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The economic impact of restrictions on housing supply: an investigation for the Barker Review

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Contents

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Introduction & summary

- This paper considers the wider economic impact of the low level of the price elasticity of private residential investment observed since 1988.
- Part 1 of looks at evidence from counterfactual simulations using the Experian Business Strategies UK Quarterly Model. Part 2 looks below the aggregate UK level to see if there are any differential north-south implications and to see if this has had implications for the capacity of the UK economy as a whole.
- Econometric evidence shows a sharp reduction in the price elasticity of private residential investment from mid-1988. Before then, we estimate that the long-run elasticity was 0.72 and that it was not significantly different from zero after mid-1988.
- Splitting private residential investment into new construction and repair, maintenance and improvement reveals no evidence of a long-run elasticity of new construction that is significantly different from zero over any time period and shows that the fall in the aggregate elasticity after the late eighties was due to a fall in the elasticity of repair, maintenance and improvement.
- Counterfactual simulations over the 1994 to 2002 period using the Experian Business Strategies UK Quarterly Macroeconomic Model indicate that if there had been a higher elasticity of private new construction of private residential investment since the mid-90's then the impact of aggregate demand would have dominated any deflationary impact from lower house prices leading to higher GDP, employment and consumer spending in 2002 than actually happened but accompanied by marginally higher inflation and a higher interest rates.
- A simulation over the 2004-2016 period, which assumes a gradual increase in the long-run elasticity of private new construction from 0 to 3, shows a sustained positive impact on GDP and employment. There is also evidence of a re-balancing of the economy with higher manufacturing output and lower household spending. There are also gains to public finances and to the current account.
- A feature of both the counterfactual simulation for 1994-2002 and the simulation over the 204 to 2016 period is the (assumed) muted response of productive capacity (underlying or potential GDP) and the consequential tightening of the output gap. This has consequences for both inflation and interest rates.
- One way that potential GDP could increase is through an easing of regional mismatches in the economy.
- Regional mismatches are very evident in relative employment rates yet recent years have seen growing net out-migration from south to north.
- Since the late eighties, housing starts in the south have been lower than in the north despite the south's growing share of national population.
- The process of easing regional mismatches in response to increased housing investment is slow but it will eventually yield economic benefits.
- In a separate exercise, we estimate that if the rise in real house prices since 1974 has resulted in a £91bn loss in consumer surplus and a £1.5bn deadweight loss to the UK economy.

1. Macroeconomic simulations

1.1 THE EXPERIAN BUSINESS STRATEGIES UK QUARTERLY MODEL

The Experian Business Strategies UK Quarterly Model is a large-scale quarterly frequency macroeconomic model of the UK economy. It is built around a national income accounting framework and has 213 stochastic equations and 264 identities. As well as containing expenditure and income blocks the model also contains a limited output side which identifies the value added of 11 sectors as an integral part of the model.

We have used the model to investigate the impact of a low price elasticity of private residential investment on the UK economy over the last decade by running counterfactual simulations which pose the question "what if the elasticity had been higher?" The private residential investment equation is described in some detail in the following (1.ii) section.

Over key relationships in the model for this work are:

House Prices – are based on an inverted demand function. The real price of houses varies positively with the real incomes of the credit constrained (mainly non-property disposable income) and with the ratio of financial wealth to non-property disposable incomes and negatively with real mortgage interest rates. Real rates are defined as nominal rates adjusted for changes to mortgage interest relief less expected house price inflation. Expected house price inflation is a function of current house price inflation, current consumer price inflation and changes in mortgage interest rates.

Terms for the ratio of part-time to total employment and the expected change in unemployment are also included as proxies for the uncertainty surrounding future incomes and the change in equity prices is also included in recognition of the substitutability of equities and houses as an investment asset.

The house price index used is the UK index produced by the ODPM.

Household Consumption – is based on the life cycle hypothesis. Spending is a function of non-property disposable incomes, property incomes of the credit constrained, the ratio of housing and financial wealth to non-property disposable incomes of the non-credit constrained, nominal short-term interest rates and the ratio of part-time to total employment and the expected change in unemployment (included as proxies for the uncertainty surrounding future incomes).

Housing wealth is defined as house prices multiplied by the residential capital stock multiplied by the owner-occupied share of the residential capital stock. The owner-occupied share is exogenous.

Inflation – the change in inflation is determined by the change in indirect taxes, the change in import prices and by the ratio of GVA to the underlying trend in GVA (referred to below as the output gap).

Short-Term Interest Rates – are determined by a reaction function. Two alternatives are used in the simulations reported here. In one, the expected change in inflation is determined solely by the current output gap, in the other it is determined by the current output gap and the current rate of house price inflation (see the Appendix).

Exchange Rate – the one-quarter ahead expected exchange rate is defined as either a function of the lagged actual exchange rate or of the lagged actual exchange rate and the relative price of consumer goods (UK vs. OECD), the ratios net acquisition of financial assets of the household and government sectors to nominal GVA, the expected value of future oil production and the ratio of business investment to GDP (see the Appendix). The difference between the actual and one-quarter ahead expected exchange rate is determined by the difference between UK and overseas interest rates (UIP assumption). An alternative exchange rate equation makes the difference between the actual and one-quarter ahead expected exchange rate is determined by the difference between UK and overseas interest rates and the change in UK house price inflation. The latter is intended to act as a proxy for changes in interest rates expected in forex markets (see Appendix).

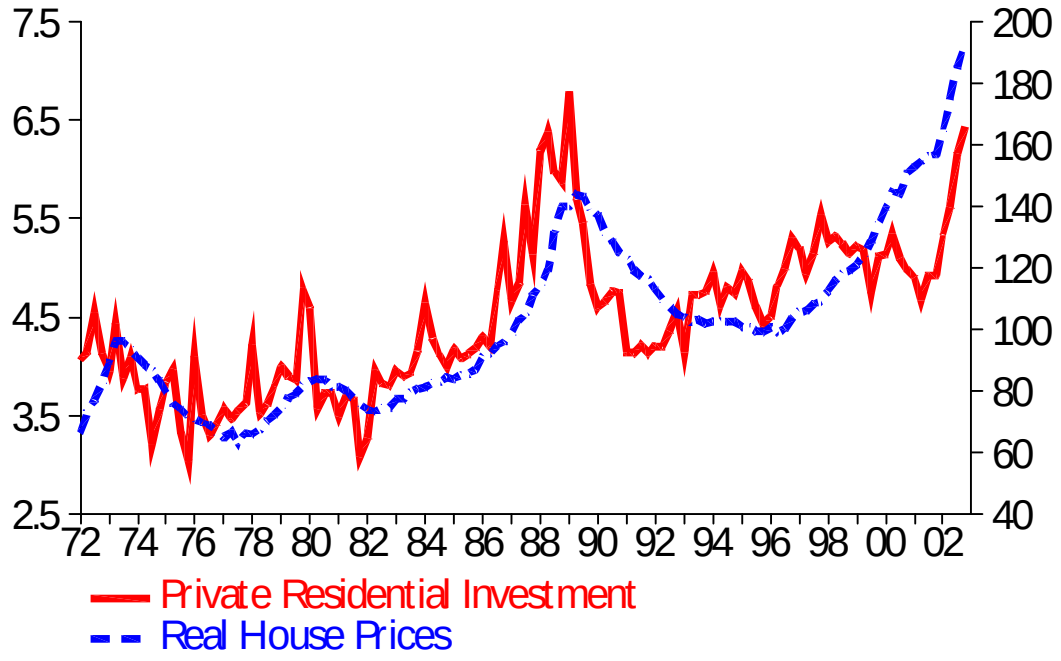
Potential GVA – is a key input into the output gap calculation. In the simulations presented below, potential GVA is assumed to change by an amount equal to the change in the output attributable to the ownership of dwellings, which in turn varies with the residential capital stock. As any changes to the residential capital stock will be due to changes in investment, which are the main focus of the simulations, this appears to be an appropriate assumption. Part 2 looks at the possibility of potential GVA increasing as a result of an easing of regional mismatches.

1.2 THE PRIVATE RESIDENTIAL INVESTMENT EQUATION

The UK Quarterly Model has an equation for private residential investment rather than for housing starts. This is partly because private residential investment is required to feed into total investment and into aggregate demand and partly because it is appropriate for feeding into the identity for gross stock of fixed capital in residential buildings.

Figure 1 shows movements in private residential investment and real house prices (the ODPM house price index deflated by the household consumption price deflator). Until the middle of 1988, private residential investment and real house prices are clearly correlated. Since the middle of 1988 this relationship appears to have broken down. First of all, private residential investment fell away strongly in the period after 1989 Q1 while real house prices stayed quite high even though it was falling. Subsequently, private residential investment remained quite weak after real house prices turned around in 1996. Private residential investment actually fell by 0.9 per cent between 1996 and 2001 while real house prices increased by over 50 per cent over the same period. The misalignment was partly corrected by a 21.2 per cent increase in private residential investment in 2002 but even taking this into account it only increased by 20.1 per cent compared to a 78.1 per cent increase in real house prices.

Figure 1: Private residential investment & real house prices



Source: ONS, ODPM

This is interpreted in the model as a change in the price elasticity of supply of private residential investment. Because of the obvious break in the relationship it is not possible to estimate a constant elasticity of supply over the entire period. To overcome this the model uses the following specification:

Equation 1

$$FIPRS_t = \sum_{i=1}^{3} \beta_i FIPRS_{t-i} + \sum_{i=1}^{2} \alpha_i \, PH_{t-i} / PDHHCE_{t-1} + \alpha_3 DHS . PH_{t-2} / PDHHCE_{t-2} + u_t$$

where:

FIPRS is	private residential investment
PH	the ODPM UK house price index
PDHHCE	household spending price deflator
DHS	a dummy variable equal to 0 up to 1989Q1 and 1 from 1989Q2

The α_i and β_i are estimated coefficients and u_t is the OLS residual.

