differences in the inherent characteristics of financial and housing wealth seem to only serve to complicate matters further. Housing and financial assets differ in many ways, including taxation, bequest motive, the duration of shocks hitting the asset's market²¹, market information asymmetries in terms of valuation, market

¹⁹ See Klyuev and Mills (2006).

²⁰ For a more detailed review on the subject, please see Mishkin (2007), as well as the literature discussion sections from the papers explored in this survey.

²¹ See Kishor (2007).

thinness, asset liquidity and price volatility, asset holding distribution among households²², etc. One of the most obvious channels from housing activity to final household consumption rests on the fact that house price appreciation is largely dependent on the growth in sales volumes and sales transactions, which then implies increased spatial movement of households. This, in turn, leads very frequently to the need to refurnish newly purchased houses with household goods, most often durable goods, such as new furniture, fridges, and stoves, as well as the need to purchase a vehicle for a longer commuting travel. Although all of these issues influence the link between housing market activity and household consumption, due to space limitations I will attempt to be selective in the studies to be surveyed. Indeed, the goal in this section is to raise some of the most salient issues driving current research, and not so much to provide a detailed criticism of this literature, which is a task beyond the scope of this essay.

To start our survey, Case, Quigley, and Shiller (2005, hereafter CQS) compare the wealth effects from both the stock and the housing markets across 14 countries during a 25 year period and find large and statistically significant effects of housing wealth changes on household consumption. Their motivation to explore the relative sizes of housing and financial assets' wealth effects stems from their recognition that changes in value of assets with fundamentally different characteristics should have different effects on household behaviour toward short-term consumption. This is true, for instance, as it relates to households' perception of the temporal durability, the measurability, or even the level of certainty of such changes in value, the motives for asset accumulation, etc.

CQS define housing market wealth as the product of the homeownership rate, household

²² If financial asset holdings are assumed to be more concentrated in the hands of wealthier households, and if richer people are assumed to have a lower marginal propensity to consume out of increases in wealth, then it would be reasonable to expect higher wealth effects out of housing assets than out of financial assets such as stocks and bonds.

counts, and the housing price index, and then use this measure in their various panel data specifications, both internationally and across U.S. States. It is important to note, however, that CQS's measure of housing wealth differs from the more frequently used one in the literature, which equates it to the total market value of the housing stock minus outstanding mortgage loans. Then, while using their definition, CQS conclude that their empirical evidence supports the claim that changes in housing prices should have statistically significant effects on aggregate consumption. Their definition of housing market wealth, however, would lend itself to some ambiguity with regards to their last conclusion. This is so because it seems clear that the housing price index is but one of three arguments in the definition of housing wealth. Housing wealth could therefore increase even if the price index does not increase directly, for example, thanks to an increase in the number of households. This implies the need for more housing units to be built and/or a decrease in the rental market vacancy rate, each of which does not necessarily need housing prices to change. Nonetheless, this definition also opens the door to a richer conceptualization of housing wealth, and channels other than house price increases, through which household consumption fluctuates in the short term due to housing market dynamics. In the end, CQS conclude from their various regression results that, across most specifications and approaches used, the housing wealth effect coefficients were significantly different from zero and substantially higher than those for financial market wealth, which were for the most part small and insignificantly different from zero.

In agreement with CQS, Benjamin, Chinloy, and Jud (2004, hereafter BCJ) analyze this interesting issue by contending that housing wealth effects should be much higher (about four times higher) than financial wealth effects, due to differences in the liquidity between the two types of assets. They point out not only that homeownership is much more widespread than the ownership of financial wealth, but also that a substantial share (about 75 per cent according to their estimates) of holdings of financial assets (especially in developed financial markets) tends to

be concentrated in relatively less liquid financial instruments, such as retirement savings and pension funds, also more widely held by middle- to higher-income households. Conversely, the more favourable tax treatment of housing in the U.S., coupled with other policies to encourage homeownership growth, have led to a more equitable and widespread access to real estate ownership. This leads BCJ to the conclusion that more accessible options for liquidating increases in housing equity are much more widespread than those for many financial assets, constituting an important stabilizer for household consumption and aggregate demand through fluctuating economic cycles.

Boone and Girouard (2002) also explore the links between household wealth and consumption by specifying both long term and short term consumption equations, which they model and test by regressing a measure of household consumption both to aggregate and disaggregate measures of wealth. They also study the effects on the marginal propensity to consume out of housing wealth of taking into account the possible structural break caused by the financial innovations of the last two decades. Their comparative cross-country regression results provide evidence related to wealth effects in favour of the following claims for the U.S.: 1) the long run total wealth effect is 4 per cent and highly significant; 2) the short run total wealth effect is higher at 9 per cent and still significant; 3) the short run financial wealth effect is slightly higher than the housing wealth effect (4 per cent versus 3 per cent) but highly significant at the 1 per cent level of significance, compared to the housing wealth effect coefficient, which is only significant at the 10 per cent level; 4) increased financial deregulation has contributed to strengthening the housing wealth effect by increasing the elasticity of consumption to housing wealth changes in a statistically significant way across the countries studied; and 5) statistical results vary widely across countries and asset types, since cross-country comparative analysis is complicated by differences in the relative asset distributions, as well as in the degree of financial market flexibility and stages of deregulation and innovation.

Similarly, Muellbauer (2007) analyzes in substantial detail the effects on consumer spending of house price changes, taking into account developments in credit and financial markets from a permanent income hypothesis/life cycle consumption framework. He compares the marginal propensity to consume out of housing wealth between the U.S. and the U.K., and estimates them to range from 6 to 7 per cent in the former and about 3 per cent in the latter. He also points to the existence of substantial bias in previous studies of housing wealth effects, especially as they aggregate time periods and fail to adjust their models to properly account and control for credit market liberalization and innovation. Accordingly, he sheds some doubt on the above mentioned cross-country study by Case, Quigley, and Shiller (2005). In his study, he takes particular care to add more appropriate controls, for example, by making use of a credit market development indicator. Furthermore, in Muellbauer's analysis, financial liberalization takes the form of not only increased access to home equity for owners, but also of increases in the allowable amortization period of the loan and reductions in downpayment requirements (i.e. higher loan-to-value ratios), both of which make it easier for first-time homebuyers to purchase a home. In accordance with our previous analysis, he points out that in the absence of credit market flexibility, or in undeveloped mortgage markets, an increase in house prices has the likely effect of reducing aggregate consumption by constraining first-time homebuyers to save more for a downpayment at the same time that owners are unable to access the gained home equity. In contrast, in an environment of flexible credit markets it is possible for aggregate consumption to increase, due to the positive net effects of a smaller negative impact on young renters, since their need to save has been reduced (or at least partially compensated for the increase in home prices), and the much larger positive effect on owners who can provide more collateral to access their gain in equity²³.

²³ Another relevant study on this topic can be found, among others, in Campbell and Cocco (2005), who use micro data extensively to study the heterogeneity of housing wealth effects, both predictable and

Lastly, Carroll, Otsuka, and Slacalek (2006) raise one interesting issue about housing wealth effects, namely the sluggishness, or habit formation effect, of the reaction of aggregate consumption to changes in wealth. Accordingly, while they estimate a modest short-run (one quarter lag) marginal propensity to consume out of housing wealth to be about 2 per cent, their longer term (more than one quarter to a few years) estimate ranges as high as 9 per cent.

4.. Monetary Policy Shocks, Transmission Mechanisms, Housing, and Business Cycles

4.1. Introduction to the Second Set of Building Blocks

As has already been mentioned, business cycle models, especially since the development of the RBC theory, have focused very frequently on the co-movement puzzle of cyclical economic activity. For this reason, the idea of exogenous technology shocks having multi-sectoral, far-reaching macroeconomic effects has been popular among earlier academic studies. The search for the single most relevant shock to the economy driving cyclical fluctuations, however, has led researchers to look for alternative sources beyond shocks to the production technology. An increasingly popular choice is the stance of monetary policy and the various channels and mechanisms through which interest rate disturbances are transmitted to the real economy. Our interest here is to explore the role of housing within such channels and transmission mechanisms. The following analysis, then, will not only introduce the second set of building blocks, but will also enrich the discussion of housing wealth effects.

The basic logic behind this popular choice can be broadly explained as follows. The central bank, in pursuit of the goals of full employment and low inflation, is charged with the

unpredictable, among different household types by age cohort in the presence of relaxed borrowing constraints.

setting of monetary policy, which becomes expansionary in order to encourage economic activity and contractionary in order to fight inflationary pressures. The main policy tool under the central bank's control is the behaviour of the very short term interest rate, and the ultimate goal is the achievement of a long term, smooth upward trend in economic activity, while controlling for the volatility of output fluctuations during the cycle. Indeed, by definition, the effects of the stance of monetary policy are not limited to any specific region or industrial sector, but are bound to have wide-ranging consequences for the whole macroeconomy. Monetary disturbances, then, would seem to naturally qualify as important single shocks to the economy.

