Why are we in a recession?

The Financial Crisis is the Symptom not the Disease!

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Globalization has made it possible for labor in developing countries to augment labor in the developed world, without having to relocate, in ways not thought possible only a few decades ago. We argue that this large increase in the developed world's effective labor supply, triggered by geo-political events and technological innovations, coupled with the inability of existing institutions in the US and developing nations themselves to cope with this shock set the stage for the great recession. The financial crisis in the US was but the first acute symptom that had to be treated.

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1 Introduction

Without doubt, the recent recession was the most severe since the great depression of the 1930s. A large part of the wealth of US households has evaporated: For example, the value of corporate equities has come down substantially during the past decade, from \$19.4 trillion (2.1×GDP) in 1999 to \$15.2 trillion (1.1×GDP) in 2008. Household net worth in the US (including nonprofit organizations) has gone from \$42.1 trillion (4.4×GDP) to \$51.7 trillion (3.6×GDP) in 2008.[1] At the same time, the consumer price index (CPI) increased by 29% from 1999 to 2008, and the number of households in the US increased to 117 million in 2008 from 104 million in 1999. As a result, the net worth per household in real terms (1999 dollars) declined sharply from \$402,000 in 1999 to \$343,000 in 2008, corresponding to a 15% drop during the past decade. The unemployment rate captures the difficult times of the average citizen even better: it has gone up from 4.4% in 1999 to 7.2% in 2008 – and is currently estimated to be at 9.5% (July 2009) even as discouraged workers increasingly have dropped out of the workforce and no longer are counted in the unemployment statistics.

This raises the question as to what caused the great recession? According to folk wisdom, the financial crisis brought on the recession, which of course begs the question: what caused the financial crisis? The standard answer is, easy credit, financial innovation and lax regulation led to the crisis. But then, what caused easy credit and lax regulation? A common explanation points to the savings glut in Asia, and the fact that a major part of these savings flow into the US resulting in too much money chasing too few opportunities in the US financial system. Why is there too much saving in Asia and why do those savings flow to the US? Asians just like to save and Americans just like to consume more! According to this logic all that is needed to remedy the situation is to induce Asians to save less and consume more.

In this paper we argue that this causal logic is misleading. All these phenomena – savings glut, easy credit and lax regulation, and the financial crisis – are closely interlinked and there is a deeper driving force. While each piece is well understood and has been the subject of much research, our focus here is to emphasize how a common driving force is linking them all together. In what follows we make the case that a huge and rapid increase in the developed world's effective labor supply, triggered by geo-political events and technological innovations, is the major underlying force that is affecting world events today.[2] Labor in developing countries – countries with vast pools of grossly underemployed

[1] Table F.100 of the Flow of Funds, `http://www.federalreserve.gov/releases/z1/Current/z1r-3.pdf`

[2] Export driven growth and development has happened before: examples include Japan, Taiwan, S. Korea, Singapore, and Hong Kong. The difference is that the magnitudes are vastly different. China and India have a combined population of 2,500 million which is more than ten times the combined population of Japan, Taiwan, South Korea, Singapore, and Hong Kong.

people – can now compete with labor in the developed world without having to relocate in ways previously not possible.[3] For example, a hedge fund can hire an analyst in the Philippines to produce research reports on American firms at a fraction of the cost of an analyst living in the US, without sacrificing quality. A radiologist in Nigeria can analyze the X-Ray of a patient taken in Boston over the internet and send her diagnosis back thereby competing with a local radiologist located in Boston. A non emergency call to the doctor's office can be answered by a triage nurse located in India and without noticeable difference to the patient. A snow blower manufacturer in Wisconsin can move a large part of the manufacturing operations to China resulting in substantial savings with little impact on quality. In essence, the internet and innovations in transportation are virtually reshaping the world economy. The productive citizens of less developed countries have increasingly joined the workforce of developed countries, without the need to change their citizenship. China, (and to a lesser extent, India) being well organized with a stable political system, a large trained labor force, and excellent infrastructure facilities within special economic zones, has been the major beneficiary of this recent technological revolution. Even if only 10 percent of the population of India and China are potentially qualified enough to compete in the western world's labor market, that translates into an increase in the western world's labor supply of nearly 200 million people, almost the same size as the U.S. labor force.

The inability of existing financial and legal institutions in the US and abroad to cope with the events set off by this force is the reason for the current great recession: The inability of emerging economies to absorb savings through domestic investment and consumption caused by inadequate national financial markets and difficulties in enforcing financial contracts through the legal system; the currency controls motivated by immediate national objectives; the inability of the US economy to adjust to the perverse incentives caused by huge moneys inflow leading to a break down of checks and balances at various financial institutions, set the stage for the great recession. The financial crisis was merely the first symptom.

The remainder of the paper is organized as follows. Section 2 makes the case that the causes of the US recession must be understood in an open economy context. In section 3 we describe developments in emerging Asia which led to the savings glut and the channeling of foreign savings into US financial markets and provide a stylized two country model. Section 4 focusses on US household consumption versus savings decision and house prices while Section 5 looks at the empirical relationship between the current account and the housing market in the US. Section 6, makes the point that a house price bubble is different than a stock market bubble in its real implications. Section 7 discusses the potential causes of the initial bursting of the bubble in the subprime market and Section 8 draws some parallels to

[3] See Blinder (2005) for a comprehensive discussion of this point

the experience of other countries. Finally, Section 9 concludes.

2 A Global Perspective

The world has been subjected to several major unanticipated shocks during the last three decades that have led to globalization. President Nixon's historic trip to Beijing gradually opened China to the West and eventually led to the normalization of diplomatic relations between US and China in January 1979. It took China more than a decade to get organized to compete in world markets. India too liberalized during the early nineties which set the stage for opening of trade between India and the rest of the world. The fall of the Soviet Union ended the cold war and helped the developing world focus on economic growth based on trade with the Western world. The innovations in communications and transportation during the last two decades of the twentieth century accelerated the globalization process tremendously. The developments in Retailing in the U.S also played a key role in globalization. Reaching U.S consumers is no longer a difficult and costly exercise for manufacturers in China, India, and the emerging nations of the world – technological innovations have made it feasible for retail chains like Walmart, Target, and Home Depot to specialize in locating low cost manufacturers around the world and manage global supply chains efficiently. The lack of labor unions for software professionals in India and lack of strong actions by labor unions in China's export sector (until early 2010) contributed in no small way to the speed with which globalization has taken place.[4]

The increasing globalization of the last decades has produced significant gains from trade which arguably have increased living standards in much of the world and lifted millions of people out of abject poverty. Globalization has, however, also created an unprecedented degree of interdependence among the major economies of the world through trade links and international capital flows. The current crisis must be understood in this context.

In a closed economy, it is a simple accounting identity that the sum of domestic investment must equal domestic savings in each period. In a world of open economies, this identity (between sources and uses) must still hold, albeit at a global level. What changes in an open economy is that individual countries temporarily can run a current account surplus or current account deficit, due to excess saving or excess consumption/investment. In the absence of transactions costs and other frictions like taxes, entry barriers, governmental intervention in markets etc., and when competitive markets for *all* goods, services and securities exist, this should in general produce global competition for investment flows and lead to more efficient use of resources, with capital flowing to those regions where

[4]Strong labor unions facilitate real wage increases, thereby acting as shock absorbers that can slow down the growth in exports even when exchange rates fail to adjust.

it is most productive.[5] In fact, the group of emerging and developing countries ran large current account deficits until the late 90's due to extensive investment in infrastructure and industrial capacity. As a result, the emerging economies in Asia as a group consistently experienced real GDP growth rates in excess of 7% over the period 1982-2008, in large part driven by exports.[6]

A major change in capital flows occurred in the aftermath of the 1997 Asian crisis in which a number of countries in the region found that they had been overly reliant on short term dollar denominated financing and possessed insufficient reserves to defend their currencies. In response, many Asian economies tightened capital controls and made a concerted effort at building up substantial dollar reserves as a buffer against future macroeconomic shocks. This, in combination with inadequate domestic financial systems incapable of absorbing local savings, had the effect of channeling a substantial portion of savings into dollar denominated assets. Whereas the combined current account surplus of the BRIC[7], NIAC[8], and ME[9] countries was \$4Bn in 1996, it increased to +\$149Bn in 2000 and +\$798Bn by 2007 – roughly equal to the US current account deficit of \$788 Bn in 2007. Similar, albeit less extreme, patterns held true for other emerging and developing economies, leading to a "Global Savings Glut", as pointed out by Bernanke (2005) and Dooley et al (2005). Almost the entire increase in current account balances from BRIC, NIAC, and ME countries (the latter benefitting from a dramatic rise in oil prices after 1997) has been matched by an increase in the current account deficit of a single country: the US. We argue that this pattern (along with a period of easy US monetary policy) precipitated the stock market and subsequent housing bubbles in the US. The current crisis is therefore best understood in an open economy context.[10]

[5] When markets are incomplete, free trade need not make everyone better off. For example, Newberry and Stiglitz (1984) show that free trade may be Pareto inferior to no trade when insurance markets do not exist.

[6] Until the late 90's, foreign direct investment outstripped the value of exports leading to a negative current account balance.

[7] Brazil, Russia, India, and China

[8] Hong Kong, South Korea, Singapore and Taiwan

[9] Middle Eastern oil exporting countries

[10] Globalization has made the US an open economy, and closed economy general equilibrium models commonly used in macro economic analysis are arguably unsuitable for understanding the current recession. For example, Bernanke and Gertler (2000) examine the implications of asset price volatility for management of monetary policy using a closed economy general equilibrium model and conclude that "central banks should focus on underlying inflationary pressures." Notably, Alan Greenspan appeared supportive of notion that the Fed should largely ignore asset bubbles and stick to its traditional policy of controlling inflation. In the Bernanke and Gertler (2000) model, asset prices driven by bubbles are almost perfectly correlated with inflation, and so targeting inflation is enough; there is no need to explicitly target asset price bubbles if the objective is to stabilize macro economic variables. Such a conclusion need not in general hold in an open economy. As Jaimovich and Rebelo (2008) demonstrate, the response of real activity to news about the future in open and closed economies can be quite different.

3 The Emergence of China, Labor Supply Shock, Current Account Deficit, and Capital Flows

3.1 The Rise of China

China has arguably benefited greatly from globalization and has emerged as one of the most important creditor nations and trading partners of the US.[11] In 1980, China accounted for less than 2% of world GDP. By 2007 this figure had grown to almost 6% and 12% when adjusted for purchasing power parity, making China the third largest economy and on track to overtake Japan as the second largest economy as early as 2011 (see Figure 1). This meteoric rise has been facilitated by recent innovations in the communications and transportation technology that have helped open up the services of China's enormous pool of underemployed labor to the western world. Table 1 below shows the remarkable role played by exports in driving the growth of both China and India over the last two decades.

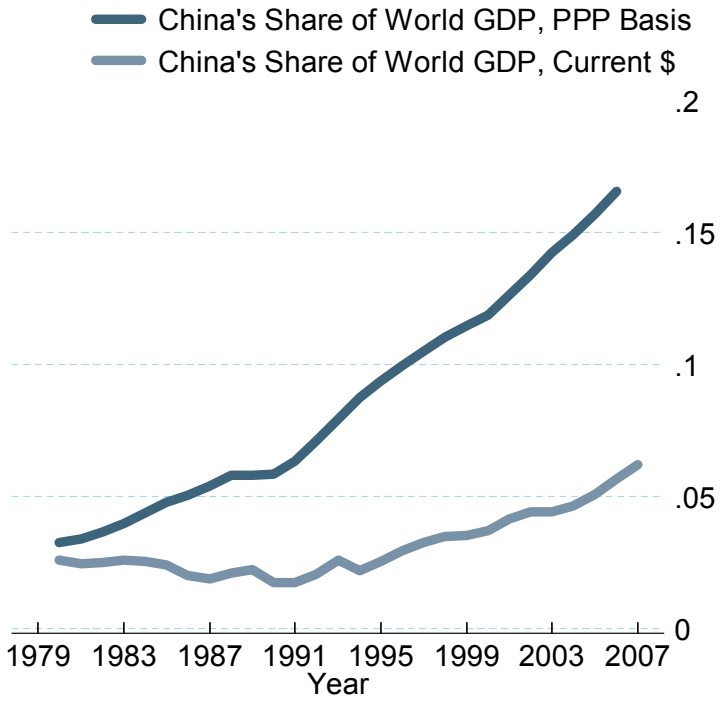


Figure 1: China's Share of World GDP. Source: IMF Data, World Economic Outlook Database

China's export led growth boom has enabled the movement of a large segment of the rural population to coastal cities and special economic zones at the rate of almost 20 million each year. The urban population in China increased by nearly 300 million from 1990 to

[11] While China arguably benefited the most from globalization, other emerging nations like, for example, Brazil and India benefited greatly as well.

2007 and in the 12 years between 1995 and 2007 the share of the urban population more doubled from less than 20% in 1995 to nearly 45% in 2007. A significant part of those who migrated to urban areas ultimately have become part of the developed world's workforce through employment in industries exporting to the West.