The estimated short run elasticity (this is for the quarter after any price change as we assume that there is no instantaneous response) is equal to α_1 and the long-run elasticity is given by: $(\alpha_1 + \alpha_2 + \alpha_3 DHS)/(1 - \beta_1 - \beta_2 - \beta_3)$. The elasticity of supply will be positive as long as the sum of the α_i is greater than zero. The unrestricted estimation results for Equation 1 are given in Table 1:

Table 1: Private residential investment – unrestricted results
OLS, 120 observations, 1972Q1 – 2001Q4

	Estimated coefficient	**Estimated t-statistic**
$FIPRS_{t-1}$	0.5229	6.00
$FIPRS_{t-2}$	-0.1150	-1.13
$FIPRS_{t-3}$	0.2443	2.62
$PH_{t-1}/PDHHCE_{t-1}$	1.072	3.88
$PH_{t-2}/PDHHCE_{t-2}$	-0.8022	-3.31
$DHS_t.PH_{t-2}/PDHHCE_{t-2}$	-0.3377	-3.38
Constant	0.5440	
R^2	.814	
DW	2.01	
Post sample stability, $\chi^2(8)$	2.72	
LM, $\chi^2(8)$	12.1	

As Table 1 shows, the estimated short-run elasticity of supply is greater than one. The estimated long-term elasticity of supply is equal to 0.78[1] before 1988Q2 but is actually negative (-0.20[2]) after 1988Q2. Although negative, the estimated long-run elasticity of supply is not significantly different from zero and the actual equation used in the model restricts the long-run elasticity of supply to be equal to zero after 1988Q2. The estimation results for the restricted version are shown in Table 2:

Table 2: Private residential investment – restricted results

OLS, 120 observations, 1972Q1 – 2001Q4

	Estimated coefficient	**Estimated t-statistic**
$FIPRS_{t-1}$	0.5182	6.03
$FIPRS_{t-2}$	-0.1258	-1.25
$FIPRS_{t-3}$	0.2140	2.57
$PH_{t-1}/PDHHCE_{t-1}$	1.161	4.65
$PH_{t-2}/PDHHCE_{t-2}$	-0.8763	-4.65
$DHS_t.PH_{t-2}/PDHHCE_{t-2}$	-0.2844	-4.65
Constant	0.6078	
R^2	.813	
DW	2.00	
Post sample stability, $\chi^2(8)$	2.34	
LM, $\chi^2(8)$	13.0	

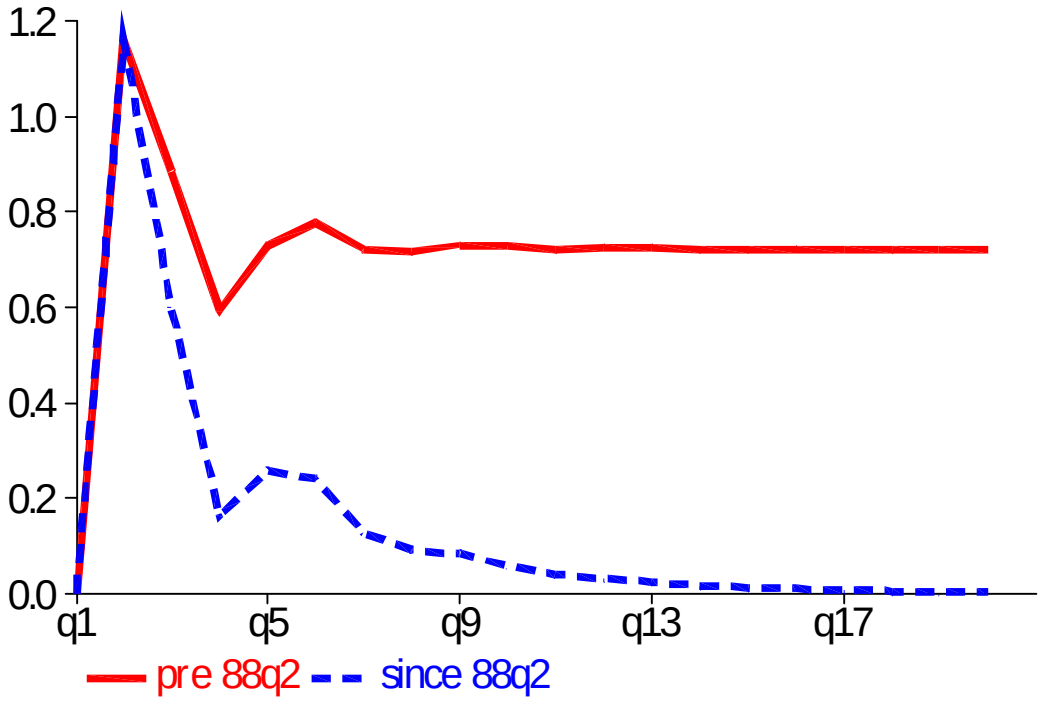
In the restricted equation, the estimated long-run elasticity is equal to 0.72 before 1988Q2 and zero afterwards. Figure 2 shows the response of residential investment to a sustained increase in real house prices. The peak response is after two quarters in either case, but in the pre-

[1]Long-run elasticity pre-88:2 = (1.072-.8022)/(1-.5229+.1150-.2443)= .7757
[2] Long-run elasticity from 88:2 = (1.072-.8022-.3377)/(1-.5229+.1150-.2443) = -.1952

1988Q2 relationship it levels off at a lower but positive level while it gradually approaches zero in the post-1988Q2 relationship.

Note that the equation was only estimated using data up to 2001 while official data are currently available to 2003Q1. This follows our usual practice of only using data up to the period covered by the latest National Accounts Blue Book[3] because of the liability of more recent data to substantial revision. This means that the estimation period does not include the rapid expansion of private residential investment in 2002. Using data up to 2003Q1 the unrestricted results show an estimated long-run elasticity of supply which is marginally but not significantly positive.

Figure 2: The elasticity of private residential investment w.r.t house prices



Note that the break in the relationship between private residential investment and real house prices from 1988Q2 is purely an empirical rather than one driven by theory. Possible explanations include a change/tightening of the planning system and an excess of investment in the years leading up to 1988Q2 in the anticipation of continuing increases in real house prices. This may have left developers with unsold properties and in financial difficulties with a subsequent impact of the psychology of developers that has persisted for over a decade. Whatever the reason, this specification will allow us to look at the consequences of the apparent change in the elasticity of supply in mid-1988.

Note also that the impact of any counterfactual assumption regarding the elasticity of supply since 1988Q2 will depend on the level of real house prices at the time. Specifically, had the elasticity of supply not changed, the equation suggests (in a single equation rather than a full

[3] This work was carroed nout before the publication of the 2003 National Accounts Blue Book

model context) that private new residential investment would have been higher between 1988Q4 and mid-1994, much the same as they actually were between mid-1994 and early 1997 when real house prices were close to their low point and then substantially higher in the period since early 1997 reaching a peak of nearly 50 per cent above actual in 2003Q1.

Disaggregating private residential investment

ONS do not provide a breakdown of private residential investment into new construction and repair, maintenance and improvement. We can, however, use data from the DTI on the output of the construction industry to create a breakdown. We have taken the private new housing component of the DTI data to represent new construction and have designed a residual, repair, maintenance and improvement category which is equal to the ONS series on total private residential investment less private new housing work. Figure 3 compares these two series with movements in real house prices. It is readily apparent from Figure 3 that the most obvious relationship is between "other work" and real house prices, before the late eighties at least. With this in mind we have re-estimated the Equation 1 (Table 1) in two parts, new construction and other work. This time we have restricted the estimation period to 1976 to 2001 as Figure 3 shows something of a break in the relationship in earlier years. We also had problems with serial correlation with estimating the equations over the broader, 1972-12001, period. We have also allowed the step in the dummy variable to take place in different period for the two equations. The results are shown in Table 3.

Figure 3: Private residential investment and real house prices

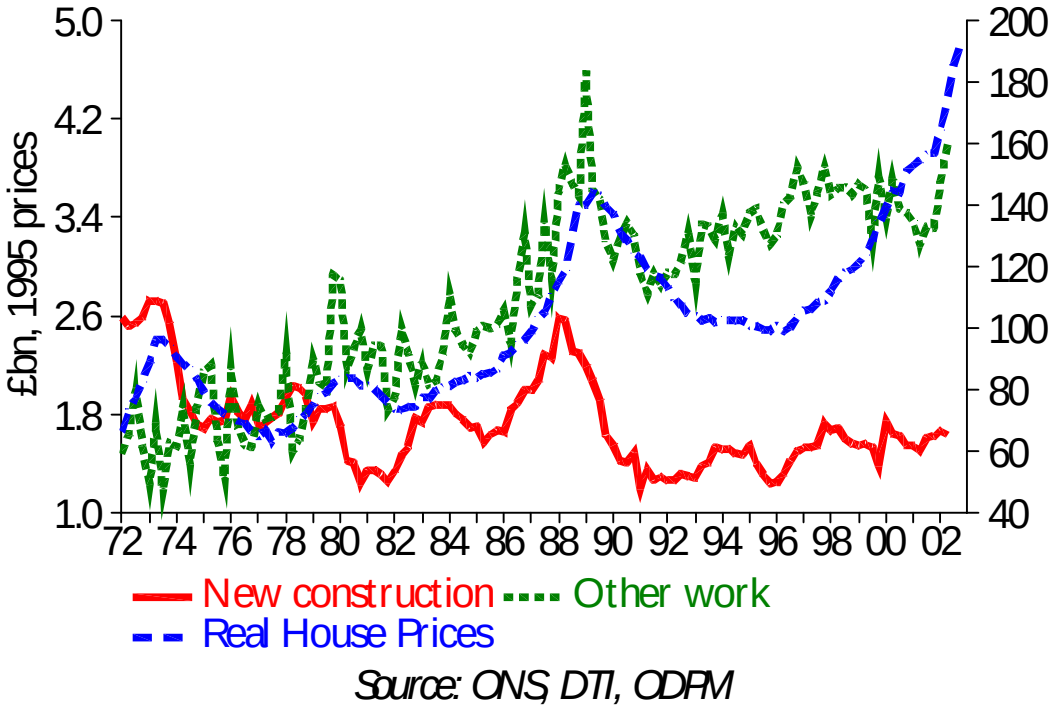


Table 3: Private residential investment – unrestricted disaggregated results

OLS, 104 observations, 1976Q1 – 2001Q4

	New construction		**Other work**	
	Estimated coefficient	**Estimated t-statistic**	**Estimated coefficient**	**Estimated t-statistic**
Dep Variable t-1	0.8385	8.89	0.2101	2.41
Dep Variable t-2	0.1982	1.57	-0.1411	-1.58
Dep Variable t-3	-0.2143	-2.27	0.2463	2.89
$PH_{t-1}/PDHHCE_{t-1}$	0.8568	2.86	1.6900	4.44
$PH_{t-2}/PDHHCE_{t-2}$	-0.9277	-3.07	-0.6250	-1.71
$DNH_t.PH_{t-2}/PDHHCE_{t-2}$	0.0442	0.56		
$DOW_t.PH_{t-2}/PDHHCE_{t-2}$			-1.1144	-5.03
Constant	0.0748		0.8213	
R^2		0.875		0.879
DW		1.96		2.03
Post sample stability, $\chi^2(8)$		16.9		4.68
LM, $\chi^2(8)$		17.6		13.5