Furthermore, according to the above definition, the stance of monetary policy should tend to accompany fluctuations in the macroeconomy quite closely. The cyclical dynamics of monetary policy could help explain economic developments during business cycles, by explaining the cyclical behaviour of different agents and the various components of GDP in response to monetary policy shocks. According to conventional wisdom, it is typically the case that a monetary tightening tends to precede, or lead the economy to reach, a peak in activity, while a monetary easing tends to encourage economic recovery and growth after a recession or a slowdown in activity. Furthermore, sound monetary policy is vital for the financial health of an economy, while at the same time the development of the financial market system and the institutional framework are crucial for monetary policy to be effective. Monetary policy decisions ultimately attempt to establish a desired equilibrium between money supply and money demand, where the efficient functioning of credit markets is key. As Bernanke and Gertler (1995) point out, in accord with our previous discussion of the permanent income hypothesis/OLG model, “while money demand is procyclical, credit demand appears to contain a significant countercyclical component, which arises from the desire of households and firms to smooth the impact of cyclical variations in income on spending or production.” (page 44)

In what follows, the goal is not to review the effectiveness of monetary policy for macroeconomic stabilization²⁴, or even to claim that monetary policy shocks are the most important factors in explaining either business cycles or the cyclical behaviour of housing market dynamics. Rather, I will discuss some of the most salient theories attempting to explain the links between the transmission mechanisms of monetary policy disturbances, the special role of housing market dynamics, and business cycle fluctuations.

4.2. Background on Monetary Policy Transmission Mechanisms

To start our survey, Smets (2007), commenting briefly on Leamer (2007), argues in favour of analyzing the financial channels between housing cycles and business cycles as crucial. He claims that housing dynamics in themselves do not cause recessions, and the fact that the cyclical dynamics show housing investment leading the cycle should be seen only as a characteristic of the leading indicator property of housing investment (Fact #2) and not the ability of it to bring about recessions. The fact that housing investment is a relatively small component of economic activity, and yet it is one of the most volatile ones (Fact #3), with earlier and proportionally larger effects on output and cyclicalities, then implies that there are other factors leading to sectoral and aggregate multiplier/spillover effects. Leamer himself argues that resale transactions in themselves should have little or no direct effects on GDP, since of course no additional production has taken place due to the sale of an existing property, but merely a redistribution of wealth. Leamer, however, mentions that housing price fluctuations can channel to the real economy by affecting the volume of sales, thus directly affecting labour in industry sectors directly related to housing and housing finance. As well, resale market dynamics and price fluctuations provide spillover demand to the new home market, which implies fluctuating levels of residential investment and construction labour.

²⁴ Please refer to Appendix B.

Smets argues that Leamer fails to properly account for the role of financial markets, in the sense that the housing market could be better regarded as a channel through which disturbances to the financial markets are transmitted to the real economy by the household sector²⁵. Since housing is particularly sensitive to interest rate fluctuations and credit cycles, monetary policy should have more explanatory power concerning the links between housing cycles and business cycles.

In order to further develop the theoretical background on the importance of financial markets, and thus of monetary policy transmission mechanisms through the housing market, we look at the recent research by Mishkin (2007). Mishkin discusses six transmission mechanisms and channels from monetary policy disturbances: “through the direct effects of interest rates on (1) the user cost of capital, (2) expectations of future house-price movements, and (3) housing supply; and indirectly through (4) standard wealth effects from house prices, (5) balance sheet, credit-channel effects on consumer spending, and (6) balance sheet, credit-channel effects on housing demand.” (page 5). In what follows, I will briefly address these transmission mechanisms and introduce some relevant ideas. Issues related to standard housing wealth effects have already been discussed in detail in the previous section, and will therefore be skipped.

Within the group of direct channels, Mishkin explains that an monetary disturbance will affect the interest rate, and therefore the user cost of capital (*UC*), or implicit rental rate (related to Fact #6). *UC* here is expressed in terms of the after-tax real interest rate and the expected real rate of housing price appreciation, according to the following equation:

$$UC = P_h[\{(1-t)i - \pi^e\} - \{\pi_h^e - \pi^e\} + \delta] \quad (1)$$

where P_h is the relative purchase price of new housing capital and t is the tax rate for interest rate deductibility, if applicable. Analyzing the user cost of capital is important because, as the interest

²⁵ Please refer to Appendix C.

rate i rises, UC increases, and therefore the demand for new housing falls, leading to a reduction in housing construction and therefore in aggregate demand. The above equation also implies that it is not only current monetary shocks that may affect the current UC , but also the expected monetary policy stance may affect the UC by influencing Π_h^e (that is, the expected house price appreciation). As well, on the supply side, residential investment is directly affected by short term interest rates as they affect builders' cost of financing new housing construction. One way of looking at this is to analyze the Tobin's q for the housing market (i.e. market value of a newly built home, divided by the construction cost of a new home). Following a monetary tightening, not only does the market value of a newly built home grow at a slower rate, but also the cost of financing the rental cost of labour and materials is pushed higher. So as builders' revenues and costs are affected negatively, the rate of growth in supply of new housing declines, affecting labour and material industries related to housing, thus leading to lower GDP growth.

To explore more in detail the balance sheet and credit channels of monetary policy disturbances as they relate to the housing market, I survey three older studies, published back to back for the Symposium on the Monetary Policy Transmission Mechanism, by Mishkin (1995), Taylor (1995), and Bernanke and Gertler (1995, hereafter BG). Although the literature tends to focus more extensively on the effects on firms, it is possible, as will be explained, to draw insightful parallel implications to the housing market and household sector. Mishkin opens the symposium with a fairly basic introduction to the various monetary policy transmission channels to the real economy. Since I have already introduced Mishkin (2007), I will therefore review his conclusions from the earlier paper only briefly before entering into a more detailed analysis.

Mishkin (1995) explains that the credit channel can be divided into two sub-channels: the bank lending and the balance-sheet channels. Through the bank lending channel, a monetary

contraction draws down bank reserves and deposits, which leads banks to reduce their lending to both businesses and households (including mortgage credit). This leads to lower investment and private consumption, causing output to fall. Through the balance-sheet channel, a monetary contraction can have adverse effects on both firms' and households' net worth positions. This can happen either by increasing debt service interest costs (thus reducing the demand and therefore the market value of assets such as equity stocks for firms or houses for households), by reducing revenues due to slower economic activity, or both. The effect is thus to magnify the adverse selection and moral hazard problems from the lenders' perspective, since firms' financial ratios or households' ability to provide for a downpayment or asset collateral worsen, all of which lead lending, investment and spending, and ultimately output, to fall.²⁶

These channels help explain some of the effects of monetary policy on real economic activity via the housing market. In what follows, the goal is to go a bit deeper on issues and implications related to business cycles and housing market dynamics. Although BG (1995) focus mostly on the credit channels and effects of monetary policy on firms, they offer as well a more detailed analysis on the links between the transmission of monetary policy shocks through housing consumption and residential investment. As a result of a VAR analysis, BG lay down one of the backbones of their study in the analysis of four basic facts relating to the effects of an unanticipated contractionary monetary policy decision. The following facts will also pave the ground for a discussion of BG's 'financial accelerator' mechanism. BG claim that:

1. While a contractionary shock leads to a transitory rise in short term interest rates, it tends to result in more sustained declines in real GDP and inflation. This fact constitutes strong evidence supporting BG's claim that credit channels are not just channels, but can also have amplifying and persistent effects on the real economy;

²⁶ See also Mishkin (1978), who discusses the role of household balance-sheet fluctuations for macroeconomic activity during the Great Depression. Bernanke (2007a) also discusses the Great Depression with a focus on credit channels and the financial accelerator.

2. Final demand declines fairly fast, while production reductions tend to lag demand due to rising inventory stocks in the short run. Eventually, inventory depletion tends to exert a substantial drag on output. This fact concerns the dynamic timing of different economic variables and components of GDP following a contractionary monetary shock;
3. Within final demand, residential investment experiences the earliest and sharpest decline, accounting for a substantial share of initial GDP weakness, with consumer spending on other durables and non-durables being next in line. This fact implies that housing demand and residential investment are among the most interest-sensitive parts of aggregate demand (Fact #6) and among the most volatile components of GDP (Fact #3). This clearly exposes the significance of housing market dynamics for the study of cyclical fluctuations;
4. Fixed business investment, mostly on equipment capital, declines with a lag from final consumer spending, and even from much of the decline in production and interest rates. This lag has typically been anywhere between 6 to 24 months. Therefore, facts 2, 3, and 4 imply that not only do housing consumption and investment spending lead business investment spending, but also that the chronology of declines following a negative monetary shock bears a close analogy to the evidence shown by Leamer (2007) concerning the sectoral ordinal dynamics at cyclical frequencies (Fact #2).

4.3. The Credit Channel and the Financial Accelerator Mechanism

“The unusual buildup of household liabilities in the 1929 boom year and the ensuing stock market crash, which lowered the value of household financial asset holdings, left consumers in a weaker financial position, where the probability of financial distress had increased. Consumers no longer wanted to hold as large a proportion of their portfolio in illiquid tangible assets, such as consumer durables and residential housing. Expenditures for these assets therefore declined sharply and, through multiplier-accelerator effects, helped stimulate the large drop in demand in other sectors of the economy. The unusually strong downturn was then the result.” (Mishkin, 1978, pp. 929-931).

The financial position of households has clearly been recognized for quite some time as having a special role in aggregate macroeconomic fluctuations. The quote above mentions “multiplier-accelerator effects” as being key to the sharp decline in aggregate demand; however, the idea had not yet been formalized. This is done by Bernanke et al.²⁷, who discuss the important concept called the ‘financial accelerator’. The financial accelerator provides a powerful argument for the role of credit and financial market frictions, and thus monetary policy, in generating and propagating business cycles through housing market dynamics. The financial accelerator concept is discussed at length with respect to firms and business credit and investment, but it is easily extendable to model the household sector. A crucial concept behind the financial accelerator is what Bernanke et al. call the ‘external finance premium’.