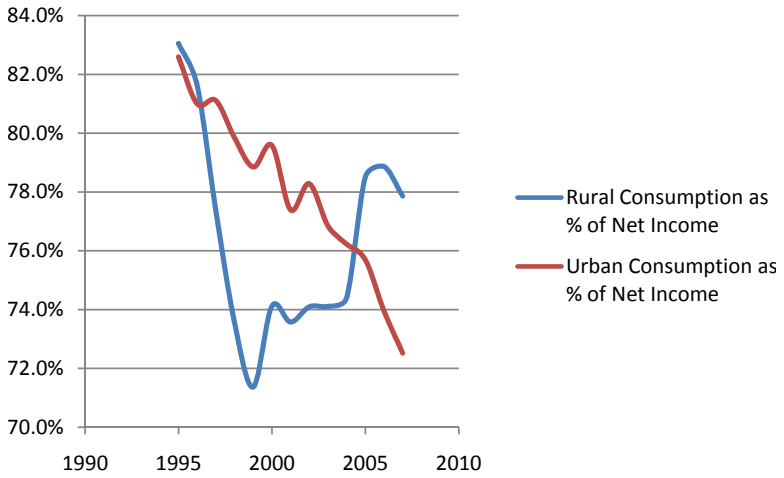


Figure 2: The Ratio of Consumption to GDP in China. Source: Derived from China Statistical Yearbooks (1995-2008), Table 9-7/10-18.

As a result of the rapid expansion of the export sector, per capita income in urban areas more than tripled from 1995 to 2007 while the disparity between urban and rural incomes widened considerably: the ratio of urban to rural per capita income increasing from 3.3 in 1995 to 4.3 in 2007. Moreover, as can be seen from Figure 2, the urban consumption rate as a percentage of disposable income dropped from 83% in 1995 to 73% in 2007 indicating that the millions of new urban chinese workers dramatically increased their savings rate. There are several possible explanations for this phenomenon. It may in part be due to durable goods and housing becoming more important components of consumption for the urban worker. A second major factor is that consumer credit markets in China are not as yet as well developed as in the US, limiting the chinese households ability to smooth consumption. Purchases of most big ticket durable items like automobiles involve little credit, and even home purchases involve about 30% down payment. According to a study by Bingxi and Lijuan (2007), the main lenders to consumers in China are commercial banks; and consumer loans constituted only about 12.5% of all bank loans in 2007 and 80% of those loans were for housing.[12] Finally, the need to save for retirement in the absence of a social security system means that even the less well off workers need to put money aside.

[12]In contrast, credit market debt owed by the household sector in the US is comparable in size to credit market debt owed by the financial sector that includes all commercial banks and bank holding companies – the former was $13.7 trillion and the latter was $16.5 trillion at the end of the 2nd quarter of 2009 (Table L1, Flow of Funds Accounts of the US). See also Shimek & Wen (2008).

China

	1992	2001	2008
GDP (in US $ billions)	488	1,325	4,520
Gross Domestic Investment/GDP (%)	31	34	42
Exports of Goods and Services/GDP (%)	22	23	35
Gross Domestic Savings/GDP (%)	40	34	50
Balance on Current Account/GDP (%)	1	1	9

India

	1,992	2,001	2,008
GDP (in US $ billions)	281	473	1,207
Gross Domestic Investment/GDP (%)	22	24	33
Exports of Goods and Services/GDP (%)	9	13	24
Gross Domestic Savings/GDP (%)	22	23	32
Balance on Current Account/GDP (%)	(1)	0	(2)

Table 1: Comparing the different growth experiences of India and China over the last two decades.

The consequence of the frugality of the Chinese consumer can be seen from Figure 3: The growth in Chinese savings relative to US savings has been dramatic. Chinese savings were less than a third of US savings till 2000 but grew to be 130% of US savings by 2007.[13]

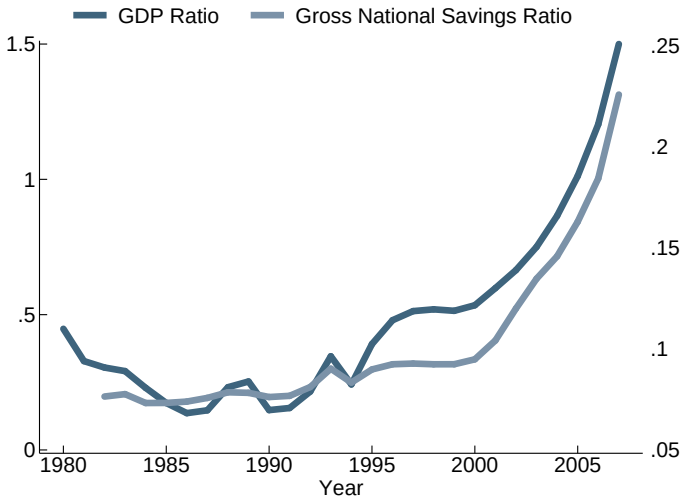


Figure 3: The ratios of China and US gross national savings (left scale) and nominal GDP (right scale). Source: Based on data from China National Bureau of Statistics and the BEA. National savings equals gross domestic investment plus the current-account balance.

[13]We computed Savings using the formula, Aggregate Savings = Gross Domestic Investment + Current Account Balance.

3.2 Labor Supply Shock

To put things in context, the size of the increase in the developed world's labor supply is of a similar order of magnitude as the increase in the western world's access to land and natural resources following the discovery of the Americas. A shock of such a magnitude to the developed world's labor supply is likely to adversely affect some and positively affect others in the short run, even if everyone potentially is made better off in the long run. Those in the emerging economies who now have new opportunities will flourish. A significant fraction of those in the western world who remain employed will benefit and see their wages go up while others will see their jobs vanish. Although the wages of a significant fraction of the population in the western world could be adversely affected in the short run, this effect will be partially offset by the availability of cheaper consumption goods. Our mental model leading to this conclusion is described below. Since our focus is on understanding the short run transitional dynamics of the world economies, we assume that the technology prevents the use of capital or labor in excess of narrow limits.

> Consider a one period model of two countries, Rich (R) and Poor (P). We will differentiate between the beginning of the period and the end of the period. R has one unit of (skilled) Labor (L) and 1.1 units of capital (K) while P has one unit of (unskilled) labor but no capital (K). There are two technologies, r and p. Technology r needs 1 unit of K and 1 unit of skilled labor L and produces 1 unit of output. Capital does not depreciate. Country R can convert consumption good into capital good and the other way around without costs. Technology P takes in 0.1 units of K and 0.8 units of unskilled labor L and produces 0.41 units of consumption good. Again, the capital does not depreciate. In this one period economy, technology R can be scaled down but not up; and the same is true for technology P. The technologies however can be off shored – i.e. the technology R and P can be moved across the two countries and unskilled workers can be trained to use technolgy R. Movement of capital and technology and training of unskilled labor can be done instantaneously; production using technology R and P take the entire period.
>
> Note that there is only one capital good, but two technologies – i.e., two types of intellectual capital – and technology once it has been developed can be copied or transferred across countries just like capital good. These assumptions are consistent with the view that highly skilled human capital that only developed countries possess is necessary for creating superior technology, but once created, labor in emerging economies can be easily trained to adapt the superior technology.

Consider the following three cases: (a) No trade; (b) Capital can move across countries; and (c) Off shoring – i.e., technology can move across countries. While several outcomes are possible, we will examine one particular set of outcomes.[14]

Under no trade, for convenience, assume that the rental rate for capital is set exogenously at 0%. Letting the rental rate for capital be determined by market clearing will not change the nature of the conclusions. Country R will use K = 1, L = 1 (full employment,) produce 1 unit of output all of which will go to labor, i.e., the wage rate will be 1. Country R will convert the 1.1 units of capital left at the end of the period into consumption good and distribute as liquidating dividends. Country P will not produce any output with 100% unemployment or subsistence level of existence. The output of consumption good in the two countries together will be $1 + 1.1 = 2.1$

Now consider case (b), i.e., capital can move. Country R will export 0.1 of capital to country P. Country P will use L = 0.8 (80% employment) and K = 0.1 and produce 0.41 units. Suppose country P pays a rental rate on capital of 10% to induce capital movement from R to P. In that case P will return the capital of 0.1 units plus rental rate of 0.01 units, i.e., 0.11 and will be left with 0.4 units to be given to local 0.8 units of labor hired – a wage rate of 0.5. Country R will again pay a liquidating dividend of 1.1 by converting all capital left at the end of the period into consumption good. Total output of consumption good together by R and P will be $1.41 + 1.1 = 2.51$.

Suppose the situation in case (b) prevails *and in addition* off shoring is made possible, i.e., case (c) but labor cannot move. A number of outcomes are possible in this case and we will consider one of these. Suppose country R moves 0.2 of its capital to country P, hires and trains the 0.2 of P's unemployed labor and pays them a wage rate of 0.5. In addition country R lays off 0.2 of labor in R; pays the difference in R's wage rate of 1 and P's wage rate of 0.5 minus P's capital rental rate of 10% on capital moved, i.e., 0.2×0.5 - $0.2 \times 0.10 = 0.08$ to the 0.8 units of labor retained in R (i.e., a wage rate of 1.1 instead of 1). Total consumption good output (including liquidating dividend paid by converting capital left at the end of the period into consumption good) of R and P together will remain at $1.41 + 1.1 = 2.51$. Those who remain employed in R will earn a higher wage; those who own capital in R receive 0.02

[14] The set of outcomes are determined by the rental rate of capital, which in turn will depend on the relative bargaining power of the two countries. For example, country P will have a very small consumption if country R has sufficient market power and sets the rental rate for capital sufficiently high. We consider a set of outcomes that is not that extreme.

more in all; and labor in P will be strictly better off. The 20% unemployed in R will be strictly worse off. Country R will have a much larger trade deficit of 0.1 units.

While off shoring will increase the trade deficit of country R several fold, the current accounts of both countries will be balanced and remain at zero *in this one period* example. Under (b), current account of R will be credited for export of 0.10 units of capital, interest received of 0.01 units; and the debits are for import of 0.10 units of capital back, and import of 0.01 units of consumption good using the interest. Under (c), in addition to the entries under (b) current account of R will be credited for the export of 0.20 units of capital and debited for the import that same capital back, i.e., with zero impact; and credited with an interest received of 0.02 units, a foreign investment dividend of 0.08 units, and a corresponding debit of of 0.1 units for import of consumption goods, again with zero impact on current account balance.

In this one period model economy neither country has an incentive to save and hence the current account balance has to be zero. Introducing many periods alone will not help explain the the current account surplus of the poor country (China) and the corresponding current account deficit of the rich country (US). For example, Moore (2007) finds that in a two sector model with linear technologies off shoring leads to a rising skill premium (as in our simple mental model above) but a current account surplus for the rich country and current account deficit for the poor country. As Kohler (2001) observes, this is also the textbook view of the effect of outsourcing on the current account balanced of rich and poor countries in the international trade literature.

China is not the only country with a large current account surplus during its rapid rise that poses a challenge to classical economic models. Japan too experienced a sharp rise in its trade balance when its per capita GDP more than tripled from under $10,000 in late seventies to equal that of the US by late eighties – see Figure (4). In order to understand this aspect of history, where the poor country generates a large current account surplus during the period of development, in addition to introducing many periods, the following features may have to be modeled.

(i) Suppose services from durable goods like automobiles, residential housing, and household equipment like refrigirators and washing machines form a major component of consumption. In that case, during the initial years of development those in the poor country will have the incentive to save substantial amount of their income towards down payment on purchase of durable goods. In China a

typical household will have to pay in full for an automobile, and put 30% down for a house. A typical household in even the ninth income decile may have to save for more than 4 years to have enough for down payment on a modern house[15]. Further, there is also the need to save for retirement. Absent financial instruments and legal systems to facilitate inter generational borrowing and lending, the surge in savings of those employed in relatively higher paying jobs in export oriented industries will necessarily have to be absorbed by investment. When a surge in employment causes savings to outpace domestic investment capacity, some of those savings may have to be invested abroad for a while leading to a current account surplus for P and a corresponding deficit for R.

(ii) Most of the foreign direct investment in China came from South Korea, Taiwan, and Japan which took advantage of relatively cheap Chinese labor to produce final goods. That led to the import of large quantities of intermediate goods from those countries into China and export of the assembled final goods mostly to the US, leading to a large Chinese trade surplus with the US [16]. The rise of China gave a large competitive manufacturing cost advantage to South Korea, Taiwan and Japan which were already major exporters to the US; were already a part of the US supply chain; and had in depth knowledge of the nature of the US demand for goods and services. Therefore, it may be necessary to allow for the presence of one more rich country and model the interaction among two well developed economies when one of them has access to the pool of cheap labor in a less developed country in order to understand the transitional dynamics of funds and goods flows. When the final stage in the manufacturing process is moved to the poor country from the rich country, the rise in savings due to rising incomes may be more than can be absorbed by local investment opportunities and lead to capital outflows.

Notably, this model does not seem to capture what happened to developed economies of the West when Japan, Taiwan, and Korea developed through exports. Western economies also gained in the process. So, what is wrong with this model? We assumed that the 0.2 of labor in R replaced by 0.2 of labor in P will remain idle. But they can be redeployed in other productive activities. That will increase output in R and can lead to Pareto improvement. But redeployment in R takes time and can become an issue if the magnitude of labor redeployment involved becomes large within a relatively short period of time. We think that that is what is happening now with China's, and to a lesser extent, India's export

[15] Assumptions: A modern house is priced at 250,000 yuans; savings of a typical household in the highest income quintile is 18,241 Yuans per year; real interest rate relative to housing price inflation is 0% per year.

[16] See page 222, Wu (2005).