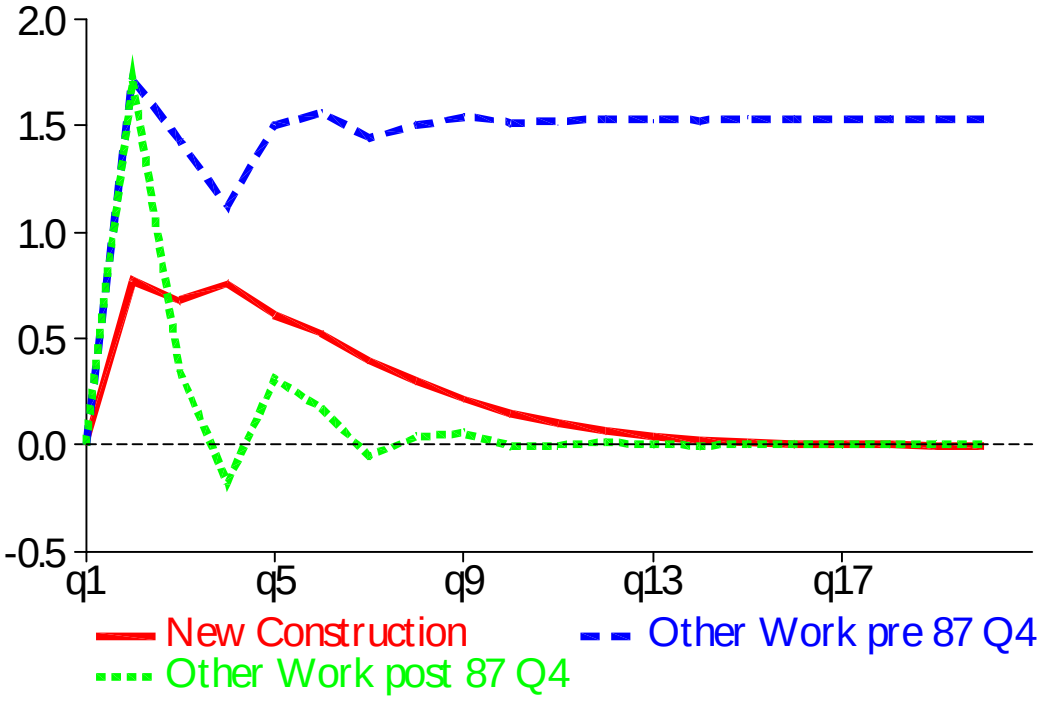
Where "DOW" takes the value zero until 1988 Q3 and then one thereafter, while "DNH" takes the value zero until 1991 Q1 and one thereafter (the steps were derived by finding the step which minimised the sum of squared errors). Table 3 reveals no evidence of a non-zero long run elasticity of new construction with respect to real house price. The estimated long-run elasticity is actually negative but insignificantly different from zero. The relationship for "other work" by contrast looks very like that for private residential investment as a whole with the long-run elasticity being significantly positive until the late eighties and then being insignificantly different from zero. We have estimated restricted versions of the equations shown in Table 3 where the long-run elasticity is equal to zero after 1988 Q4 in the case of "other work" and where it is always zero in the case of new construction. The results are shown in Table 4 and the elasticities (in response to a sustained increase in real house prices) are shown in Figure 4 (which is analogous to Figure 2 for the aggregate private residential investment equation).

Table 4: Private residential investment – restricted disaggregated results

OLS, 104 observations, 1976Q1 – 2001Q4

	New construction		Other work	
	Estimated coefficient	**Estimated t-statistic**	**Estimated coefficient**	**Estimated t-statistic**
Dep Variable t-1	0.8805	9.36	0.2056	2.44
Dep Variable t-2	0.2079	1.62	-0.1462	-1.68
Dep Variable t-3	-0.2538	-2.69	0.2342	3.04
$PH_{t-1}/PDHHCE_{t-1}$	0.7715	2.64	1.7108	5.95
$PH_{t-2}/PDHHCE_{t-2}$	-0.7715	-2.64	-1.3498	-5.95
$DOW_t.PH_{t-2}/PDHHCE_{t-2}$			-1.0778	-5.95
Constant	0.0744		0.8403	
R^2		0.868		0.878
DW		1.97		2.01
Post sample stability, $\chi^2(8)$		14.1		4.53
LM, $\chi^2(8)$		18.4		8.9

Figure 4: The elasticity of private residential investment w.r.t house prices – dissagregated results



The residential capital stock is equal to the lagged residential capital stock plus residential investment (private and public) less scrapping/demolitions (which is proportional to the capital stock in the model). In 2002, value of total residential was equal to just 2.2 per cent of the value of the residential of the capital stock or 2.1 per cent for residential investment. This means that even if the level of private residential investment in 2002 had been double what it actually was, then the residential capital stock would only have increased by 2.1 per cent. This is an important point in interpreting the estimates of the elasticity of private residential investment reported above. These are not elasticities of supply but elasticities of incremental additions to supply. A price elasticity of private residential investment of 0.73, for example, is the equivalent of a short-run (one-year) elasticity of supply of just 0.015 although this would increase over time if the price change was sustained. This is even more apparent if we just consider private new construction. In 2002 private new construction was the equivalent of just 0.6 per cent of the residential capital stock. This means that a doubling of private new construction will only increase the residential capital stock by 1.2 per cent.

Reconciliation with other estimates

The finding that there is no evidence of a positive long-run elasticity of private new housing construction is seemingly at odds with other work. Mean (work for the Barker Review 2003) argues that there is evidence from individual regional regressions of a positive long-run elasticity of private new housing starts with respect the house price-housing construction cost ratio in all English regions except Yorkshire and Humberside (Mean (2003), Table 7) although the results from a panel estimation showed no significant long-run elasticity for the South East or the South West (Mean (2003) Table 4). A further estimation at the England level, which includes housing transactions as an explanatory variable (Mean 92003), Table 9), shows a long-run elasticity of housing starts which is insignificantly different from zero.

A number of considerations need to be taken into account in comparing Mean's work with the results presented above. One is that Mean looks at England; the work here is for UK. Another is that Mean looks at the house price to construction cost ratio while we look at real house prices. More important is that the work here looks at the value of private new housing construction work measured at 1995 prices (i.e. the volume) rather than housing starts. Over the period considered there has been a sustained and statistically significant fall in the ratio of the volume of construction work on private new housing to the number of housing starts. This probably reflects the increasing importance of flats in new construction and the consequent impact on average values.

The result is that while Mean found a evidence of a slight upwards tend in starts up to 1990 (Mean (2003), p. 2), no such trend is evident in the volume of new construction and as we cannot explain changes in a stationary series (new construction) purely with reference to a changes in a non-stationary series (house prices), it is not surprising that we find no significant long-run relationship.

We have looked at the volume of new construction rather than housing starts, partly because it fits rather better into a macroeconomic modelling framework and partly because we consider that it is the appropriate measure of incremental changes to the residential capital stock with, in turn, is the most appropriate measure of housing supply (as opposed to the stock of dwellings which does not allow for changes in the dwellings mix over time – i.e. a bigger ratio of flats to houses).

1.3 COUNTERFACTUALS WITH A HIGHER PRICE ELASTICITY OF RESIDENTIAL INVESTMENT

1.3.1 Alternative results

During a period of high real house prices, an increase in the elasticity of private new housing construction will lead to an increase in the level of private residential investment and this can be expected to have a number of macroeconomic impacts:

1. An increase in investment will be an increase in aggregate demand which will lead to a higher level of output and employment.
2. In increase in private residential investment will increase the residential capital stock which, in turn, will put downwards pressure on house prices.
3. Changes to both house prices and the residential capital stock will affect the value of housing wealth and this will impact on the level of household spending.
4. Longer-run impacts will depend on the impact on inflation and the reaction of interest rates.

This Section looks at the impact on the Experian Business Strategies' UK Quarterly Model of a change in the price elasticity of private residential investment. Specifically, it shows the results of counterfactual simulations where we pose the questions[4]:

- "What would have been the macroeconomic impact been if the short-run elasticity of new construction with respect to real house prices had increased to two at the beginning of 1994 rather than staying at 0.7715 as shown in Table 4"

- What would have been the macroeconomic impact been if the long-run elasticity of new construction with respect to real house prices had increased to two at the beginning of 1994 rather than staying at zero as we observe in reality?"

As explained in Section 1.i, the model's properties will vary to some extent with the assumptions made about the determination of interest rates and exchange rates. Table 5 shows the implications of a number of combinations of assumptions for GDP and house prices in 2002. The assumptions are:

Interest rates

Expected inflation (expected by the MPC) depends on current inflation and the current level of the output gap (***assumption B***)

Expected inflation (expected by the MPC) depends on current inflation, the current level of the output gap and the current level of house price inflation (***assumption P***)

Exchange rates

The difference between actual and expected interest rates varies only with relative interest rates (***assumption B***)

The difference between actual and expected interest rates varies with relative interest rates and the change in house price inflation (***assumption P***)

[4] All of the counterfactual assumptions reported were requested by the Barker Review team.