Simply put, a firm (household) seeking to borrow funds from banks in order to finance working capital and fixed investment (household expenditures on durables and non-durables, including housing) will face an interest rate which is positively related to its risk, and therefore inversely related to the quality of its net worth (i.e. balance sheet strength). Business investment expansion (household consumption and residential investment) are, in turn, inversely related to the cost of borrowing. Banks incur agency costs in credit contract enforcement, which may constitute significant risks to their lending activities, since there exist inherent information asymmetries between borrowers and lenders as to intentions, credit capacities, risk profiles, etc. The potential dangers of moral hazard and adverse selection are therefore intensified in the absence of effective monitoring procedures related to credit granting and use. Higher lending risks naturally lead to interest rate premiums, which increase the cost of borrowing. In order to reduce these costs, firms and households must then be able to show a strong financial position, which for the latter it usually takes the form of access to collateral, the most popular source being housing.

²⁷ See Bernanke and Gertler (1989 and 1995), and Bernanke, Gertler, and Gilchrist (1998).

Therefore, firms (households) with weaker net worth positions (lower collateral value) tend to face a higher premium rate on their financing contracts from external sources (i.e. banks) that reflects the increased risks to lenders. A higher financing rate, in turn, increases the gap between the external and the internal cost of financing (e.g. out of retained earnings for firms, or out of alternative sources of interest-earning savings for households, both of which carry potentially much higher opportunity costs than bank financing). This external finance premium has the effect of increasing the relative cost of borrowing, thus reducing the incentives to spend and invest by both firms and households, leading output to fall. The opposite is equally true, in the sense that a stronger financial position of firms and households will reduce their external finance premium, and therefore their cost of borrowing, thus inducing expenditure and investment expansion, and leading output to rise.

The balance-sheet channel through the size of the external finance premium is therefore a crucial factor to understanding BG's finding in fact (1) above. The external finance premium, therefore, leads to an important relationship. The financial position of firms and households will tend to be strongly procyclical, as net revenue flows, profits, incomes, and prices of assets and equities tend to rise during expansions and decline during contractions. This implies that cyclical phases will be persistent in the presence of fluctuations in the external finance premium. Thus, the financial accelerator reinforces the propagation mechanisms of monetary policy shocks via the housing market, through the effects of interest rates on businesses' and households' net worth positions and collateral capacity. Such procyclicality will tend to be magnified through the financial accelerator effect, due to the implication that borrowers' balance sheet positions will tend to be endogenously self-reinforcing. This effect could be regarded as a persistent vicious/virtuous financing circle, until the point where the economic fundamentals of a cycle are unable to face unsustainable levels of consumption expenditure, investment, and credit use. As Bernanke, Gertler, and Gilchrist (1998, p. 4) clearly explain, "to the extent that borrowers' net worth is

procyclical (because of the procyclicality of profits and asset prices, for example), the external finance premium will be countercyclical, enhancing the swings in borrowing, and thus in investment, spending, and production.”

The external finance premium and financial accelerator concepts discussed above strongly imply that housing, as households' main source of collateral to lower the cost of borrowing, has a pivotal and critical role in understanding the behaviour of the household sector. It is worth mentioning, however, that discussions on the financial accelerator may tend to have relatively asymmetric results depending on the direction of the disturbance. Bernanke and Gertler (1995, page 39) explain that “...the response of the external finance premium to financial conditions should be greatest during recessions, when liquidity constraints are likely to bind across a broader cross-section of firms; during booms, small firms appear to smooth production in much the same way that large firms do.” This is potentially true as well with regards to the household sector. However, the intuition does not seem to be as evident, and would therefore constitute an interesting and important topic of future research.

The intuition in BG's assertion above could be adapted to the case of the household sector with the help of the following analogy. One could regard more liquidity-constrained renters and first-time homebuyers to be the (rather imperfect) analogues of small firms, whose borrowing constraints make them dependent on direct bank lending. Similarly, homeowner households, who are able to provide housing equity as collateral for loans, could be considered to be the analogues of larger corporations facing less credit constraints, who can tap into the broader capital markets thanks to their stronger ability to provide credit security and collateral.

Given the analogy above, the different nature of the business and household sectors introduces a measure of ambiguity when trying to extend BG's assertion to the latter sector. While

competitive pressures within the business sector often imply that firms' ability to increase prices are made difficult by the threat of lower sales and market share, the housing market tends to be characterized by substantial downward price stickiness. This is so because, as discussed by Leamer (2007), households regard housing not only as consumption of housing services and as an investment, but they also attach a great deal of emotional value and pride to the home where they live in. During an economic slowdown or recession, which is typically preceded by a contractionary monetary policy, the financial position of household borrowers worsens and credit granting is reduced. This initially leads to an increase in the supply of existing housing listed for (sometimes distressed) sale, but it is the sales volume that typically gets hit harder, undergoing substantial downward adjustments. Housing prices, on the contrary, tend to suffer relatively smaller downward changes. This is usually due to the fact that households may simply decide to take their house off the market and wait for better economic times, as the slower market may not match their perceived or desired home value. Firms, on the other hand, would almost certainly experience a decline in their financial position during a downturn, as the market value of their equity falls, unless they decide to do as the household would and go out of business, in which case they must assume a net loss. Contrary to businesses, then, the net worth position of homeowner households who decide not to sell is not directly affected by the cyclical slowdown. Nonetheless, if the recession is strong enough to spread the problems to the financial industry, as is the case in the current crisis in the U.S., credit granting could become more restricted even to worthy borrowers, therefore extending the credit constraints to a broader cross-section of the population. As well, lower sales volume and less spillover demand into new home construction would negatively impact the labour income and revenue flows of related industry sectors, resulting in the further worsening of net worth positions and credit constraints of both households and firms.

On the other hand, during an economic expansion, which is typically preceded by an expansionary monetary policy, credit tends to become less expensive and net worth positions

improve. Therefore, as credit constraints become less of a problem to a broader cross-section of the population, the sales-to-active-listings ratio increases and tends to have a greater effect on housing prices. This happens due to the greater potential for emotional housing frenzies and (sometimes irrational) expectations of value appreciation, which lead prices to be bid up relatively faster. Net worth positions will then improve further, thanks to both the appreciation in the market value of housing assets (i.e. collateral) and to the rising labour income and revenue/profit flows of related industry sectors. This in turn lowers the external finance premium on prospective borrowers and further propagates the expansion in credit granting, consumption and investment, and ultimately output. For the household sector, therefore, credit and mortgage market development are key, since more flexible and accommodative guidelines on loan-to-value ratios represent channels through which collateral requirements can serve to amplify the effects of the financial accelerator on household consumption and investment decisions. Whether the response of the external finance premium to financial conditions is greater during recessions or expansions for the household sector remains largely an empirical issue; still, the analogy between firms and households remains a strong and interesting one worthy of future research.

PART III: The Housing Market-Monetary Business Cycle Model Framework:

A Literature Review of the Recent Empirical Evidence

5. Monetary Policy Shocks, Financial Markets, Housing Markets, and Business Cycles:

5.1. Empirical Evidence from an International Perspective

The previous sections introduced the roles of monetary policy shocks and financial market channels, linking housing market variables to cyclical fluctuations through their effects on household consumption behaviour. In what follows, I will discuss some relevant issues arising from a review of the recent literature covering evidence from an international perspective, in an attempt to shed some light on cross-country heterogeneity regarding the issues at hand. As well, it will also prove important to review the extensive and growing literature on the changing links between housing markets and business cycles, due to the effects of financial market development, deregulation, and innovation on the degree of flexibility and depth of housing finance systems.

Various researchers have studied the links between house price cycles and business cycles from an international perspective. This is clear, for example, in an economic study released by the Organization for Economic Cooperation and Development (OECD), by Girouard and Blöndal (2001, hereafter GB), who undertake a cross-country analysis and provide evidence of a close relation between real house price dynamics and economic cycles. The correlation coefficient between real house price changes and the output gap for the U.S. appears to be only substantial and statistically significant during the 1990's after the financial liberalization period. However, their results vary significantly across countries and time periods. GB also review the links between housing wealth effects and the role of borrowing constraints, and how the former have been enhanced by the relaxation of the latter, thanks to the recent period of financial deregulation. Cross-country heterogeneity in mortgage market characteristics as well as stages of financial market development could constitute strong factors driving their wide range of empirical results.

Several other studies have exploited the extensive historical evidence linking house price cycles and business cycles. Borio and McGuire (2004, hereafter BMG) show that since the housing market is particularly sensitive to interest rates, housing price peaks tend to lag equity peaks, on average, by about one to two years. They claim that the length of the lag is largely dependent upon the stance of monetary policy immediately following the equity peaks (i.e. at the start of a recession or slowdown). Accordingly, during periods of strong economic growth, monetary authorities typically pursue a contractionary monetary policy stance as inflationary pressures mount. This in part brings about a peak in economic activity and exerts a dampening effect on house price growth. However, following a peak and into the recessionary path, monetary easing usually continues temporarily in order to cushion the economy from a sharp downturn, thus providing additional support to house price growth. This is accompanied by the historical tendency for housing sales volumes to adjust earlier and proportionally more than house prices to changes in economic fundamentals, since housing prices tend to show downward stickiness. BMG also emphasize the importance of accumulated financial imbalances during economic expansions, measured by excessive borrowing and deteriorating balance sheets, in increasing the severity of house price declines after a peak.