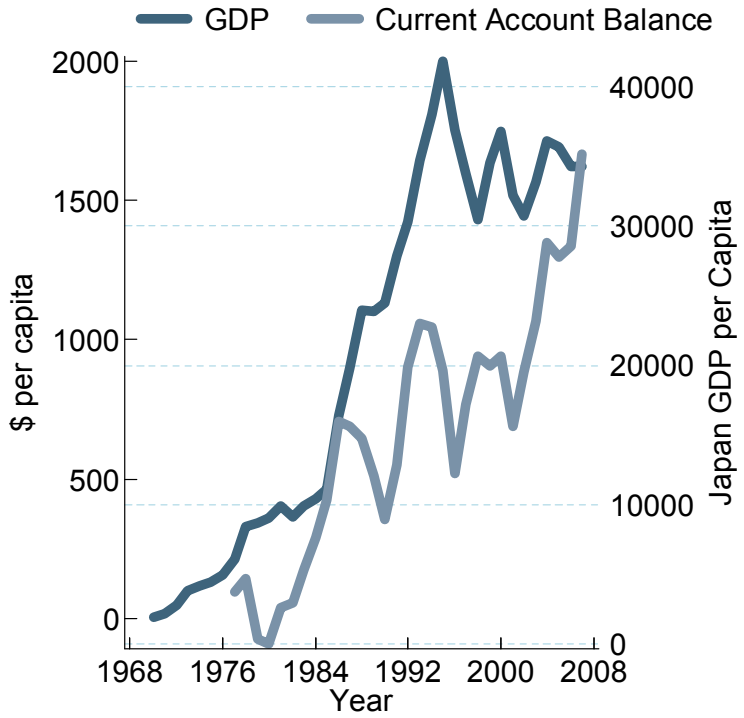


Figure 4: Japanese current account balance (LHS) and GDP (RHS) per capita. Source: United Nations Statistics Division, WB Estimates, IMF

driven growth drive through off-shoring. For redeployment of labor in R to take place, savings from P's employed has to flow into productive activities in R. As Cabellero and Krishnamurthy (2009) observe, that may not be possible to attain if P insists on investing only in safe assets in R.

This view is supported by the fact that the share of wages and salaries as a percentage of US Gross Domestic Product (GDP) has dropped to 46% in 2007 from 49% in 2000. Wages and salaries plus proprietors income dropped to 54% of GDP in 2007 from 57% of GDP in 2000. With about 117 million households in 2007, that drop in labor share of GDP translates to a drop of $3,600 per household. However, during the same period, even though income was redistributed from citizen-workers to foreign-workers and owners of capital, the share of private consumption in the US remained at 70% of GDP. This raises the question as to why annual household consumption did not drop?

3.3 Current Account Deficits and Capital Flows into the US

The export led growth of the emerging economies coincided with a sharp increase in the current account deficit of the US which ballooned from $124Bn in 1996 ($1,006 per US household) to $413Bn in 2000 ($3,787 per US household) and $738Bn in 2007 ($6,194 per US household.) To balance this deficit on the current account, massive capital inflows

took place. To understand this pattern in capital flows, one must recall that the Dollar remains the effective reserve currency of the world. Moreover most commodities are traded in Dollars. The US is therefore a natural recipient of liquidity from developing and emerging economies wishing to build up their reserves as a buffer against macroeconomic shocks. In a world where the dollar is the de facto reserve currency, a net foreign liquidity demand necessarily implies a commensurate increase in the US current account deficit. This model is sustainable as long as the demand for reserves is not too large relative to the size of the US economy. It ceases to be fiscally sustainable in the long run if the demand for reserves grows at a much faster rate than the US economy and becomes "too large" as this will tend to lead to an ever increasing debt burden as a fraction of GDP.[17] This effect is illustrated in Figure 5 which shows the dollar denominated foreign reserve holdings held by foreign central banks as a fraction of US GDP. The foreign reserve holdings of US dollars, which had been at less than 11% of US GDP prior to 2000, grew rapidly after 2002, in fact it almost doubled over the 5 year period from 2002 and 2007.[18] Much of the demand came from the fast growing emerging economies, especially China, which, in aggregate, no longer can be considered small and whose growing demand for dollar liquidity began to have a significant impact on US financial markets.

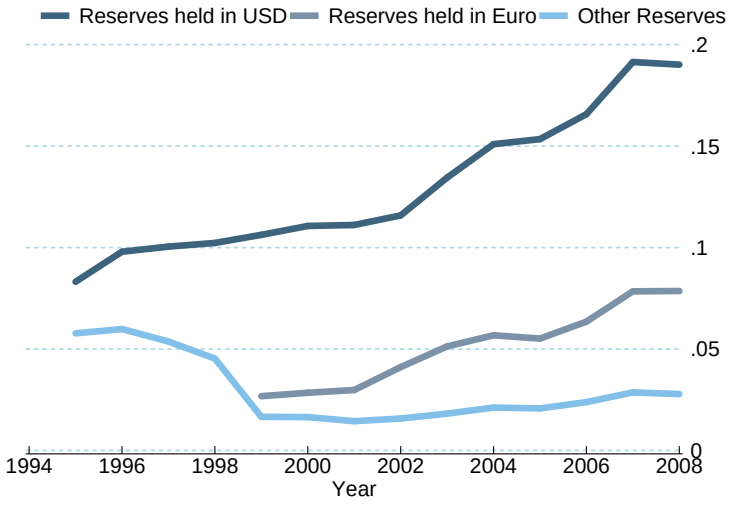


Figure 5: Foreign holdings of Dollar reserves as a fraction of US GDP. Source: IMF COFER

A large part of the capital flow was initially into US government debt; foreign holding of the US government debt increased from 18 percent of the total government debt of $5.66 trillion in December 2000 to 28 percent of total government debt of $9.5 trillion in June

[17] Although this effect in principle could be offset by an increase in the private savings of US households abroad, there is little sign of this on the horizon as of this writing.

[18] This is even more remarkable as the annual US GDP growth over that period averaged almost 3%.

2008. These massive inflows of international reserves from emerging economies like China were largely insensitive to interest rates and put downward pressure on real interest rates across the maturity spectrum despite widening US current account deficits.

Current account deficits in and by themselves are of course not necessarily bad, provided the capital flows that occur to balance those deficits are put to productive use (e.g. infrastructure, R&D, etc.) The flood of liquidity pouring into the US initially flowed into Treasuries and the stock market through sovereign wealth funds, fueling the tech bubble.[19] While the capital inflow did help spur innovation in the technology sector, shareholders did not necessarily benefit since they (on average) overpaid for their investments, as borne out by the crash of 2000. Much of the benefit of the technology innovation instead accrued to countries like China (and to a lesser extent, India) whose vast labor resources became much more accessible to Western companies seeking to reduce cost by outsourcing of manufacturing and services. China in particular benefitted in this respect due to its vast pool of labor and the greater openness of its special economic zones developed throughout the 1990s with the initial wave of foreign investment and technology transfer, especially from Japan and Germany. During this period China quickly emerged as the US's fastest growing creditor, second only to Japan in size: In 1994 China held $18Bn in US assets (almost exclusively Treasuries) which grew to $92Bn in 2000 (roughly $72Bn Treasury debt and $20Bn Agency debt) and $922Bn in 2007 (roughly $466Bn in Treasuries and $376 in agencies with the balance in corporate debt and equity), almost 25% of China's GDP.

The dramatic rise in China's trade surplus with the US should have led to a gradual appreciation of the Chinese currency relative to the US dollar which would have served to temper the rate of increase in the US trade deficit. However, as can be seen from Figure 6, the Chinese policy of maintaining the competitiveness of its export sector kept the Yuan from appreciating against the US dollar through a system of strict capital controls. As a byproduct, this policy massively increased China's dollar denominated reserves. While this strategy allowed the Chinese economy to grow by riding an export boom, it stifled the growth of domestic household consumption (at least initially). Most economists would agree that China could have made better use of its savings by investing in real capital domestically which eventually would lead to an increase in domestic consumption and imports.[20] However, overriding domestic policy priorities, such as "maintaining social

[19] In this respect the new inflows were different in nature from the Japanese investments of the 1980's included large investments in real assets (e.g. the Rockefeller Center) and outright acquisitions of US firms that included Universal Studios. Attempts by Dubai Ports World to take over the management of six US ports in 2006 and China National Offshore Oil Corporation's (CNOOC) bid to buy Unocal, the ninth-biggest US oil firm were stifled by political pressures.

[20] "*Another factor contributing to our trade imbalance with China is its exchange rate policy and its accumulation of reserves, even though trade impacts may not be the purpose of this policy. China's current account surplus, along with huge capital inflows, has created an immense accumulation of reserves $130 billion, the second-highest level in the world. While comfortable levels of reserves are essential for every*

harmony and stability", meant that Chinese policy makers were keen to "maintain sound development trends", i.e. weary of spurring too rapid consumption growth that would inevitably be concentrated in a few urban costal areas.[21] To the extent that this remains a major concern of Chinese policy makers, it may continue to impede the long term return to a sustainable equilibrium.

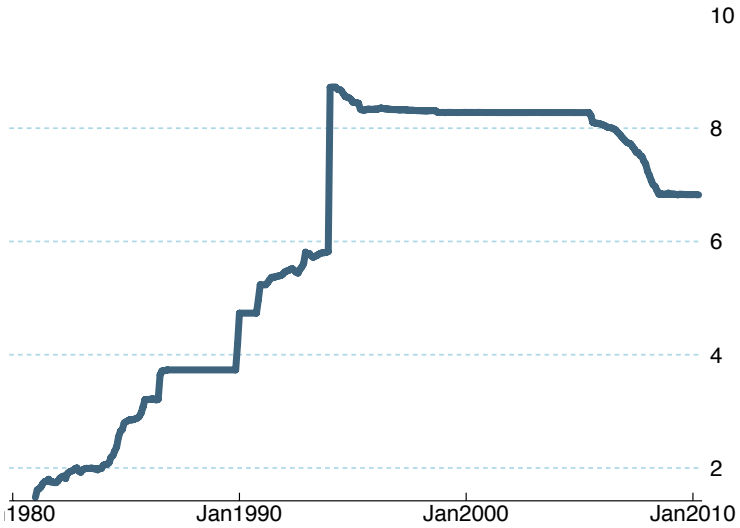


Figure 6: Foreign exchange rate (Yuan/US$) as of January 1 each year Source: FRB St. Louis

After the stock market crash of 2000, capital continued to flow into the US but now increasingly into safer fixed income instruments. The decreasing government financing needs and the low treasury yields made alternative government backed investments, such as GSE mortgage pools, more attractive due to the spreads these investments initially offered. Figure 7 shows the pattern of Chinese net acquisitions of US assets over the period 2001-2008. The largest increases were in corporate (including non-Agency) and Agency debt while equities did not play any significant role until 2007-8. The flow of money into securitized mortgage pools helped drive down the cost of borrowing and created record profits years for Fannie Mae and Freddie Mac as mortgage volumes increased. With the pool of conforming mortgages limited and the secondary mortgage spreads on GSE pools diminishing, investment banks set up their own pools of "private label" (non-conforming) mortgages providing investors the desired higher yields at seemingly trivial additional risk.

economy, especially in the context of recent financial turbulence, the levels China has reached raise questions as to whether continued reserves growth represents an efficient use of China's savings, a matter I discussed with China's leadership when I was in Beijing. China can earn higher returns by investing in real capital than by money market investments. Such a move would not only bolster Chinese development, it would help increase Chinese imports, helping to moderate China's external imbalances.", Robert E. Rubin, speech to the Council on Foreign Relations, October 27, 1997

[21] Quotes from Xinhua news agency, President Hu Jintao in speech to factory workers in Hebei province, May 25, 2008.

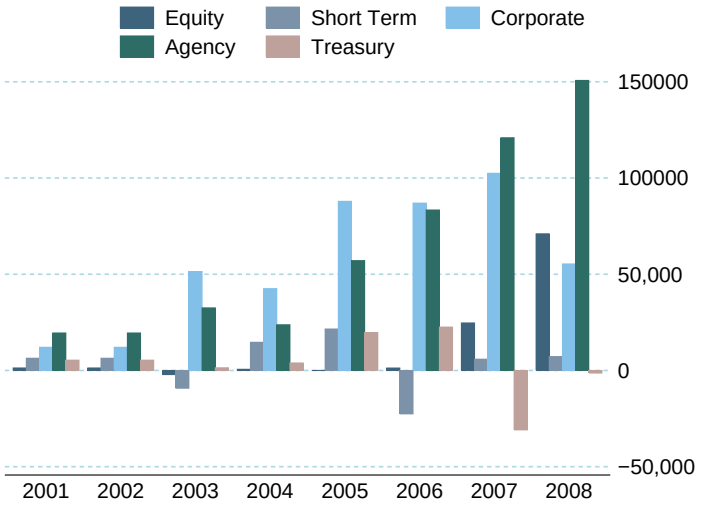


Figure 7: Change in Chinese holdings of US assets by asset class in US $M.

Thus the flow of capital was ultimately funneled into the US housing market leading to the housing bubble. Figure 8 below shows the close relationship between US current account deficits and household indebtedness.