Impact of Government finances on exchange rates

Government finances have an impact on the expected exchange rate (***assumption Y***)

Government finances do not have an impact on the expected exchange rate (***assumption N***)

Table 5: Impact of varying the elasticity of investment in new housing for 1994-2002 on GDP and house prices in 2002

assumptions:						
Interest Rates	*B*	*B*	*P*	*P*	*P*	*P*
Exchange Rate	*B*	*B*	*B*	*B*	*P*	*P*
Impact of GG on Exchange rate	*Y*	*N*	*Y*	*N*	*Y*	*N*
GDP						
Short-run elasticity of 2	0.0	0.0	0.1	0.1	0.1	0.0
Long-run elasticity of 2	0.9	1.0	1.0	1.0	1.0	1.0
House Prices						
Short-run elasticity of 2	-0.9	-1.0	-0.8	-0.8	-0.8	-0.8
Long-run elasticity of 2	-1.2	-1.2	-1.1	-1.1	-1.1	-1.0

As Table 5 shows, in practice, there is not that much difference between the results under different assumptions. There is some difference in the detail. In particular, the nominal exchange rate falls if we assume that government finances do not have an effect on exchange rates and, as a consequence, manufacturing output does better. The improvement is, however, marginal, and the rest of the analysis is confined to the set of assumptions represented in the first column of numbers in Table 5 where house price inflation does not directly affect either base rates or the exchange rate and where government finances do affect the exchange rate. These are the usual assumptions used in the Experian Business Strategies UK Quarterly Model.

As we might have expected, Table 5 also shows that an increase in the long-run elasticity will have a much bigger impact that an increase in the short-run elasticity so the rest of the analysis focuses on the counterfactual where the long-run elasticity of new construction with respect to real house prices is assumed to have been greater than zero since 1994. Table 6 shows the impact of this assumption on a wider range of variables and with different assumptions about the long run elasticity (e=2 is the equivalent of the first column of numbers in table 5).

Table 6: Impact of varying the elasticity of investment in new housing for 1994-2002 on the economy in 2002

	Assumed Elasticity		
	e=1	e=2	e=3
Private New Construction	50.6	125.2	234.6
Total Private Residential Investment	14.9	36.9	69.2
GDP	0.4	0.9	1.8
Manufacturing Output	0.4	1.1	2.0
Household Spending	0.1	0.4	0.8
Employment	0.5	1.2	2.2
Exchange Rate	0.1	0.3	0.6
House Prices	-0.6	-1.2	-1.9
Housing Stock	0.7	1.6	2.8
Base Rate	0.1	0.3	0.6
Inflation	0.1	0.1	0.3
GG Net Borrowing (% GDP)	-0.2	-0.6	-1.1

All figures are percentage difference from actual except base rate, inflation and general government net borrowing which are differences from actual.

The main feature of Tables 5 and 6 is the impact on aggregate demand and GDP. In the e=2 case private new construction more than doubles (relative to actual) by 2002 and private residential investment rises to a level which is 36.9 per cent higher than the actual by 2002. This pushes up total investment by nearly six per cent and has an impact on output in other sectors as well as construction both directly and through intermediate purchases by the construction industry.

The aggregate demand effect tends to dominate all others, leading to levels of household consumption that are higher than actual in 2002 despite the potentially depressive effect of lower house prices on spending and to an RPIX inflation rate which is marginally higher than actual in 2002 even though house price inflation is considerably weaker.

Although new construction increases by 125 per cent relative to actual by 2002, the residential capital stock is only 2.8 per cent higher. This reflects the point made in the previous section that new construction is quite small relative to the value of the residential capital stock and that any increases in new construction will take a considerable time to have much of an influence on housing supply. Note also that new construction is only about 30 per cent (actual rather than counterfactual) of total private residential investment and that we have made no counterfactual assumptions regarding the elasticity of the repair, maintenance and improvement element.

Nonetheless, the counterfactual implies that the residential capital stock would have increased by 1.6 per cent relative to actual by 2002 (e=2) and this is sufficient to reduce house prices relative to actual by 1.2 per cent. The long-run elasticity of house prices in the model with respect to the residential capital stock is actually equal to -2.2. The house price fall is muted because of the impact of higher aggregate demand on employment and incomes and hence on the demand for housing. Note also, that although house prices fall relative to actual, the average rate of increase (in the e=2 case) in the counterfactual between 1993 and 2002 is

still 8.2 per cent (compared to an actual of 8.3 per cent). The muted impact on house prices, togther with the increase in the size of the residential capital stock also explains why housing wealth does not fall (Figure 9).

Another observation from Table 6 is that government borrowing is considerably reduced as a result of higher tax revenues and lower benefit payments and this is the main reason why the nominal exchange rate increases relative to actual.

1.3.2 Changes over time

Figure 5 to 11 below show how the changes to the economy evolve over time (in the e=2 case).

Figure 5: Impact of an assumption of a long-run elasticity of 2 for private new construction on private new construction

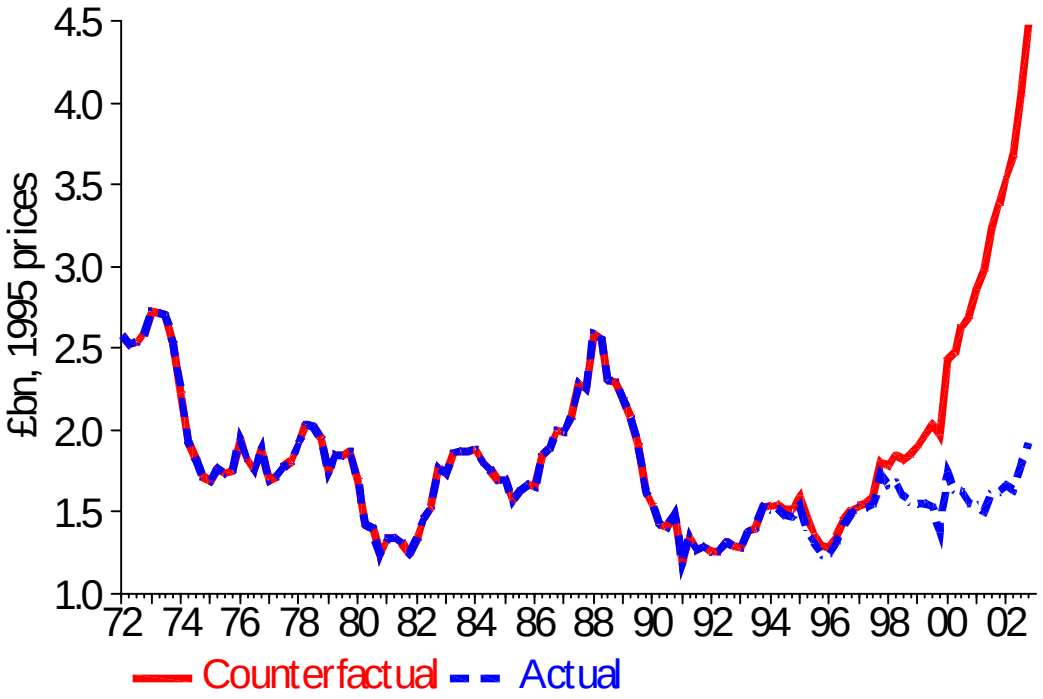


Figure 6: Impact of an assumption of a long-run elasticity of 2 for private new construction on private new construction

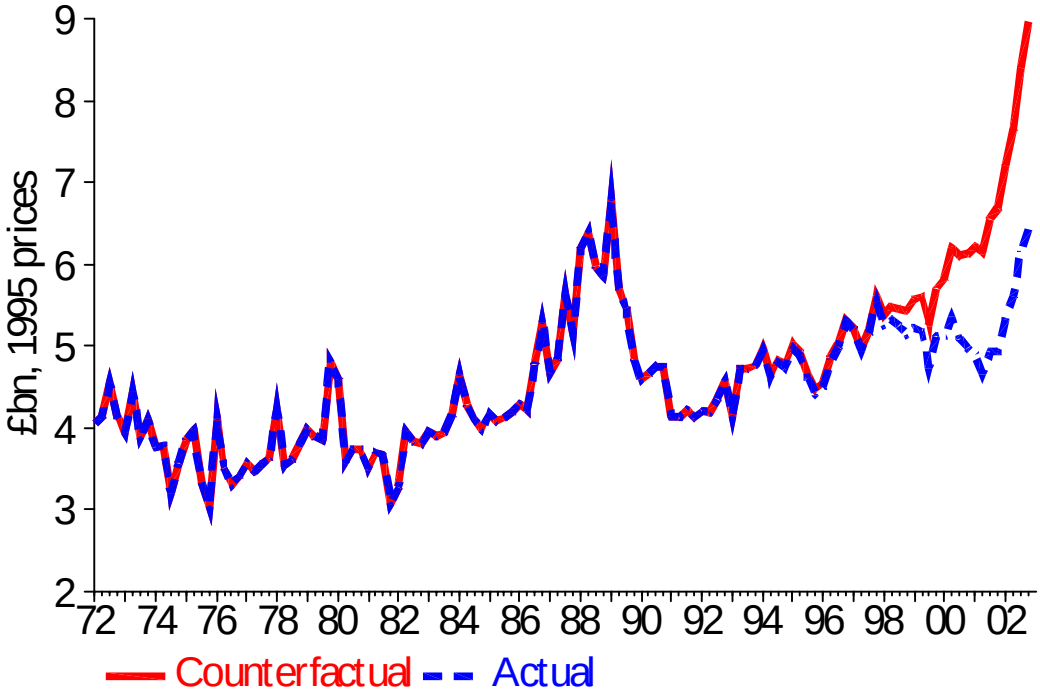


Figure 7: Impact of an assumption of a long-run elasticity of 2 for private new construction: iii