Financial imbalances and balance sheet deterioration, as already discussed, can have endogenous amplified effects through the external finance premium and the financial accelerator, one particular example of which we can clearly observe today in the current financial crisis and credit crunch. As we now know, excessive borrowing and lending, in an environment of low interest rates and high housing demand, exposed a large cross-section of homeowners, especially owners of sub-prime mortgage loans, to unsustainable financial arrangements once housing prices stopped growing and started to decline. Worsened net worth positions have led to massive rates of delinquency, default, and foreclosure, thus exposing lenders' deteriorating balance sheets and

leading to a credit crunch, as financial institutions retrenched in search of healthier capital ratios. Household balance-sheet weakness, in addition to lowering access to credit, significantly reduced private consumption spending and investment, therefore hurting the business sector's financial positions and further worsening the banks' lending risk and balance sheets.

Feldstein (2007) analyses the current housing crisis along the lines of our current discussion, by paying particular attention to the effects of credit market links from housing to the current business cycle. Among other things, he stresses the fact that American homeowners are able to renegotiate or refinance their mortgage contracts, at any time and at no cost or penalty, when faced with either lower interest rates or house price appreciation. This resulted in the further amplification of housing wealth effects. This contrasts sharply with the typical mortgage contract in many other countries, including Canada, where the most popular mortgage contract terms tend to be largely closed in terms of re-payment flexibility, which is subject to substantial penalties that encourage homeowners to respect the initial terms even if interest rates fall and/or house prices appreciate in value.

Furthermore, in a recent International Monetary Fund (IMF) study, Cardarelli, Lall, and Elekdag (2008, hereafter CLE) provide historical cross-country evidence as to the importance of financial imbalances for business cycle analysis. CLE claim that periods of financial imbalances are more likely to be followed by more severe economic downturns and recessions when the negative effects on the banking sector become larger. They focus particularly on the significance of the degree of reliance on external financing (the balance sheet channel and the financial accelerator mechanism), in addition to lenders' leverage through the bank capital channel. CLE's research seems to confirm the procyclicality of net worth positions and of the external finance premium, which impact lenders' balance sheets and therefore their ability to provide credit to the system. They also provide ample historical evidence of substantial and rapid build-ups in asset

prices (especially in real house prices) and in the credit-to-GDP ratio, in the period preceding financial stress episodes and severe economic downturns.

CLE's paper also seems to provide some historical (although not entirely conclusive) evidence of the special role of monetary policy shocks in explaining cyclical fluctuations. In exploring the determinants and severity of financial stress leading to cyclical downturns, CLE also study the relative influence of four types of shocks, namely oil prices, labour productivity, fiscal policy, and monetary policy. In order to do this, they build a 'Financial Stress Index' (FSI) as the average of various financial variables, including the TED spread (the interbank offered rate minus the yield on treasury bills) and the slope of the yield curve, both of which are closely related to monetary policy. Although they find evidence of a stronger correlation between the FSI variable and monetary policy, they also explain that this is mainly due to the influence of monetary policy in the construction of the FSI variable. Still, they show that, in analyzing each of the four exogenous shocks separately, economic downturns tend to be more severe when preceded by high values of the FSI variable. Indeed, this essentially implies that monetary policy ultimately plays an important role in cyclical fluctuations.

A very recent study conducted by Cardarelli, Igan, and Rebucci (2008, hereafter CIR), explores the changing links between housing market activity and the spillovers to the real economy.²⁸ They focus particularly on housing wealth effects and the role of financial and institutional framework development, as well as that of monetary policy, during business cycles for a sub-set of rich economies. CIR's main argument is that developments within the institutional and financial market frameworks may have increased the amplifying strength of housing market spillovers to the real economy, in countries where such developments have been deeper and faster. Thus, this implies that easier and more flexible access to credit facilities reduces the borrowing

²⁸ Please see Cardarelli, Monacelli, Rebucci, and Sala (2008) for a similar preliminary study.

constraints on a larger cross-section of households, allowing them to smooth consumption in response to lower incomes during cyclical downturns, and therefore providing a measure of economic resilience to negative shocks. On the other hand, the higher dependence on housing collateral and net worth positions increases the risks of protracted downturns during periods of housing market weakness. The important implication here is that transmission mechanisms from monetary policy to the real economy, via housing markets, will tend to be stronger and deeper with more developed credit markets. Therefore, the role and effects of short term monetary policy shocks may have increased during recent decades.

A substantial portion of their analysis is based on their construction of an index of mortgage market development, which measures the degree of 'completeness', and takes into account: typical loan-to-value ratios and maximum amortization periods; households' ability to obtain a MEW and to prepay mortgages without penalties; and the state of development of secondary mortgage markets. With values ranging from 0 to 1, the U.S. ranks by far as having the most complete mortgage market, with a value of 0.98. This is evidenced by the fact that the share of U.S. mortgage debt outstanding as a percentage of GDP nearly doubled from 1990 to 2006, reaching a value close to 80%. This contrasts sharply, for example, with the experience of countries like Canada, which with an index value of 0.57, its mortgage debt outstanding as a percentage of GDP was slightly over 40%, increasing only mildly from 1990. In this respect, CIR calculate a positively strong and statistically significant correlation coefficient of 0.8 between their mortgage market index and the average 2001-2006 residential mortgage-debt-to-GDP ratio for a set of 17 developed countries. With respect to wealth effects, CIR also find a correlation of 0.8 between their mortgage market index and the long-run marginal propensity to consume out of housing wealth. Similarly, during the period from 1983 to 2007, there exists a positive correlation between the mortgage market index and the share of output variation explained by housing demand shocks.

Regarding monetary policy shocks and housing markets, CIR claim that financial market deregulation may have strengthened the role of housing in the transmission mechanisms to the real economy. They argue first that increased competitive pressures among financial institutions may have led to a faster responsiveness to monetary policy interest rate changes, and therefore to a faster adjustment of the bank prime lending rate. In addition, the expansion and increased accessibility of credit products imply that both residential investment and consumer spending, as well as house prices, will also be more responsive to interest rate fluctuations. In order to analyze the effects of monetary policy shocks on output and housing market variables in the United States, both before and after the period of financial deregulation in the early 1980's, CIR construct a VAR model. Their results suggest that the responses of both output and real residential investment to negative monetary policy shocks in the recent period were of lower magnitude but much more persistent (approximately doubled), while real house prices reacted more slowly and suffered higher and more persistent declines. However, to account for differences in the conduct of monetary policy between the two periods, the VAR responses were normalized so as to obtain the elasticity to a 100 basis point increase in interest rates. Their conclusions suggest that countries with higher values of the mortgage market index also tend to experience a higher elasticity of house prices, residential investment, and output to monetary policy shocks. This way, CIR provide cross-country evidence in favour of the claim that more developed systems of housing finance tend to increase the role of housing in the transmission of monetary policy shocks to the real economy during business cycles.

Similarly, Iacoviello (2002) provides evidence, from a structural VAR multivariate macroeconomic model, that the strength of the transmission of monetary policy shocks to the housing market and output could be strongly conditioned by the institutional structure of housing finance systems across countries. He estimates that “countries with low transaction costs, high

LTV ratios, a large owner-occupied sector and a large proportion of variable-interest mortgages should experience relatively high house price volatility and a greater role for housing in the transmission mechanism” (Iacoviello, 2002, page 15). Iacoviello’s results further confirm CIR’s results above.²⁹

We can find, as well, international evidence of the existence of a credit channel of monetary policy through housing and the role of the financial accelerator mechanism. For example, Almeida, Campello and Liu (2006, hereafter ACL) provide a direct test of the financial accelerator. They focus on the role of collateral constraints across 26 countries, measured by varying maximum loan-to-value (LTV) ratios, in affecting the sensitivity of housing prices to housing demand shocks (e.g. monetary easing). ACL’s logic is simple and yet powerful in testing the financial accelerator, and along the way they discuss various relevant issues that further enrich our analysis. They basically argue that in countries where more flexible systems of housing finance allow for higher LTV ratios, the response of liquidity constrained households to an income/demand shock should be greater than in countries with less developed mortgage credit markets³⁰. Thus, they argue that “the effects of an income shock on constrained agents’ spending should be greater when debt capacity is more procyclical” (p. 322).

ACL’s main findings advance that, if collateral constraints are binding, then: a) the sensitivity of both housing prices and new mortgage borrowing to aggregate demand shocks should be an increasing function of the maximum LTV ratio, and b) the financial accelerator mechanism should be stronger in countries where household income constraints are less likely to bind. For example, their empirical estimations suggest that a 2% reduction in per capita output

²⁹ For a discussion of cross-country heterogeneity in mortgage financing institutional framework, efficiency of housing finance systems, and a test of credit channels of monetary policy, please refer to Iacoviello and Minetti (2008).

³⁰ For example, when the maximum LTV ratio is 90 per cent, an additional \$10,000 (either from savings or from housing equity) would allow a household to afford an extra \$100,000 in the value of a home.

will lead to a decline in housing prices by about 1% more in a country like the United Kingdom (maximum LTV ratio of 0.95) than in a country like Italy (maximum LTV ratio of 0.6). Their results are further confirmed through the use of an instrumental variables approach controlling for various other economic factors that could be driving this relationship, such as cross-country differences in financial and economic development, as well as varying homeownership rates. This would therefore imply, as well, that if financial market development and deregulation increases the maximum LTV ratio, this would then directly increase the role of the financial accelerator mechanism in the transmission of demand shocks to the real economy through house price dynamics.