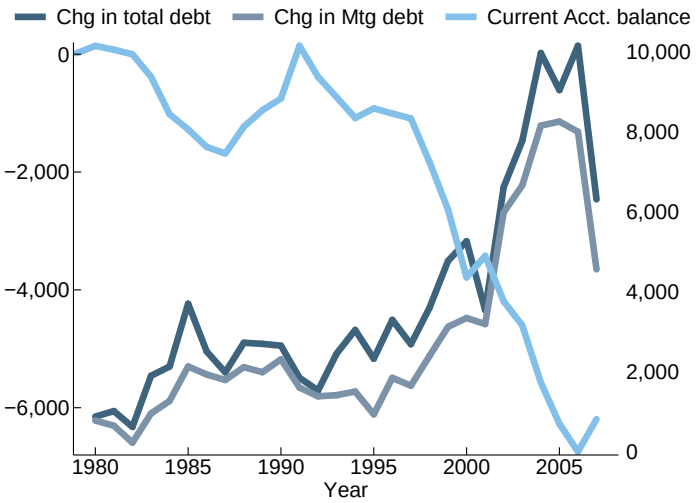


Figure 8: Current account balance and change in household indebtedness. All numbers are in US$ per household. Source: Treasury

To summarize, the sudden increase in labor supply from workers in developing countries because of globalization should have resulted in significant sections of the population in developed countries experiencing a decline in their living standards as more and more manufacturing and service jobs are outsourced. However, the flow of cheap liquidity from abroad

during this period helped fuel the housing bubble creating the illusion of wealth among households sustaining the high level of consumption, thereby masking the real structural changes that were taking place in the world economy.[22,23] We will provide support for this view in the sections that follow.

4 US households

It is a striking empirical fact that per capita consumption in the US grew at a steady rate of roughly $1,994 per year over the period 1980-1999, but jumped abruptly to approximately $2,849 per year from 2001 through 2007 (see Figure 9). How was this remarkable increase in consumption financed? The increase happened despite the March-November 2001 recession and subsequent jobless recovery which resulted in no significant increase in hourly earnings nor in non-farm employment rates. [24] In fact, per capita consumption in excess of wages and salary accruals and proprietors' income increased by almost 230% from approximately $2,181 in 2000 to $7,255 by 2007. The stock market was also roughly flat between 2000 and 2007 with the S&P500 starting at 1,499 in 2000 Q1 and ending at 1,421 in 2007Q1. The single item in the portfolio of US households which performed spectacularly well during the period was their heavily leveraged position in real state: Home values went through an unprecedented growth spell, almost doubling in value between 2000 and the peak in early 2007.

Starting in the late 1990's the average national home value appreciation went from around 5% per year to a peak of 15% per year in 2006 before collapsing in late 2007 (see Figure 10). Over the pre crisis period, the S&P/Case-Shiller home price index went from 100.77 in 2000Q1 to 186.07 in 2007Q1.

Despite this dramatic increase in home values, households on average did not increase their home equity much, implying that excess consumption (including consumption of larger homes) absorbed most of the windfall gains. As can be seen from Figure 11, US household residential leverage (residential mortgage debt as a fraction of residential home value) increased from about 0.42 in 2000 to about 0.52 in 2007.

The sharp increase in leverage becomes transparent when we measure leverage as the

[22] Households may of course simply have reacted in a (bounded) rational fashion given a belief that the housing bubble would last, as predicted by models along the lines of Lettau, Ludvigson & Steindel (2002

[23] According to Krugman (2008), empirical evidence of this phenomenon might be very difficult to capture from the existing data on the trade patterns, and that may explain the why there is not much agreement on this among academics and regulators.

[24] Between 2001 and 2003, total non farm employment declined from approximately 132 million to 130 million while the ratio of employed people to population declined from 64 percent to approximately 62 percent. At the same time, the ratio of wages and salary accruals to national income declined from 55 percent to 53.2 percent while the median usual weekly earnings (in constant (1982) USD) remained flat at USD 325.

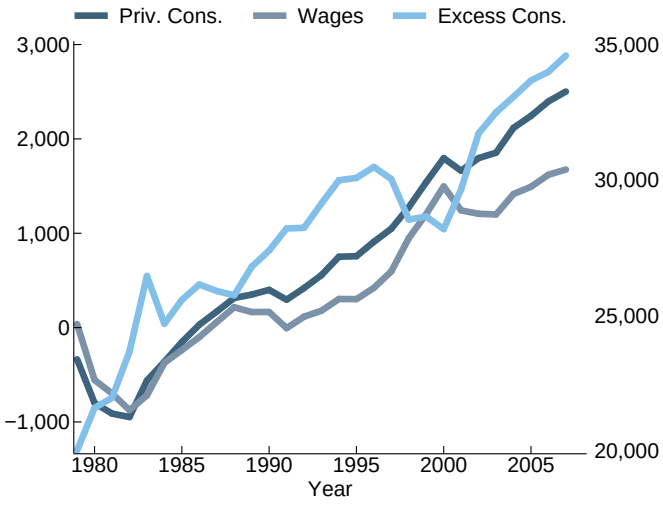


Figure 9: Private consumption and total wages incl. benefits (right axis) along with excess consumption calculated as private consumption less total wages (left axis). All numbers are in 1980 $ per household.

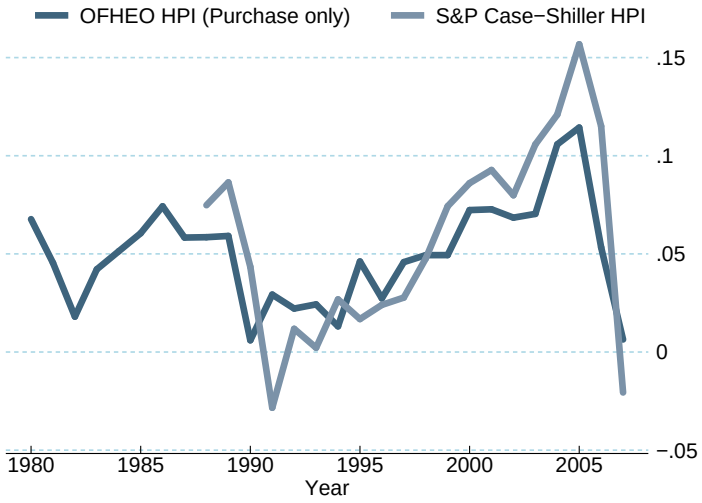


Figure 10: Home price appreciation (Q1 to Q1). Source: FHFA, Standard & Poors

ratio of debt to wages as seen in Figure 12. The ratio of mortgage debt to wages almost doubled from about 0.6 to 1.2, with most of the increase occurring during the 2000 - 2007 period[25].

Home prices rose sharply during 2000-2007. Whereas it took 20 years for household

[25]Palumbo and Parker (2009) point out that the System National Accounts for the US by the Bureau of Economic Analysis picks up the increases in the leverage of the household sector, but miss the rise in exposure to the US exposure to the housing market in the financial businesses sector.

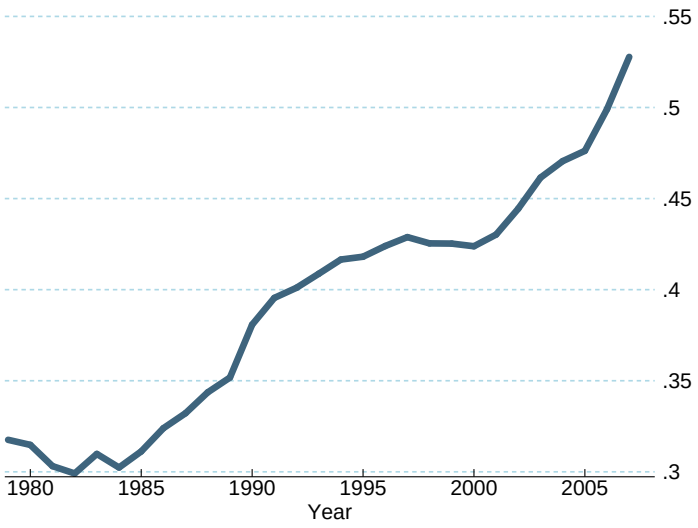


Figure 11: Average US household residential levererage computed as total residential mortgage debt divided by residential home values (primary residence only). Source: FOF, FHFA, OFHEO

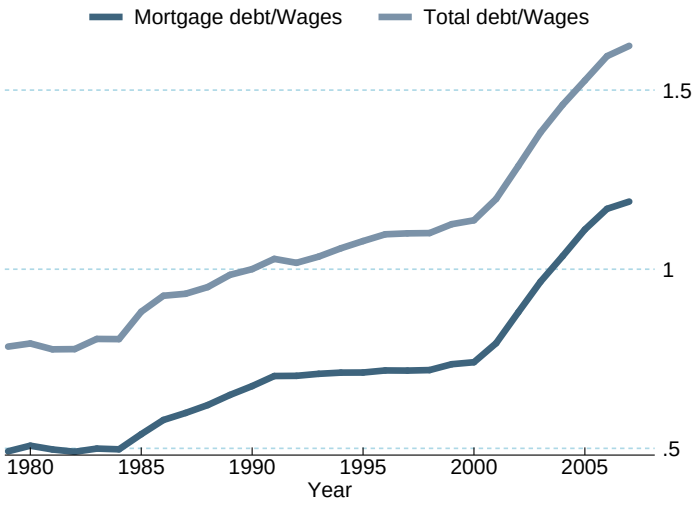


Figure 12: Average US household residential levererage computed as household debt divided by wages). Source: FOF, BEA

real estate value to increase by $72,916 per household – from $36,437 in 1980 to $108,633 (2.4WS) in 2000 – it took only 7 years for it household real estate value to increase by another $63,558 to $172,197 by 2007. As a multiple of household wages and salaries, household real estate value increased sharply from 2.4 to 3.1 during 2000-2007, whereas it only increased from 2.1 to 2.4 during 1980-2000. While home equity rose by 52 cents

for every dollar rise in home value between 1980 and 2000, home equity increased by only 29 cents for every dollar increase in home prices during the 2000-2007 period. This meant that rather than building equity, households withdrew a larger fraction of the increase in their home equity for consumption purposes, by maintaining a huge debt burden and consequently being massively exposed to the risk of falling home values, as subsequent events have borne out.[26,27]

It is important to note, however, that the behavior of US households during 2000-2007 can be rationalized if households firmly believed that past rates of house price appreciation were sustainable, and did not realize that they (or their children) would be liable for paying down the US government external debt eventually.[28] Understanding the fundamental forces driving housing prices is not easy and it is reasonable to assume that US households took home price increases to be permanent. Suppose households (on average) simply extrapolated prevailing economic conditions in forecasting the future, and believed that home values would continue to increase and that cheap credit would continue to be available through easy monetary policy and massive foreign capital inflows. Then the *permanent income hypothesis* would in fact suggest that households should increase their consumption by borrowing extensively against their unrealized housing gains. In the next section we show, using a stylized rational model of household consumption portfolio choice, that US households behavior was consistent the belief that the rise in housing prices were permanent.

[26] "The accessibility of the mortgage market to a wide variety of households has facilitated the extraction of equity in home ownership. Close to a fourth of the wealth of U.S. households, as you know, is in the form of equity in owner-occupied housing. When house prices increase, the level of this wealth–in the form of capital gains–rises, a substantial part of which is extracted as cash, mainly as a consequence of home turnover. We estimate, based on a median period of owning a home of nine years, that each home sale since 1995 has averaged roughly $35,000 in capital gains, implying a total of $150 billion annually for the economy as a whole. This is largely in the form of unencumbered cash, since, generally speaking, we find that the mortgage taken out by the buyer exceeds that of the remaining balance of the seller by something close to the realized capital gain. In addition, cash is extracted from unrealized capital gains through the refinancing process. While it is difficult to know precisely, at least a third to half of homeowners took some cash out when they refinanced their mortgages last year," Greenspan (1999).

[27] The danger of easy monetary policy leading to a boom and subsequent bust has been studied as one of the causes of the Great Depression. von Hayek (1933) suggests that an abrupt easing of monetary policy in the US starting in 1927 combined with the reluctance to liquidate unsound firms successfully postponed what would have been a mild recession by two years but created the preconditions for the Great Depression. In particular, Hayek argues that the policy of "easy money" lead to over-investment through "forced savings" leading to severe real distortions. In the current crisis, this raises the important question: Will the US stimulus package will ease or prevent the efficient process of liquidation, and hence whether it will further steepen the eventual cost of the crisis?

[28] The government's debt held by citizens wash out in the aggregate, but the external debt can not grow faster than GDP forever.

4.1 A Stylized Model of Households' Consumption Choice

We construct a stylized model of household behavior in order to better understand the response of households' consumption to a perceived increase in real estate wealth. The permanent income hypothesis states that households smooth the consumption of anticipated wealth increases over time while their consumption adjusts contemporaneously to *unanticipated* wealth changes. Consistent with this hypothesis, numerous studies have shown that changes in consumption are positively correlated with labor income and changes in wealth. Although one may think of housing and financial wealth as equivalent, there are a number of reasons to believe that households may respond differently to a $1 increase in financial assets versus a $1 increase in house prices. As Campbell and Cocco (2007) point out[29], housing is a leveraged asset for the average household and a $1 increase in housing values will act with a multiplier in relaxing a financially constrained household's borrowing constraint. Financial assets held by households, on the other hand, are typically not highly levered.[30]

Consider the following the simple model of household behavior where households derive utility $u(C_t, H_t)$ from consumption of non-durables C_t and housing H_t with prices P_t^C and P_t^H respectively. Each period, the household is endowed with one unit of labor income worth W_t and is subject to the budget constraint

$$S_{t+1} + P_{t+1}^H H_{t+1} - M_{t+1} = W_t - P_t^C C_t - T_t + \tag{1}$$

$$(1 + r_{t+1}^S) S_t + (1 + r_{t+1}^H) P_t^H H_t - (1 + r_t^M) M_t \tag{2}$$

where T_t are taxes, S_t is household net dollar holdings of financial assets (other than the risk-free), M_t is mortgage debt and r^S, r^H, r^M are the nominal returns on financial assets, housing and mortgage debt respectively. In addition, we follow Campbell and Cocco (2007) in assuming that individual households (denoted here by subscript i) are subject to a financing constraint which must then also hold in aggregate:

$$M_{it} \leq (1 - d) P_t^H H_{it} \tag{3}$$

$$S_t \geq 0$$

[29] Buiter (2008) argues that there will be no pure wealth effect on consumption from a change in the fundamental value of house prices, but there will be a wealth effect due to a change in the speculative bubble component of house prices.