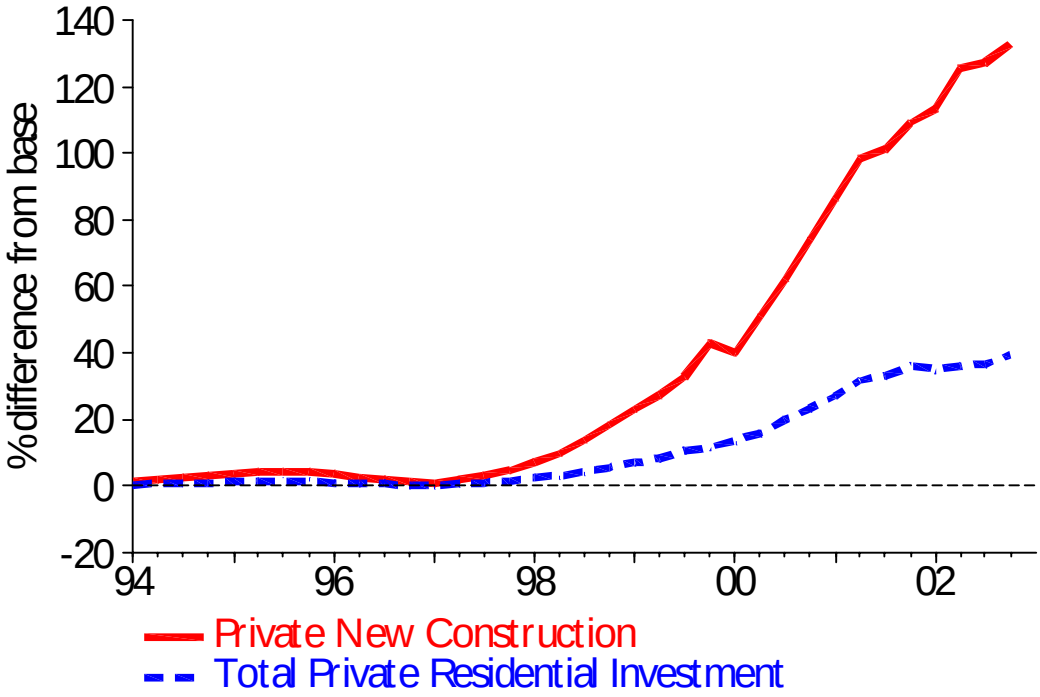


Figure 8: Impact of an assumption of a long-run elasticity of 2 for private new construction: iv

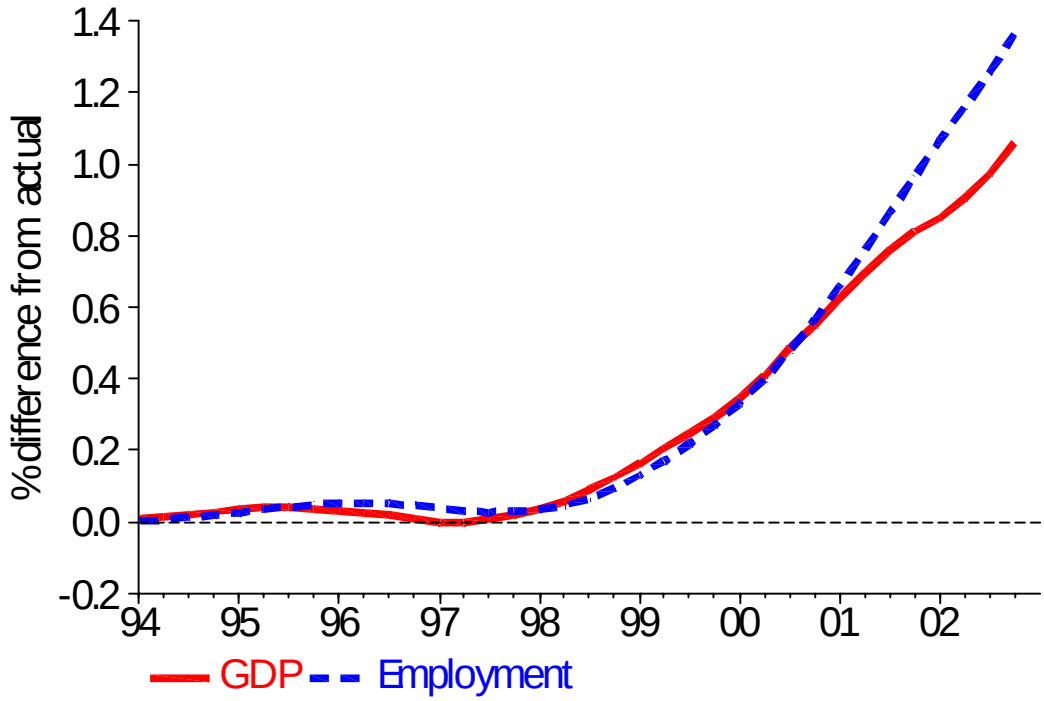


Figure 9: Impact of an assumption of a long-run elasticity of 2 for private new construction: v

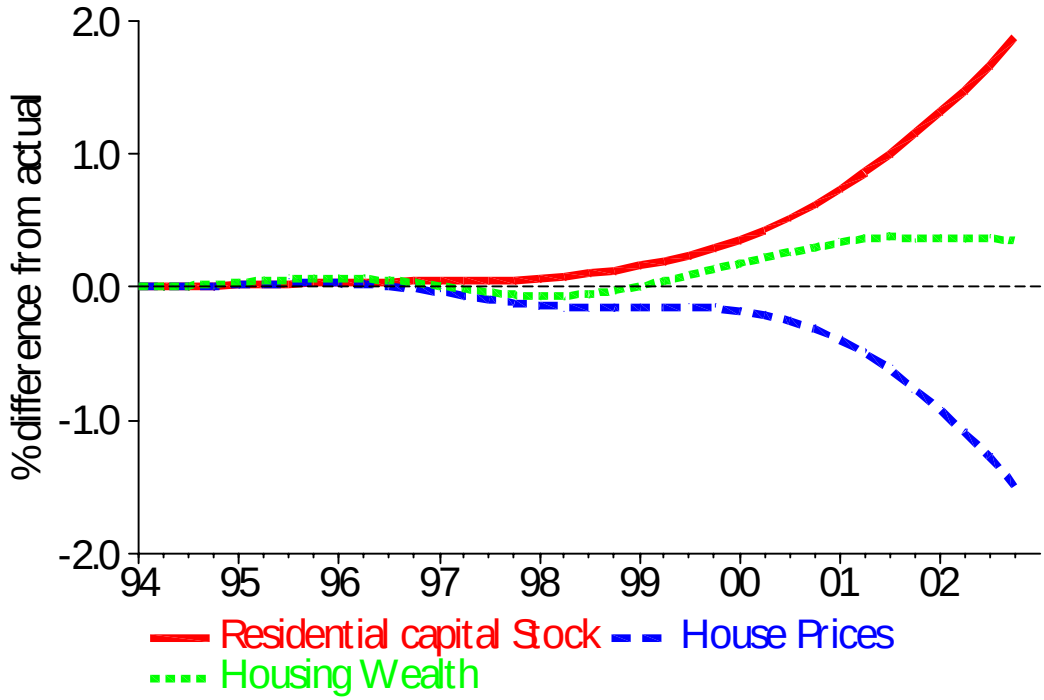


Figure 10: Impact of an assumption of a long-run elasticity of 2 for private new construction: vi

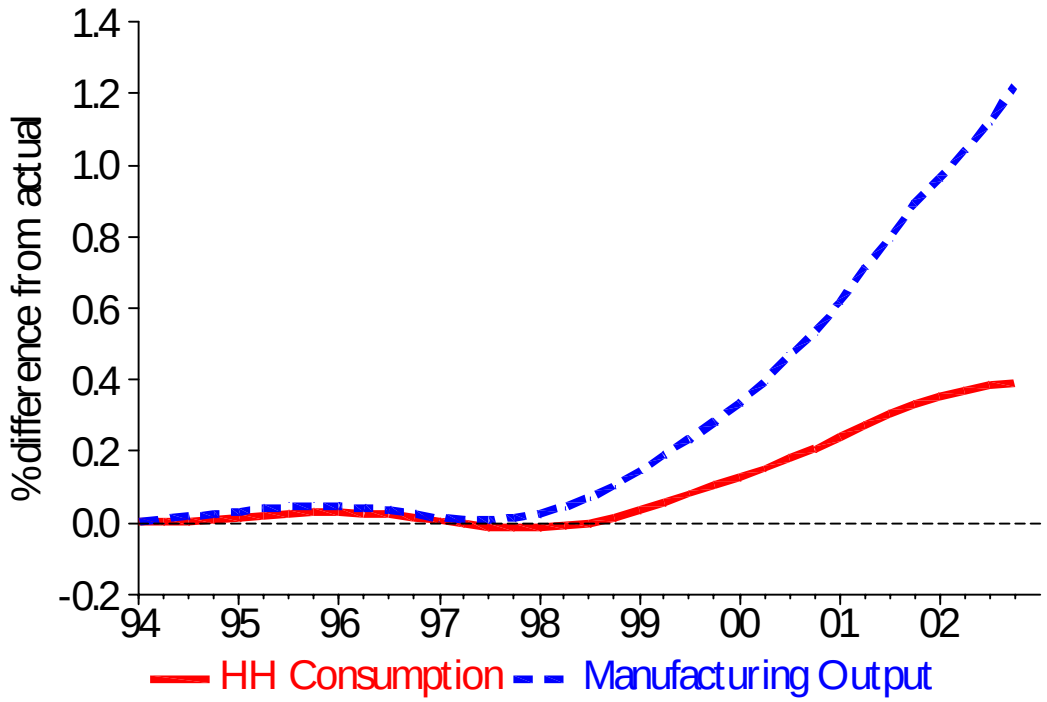
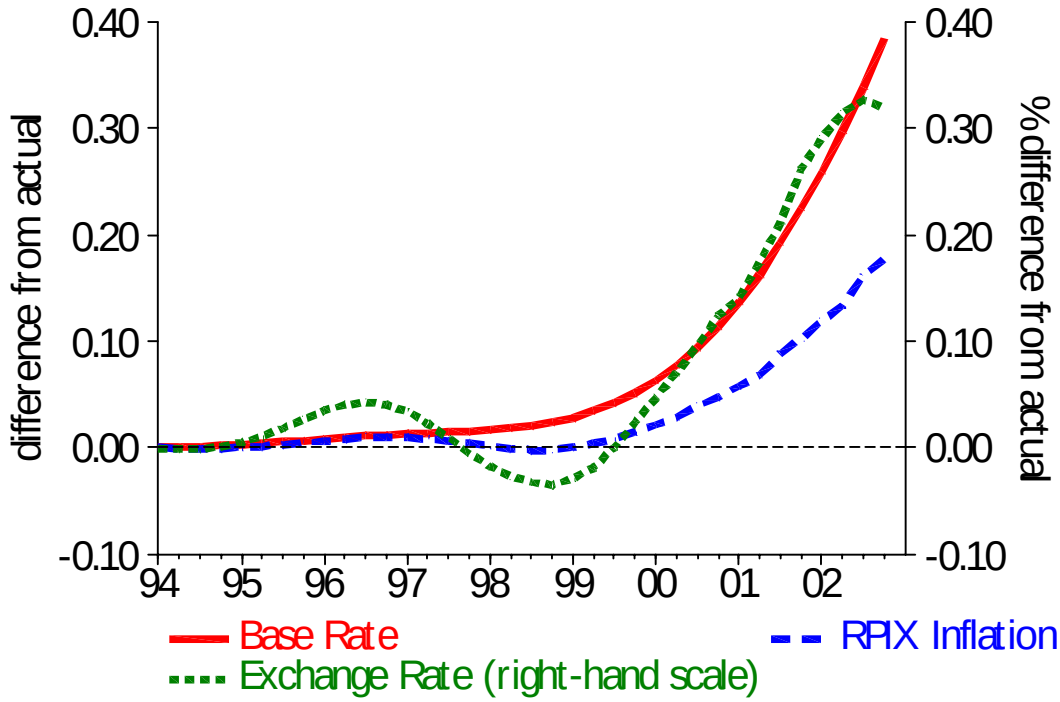