5.2. A Literature Survey of Recent Economic Models

The last section of this literature review surveys a selection of recent papers modeling the roles of housing markets and the financial accelerator mechanism in the transmission of monetary policy shocks to the real economy. These models make extensive use of the theoretical building blocks discussed throughout this essay, and at the same time introduce some additional issues that open the door to improvements in future research efforts. In what follows, I will introduce the main features of a selection of models and relate them to issues discussed throughout this essay, transcribe the mathematical expressions which are most revealing and relevant to our central topics, and then provide their most powerful conclusions.

The empirical literature on housing macroeconomics usually models households as consuming units of housing services per unit of housing stock. As well, households are required to pay either a real or an imputed rental payment for the use of such services.³¹ Section 3.2. also discussed that households, when faced with a price increase, might find that their opportunity cost of consuming those housing services has increased. With this in mind, Aoki, Proudman, and

³¹ Please refer to Appendix A.

Vlieghe (2004, hereafter APV) construct a general equilibrium model that provides for a direct empirical test of the central topics of this literature review. APV model household behaviour as being a mix of household and consumer types. The household owns and rents out the housing unit to consumers and must at the same time decide on a transfer payment amount to the consumers, which represents their consumption possibilities. Therefore, when faced with a house price appreciation, if the household decides to keep the transfer payment constant then equity and net worth rise (i.e. homeowner behaviour is dominant), while if the transfer payment increases then household consumption and utility rise (i.e. consumer behaviour is dominant). This way, “the household faces a choice between current consumption and a cheaper future finance premium....In general, there exists a target level of net worth relative to debt (i.e. leverage), and transfers depend on the deviation of leverage from such target....Transfers are assumed to be increasing in the net worth of the household relative to their debt....Fluctuations in the transfers...can be thought of as borrowing against home equity for consumption (MEW)” (APV, page 421).

In addition, section 3.2. also discussed the importance of accounting for household heterogeneity, usually according to age or level of patience in intertemporal consumption. APV deal with household heterogeneity by assuming two types of consumers: PIH consumers (patient and liquidity unconstrained as in the ‘permanent income hypothesis’) and ROT consumers (impatient or subject to borrowing constraints, such that their behaviour follows a simple ‘rule-of-thumb’), whose borrowing depends strictly on the value of their collateral, since they consume all of their income in each period. Agent heterogeneity in this framework is important because the amplification effect of the financial accelerator mechanism depends on the existence of borrowing constrained agents. In APV’s model, PIH consumers are assumed to have a lower marginal propensity to consume out of wealth than ROT consumers (this would also explain why ROT consumers are borrowing constrained). The model also includes: a) producers of homes, whose

activities are driven by a Tobin's q-theory of investment (as discussed in section 4.2.); b) producers of consumption goods, whose prices experience nominal stickiness; and c) a central bank, which conducts monetary policy according to a standard Taylor rule. Finally, credit markets are subject to imperfections, which lead to agency costs in the enforcement of debt contract and therefore to the external finance premium.

Since the financial accelerator mechanism through housing depends on the size of the external housing finance premium, the following analysis focuses on the house purchase decision. APV model the external finance premium as a decreasing function of the ratio of net worth to real housing assets, $N_{t+1}/q_t h_{t+1}$, which implies that the marginal cost of borrowing is given by the function $f(N_{t+1}/q_t h_{t+1})R_{t+1}$, $f' < 0$, where R_{t+1} is the risk-free interest rate. This in turn implies that the stance of monetary policy, as it affects the risk-free interest rate, has a direct impact on the marginal cost of borrowing. Since the optimality condition requires that the expected return on housing demand must equal the marginal cost of borrowing, the demand for housing is dictated by the equality:

$$E_t \left[\frac{X_{h,t+1} + (1-\delta)q_{t+1}}{q_t} \right] = f(N_{t+1}/q_t h_{t+1})R_{t+1} \quad (2)$$

where $X_{h,t+1}$ is the real rental price paid to households by consumers, δ is the depreciation rate of houses, N_{t+1} is the household net worth after purchasing the house, and q_t is the real price of houses h_{t+1} . The value of homeowners before the time of purchase V_t , which is of paramount importance for the determination of the external finance premium, is given by the following equation:

$$V_t = R_{h,t} q_t - \delta h_t - f(N_t q_t - \delta h_t) R_t b_t \quad (3)$$

where $R_{h,t}$ is the ex post return from housing and b_t is the borrowing amount needed. This, in turn, implies that after the purchase of the house, $N_{t+1} = V_t - D_t$, where D_t is the transfer payment (or dividend) from the households to the consumers. Such transfers are further assumed to follow a

dividend rule, which follows an increasing function of the household leverage ratio $N_{t+1}/q_t h_{t+1}$. House prices, indeed, can impact both the household net worth position and the external finance premium in a non-negligible way. This is evidently at the heart of the financial accelerator mechanism.

In APV's model, a positive monetary policy shock activates the financial accelerator mechanism, leading to the amplification and propagation of the shock to the real economy. A reduction in R_{t+1} decreases the marginal cost of borrowing for any given value of $N_{t+1}/q_t h_{t+1}$, which triggers an increase in the demand for housing, leading to an increase in house prices and to the improvement in households' net worth position. This, in turn, lowers the external finance premium and leads to a proportionally larger increase in housing demand and to a rise in the transfer payment to consumers within the household, which increases private consumption and utility. APV provide VAR model simulations with impulse response functions for house prices, housing investment, consumption, and the external finance premium to a 50 basis point reduction in the central bank interest rate, both with and without credit frictions (financial acceleration), using data for the United Kingdom. In the presence of a financial acceleration mechanism, they find that the initial peak responses of house prices, housing investment and consumption are significantly amplified, respectively by 18 per cent, 106 per cent, and 93 per cent.

APV also derive the real effects of the financial acceleration mechanism to a process of financial market development, which usually involves a reduction in the transaction costs of mortgage borrowing. They simulate this by increasing the elasticity of the transfer payment (i.e. MEW) to housing equity, and find that a decrease in R_{t+1} causes a larger share of the MEW to be devoted to goods consumption and less to housing demand, which in turn reduces the balance-sheet effect and therefore the financial accelerator amplifying mechanism through housing. It is not entirely clear, however, whether the findings in APV's model would still hold if one assumes

that the share of ROT consumers, which is held constant in their model at 0.5, decreases with financial deregulation. As well, the model's results are driven by a positive monetary disturbance, and it is not clear whether their assumed symmetry in the impulse response functions would hold in the case of a monetary contraction. One would expect agents to tend to react differently depending on the direction of the disturbance, and so the transfer rule might change depending on whether the household or the consumer type of behaviour dominates.

Another recent paper by Iacoviello and Neri (2008, hereafter IN)³² describes and attempts to quantify housing markets spillovers to the real economy through the use of a dynamic stochastic general equilibrium (DSGE) model framework. The main features of their paper, which are relevant to this essay, can be summarized as follows: a) financial frictions due to imperfect credit markets, with collateral constraints and a maximum loan-to-value (LTV) ratio measuring the liquidity of housing wealth; b) multiple production sectors (consumption goods and housing construction), each of which makes use of standard Cobb-Douglas production functions, but whose technologies make use of different sets of inputs (with the housing sector using an intermediate capital good produced in the consumption sector, as well as land, in addition to labour and capital); c) heterogeneity in households' discount factors, which makes some households patient (assumed to behave as unconstrained lenders) and some impatient (constrained borrowers with higher marginal propensity to consume), the quantity of each being measured by relative wage shares; d) nominal rigidities due to a monopolistic competition setting, with price rigidities in the consumption sector, and wage rigidities in both sectors due to the existence of labour unions; e) a variety of stochastic shocks, including housing preference (i.e. demand) and monetary policy shocks; and f) a central bank that follows a standard Taylor rule to set the short

³² See also Iacoviello (2005), who develops and estimates a monetary business cycle model, with collateral effects and a focus on the role of the financial accelerator mechanism in the transmission of monetary policy shocks through the housing market. The model developed by Iacoviello and Neri (2008) is largely based on Iacoviello (2005). Also, Monacelli (2006) reaches similar conclusions as in Iacoviello (2005).

term interest rate R , which includes an i.i.d. zero-mean and σ_R^2 shock term $u_{R,t}$ with a persistent stochastic process s_t of the following form:

$$R_t = R_{t-1}^{rR} \pi_t^{(1-rR)r_x} \left(\frac{GDP_t}{G_c GDP_{t-1}} \right)^{(1-rR)r_y} \frac{u_{R,t}}{s_t} \quad (4)$$

The relevance of IN's paper to our essay's main subject is their focus on the spillovers, in excess to the traditional housing wealth effects, from housing market dynamics to the real economy, stressing the special role played by monetary policy and credit market imperfections on borrowing constrained households. Household utility depends on consumption c_t (with larger habit formation factors assumed for impatient households), discount factor β (assumed lower for impatient households, implying that they discount the future more heavily and have a higher MPC), housing demand preference on housing stock holdings jh_t , and leisure time. The utility maximization problem for constrained impatient households is subject to a budget constraint, which includes a mortgage borrowing constraint, of the following form:

$$\begin{aligned} c'_t + q_t h'_t - b'_t &= real_labour_income'_t + q_t (1 - \delta_h) h'_{t-1} - R_{t-1} b'_{t-1} / \pi_t + Div'_t \\ b'_t &\leq m E_t (q_{t+1} h'_{t+1} / R_t) \end{aligned} \quad (5)$$

where: primed variables denote impatient households, the borrowing constraint holds with equality near the steady state, and q_t , b_t and m denote house price, mortgage borrowing and maximum LTV ratio, respectively. It is evident from equation (5) that the constrained household's utility is an increasing function of the LTV ratio m , since consumption possibilities would in principle be expanded. Furthermore, housing prices affect not only the borrowing capacity of constrained households, but also their spending choices. As well, b'_t is a decreasing function of R_t , implying that mortgage credit, and therefore housing demand, is highly sensitive to monetary policy disturbances (Fact #6).