[30] "... the equity extracted from housing does not fall unexpectedly into the sellers' laps all of a sudden. People who own a home likely have a sense of the appreciation in its value over the years. These unrealized gains may be factored into their long-term planning, and thus may influence spending on goods and services both well before and after the home is sold, rendering it difficult for models to capture this influence. For example, a middle-aged person who is sitting on a substantial unrealized gain in his or her house, but does not plan to sell for ten years, may still boost consumption today in anticipation of the realization of that gain.", Greenspan speech to the Mortgage Banker's Association, 1999.

where d is the minimum down payment (say, 20%).

A non-zero shadow value of the leverage constraint in (3) in the household optimization problem implies that housing wealth, labor income and financial wealth will act very differently when the leverage constraint starts to bind for more households. In particular, the results in Campbell and Cocco (2007) imply that, while we would not expect consumption to react to anticipated changes in either labor income nor financial wealth, anticipated changes in housing wealth should lead to changed consumption behavior for the subset of financially constrained households. Unanticipated changes in all types of wealth, on the other hand, should have the expected immediate effect on consumption. Since we here deal only with macro-level data, we cannot check these implications directly but instead rely on a regression specification relating changes in consumption to changes in the three components of the representative household net-worth: Human capital, financial wealth, and (net) housing wealth (t-stats in brackets below each point estimate).[31]

$$\begin{aligned}\Delta(P_t^C C_t) = \underset{(7.74)}{683} + \underset{(7.34)}{0.712}\Delta W_t + \underset{(-0.06)}{-0.001}\Delta S_{t-1} + \\ \underset{(5.68)}{0.084}\Delta\left(P_{t-1}^H H_{t-1} - M_{t-1}\right) + \varepsilon_t \qquad (4)\\ adj.R^2 = 79\%\end{aligned}$$

Note that in the specification (4), we use concurrent wage income but lagged wealth changes. This can be motivated by noting that households, when planning this years consumption, know their wages but do not know what return the stock and housing markets may bring.[32]

Notice that our point estimate 8.4% for the wealth effect on consumption due to a change in real estate net worth is the same as the estimate reported in column I of Table 1 in Case, Quigley and Shiller (2005) obtained using data on a panel of US states observed quarterly during the 1980s and 1990s. Figure 13 shows that (4) does a good job in explaining household consumption growth, consistent with the view that US households in all likelihood were behaving rationally given a belief that the rise in home prices was permanent.

For every \$1 in wage increase, 71¢ are spent on increased consumption. The corresponding numbers for a \$1 increase in housing wealth is a 8.4¢ increase in consumption spending, while other financial asset returns have little or no impact on consumption. While our estimate of 8.4¢ of consumption per dollar of real estate wealth appears rather large,

[31] Wages are a flow, but we think here of changes in labor income as a proxy for changes in the unobserved human capital.

[32] Note: What the optimizing agent framework buys us here (beyond the mere budget constraint) is the fact that housing wealth is different from other types of wealth due to the shadow value of the borrowing constraint and the fact that housing is both a consumption good and a store of value.

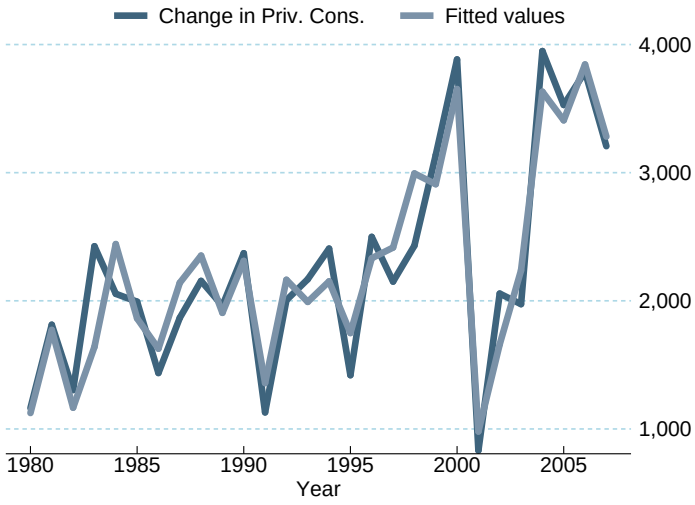


Figure 13: Year on year changes in private consumption are predicted by concurrent wages and lagged returns on housing and other financial assets. All numbers are in US$ per household.

note that we estimate the wealth effect on consumption for other wealth to be negligible – it may be so because it is difficult to borrow against other wealth, and home mortgage interest is tax deductible[33].

Having established the connection between home prices and excess consumption (leading to current account deficit), we proceed to examine the association between current account deficit and home prices in the next section.

5 House Prices and the Current Account Balance

The reaction of the real estate market (and by implication domestic consumption) to the availability of cheap and easy credit is an important channel we will consider. Denote by B_t^G the level of government debt, by T_{gt} the tax revenue of the government, by T_{ht} the taxes paid by the households, and by G_t government spending including transfers, then the government budget constraint is :

$$0 = B_t^G - B_{t-1}^G - r_t^G B_{t-1}^G + T_t - G_t \tag{5}$$

and the current account surplus is given by

[33]We find that the slope coefficients for the changes in domestic and foreign holdings of government debt are not significantly different from zero (results available upon request,) which is consistent with the view that investors ignore any changes in their financial liabilities due to changes in foreign or domestic holdings of government debt when making consumption decisions.

$$CA_t = \underbrace{W_t + r^S_{dt} S_{t-1} - C_t - r^M_t M_{t-1} - T_{ht}}_{\text{household net savings, HHS}} + \underbrace{T_{gt} - G_t - r^G_t B^G_{t-1}}_{\text{Gov't savings, GS}} + CS_t - CI_t - PI_t \tag{6}$$

where r^S_{dt} is the dividend and interest income on financial assets (including mortgages and government bonds), S_{t-1} held by households, and r^M_t is the interest rate on mortgage loans, M_{t-1} taken out by households, CS_t is Corporate Savings, CI_t is Corporate Investments, and PI_t is Private Investments by households.

Since the trade accounts must balance, capital account flows should be equal in magnitude but opposite in sign of the flows in the current account. Therefore, from the two above equations it follows that,

$$-CapitalFlows_t = CA_t = [(HHS_t - PI_t) + (CS_t - CI_t)] - (B^G_t - B^G_{t-1}). \tag{7}$$

We conjecture that to a first order, $(CS_t - CI_t) = 0$, and $(HHS_t - PI_t)$ is negative and invested mostly in housing, contributing to the housing price bubble, i.e., the capital flows into the US helped build up the housing price bubble and finance the increase in government borrowing, $(B^G_t - B^G_{t-1})$.

Taking China as our leading example of a country with large excess savings, the story goes as follows: the Chinese channel their current account surplus into US assets, in particular government bonds and household mortgages. The supply of Treasury securities, however, is limited, so much of the excess liquidity is absorbed in the mortgage market (in our simple model), leading to a positive feedback effect illustrated by the following stylized example:

> Suppose households increase consumption by \$1 today of which roughly 17¢ are spent on imports from e.g. China. Due to the high savings rate abroad, suppose 2¢ are channeled back into "safe" US denominated fixed income assets held by central banks and foreign households. If the supply of US government bonds is limited, treasury yields will start to drop to the point where foreigners in search of higher yields will find household mortgage debt attractive. That will increase the supply of mortgage debt – and in equilibrium result in an increase in the outstanding pool of home mortgages, in part due to reduction in mortgage interest rates and in part due to willingness to relax mortgage lending standards. This in turn has a direct wealth effect (lower payments) and an indirect wealth effect (increased demand for housing leads to house price inflation) which in turn results in higher consumption tomorrow.

As we will see later, a \$1 increase in inflows due to current account deficit is associated with almost a \$2 increase in home values. The wealth effect (8.4% of increase in home value) will result in an increase in consumption of 16.8¢ and a consequent increase in imports of about 3¢, i.e., the 4¢ flow back into the US will result in a 0.67¢ increase in consumption, and a 0.11¢ increase in imports. For the magnitude of the feedback effect to be much larger and significant, the share of imports in the increased consumption has to be much higher due to the change in the nature of the basket of goods consumed, and a majority of the households must be liquidity constrained, resulting in US households substantially leveraging their housing wealth for consumption purposes through home equity lines of credit.

To test this feedback from current account deficits to mortgage markets, we consider three regression equations estimated using annual data for the period 1980 - 2007.

First we examine the impact of the current account balance (CA_{t-1}) on the growth (change) on the pool of Agency and private label residential mortgage pools (ΔMP_t). We expect to see the growth in outstanding mortgage pool increase in response to an increase in the current account deficit (i.e., decrease in current account balance) with a one year lag to allow for transactions to take place. We also add the contemporaneous change in treasury issuance since it is exogenous (determined by government funding needs) and, according to our story, may crowd out demand for mortgage backed securities.

$$\Delta MP_t = \underset{(4.90)}{906.79} \; \underset{(-12.71)}{-1.11} \; CA_{t-1} + \underset{(0.19)}{0.06} \Delta B_t^G + \varepsilon_t$$
$$adj.R^2 \approx 91\% \tag{8}$$

We find that almost the entire dollar increase in current account balance goes towards increasing the pool of outstanding Agency and private label mortgages. As can be seen from the figure(14), the regression captures some of the turning points in the growth rate in the mortgage pool.

Second, we examine the change in residential home values ($\Delta P_t^H H_t$) in response to a change in the pool of outstanding Agency and private label mortgages (ΔMP_t) after controlling for the mortgage interest rate (r_t^M). The t-statistics of the estimated parameters using Newy-West standard errors with 6 lags are also provided.:

$$\Delta \left(P_t^H H_t \right) = \underset{(-1.17)}{-1684} + \underset{(2.09)}{227} \, r_t^M + \underset{(11.34)}{1.49} \, \Delta MP_t + \varepsilon_t \quad adj.R^2 \approx 77\% \tag{9}$$

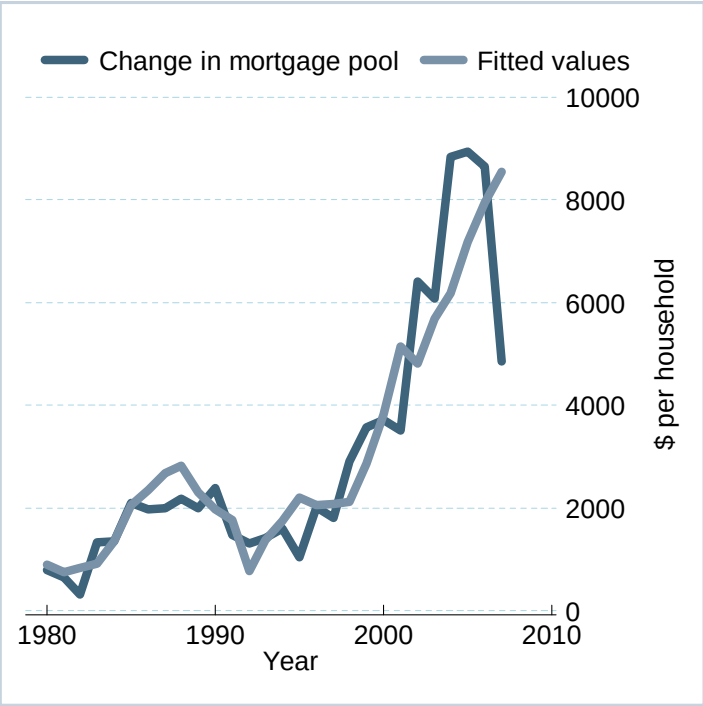


Figure 14: Change in Outstanding Mortgage Pool per HH vs CAB per HH

Again, as can be seen from the figure(15), the regression captures some of the turning points in the change in residential real estate values.

To summarize, the evidence is consistent with the view that the capital account flows that offset the current account deficits were channeled into residential housing and that contributed to the housing price bubble[34].

These findings support the feedback effect: US households consumed more than than their income because they felt wealthier due to home price appreciation. Excess consumption led to increase in current account deficit. For accounts to balance, there was a corresponding inflow of foreign capital that was channeled into home mortgages leading to a rise in home prices. That fueled continued excess consumption and the cycle continued for a while. Figure 16 illustrates that the size of the current account balance deficit was roughly of the same order of magnitude as the mortgage origination in the US. We now examine the role of financial engineering in channeling foreign funds flowing into the US into housing.

[34]This is not inconsistent with Favilukis, Ludvigson, and Nieuwerburgh (2009) who show that a two sector general equilibrium model with housing can generate large increase in housing prices when calibrated to match the increased foreign ownerhsip of US Treasury debt due to financial market liberalization can generate large increases in housing prices as observed during the 2000-2007 period in the US.