Figure 11: Impact of an assumption of a long-run elasticity of 2 for private new construction: vii



1.4 FUTURE IMPACTS

The counterfactuals considered above consider what might have happened to the economy had the elasticity of private new housing construction in the future been higher than it actually was. In this section we consider the potential impact in the future of a change in the elasticity. As the results of the model runs are base dependent (i.e. the results will depend on the actual/baseline levels for things like GDP, inflation and house prices), the counterfactual simulations for 1994-2002 will not necessarily hold for other time periods. In addition, in the simulation for 2004-2016 presented here we have assumed that the long-run elasticity of new construction gradually increases from zero at the end of 2003 to 3 by the end of 2016 in order to avoid some of the sudden impact on aggregate demand observed in the previous section. The results are shown in Table 7 below and in Figures 12 to 16.

Table 7: Impact of a gradual increase the long-run elasticity of investment in new housing from 0 in 1993q4 to 3 in 2004q4.

	2008	2012	2016
Private New Construction	80.9	217.1	406.3
Total Private Residential Investment	18.9	46.1	77.4
GDP	0.5	0.6	0.5
Manufacturing Output	0.4	0.6	0.5
Household Spending	0.2	-0.3	-1.5
Employment	0.6	1.1	1.2
Exchange Rate	0.3	-0.3	-1.8
House Prices	-0.3	-4.6	-12.4
Residential Capital Stock	0.8	3.4	8.3
Base Rate	0.1	0.6	1.0
Inflation	0.1	0.2	0.1
GG Net Borrowing (% GDP)	-0.3	-0.6	-0.6
Current Account (% GDP)	0.0	-0.1	0.2

All figures are percentage difference from actual except base rate, inflation and general government net borrowing which are differences from actual.

The main difference between the results for the future shown in Table 7 and the counterfactual run over the past shown in Table 6 (the far right-hand column of Table 6 is the appropriate comparison with Table 7) is the much bigger impact on new construction (the run is over a longer period and house prices are higher than over 1994-2002 even though there is only a gradual increase in the elasticity) and a more muted impact on GDP. Nevertheless, the simulation does show a substantial re-balancing of the economy (Figure 15), GDP that is higher than base and reduced government borrowing.

The model has been specified so that a switch to a non-zero elasticity will eventually (once the lags in the equations have worked their way through) increase investment in new housing in proportion to the level of real house prices relative to the base year (1995), If real house prices are 20% above 1995 levels and the elasticity switches from zero to three, investment in new housing will eventually increase by 60%. This is not the same as assuming that a positive elasticity will only apply to future price changes. If we assumed the latter, and if real house prices were not to change in the future, there would be no impact from having a higher

elasticity on investment. Under the assumption used there is a substantial increase as real house prices are still very high in historical terms even though they are expected to flatten off.

Note that the implied investment response is very large as a result of the large elasticity assumed and the current high level of house prices. Although it is beyond the capabilities of a macroeconomic model to pick up such effects, we acknowledge that, there may be severe doubts about the ability of the construction industry to accommodate such an increase and accept that that there is a possibility of severe construction cost inflation in housing would occur if volumes were to increase by so much. This applies equally to the backward looking counterfactuals and the forward looking simulations.

Figure 12: Impact of a gradual increase in the lr elasticity of private new construction 2004-2016: i

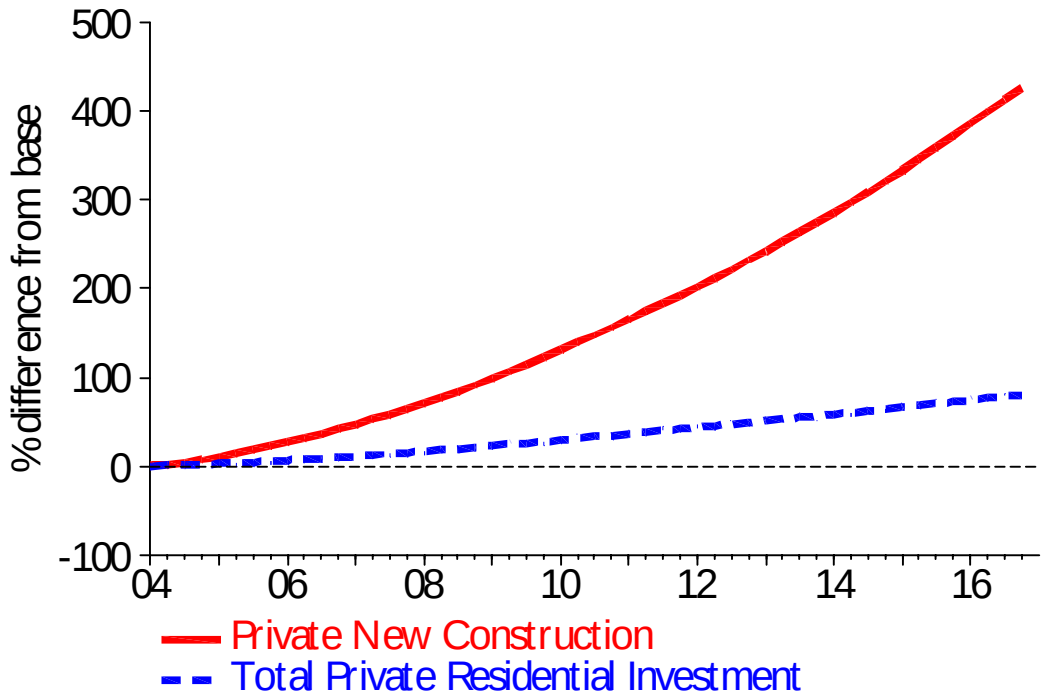


Figure 13: Impact of a Gradual increase in the LR elasticity of private new construction 2004-2016: ii

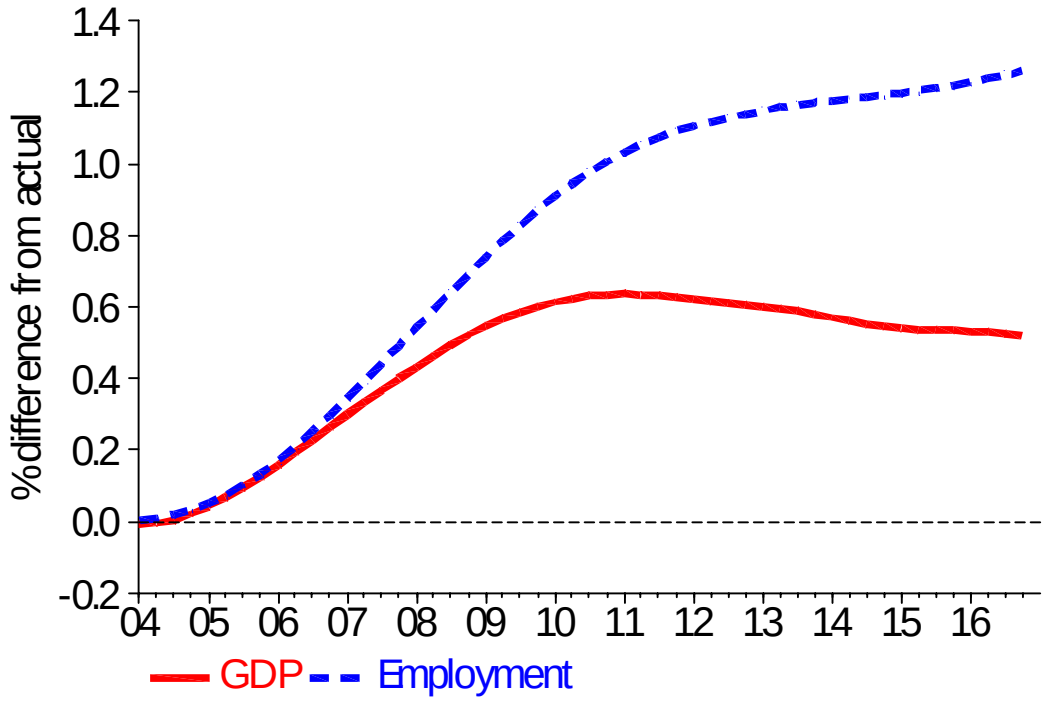


Figure 14: Impact of a gradual increase in the LR elasticity of private new construction 2004-2016: iii