Positive housing preference shocks raise housing demand and prices, thus improving

households' collateral and net worth positions. The existence of collateral effects imply that such shocks affect both their borrowing and consumption capacities, with impatient households showing higher sensitivity to such shocks and leading to higher aggregate consumption. With regards to monetary policy shocks, IN's model shows that a surprise increase in R_t discourages borrowing and housing demand, leading to falling house prices and declines in residential investment consistent with the VAR impulse response functions as discussed in Bernanke and Gertler (1995) in Section 4.2. In addition to this, fluctuating housing prices impact the housing producing sector's incentives to modify housing investment, which experiences a magnified reaction due to wage rigidities that limit input cost adjustments. Such a mechanism allows IN to account for the high volatility and interest rate sensitivity of residential housing investment to cyclical shocks, with quantitative results consistent with Fact #3 (Section 2). As well, IN's model leads to results that successfully account for the sectoral comovement (Fact #1) and the procyclicality of housing prices and investment (Fact #5). IN estimate that monetary policy shocks account for approximately 20 per cent of housing market fluctuations at cyclical frequencies. They also conclude that housing market spillovers to the real economy through wealth effects are magnified by the presence of financial market frictions and collateral effects, which according to their estimates, increase the MPC out of housing wealth by about 23 per cent. Finally, they also account for the possible structural break in their sample due to the recent period of financial liberalization, which has affected, among other things, the maximum LTV. In this regard, they estimate that the contribution of collateral effects in explaining the total variance in consumption growth increased from 4 per cent in the earlier period to 12 per cent in the more recent one. While they estimate that higher LTV ratios led to a decrease in the share of constrained households, their results also imply that they have overall become more responsive to cyclical shocks.

The concept of a financial accelerator mechanism leading to significant short term effects

on the real economy through housing depends strongly on the existence of a large enough pool of liquidity constrained agents. APV, for example, assume a constant share of ROT consumers equal to 0.5; however, it is evident that their variable suffers from substantial measurement difficulties. An alternative modeling strand attempting to deal with this issue goes back to the basic life cycle consumption hypothesis and defines agent heterogeneity on demographic grounds. For example, one popular research paper by Mankiw and Weil (1990) analyses the effects of long term demographic changes on housing markets and long cycles in prices. The focus of this literature review, however, is short term in nature. Nonetheless, as was already discussed in section 3.2., introducing demographic heterogeneity among agents can not only add plausibility to a model framework, but can also address the measurement problem.

This is the approach taken by Ortalo-Magné and Rady (1998, 2005, hereafter OMR)³³, who propose a life-cycle model of lumpy housing consumption with credit constraints and heterogeneous agents to explain housing market fluctuations. In their model, standard life cycle housing consumption preferences imply that young constrained agents living at their parents' home save for a downpayment on a starter flat home, while adult house owners prefer to climb up the property ladder and older unconstrained households finally downsize from houses back to cheaper flats. In addition, the share of credit constrained agents is allowed to fluctuate endogenously. The main drivers of short term dynamics are shocks to income, which could in principle include monetary policy shocks. Also, consistent with the financial accelerator mechanism, OMR introduce a minimum downpayment requirement (i.e. maximum LTV ratio) as the main collateral constraint, which serves to amplify the impacts from fluctuations in house prices and therefore in households' net worth positions. This way, the initial income shock is followed by a multiplier effect that propagates through the economy.

³³ See also Davis, Ortalo-Magné, and Rupert (2007).

The key feature of OMR's model is the price fundamentals assumption, which is driven by the interaction between constrained and unconstrained agents. The housing market dynamics are driven primarily by the current income of young constrained agents, since the price of flats is a function of young agents' accumulated wealth and current income (and not per capita income), while the price of houses is a function of the price of flats and the utility premium older 'deep-pocket' households receive from houses compared to flats. While an unexpected positive shock to income would initially affect all agents equally, the downpayment requirement implies that young households can now take advantage of the leverage opportunity to afford a more expensive dwelling. This means that their housing demand sensitivity to income shocks is higher than that of older unconstrained homeowners. Housing demand then increases, leading to rising prices. Rising flat prices, in turn, improve the net worth position of flat owners, which allow them to further increase their housing demand and climb up the property ladder. Flat owners' increase in demand for more expensive houses results in house price appreciation, which leads to capital gains for older, unconstrained agents. This process leads to the amplification of the initial shock to the real economy. Therefore, housing sales and price fluctuations co-move with income, with sales volumes leading in the short term and experiencing higher volatility. Since flat owners benefit not only from the leverage introduced by the downpayment requirement, but also from the improved value of their collateral and the capital gains, house prices experience a relatively larger increase than flat dwellings, which partially limits the number of flat owners who can afford a house. One key implication from OMR's logic is that, as long as financial deregulation and innovation lead to a decrease in the downpayment requirement (i.e. increase in the LTV ratio), young agents' housing demand sensitivity to income shocks will increase, thus leading to larger amplification and spillover effects.

Indeed, while not mentioned explicitly in the model, the implications in terms of the amplification mechanisms of the financial accelerator are evidently clear. Rising incomes not only

lead to an increase in housing and private consumption, but also to a proportionally larger increase in housing demand due to collateral effects from rising prices. This reduces the lenders' agency costs and therefore borrowers' external finance premium, thus further encouraging housing and private consumption and spilling over to the real economy. In fact, the model could be further improved by introducing some of the features of the financial accelerator literature discussed in this essay. For example, OMR assume that all housing moves are vertical in nature, while the possibility to refinance is ignored. Since the number of agents and houses are both assumed to be fixed, in every period there are agents who might be willing to move but are unable to do so. Still, the market value of their property could have fluctuated in such a way so as to make mortgage refinancing an attractive opportunity to tap some of the gained equity. This would then lead to amplified effects on the real economy through consumption of durables, non-durables, home renovations, etc. Interestingly, OMR's model framework could be improved by considering the implications of monetary policy shocks and the role of the financial accelerator mechanism explicitly.

CONCLUSION

The economic and financial consequences of the recent bursting of the American housing bubble figure among the main factors leading to a turning point in the longest post-World War II economic expansion. The events that triggered the downturn followed a progression that is of particular relevance to this paper. Among some of the major events, the current cycle saw the loosening of credit granting guidelines in the midst of ever cheaper access to credit and low interest rates; the boom in housing markets and the rapid appreciation of house prices; the unprecedented explosion of household consumption and debt; the eventual faltering of house price growth; the ensuing worsening of household net worth positions and bank balance sheets; a sharp flight to safety and the resulting credit crunch that exposed the fragility of financial institutions; a nerve-wrecking retreat in stock market valuations followed by cuts in production and rising unemployment; and the reduction in aggregate consumption (especially of durables) accompanied by an increase in the household savings rate. Evidently, the current business cycle dynamics have been largely consistent with the main topics and the set of stylized facts discussed in detail throughout this essay.

The goal of this literature review was to explore and discuss the theoretical building blocks of a plausible housing market monetary business cycle model framework. The first building block, and in a sense the main focus of the essay, centered on the role of housing wealth effects in influencing aggregate demand in the short term. As was discussed throughout Section 3, however, the theoretical ambiguity of the very existence of housing wealth effects made it imperative to address and discuss a multitude of relevant issues feeding disagreement among economists. The resulting survey seems to provide enough ammunition for a constructive critique of Buiter's claim that "housing wealth isn't wealth". Interestingly, Buiter himself acknowledges that housing wealth is indeed a measure of household wealth. Rather, the essence of his claim relates to whether it is possible to obtain significant net housing wealth effects on short term

aggregate demand. One useful way to understand his main idea is to think about rising housing wealth as a zero-sum game, where the magnitude of housing market spillovers to the real economy are put in doubt. Nonetheless, the empirical observation of booming housing markets and sustained house price appreciation, accompanied by record-high homeownership rates, near-zero household savings rates, exploding household debt, and unprecedented growth in household consumption, would seem to demand an alternative explanation. To get around this dilemma, the main ideas addressed by this paper exploit the potential for positive-sum game solutions, where net effects on aggregate demand are not only possible, but could also be of significant magnitude.

Two issues that this paper explored in detail, which constituted the second set of building blocks, related to the crucial roles of credit market channels and transmission mechanisms, as well as the growing development of financial markets and systems of housing finance. This led to a detailed review of theories addressing the potential for amplified spillovers from housing market dynamics to the real economy through aggregate household consumption, in excess of standard wealth effects. An important link discussed in part II was the existence of household borrowing/liquidity constraints and the special role of mortgage credit market development in relaxing them, leading to collateral multiplier effects.