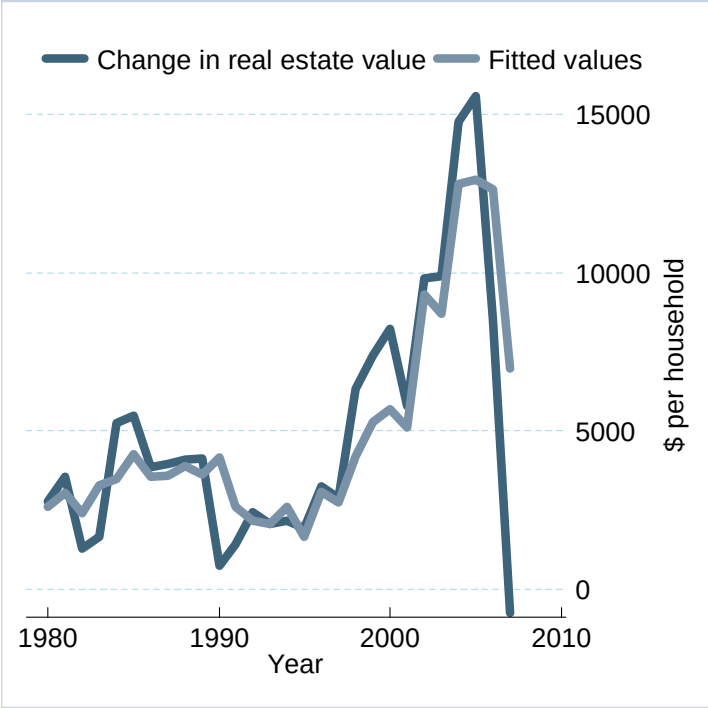


Figure 15: Change in residential real estate value vs change in outstanding mortgage pool and mortgage interest rate

5.1 The Role of Financial Engineering

Wall Street and financial engineering played an important role in facilitating what was already a crisis in the making. With US current account deficits reaching record levels, foreign savings were flowing into the US and especially fixed income markets lowering yields on Treasuries and mortgage backed securities.[35] This pattern continued after 2001 which saw substantial monetary easing in the aftermath of the 9/11 attacks and the suspension of the 30 T-bond as a result of the projected fiscal surpluses.

Prior to 1990, the Agency mortgage pools, consisting of conforming (e.g. 30 year fixed rate, $\leq$\$417K, $\geq$80% Loan-to-Value) first lien mortgages, were pretty much the only game in town when it came to mortgage backed securities, with private label issues playing only a relatively minor role (see Figure 17).

During the late 1990's a flurry of innovation took place in the mortgage industry, with new mortgage types being created which allowed homeowners to take bets on mortgage rates and enabled otherwise unqualified buyers to qualify for mortgages by deferring payments. These non-conforming mortgages were securitized through so-called "private label" Asset Backed Securities (ABS) sponsored by Wall Street. While the private label ABS

[35] See Boyd, Jagannathan and Kwak (2009) for a discussion.

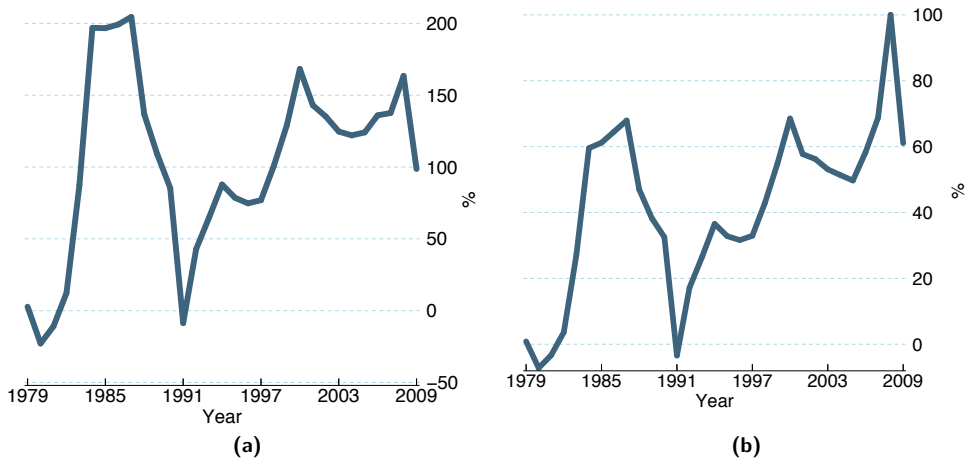


Figure 16: Size of current account deficit relative to housing market. Panel (a): Ratio of current account to estimate of mortgage origination associated with home sales (estimate based on total number of home sales and average mortgage debt per homeowner). Panel (b): Ratio of current account balance to total value of existing and new home sales. Source: FHFA

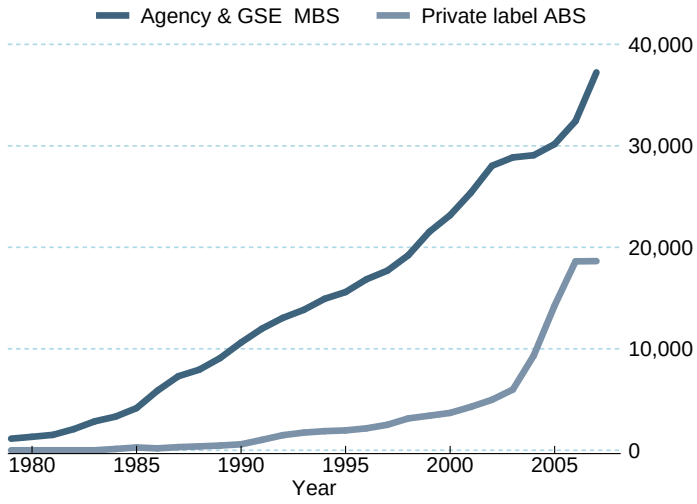


Figure 17: Outstanding mortgage backed securities by issuer in US$ per household. Source: FHFA

market had steadily increased in market share throughout the 1990s and early 2000s, it really took off at the end of the 2001-03 recession reaching a market share of around 50% by the end of 2006.

With rising housing prices and low rates on alternative investments, investors were tempted to reach for higher subprime yields, ignoring the potential for hitherto unseen levels of delinquencies down the road. The move into subprime was facilitated by Wall Street and credit rating agencies through financial engineering that transformed subprime

mortgage loans into new securities through several layers of intermediate structures that made it difficult for investors to fathom the underlying risks. At the same time, investors' appetite for taking on more traditional risks also increased substantially, as witnessed by the substantial tightening of high yield bond spreads that reached an all time low of around 258 bps in May of 2007.[36]

The adjustable rate 2/28 loans - where the interest rate for the first two years is fixed and the interest rate for the remaining 28 years is reset every six months - was common among subprime loans. The initial two-year interest rate on subprime loans was typically much higher than the then prevailing prime ARM rate. For example, Foote, Gerardi, Goette and Willen (2008) find that in their sample the first two-year rate was 7.3% in 2004, rising to 8.5% in 2006. The corresponding prime ARM rates were 3.9% in 2004, rising to 5.5% in 2006. By comparison, the corresponding fully indexed rates were 11.5% and 9.1%. Even the first two-year interest rate on a typical subprime mortgage was 300 bp higher than on the corresponding prime ARM. When housing prices were rising, most subprime mortgages were expected to be refinanced within two years of origination so that the higher fully indexed rates would never kick in. According to Foote, Gerardi, Goette and Willen (2008), over 60% of the originations prior to 2004 were refinanced within 2 years, in their sample of subprime mortgages.

Figure 18 shows that the origination of non-prime mortgages increased three-fold between 2001 and 2005, from $500Bn a year to more than $1,500Bn a year. At the same time, the Figure shows the marked shift in underwriting after 2003, with a large increase in home equity loans and sub-prime and Alt-A mortgages. The increased popularity of home equity loans is also borne out in Table 1, which shows that, although real estate values went up by $10,037 per household from 2004-7, the home equity actually fell by $10,566 over the same period, indicating that households, on average, were cashing out even faster than house prices went up. The reason for the spike in underwriting of high risk mortgages is easy to find: The credit spread for AAA MBS tranches went from 35 bps to 15 bps between 2003 and 2006. For BBB rated tranches, the change was from 375 bps to 175 bps over the same period. In other words, there was money to be made from securitizing pools of high risk mortgages and although sponsors most often would keep the equity tranche, much of this risk could be hedged out in the ABX market.[37]

Gorton and Metrick (2009) find that, of the about $2.5 trillion of subprime mortgages

[36] Based on the Merrill Lynch High Yield Master II Index.

[37] Credit Default Swaps (CDS) that are derivative contracts between two parties, where one party insures the other against default of an underlying security such as a corporate bond or a subprime mortgage backed security tranche. The ABX index references 20 mortgage-backed securities with the same credit rating and issued within six months of each other. The index is the equal weighted average of the price at which credit default swaps on those underlying names are trading. Contracts written on the index can be very liquid despite the fact that the underlying MBSs themselves barely trade.

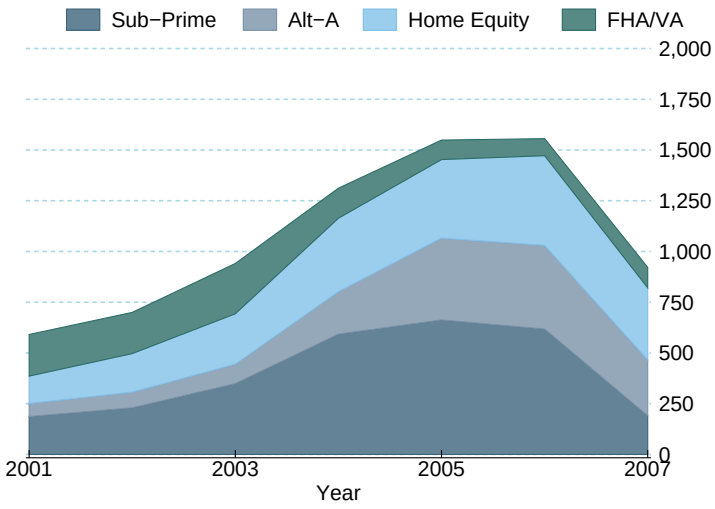


Figure 18: Origination of non-prime mortgages in US$M. Source: Federal Reserve

that were originated between 2001 and 2006, half of them were 2005 and 2006 vintages. Most subprime mortgages were securitized. 70% of subprime originations in 2005 and 2006 were securitized into residential mortgage backed securities. That typically involved pooling several individual mortgages, selling them to a special purpose vehicle (SPV), which in turn finances those mortgage holdings by issuing different tranches of bonds with credit ratings ranging from AAA to BBB (senior/subordinate structure), and often a excess spread/over collateralization structure (with an XS/OC tranche - i.e., deal assets exceed deal liabilities) and a residual unrated (equity) tranche. These tranches may be sold to investors directly or put into Collateralized Debt Obligations (CDOs) - SPVs that buy various types of debt including subprime mortgage tranches, pool those assets together and finances those assets by issuing liabilities that may also have tranche structures. All these securities are traded, and often those trades are financed using Repurchase (Repo) agreements. In a typical Repo, the owner of the security (say a bank, borrower) sells the security to the financier (lender) with an agreement to repurchase the same security at a future date at an agreed price above the purchase price. The repurchase price is set below the market value of the security involved by a haircut to provide a cushion against adverse price movements. The haircuts depend on the situation on hand and the security concerned. The repo market is rather large in size. - Hoerdahl and King (2008) find that that the notional value of the repo market (involves double counting of repos and reverse repos) in the U.S. exceeded $10 trillion by mid 2008 based on data provided by 19 primary dealers and over 1000 bank holding companies - almost 70% of U.S. GDP. Figure 19 provides some insight into the increasing use of overnight financing by primary dealers to purchase non-treasury securities and in particular mortgage linked securities. At the peak in 2007, almost $1Tn in agency

MBS was financed overnight and another $350Bn in "corporate" securities much of which was senior tranches of sub-prime CMOs. While the "rehypothecation" and staggering amounts of leverage available in repo markets arguably played an important role in the propagation and amplification of the housing bubble, it itself was only made possible by the ample supply of "real" money that both bought the mortgages and supplied the leverage.

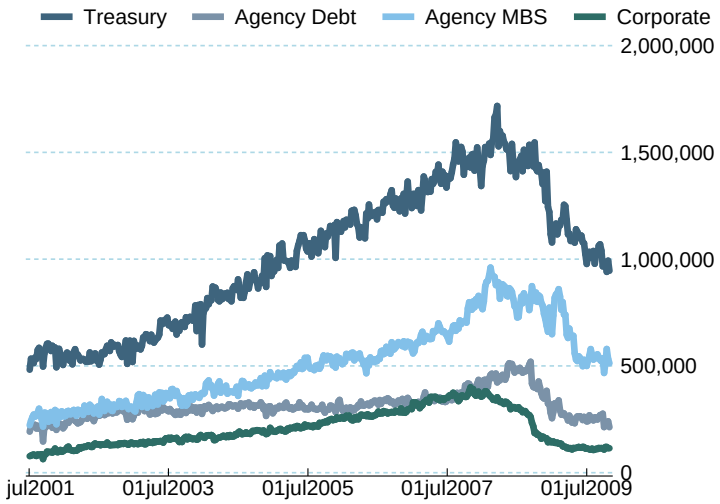


Figure 19: Average daily volume ($ Millions) by collateral type of transactions in which primary dealers Repo out the underlying security (i.e. the dealer borrows to finance the asset purchase). The definition of "corporate" securities include : bonds, notes, debentures, CMOs and REMICs (including residuals), commercial paper and privately placed securities (e.g., 144a securities). Source: Federal Reserve FR2004

Money chasing home mortgages is evident from the steep decline in the the spread between the rate at which mortgage loans were advanced to home owners and the yield on securities that were backed by those mortgages during the 2004-2006 period (see Figure 20.) There is evidence that that underwriting standards came down as a result of the money flowing into mortgages. For example, Gerardi, Goette and Willen (2008) find that prime lenders would have rejected most of the loans originated by subprime lenders, and many recent foreclosures involved mortgages with little down payment where the owners lived in their homes for a relatively short period of time, with higher foreclosures stemming from falling home prices.