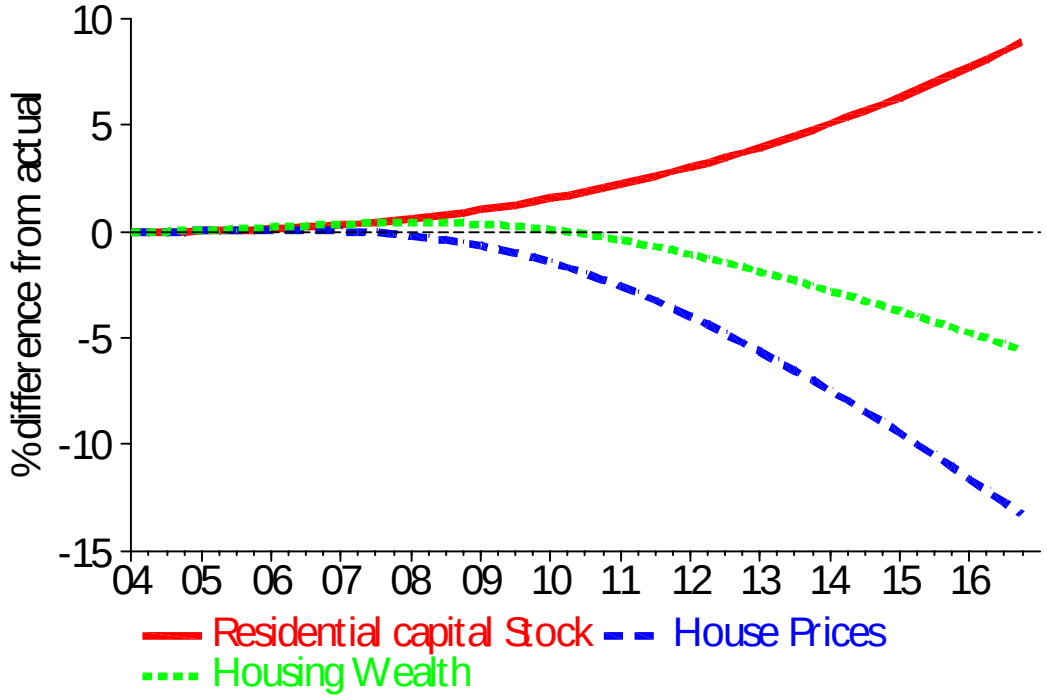


Figure 15: Impact of a gradual increase in the LR elasticity of private new construction 2004-2016: iv

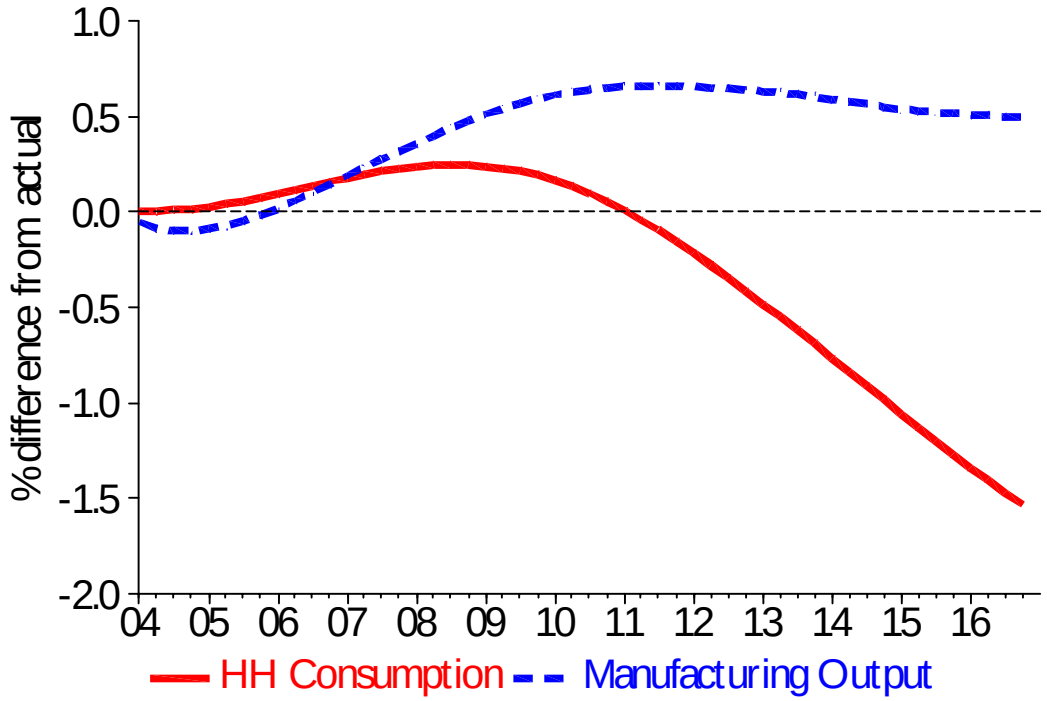
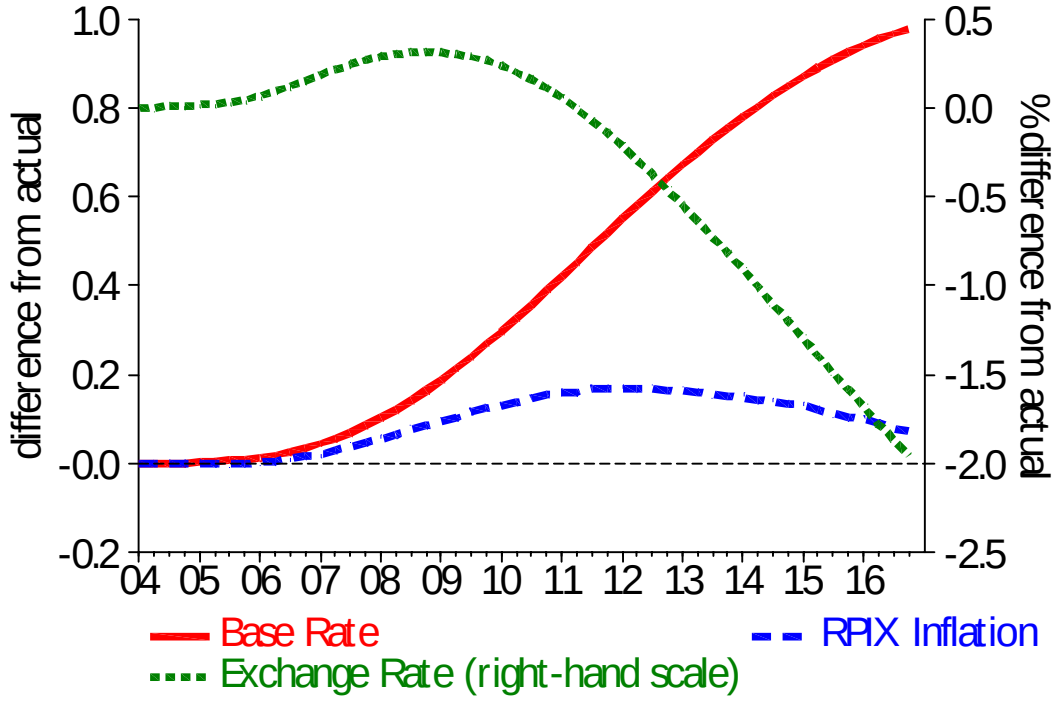


Figure 16: Impact of a gradual increase in the LR elasticity of private new construction 2004-2016: iv



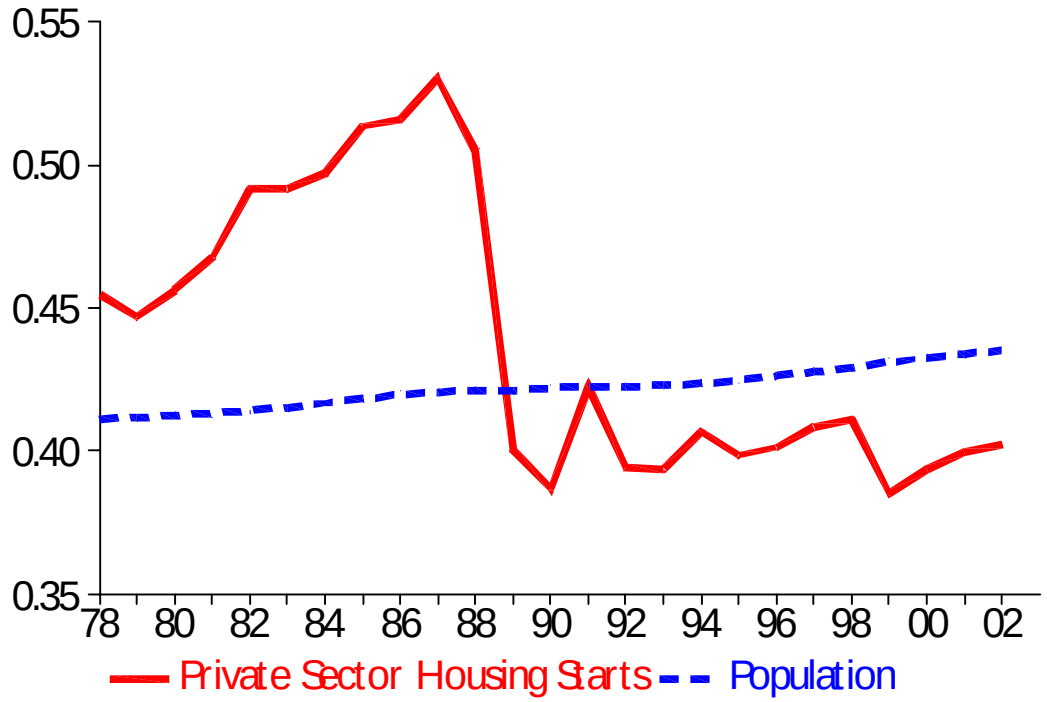
2. The regional dimension & its macroeconomic implications

2.1 REGIONAL HOUSING START ELASTICITIES

Constant price estimates of new construction work are not available by region so we have to focus on housing starts data (which as discussed above has a good relationship with the volume of new work although the ratio of the volume of new work to starts has been falling).