A strong theoretical framework for business cycle analysis must successfully address the stylized facts introduced in Part I. As well, the framework must contain the mechanisms that not only generate (or contribute to generate) short-term swings in real economic activity, but that also propagate such swings persistently through time. It could be argued, for instance, that productivity improvements, both in information technology as well as in the growing complexity of financial engineering, have constituted positive RBC-type technology shocks that fed the recent boom in financial and economic activity. On the other hand, while the stance of monetary policy has arguably been an important factor contributing to the current cycle dynamics, it is also being

harnessed as one of the indispensable ingredients toward a recipe for economic recovery. This essay has therefore reviewed in detail the cyclical effects of interest rate disturbances on the short term dynamics of housing market spillovers to the real economy, as an alternative framework to pure technology shocks. A variety of financial and credit channels were discussed, along with concepts such as the external finance premium and the financial accelerator. The financial accelerator, as the name implies, provided the theoretical foundation for both the amplification of housing market spillovers as well as a propagation mechanism of monetary shocks.

While most of the topics reviewed in this paper have been analyzed extensively in the literature, there are, in my opinion, a few research avenues worthy of future study. First, it is striking to realize that most papers analyze the effects of uni-directional monetary policy shocks; that is, they tend to focus on either positive or negative shocks. As was already hinted in Section 5.2., instead of assuming symmetry implicitly, further research should model and test whether positive and negative shocks lead to asymmetric impulse response functions. Second, it would be interesting and important (especially for policy-makers) to quantify the impacts of the financial accelerator, in what could be called a ‘financial accelerator multiplier’, or FAM for short. The strength of such a multiplier would evidently vary across countries, and even across regions and cities within a country. This would also account for the fact that, for many countries, house price dynamics is not so much a national phenomenon, but a regional one. Third, as was explained in Section 5.2., and as Bernanke (2007b) points out, it is of paramount importance, for the effects of the financial accelerator mechanism to be significant in the short term, that the share of constrained households be large enough for it to have aggregate effects. He argues that while at the firm level there seems to exist evidence that small firms do indeed play a significant role in business cycles, the size of the constrained household sector and its potential role in aggregate cyclical dynamics seems to be an under-studied issue. Fourth, as was mentioned in Section 4.3., it would be important for future research to study more in detail the dynamics and the strength of

the external finance premium to financial conditions within the household sector, both during booms as well as recessions. Fifth, there is a substantial body of literature dealing with house price determination and fundamentals, one strand of which focuses on the empirical regularity of serial positive correlation at one year frequencies and mean reversion over longer time periods.³⁴ This, for example, could be important because, as the financial accelerator mechanism explains, an increase in housing prices leads to an improvement in the net worth position of owner households, who then face a lower external finance premium that leads to a larger housing demand and further price appreciation, which could be driving the positive serial correlation at cyclical frequencies. This could even be extended and improved in a model of regional business cycle housing price dynamics, with the help of estimated regional FAMs. Finally, Disney, Bridges, and Gathergood (2006) argue that the impacts of the financial accelerator could in fact be overestimated in macroeconomic models that neglect the role of household unsecured debt, thus shedding doubt on the power of house price fluctuations to lead to amplified and persistent effects on household aggregate demand. Given that households, especially in the U.S., do indeed have access to substantial sources of unsecured debt, this issue is definitely worthy of future research.

The research papers surveyed in this literature review underscore the importance of placing housing market dynamics, monetary policy shocks, and financial market development at the forefront of business cycle analysis. The topics and issues that were selected for discussion in this essay constitute an essential set of theoretical building blocks toward the analysis of a monetary business cycle framework, that gives special roles to the household sector and the housing market.

³⁴ See, for example, Capozza, Hendershott, Mack, and Mayer (2002), and Glaeser and Gyourko (2006).

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Appendix A

Note on the Treatment of Housing in Business Cycle Models

It is necessary to provide some background details on the typical conceptualization of housing in macroeconomic models. The household is the most basic unit of analysis in most economic models. Each period, infinitely-lived households supply labour and capital as factors of production in exchange for income. Household income must then be divided between savings and consumption, the relative mix usually being determined through the maximization of a lifetime utility function, which typically depends on choices of consumption and leisure, subject to an intertemporal budget constraint. Household consumption, in turn, can be disaggregated into consumer durables, like vehicles or homes, and non-durables, like food or clothes. The budget constraint, therefore, includes a separate term representing housing expenditures. In this regard, it becomes evidently important to differentiate between the various driving factors and economic effects inherent in each type of household consumption. As has been pointed out, by far the most important financial decision in a household's lifetime is the purchase of a home. This decision also has important implications for the intertemporal substitution of consumption and savings patterns during the household's life-cycle. This also proves important to understand aggregate economic activity and business cycle fluctuations. The linkage between housing and consumption, as the literature review discusses, is pivotal for our analysis.

Within total household consumption, consumption of housing, however, has a special treatment in the literature due to its various defining characteristics (Smith, Rosen, and Fallis, 1988). Housing units are in reality heterogeneous in nature, since households can choose among different dwellings in terms of quality, size, age, design, location, etc. As well, in the modeling literature, households usually derive utility not from the number of housing units owned or their value, but from the consumption of a set of services derived from housing that improve lifestyle quality, such as number of rooms, comfort, availability of space, proximity to amenities and work,

and location within a peaceful neighborhood for quality sleeping time, among others. Households, in turn, are assumed to face a rental payment in return for the right to consume these housing services. Rental payments are further assumed to be explicit for renters, but implicit, or imputed, for owners. The most common treatment of such heterogeneity within the macroeconomics and business cycle literature, however, is to assume that both the housing stock and services are homogeneous. In addition, due to both the durability and heterogeneity of housing, households are assumed to derive utility from the consumption of units of homogeneous housing services per unit of homogeneous housing stock per unit of time, implying in the end that the housing stock and housing services are directly proportional. It is typically assumed, then, that it is the consumption of units of housing services and not of housing units per se that enters the household's utility function. Accordingly, households are assumed to exchange, not housing units per se, but rather units of housing services, whenever they decide to engage in housing transactions.

This is of great importance when analyzing the effects of house price fluctuations on household behaviour. For example, it is possible at least in theory for a household not to feel richer after an appreciation in the price of a home if the opportunity cost of consuming housing services has also increased. Households, in turn, must face a tenure choice between owning or renting at different stages of their lives, which involves important investment decisions that can greatly influence inter-temporal consumption and savings patterns. For our purposes, however, due to the fact that housing services are offered by both owned and rented dwellings in a similar fashion, the analysis abstracts from any further investigation of housing tenure choice.

Appendix B

Note on the Analysis of Monetary Policy Shocks

In analyzing the conduct of monetary policy, it is important to clarify certain issues that have been assumed in this literature review. First, not all monetary contractions will lead to substantial declines in economic activity, in the same way that not all monetary expansions will lead to a phase of sustained economic growth. This is usually the case when monetary authorities attempt to merely fine-tune their policy tools by adjusting to short term economic news and developments. Typically, non-trivial and longer-lasting effects on economic activity are observed either a) when households and firms perceive, or have reasonable grounds to expect, a predictable change in the monetary policy stance, due to a marked change in the balance of risks between inflationary pressures and full employment, or b) when an unexpected disturbance in monetary policy direction leads economic agents to significantly change their perception of the economic reality. Concerning this last point, it is important to note that even though the literature tends to focus largely on the effects of unexpected monetary policy disturbances, recent developments (especially in the U.S. and other developed countries) related to the higher transparency with which central banks must conduct monetary policy, coupled with the widespread public access to economic information, have made the prevalence of unexpected changes in policy direction to become more rare. It is then usually the case that most unexpected shocks nowadays tend to concern the magnitude, and not so much the direction, of monetary policy decisions, which could be argued to constitute in themselves changes in monetary stance insofar as they convey new information to the public about future interest rate movements. Notwithstanding, the essay makes use of the concept of unanticipated or unexpected monetary policy shocks, as is popularly used in the literature.

Second, although monetary policy can be very successful in achieving its objectives, it

usually features a multitude of complicated economic dynamics³⁵ that have the potential to lead to unintended or undesired consequences. This is one of the main reasons why, for example, there is now a growing and heated debate concerning monetary policy rules, which some criticize as being among the potential causes of macroeconomic instability and fluctuations. Monetary policy has even been related to the current disastrous financial and housing crises and the recession now hitting the U.S. and other countries, as it has been blamed for keeping interest rates too low for too long. Low interest rates, in addition to the loosening of financing guidelines, is frequently blamed for having caused agents to under-price risks and therefore enter into riskier financial contracts, thus leading to an unsustainable boom in housing activity. While it is not the goal here to contribute to the debate, it becomes clear that monetary policy is an extremely challenging issue, which has the great potential to generate non-trivial effects on the real economy. Monetary policy, therefore, has given strong arguments to those claiming its quantitative and qualitative significance during business cycles. Furthermore, housing market dynamics, both on the supply side (with residential investment in new construction) as well as on the demand side (with the consumption of housing), are particularly sensitive to interest rate fluctuations. Housing dynamics therefore play a major role on the transmission of monetary policy to the real economy. Hence, the relevance in reviewing what the literature has to say concerning monetary policy shocks, housing markets, and business cycles.