To summarize, financial engineering greatly expanded the capacity of the US housing market to absorb the money that was flowing into the US at increasing rates, thereby allowing households to achieve record high levels of leverage, as seen in Figure 12. At the end of 2006, subprime and alt-A loans accounted for roughly 72% of ARM debt outstanding - that is roughly $2.5 trillion in debt, or 25% of the total mortgage debt outstanding. This



Figure 20: 30 Year Conventional Fixed Mortgage Rate Minus Yield on Corresponding Mortage Backed Security in the Secondary Market). Source: Bloomberg: 30 Year fixed rate and Fannie Mae current coupon yield. Bloomberg codes: ILM3NAVG Index (mortgage rate); MTGEFNCL Index (Fannie 30 yr yield)

represents about 9.6 million loans, or roughly 19% of the total number of mortgage loans outstanding. The money flowing into the housing market led to the housing price bubble: The S&P Case - Shiller home price index increased from 100.77 in 2000 Q1 to 186.07 in 2007 Q1, i.e., an increase of 86%.

5.2 The Role of the Government

Certain actions taken by the US government and its agencies during the 2001-2007 period have been suggested as contributing factors in the buildup to the financial crisis.

While fiscal policy may have played some role in laying the ground work for the financial crisis, it was less important than the behavior of the private sector and households. During mid 80s, government deficits were around 4.5%, larger than the Balance of Payment deficits which were around 3.25%. Since the capital flows into the country that were needed to offset the current account deficits were smaller than the government deficits, part of the government deficits were offset by net domestic private sector savings, i.e., the private sector accounted for a net surplus of capital flows. This had changed dramatically starting in the late 90's. By 2006, the federal deficit was around 2.5% and dwarfed by the current account deficit of around 6%, the result of a decade of net capital inflows. In other words, while the government deficit is clearly important, it was not the main driver of capital inflows during the buildup to the recent crisis.[38]

[38] Ever since the first income tax was introduced in the US in 1894, interest expenses have been deductible

The stance of monetary policy during the post recession 2002-2005 period was arguably very accommodative with the real short rate in negative territory during much of the period. Combined with a steep slope of the yield curve, it no doubt provided an incentive for homeowners to shift into riskier ARMs and for investors to finance short and invest long. However, even if the growth of the housing bubble benefitted from the low level of the policy rate, it hardly can be blamed for the poor quality of the subprime mortgages originated with much of the expansion coming from the subprime and Alt-A segments. Moreover, it is difficult to make the direct link between the level of the fed funds rate and house prices given that the rate of house price increases accelerated sharply in 2005 and 2006 long after the fed had started tightening substantially.

Arguably the most direct way in which government policies helped spur the housing bubble was through the affordable housing mission given to the government sponsored enterprises (GSEs) Fannie Mae and Freddie Mac by congress in 1992 in order to expand housing opportunities for low- and moderate-income families. In nutshell, the basic business model of these GSEs consisted of two lines of business. The first, was the securitization and guaranteeing of conforming prime mortgages which required a relatively low level of capital reserves (2.5% was mandated) given the high quality of collateral (the federal government providing the ultimate tail risk insurance). The second line of business was the retained portfolio of investments in MBS which was allowed under the charter as long as the tranches purchased satisfied the 80% LTV requirement. The GSEs could not guarantee subprime mortgages directly in order to fulfill their affordable housing mandate. Instead they were allowed to purchase ostensibly safe tranches of private label MBS securities backed by subprime mortgages and count these investments toward their obligations to lend to lower-income home buyers. In addition both Fannie Mae and Freddie Mac bought huge amounts of Alt-A and option ARM mortgages (although these did not count toward their HUD requirements) at very attractive spreads to their near treasury cost of funding. In fact, the majority of the profits mad by the GSEs in the years leading up to the crisis came from the retained portfolio (arbitraging the implicit tax-payer guarantee of agency debt) rather than the core guarantee business. The ability to lever up 40 times, meant that the GSEs' retained portfolios (much of it subprime) quickly grew to gigantic proportions and on the eve of the crisis in 2007 the GSEs, with more than a trillion dollars in their retained portfolios, were the single largest subprime investors.[39]

with the original logic being that most interest expenses were associated with the running of farms and businesses. The deduction effectively treats mortgage interest as a business expense thereby allowing homeowners to deduct it from taxable income. However, whereas a business must pay tax on the net income with which the interest expense was incurred, homeowners do not pay tax on the imputed rental value of their own home. The mortgage interest deduction under US tax law therefore represents a subsidy to the housing market, but cannot hardly be blamed for a bubble occurring a century later.

[39] In the aftermath of the crisis, a large number of articles have been written on the the role of GSEs, see eg. Wallison and Calomiris (2008) for an early discussion.

6 Why Housing Bubbles are Different

In this section we elucidate why even a relatively modest housing bubble may have more severe real effects than other asset price bubbles, e.g. a stock market bubble.

6.1 Money Channeled into Housing has a Bigger Price Effect

To understand why money channeled into housing can have a bigger price effect, consider the following hypothetical economy with 10 households. Each household has $100 in housing wealth and $100 in stocks. Suppose there is a sudden helicopter drop of $10 per household, that each household has to use in bidding up the prices of stocks or housing.

First, suppose households decide to use the money to bid up the price of stocks. The total value of stocks before the helicopter drop of money was $1,000. The total value of stocks will go up by $100, the total amount of money dropped, i.e., an increase in price of 10%. Whether everyone invests their $10 directly in stocks or nine of the households lend their money drop to the tenth household which in turn invests the $100 ($90 borrowed plus $10 of its own) in stocks does not matter. The price effect on stocks will be the same. There is no leverage effect in the aggregate, since stocks are homogenous.

Next, suppose households decide to invest the money to bid up the price of housing. When there is no leverage allowed, and each household bids up the price of its own house, the price rise will be $\$10/\$100 = 10\%$.

Suppose leverage is allowed. Nine of the households give their money to a bank. The bank lends the $90 to one household. That household uses that to bid up the price of its house. The price rise will be $\$100/\$100 = 100\%$. Other households will also think their house value has gone up by 100%, since assessors use comparables for home valuation[40]. Hence there is leverage even in the aggregate in housing and there is a money multiplier effect on housing prices. The same amount of money flowing into housing is likely to cause a bigger price rise. This is consistent with Piazessi and Schneider (2009) who show that a small number of optimists can drive up the average transaction price of houses without a large increase in trading volume or market share.

Like all bubbles the housing price bubble also collapsed eventually. The wealth effect that kept consumption up vanished. The financial intermediaries that channel money into housing were also highly levered, worsening the situation when the bubble burst. The recession followed.

[40]Unlike stocks, houses are illiquid with few transactions relative to the number of homes in the economy. As Piazessi and Schneider (2009) observe, less than 6% of owner occupied houses are traded during a typical year whereas the annual trading volume for stocks in the NYSE is about 120%. In view of that the common practice is to value houses by examining the price at which a similar comparable house transacted recently.

6.2 A Housing Bubble is Different from a Stock Market Bubble

It is interesting to contrast this experience with the even more dramatic (in percentage terms) stock market collapse in 2000 While the stock market downturn led to the shallow recession of 2001, the collapse of the housing bubble has led to a much more severe recession now[41]. While the real effects of the recession following the stock market collapse were largely ameliorated by the highly accommodative monetary policy which saw the federal funds rate lowered from 5.31% in March 2001 to 2.09% in November 2001, it can not explain the severity of the recession we are facing now.

A crash in the value of home values has a far more severe impact on the economy than a corresponding decline in the value of stocks for the following reasons.

Residential real estate constitutes a substantial part of household wealth for most households. For the middle three wealth class quintiles of the population, the principal residence constituted 66.1% of the value of the total household assets, whereas corporate stocks and financial securities constituted only 7.9% (cf. Table 7, Wolfe (2007)). In 2004, 48.6% of all families held stocks, with a median value $24,300. In contrast, 67.7% of all families owned their primary residence, with a median value of $131,000[42]

Investment in housing typically involves leverage, whereas there is relatively little leverage in stock investments. For example, mortgage debt was about 47.4% of residential real estate value in 2004 whereas other debt was only 6.8% of the value of the other assets of households. Averages understate the leverage available for investing in residential homes. For example, 51% of all loans that originated in 2006 had a CLTV (combined loan to value ratio) of more than 80%; 29% of originations in 2006 had a CLTV of more than 90%.[43]

Residential real estate being a large fraction of the total assets of households together with the fact that households can and do use real estate as collateral to borrow against implies that a perceived increase in household wealth will result in a large increase in aggregate consumption. That view is consistent with the estimates in equation (3): a $100 increase in housing wealth is associated with a $8.40 increase in consumption. In contrast there is hardly any increase in consumption due to increased stock market wealth. The corollary is that bursting of the housing price bubble will have a far severe adverse impact on consumption.

Recovering from a recession often involves households moving to another location so

[41] That the bursting of real estate bubble, unlike the bursting of the stock market bubble, can have disastrous consequences is well recognized by economists. For example, Franklin Allen, in his keynote address at the 8th Asia Pacific Finance Conference held in Bangkok (July 22-25, 2001), cautioned that the bursting of the real estate bubble might lead to a long recession in the US just like that in Japan.

[42] Recent Changes in U.S. Family Finances: Evidence from the 2001 and 2004 Survey of Consumer Finances.

[43] "Anatomy of a Credit Collapse," Confidential Kellogg Presentation, Amitabh Arora, December 2007.

that the skills of agents in the economy are better matched to demands for those skills. However, the recovery will be made more difficult when the recession is associated with a collapse of housing prices. That is because moving involves selling the current home and using the equity released from that sale to buy another home in a different location. When the equity in the home has been lost, selling a home and moving becomes difficult. To understand why, consider a hypothetical open economy with two agents, a and b. Agent a lives and works in location A and b in location B. Each lives in a house valued at $100 and a mortgage debt of $80. There is an unanticipated technology shock that makes the skills of each agent not relevant in their respective locations. However, if A moves to B and B moves to A, they can maintain their productivity and their jobs. If the housing values remain the same, each can sell their house to the other (through an intermediary,) payoff the loan, take a new loan for the same amount, and move. Suppose, instead the housing values drop to $80 and that the banks require a minimum equity of 20%. In that case, if they cannot sell their houses – their equity has been wiped out. Because they cannot relocate, they cannot recover from the adverse impact of the technology shock.

7 Why Did the Bubble Burst?

The remarkable economic growth in emerging nations was associated with a rapid increase in prices of intermediate production goods and especially commodities, with the Goldman Sachs Commodities index more than quadrupling between 2002 and the peak in early 2008. While the wages of the median US worker grew modestly, and in line with the core CPI, over the same period, the volatile food and energy components of the CPI started growing at an accelerated rate in late 2003 through early 2008. This caused trouble for many subprime home owners with high back-end debt-to-income ratios since food and energy takes up a significant share of disposable income for such households. By mid 2007, many subprime households were effectively left with the choice between between filling their trucks and fridges or paying their mortgages which lead to a steep rise in 90+ day delinquency rates for the 2005-2007 vintages which arguably had the worst underwriting standards. Interestingly many defaults started occurring within 12-18 months of origination, well before the reset date of subprime ARMs, indicating that the cause was related to a cash flow problem rather than inability to refinance after the initial teaser rate reset.[44]

As subprime households started to default on their loans, downward pressure on house prices resulted due to foreclosures. Spreads on MBS tranches started blowing out putting subprime originators in trouble, and leading to the Bear Stearns hedge fund collapse in 2007, and banks being forced to take on more of the MBS exposure on their balance

[44] See Haughwout et al (2008) for a detailed discussion of the early delinquency phenomenon which is otherwise hard to reconcile with other macro economic shocks or strategic defaults by households.

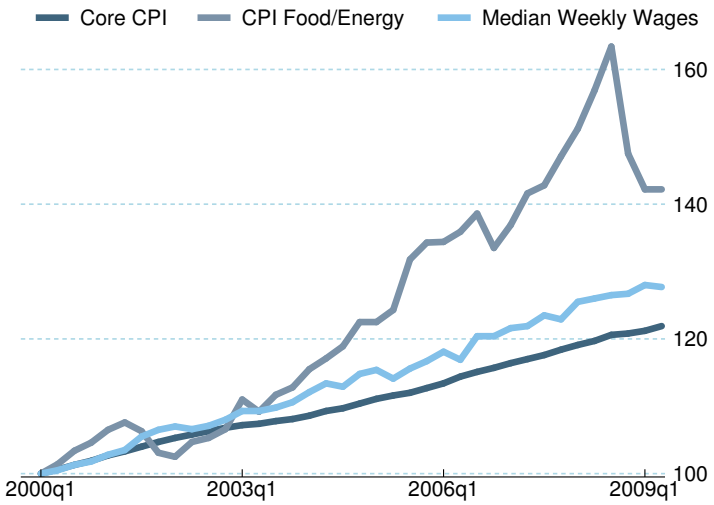


Figure 21: Core Consumer Price Index (excl. food & energy), the food & energy component of the CPI, and the median hourly wages of all employed older than 25 years. All numbers are quarterly and indexed to 2000 levels. Source: BEA & BLS

sheets. Repricing of risk in the market dried up availability of teaser rate loans to home owners with ARMs (see Figure 23) and the resulting funding problems at subprime and Alt-A lenders led to an increase in the number of disqualified borrowers due to tightened credit standards and "disintermediation". This had the effect of dramatically increasing bank inventories of foreclosed properties which was only partially off-set by decrease in housing starts.