Lastly, BG, (1995) raise one important puzzle that deserves a brief explanation, which is addressed in more detail in Taylor (1995) as well as in Mishkin (2007). Monetary policy directly affects short term rates, which are of critical importance for short-term-rate-sensitive components of aggregate demand and GDP. For instance, when short-term rates increase, it becomes relatively more costly to finance investment or purchase decisions of short-term nature, such as working

³⁵ For instance, among others, the substantial lags until the effects are observe in full, or the critique that rational agents will adjust their expectations and reactions according to their predictions of future monetary policy stance.

capital for firms or consumption of non-durable goods for households. Therefore, a monetary tightening activates the 'income effect', as it becomes more costly to service debt interest payments. However, the sensitivity to short-term rate fluctuations of purchase and investment spending decisions of longer term nature, such as capital equipment and structures for firms or housing for households, is not as intuitive. With respect to household demand for housing, fluctuations in the central bank rate usually affect the cost of borrowing directly so long as the credit facility is governed by a variable rate contract. Therefore, fluctuations in short rates will be more influential on mortgage interest costs in countries where the dominant form of mortgage financing uses variable interest rates contracts. However, in the U.S. as in other rich countries, where financial and capital markets are more developed and where banks do not depend heavily on short term deposits to finance long term lending, fixed interest rate mortgages are the dominant form of housing finance. In these cases, banks tend to finance longer term fixed mortgages through a spread over their cost of funds over similar maturities, which depend largely on long term rates and not so much on short term rates.

Taylor (1995) and Mishkin (2007) explain that the expectations model of the term structure provides the key to linking fluctuations in short-term rates and their effects on long-term rates. According to this model, effects on long rates will depend upon market participants' rational expectations as to the nature of the monetary policy stance and their reading of the information contained in it. For example, if agents expect that an increase in short rates is only transitory or short-lived, then the effects on the real economy are expected to be lower, since they do not perceive the monetary shock to reflect a significant change in monetary policy direction. Therefore, the effect on long rates is lower. On the other hand, if agents perceive that the central bank's actions convey the message that the risks to inflation have increased, and that therefore a monetary tightening change is expected to be followed by subsequent tightening moves in the near future, then the expectation of future increases in short rates will tend to have a larger

upward effect on long rates. Thus, although the term ' i ' in equation (1) constitutes the long term rate, it is in turn equivalent to the market expectations of future short term interest rates caused by the current monetary policy stance. Monetary policy shocks, then, not only affect short term rates directly, but also have the power to exert significant influence over long term rates.

Appendix C

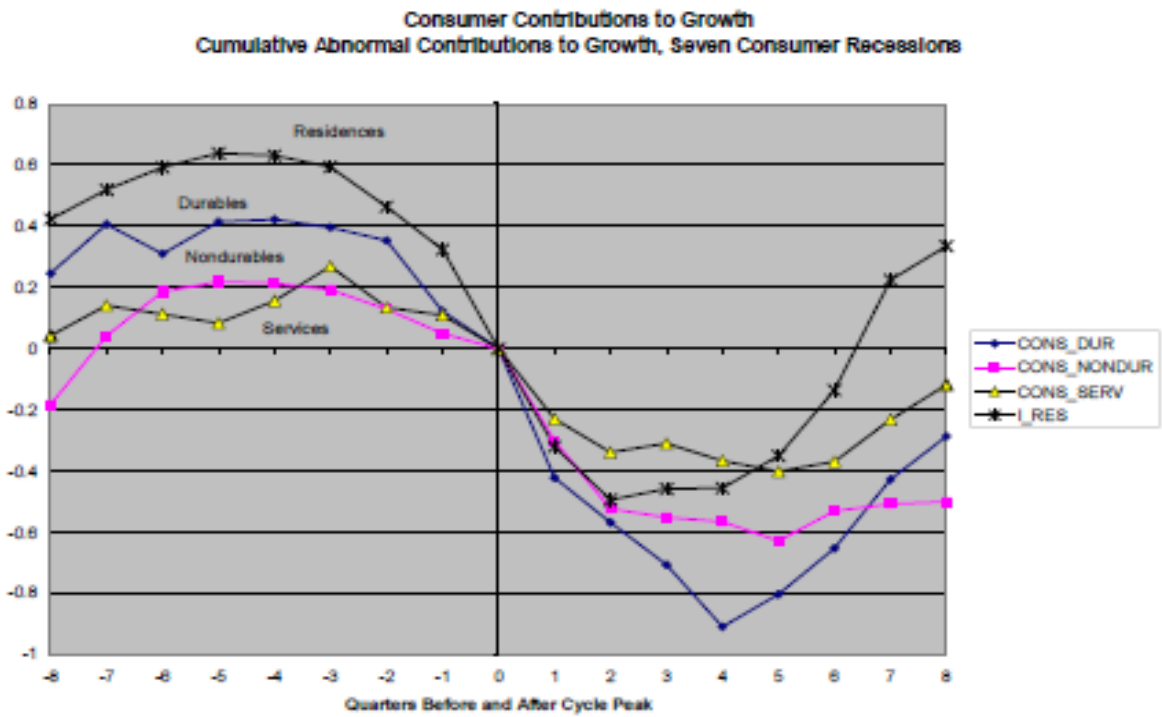
Note on the Role of Housing Markets in the Transmission Mechanism to the Real Economy

A simple analogy serves to clarify both the potential effects of house price dynamics on the real economy and the role of credit markets. It would be wrong to assume, for example, that household income has increased after observing an increase in consumer spending, if we fail to analyze the role of credit markets. The role of financial market development, in allowing households to access gained housing equity, and therefore alter their consumption and investment decisions (and thus affecting the real economy), could this way be regarded as being analogue to the creation of debit cards and automatic banking machine networks, which lead to an increase in the velocity of money circulating in the economy. The analogy is clear in the sense that, it is not the machines or debit cards themselves that increase consumption and affect the macroeconomy, but it is through their use that households are able to more easily access their wealth, by transforming otherwise inaccessible electronic funds deposited in banks into readily spendable money.

This logic also serves to respond to Mishkin's (2007, page 13) assertion that “we do not think that ATM withdrawals drive consumer spending, so one must doubt whether mortgage equity withdrawals do so.” The creation of paper money as legal tender made wealth more spendable; consumer spending has been made even easier, and has therefore increased, after the creation of debit and credit cards, since it did away with the need to carry cash. Flexible refinancing options and accessible MEW contracts have liberated illiquid housing wealth for a large section of homeowners. They have also relaxed credit constraints for those homeowners and reduced the dependence on more expensive unsecured credit facilities. Everything that makes consumer spending more accessible, or even cheaper, should in principle encourage consumption spillovers to the real economy, as was already mentioned in our discussion of housing wealth effects. However, this matter remains largely an empirical issue.

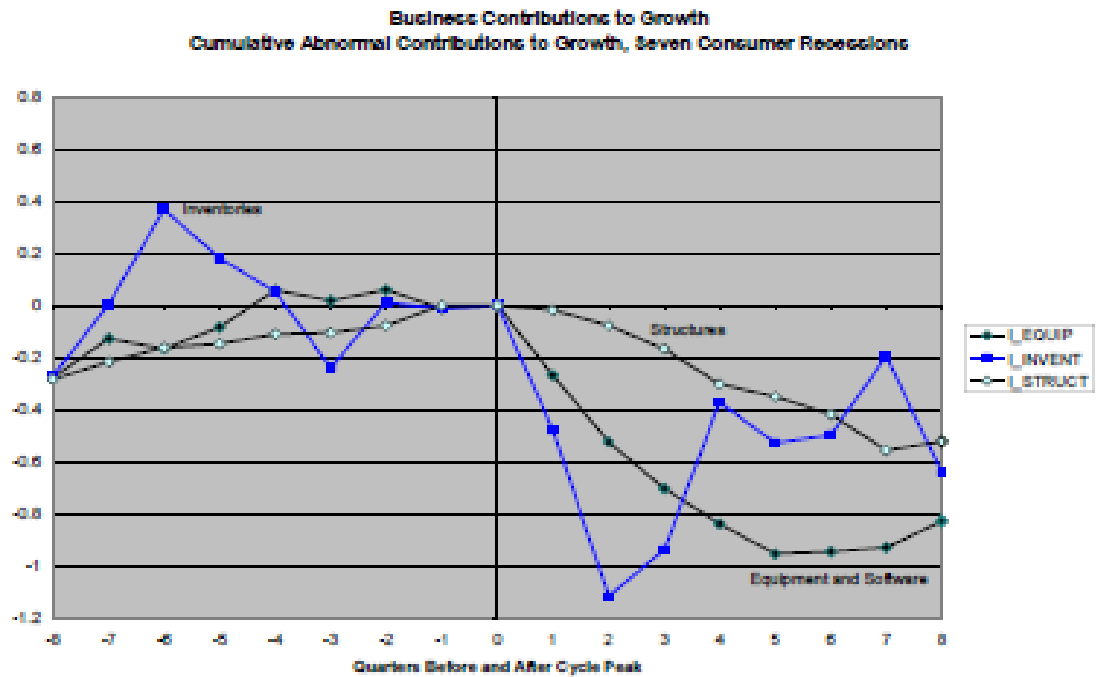
Appendix D

Figure 1



Source: Leamer (2007).

Figure 2



Source: Leamer (2007).