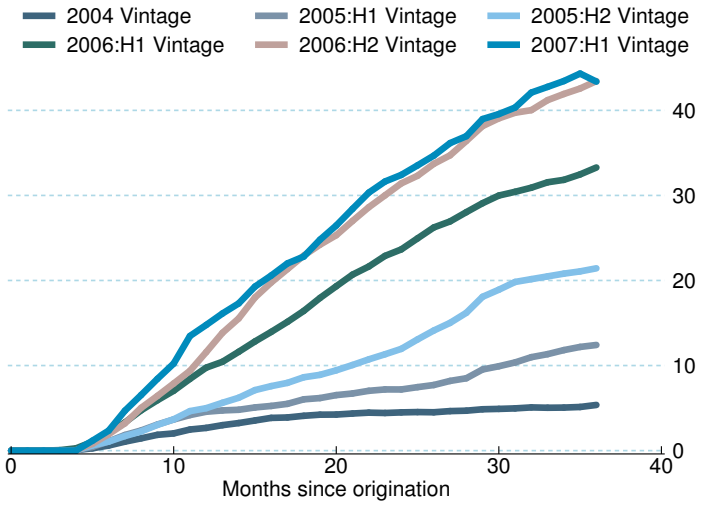


Figure 22: Cumulative serious delinquency percentage rates (90 days+) for subprime vintages as a function of months since origination. Source: LoanPerformance

Sophisticated investors who saw signs of events that could trigger the collapse of the housing bubble started taking a short position on US housing. Wall Street created financial instruments to meet the demand for shorting the US housing market. In early 2006, the first subprime mortgage backed credit derivative indices were launched (e.g. the ABX.HE index) in order to allow investors to take bets on the subprime market without holding the underlying asset backed securities. According to subsequent reporting in the press, investment banks and large hedge funds started making large leveraged bets against subprime using these newfangled instruments by late 2007. Thus financial engineering, which had helped bring about the housing bubble in the first place, also played an instrumental role in the bursting of the bubble.[45]

The sub-prime ARM debacle was eerily reminiscent of the experience with the short term balloon mortgages that were the norm prior to the Great Depression. On such balloon mortgages, the principal was at most partially amortized at maturity, leaving the homeowner with the challenge of refinancing the balance at maturity. During the Great Depression, this system of home financing resulted in a lengthy period of foreclosures and defaults as homeowners could not roll over their mortgages. As a direct consequence of this experience, the Federal Housing Administration (FHA) popularized the 30 year fixed rate mortgage in the 1930s as a standardized long-term, self-amortizing, home loan that allowed homebuyers to lock in fixed, affordable monthly payments over the entire life of the loan. It allowed generations of americans to accumulate wealth for retirement by building equity in their homes. This was yet another lesson from the Great Depression that was forgotten by the financial community by the early 2000s.

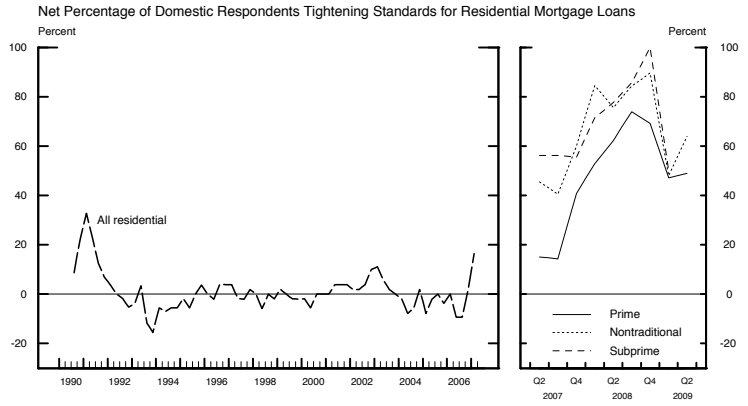


Figure 23: Percentage of loan officers at major US credit institutions reporting tightening of credit standards over prior year for residential mortgage loans. Source: Federal Reserve Survey of Loan Officers

[45] "Banks Bundled Bad Debt, Bet Against It and Won", New York Times December 14, 2009

8 The US is not Alone: Some International Evidence

A number of countries experienced a period of current account imbalances and anemic personal savings rates similar to the US.

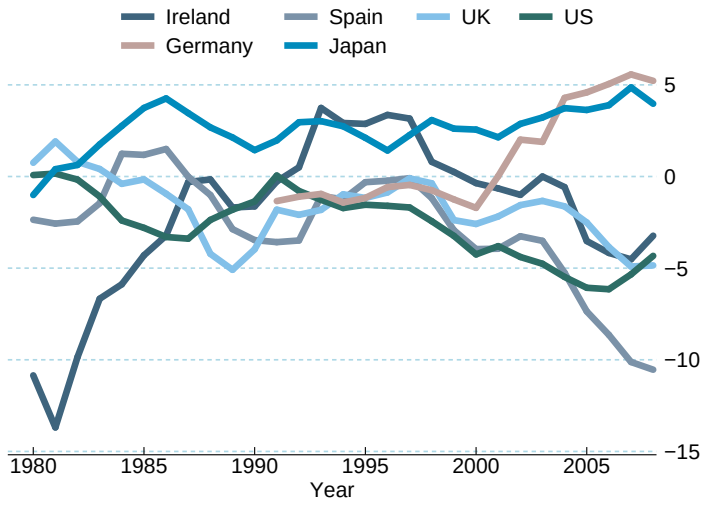


Figure 24: Current account balances as percentage of GDP. Source: OECD Economic Outlook 2008

Interestingly, every developed country running a significant CA deficit also had a housing bubble and a subsequent crash (shown by extending the graph to 2008/9.) By contrast, CA surplus countries did not have housing price bubbles as illustrated by Germany and Japan in Figure 25. Similarly to the US, these countries will now face the task of stimulating their economies while credibly promising to impose the fiscal discipline necessary to paying off their debts in the future. This will be the more challenging without the benefit of having the reserve currency at their disposal. They will not have the option of simply printing money, as the painful runs on the British pound in 1992 is still fresh in memory.

9 Conclusion

The common wisdom is that cheap money and lax supervision of financial institutions led to this financial crisis, and solving that crisis will take us out of the recession. We argue that the financial crisis is just the symptom. The fundamental cause of the crisis is the huge labor supply shock the world has experienced, that led to the glut in liquidity and money supply through the various channels discussed in this paper. In a closely related paper, Obstfeld and Rogoff (2009) argue that global imbalances did not cause the increased leverage and the real estate bubble, but they were important co-determinants. In our view, the need

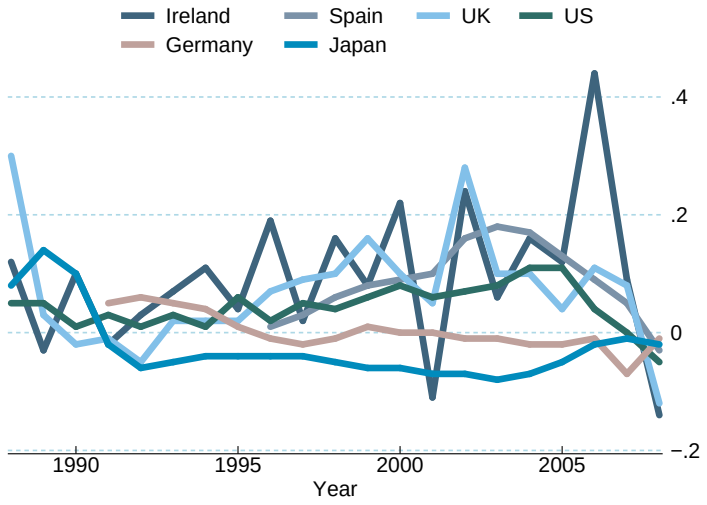


Figure 25: House price index, percentage change from previous year adjusted for consumer price inflation. Source: OECD Economic Outlook 2008

to accommodate the huge labor supply shock led to the economic policies followed by a number of countries in the 2000s that caused the distortions described by Obstfeld and Rogoff (2009).

Our analysis suggests that for recovery to take place the structural imbalances in global capital flows needs correction, in part through policy and institutional changes that promote higher saving in developed countries and capital flows into developing nations. Policies that promote households' understanding of the burden of the public debt in the US would contribute to higher saving. The value of the US dollar may have to decline substantially, and alternative reserve currencies may have to emerge to stop the flood of capital into the US. As we have argued, it is not sustainable in the long run to have the demand for dollar reserves grow much faster than the US economy.

The macro forces triggered by the labor shock is like a tidal wave that needed to wash ashore no matter what. History might have taken an entirely different path with better risk management controls in place in the US but then again, financial innovation might just have found a different way of getting highly leveraged deals done off-shore or through creative accounting[46]. However, none of these macroeconomic considerations negate the need for the development of improved risk management in the broadest sense in order to ensure financial stability and prosperity going forward.

China and India will continue to need to bring tens of millions of rural laborers into the productive workforce in the coming decades and the world economy must find a sustainable

[46]Reminiscent of when Regulation Q gave rise to the Euro dollar market in the 1970s, or how a wide array of investment vehicles are not covered in the Basel II risk accounting.

way of dealing with this influx. As China's rapid rate of growth continues, its export led growth strategy of the past cannot go on indefinitely and China's domestic consumption will eventually have to grow as a share of GDP. At the same time, Western economies will necessarily have to adjust to a new equilibrium in which commodities are scarcer and households face stiffer competition for jobs.

When millions of World War II soldiers returned home that increased the US labor force of about 60 million workers by almost 25% within a very short period of time. At that time the Department of labor, which certainly had no cause to accentuate the negative, predicted that 12 to 15 million workers would be unemployed.[47] That did not happen! That problem was managed well leading to prosperity instead of doom, thanks in no small part to the GI Bill and other governmental fiscal intervention. We believe that our analysis provides some new insights regarding the causes of the recession that will be helpful in managing this crisis well. The housing bubble created the illusion of wealth. In 2007 residential real estate was 1.45 times GDP. Suppose housing values have to drop by 25% to reach their "fundamental" levels of value. The impact on consumption given our estimate of 8.4% as being the wealth effect will be $1.45 \times 0.25 \times 0.084 = 3\%$. The economy should be able to recover from there and move on its normal growth path with the right policies in place. For example, in the US, institutions that allow households to reduce their debt burden without going through a complex and lengthy bankruptcy process would promote relocation of resources and speed up economic recovery.

[47] Richard Severo and Lewis Milford (1989), "Sweet Wine At Last," The Quarterly Journal of Military History, Winter 1989.

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A Data Sources

Data	Source
China GPD Relative to US GDP	China Statistical Yearbook, Bureau of Economic Analysis Table 1.1.5
China Savings Relative to US Savings.	China Statistical Yearbook, Bureau of Economic Analysis Table 5.1
China urban population in millions.	China Statistical Yearbook
Change in Chinese holdings of US assets by asset class in US $M.	US Treasury Department
Current account balance and change in household indebtedness.	Flow of funds accounts Table B.100, Bureau of Economic Analysis Table 4.1
Private consumption and total wages incl. benefits (right axis) along with excess consumption calculated	Bureau of Economic Analysis Tables 1.12 and 1.1.5
Home price appreciation	Federal Housing Finance Agency, Standard & Poors
S&P Case Shiller Home Price Index	Standard & Poors
Average US household residential levererage computed as total residential mortgage debt	Flow of funds accounts Table B.100
Graph incorrectly titled, should read "Total residential mortgage debt and total household debt divided by wages"	Flow of funds accounts Table B.100 and Bureau of Economic Analysis Table 1.12
Year on year changes in private consumption	Bureau of Economic Analysis Table 1.1.5, Flow of funds accounts B.100
Graph incorrectly titled, should read"Federal Deficit per household"	Congressional Budget Office of Management and Budget
Outstanding mortgage backed securities by issuer in US$ per household.	Flow of funds accounts Table L.218
Origination of non-prime mortgages in US$M.	Inside Mortgage Finance, 2007 Mortgage Market Statistical Annual
Consumer Price Index (CPI) and the Producer Price Index (PPI) for finished goods and industrial	Bureau of Labor Statistics
Percentage of loan officers at major US credit institutions reporting tightening of credit standards over	Federal Reserve survey of loan officers
Current account balances as percentage of GDP	IMF -World Economic Outlook Database
House price index	OECD Economic Outlook

Additional data sources:

Data	Source
Number of Households in the US	US Census Bureau
Trade Balance of US with partners	BEA international transaction accounts data 2a and 2b
Foreign holding of US debt	US Treasury Department
Total Public Debt (in the US)	US Treasury Department
Value of Corporate Equities	Flow of funds accounts Table L.4
Household networth	Flow of funds accounts Table B.100
US unemployment rate	Bureau of Labor Statistics
Current account balance for BRIC, NIAC, ME	IMF - World Economic Outlook Database
US Private consumption, wages, GDP data	Bureau of Economic Analysis Tables 1.1.5, 1.12
Central Bank foreign reserves	IMF COFER survey