Figure 17 shows the south's[5] share of both private sector housing starts and population. This chart shows the regional dimension of the housing problem in sharp focus. Before 1989, the south's share of housing starts was above its population share and rising. After 1989 the south's share of housing starts has been below its population share and stable even though its population share is rising.

Figure 17: The South's share of UK housing starts & population

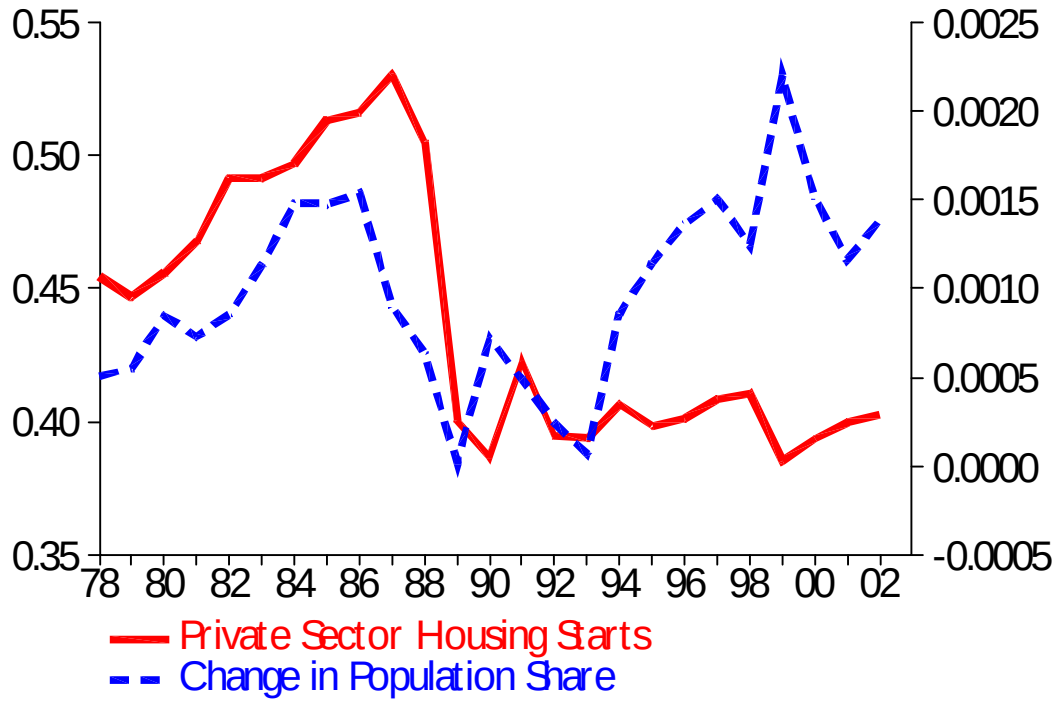


New housing should be related to population growth as much as to population levels as population growth creates a need for a net addition to the housing stock as opposed to just replacement demand. Figure 18 compares the south's share of UK private sector housing starts with the change in the south's population share. Once again the implication are very clear. Up until the late 1980s, the south's share of starts rose and fell in line with fluctuations in the change in the south's population share but since 1989 the relationship has broken down

[5] The South is defined to comprise the London, South East, East of England and South West GORs. These are the four regions which have both house prices and employment rates which are above the national average.

completely. The south's population share has accelerated until recently while its share of starts has been flat.

Figure 18: The South's share of UK housing starts & the change in its population share



We have estimated housing starts equations for the two broad regions (north and south), which are similar to the UK private residential equations described earlier. The results, after some experimentation with the exact specification, are shown in Table 8.

Table 8: Private sector housing starts
OLS 24 annual observations, 1979-2002

	North		South	
	Estimated coefficient	Estimated t-statistic	Estimated coefficient	Estimated t-statistic
$\ln(HSPS_{r,t-1})$	.4455	2.76	.4173	3.33
$\Delta\Delta\ln(PH_{r,t})$	1.336	3.65	1.493	4.91
$\ln(PH_{r,t-1})$	.2520	1.79	.4416	2.75
$DS_t.\ln(PH_{r,t-1})$	-		-.04408	-3.55
Constant	4.727		3.691	
R^2	.799		.667	
DW	1.86		1.48	
Post sample stability, $\chi^2(4)$	1.18		3.58	
LM, $\chi^2(4)$	12.0		7.89	

Where "HSPS" are private sector housing starts, "PH" are real house prices (deflated by the consumer price deflator) and "DS" is a step dummy variable taking the value zero up until 1988 and one thereafter. A number of features are apparent from the estimated equations shown in Table 8:

1. The main short-term driver of private sector housing starts, both north and south is the second difference of the log of real house prices – i.e. not just house price inflation (as with the residential investment equations), but the rate of change of house price inflation.
2. The long-run price elasticity (which, up until 1989, is given by the estimated coefficient on the lagged house price variable divided by one minus the estimated coefficient on lagged starts) is actually higher in the south at 0.76, compared with 0.45 in the north (which is not significantly different from zero).
3. There is evidence of a fall in the price elasticity in the south after 1988. The estimated coefficient on the dummy variable multiplied by the lagged house price indicates that it fell to 0.68 – down from its value before 1989 but still above the north.

The reduction in the elasticity in the south after 1988 looks small, but it had a major effect on starts. Figure 19 shows what the implied level of housing starts would have been in the south after 1988 if the price elasticity had not fallen, compared with what actually happened:

Figure 19: Housing starts in the South: actual & counterfactual

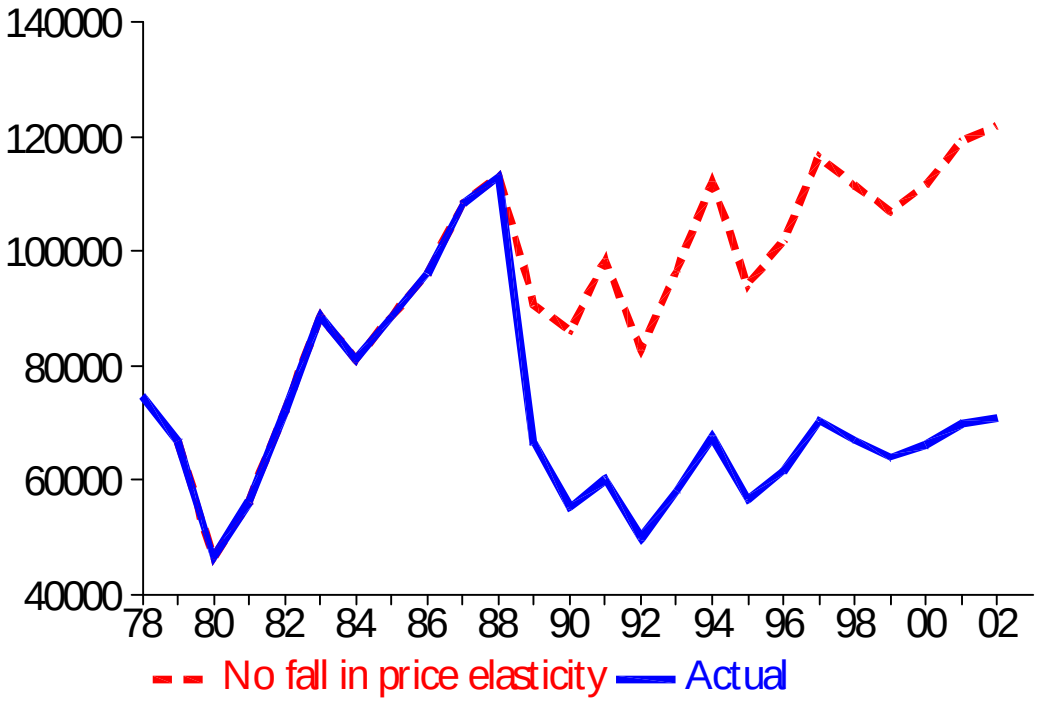


Figure 19 clearly shows the extent of the structural break in the late 1980s.

2.2 THE BROADER ECONOMIC IMPACT

Rather than try and build the regional housing starts equations up into a model capable of macroeconomic type simulations we have adopted a different approach which develops a simple accounting framework to assess the potential effects on population, employment and output in the north, the south and the UK as a whole of the macroeconomic counterfactuals and simulations presented earlier.

This approach poses the question "What if all of the change in the housing stock apparent from the macro-economic simulations shown in the previous section had happened in the South?" This is done for both the counterfactual over the 1994-2002 period with an assumed UK elasticity of new construction of two (Table 6) and for the simulation over the 2003-2016 period (Table 7).

Assuming that the south's share of the UK's residential capital stock is 0.5 (which is approximately correct based on population shares and relative house prices in 1995), the increase in the UK residential capital stock of 1.6 per cent by 2002 (Table 6) would, if it all took place in the south, equate to an increase of 3.2 per cent in the south's residential capital stock. Using the estimated elasticity of house prices with respect to stock of 2.2 from the UK Quarterly Model gives an implied relative fall in house prices in the south of seven per cent by 2002. In the 2003-2016 simulation, the equivalent estimates are a 16 per cent increase in the south's residential capital stock and a 36.5 per cent fall in relative house prices.

To get some idea of the likely impact of these changes we have fed the changes in relative house prices into a model of regional net internal migration developed for the ODPM (Appendix 2). In this model internal migration is largely a function of relative house prices and relative regional unemployment. We also assume that the out-migration of people from the north does not lead to a fall in employment in the north and this means that the unemployment rate in the north relative to the south will fall leading to a partial offsetting impact on internal migration.

The net effects of these assumptions are shown in Tables 9 and 10. In the 1994-2003 counterfactual there is a modest potential impact on UK GVA which increases by approximately 0.1 per cent relative to base. Over the longer period of the 2003-2016 simulation, together with the assumption of an elasticity of new construction that reaches three by 2016 gives a rather bigger impact of 0.475.

Although modest, these changes should be added to the macroeconomic effects identifies in Section 1. This has been done by assuming that potential GVA in the UK Quarterly Model (which determines the output gap) increases in line with the potential increase in GVA at the UK level shown in Tables 9 and 10. This leads to lower inflation, lower interest rates and higher GVA than would otherwise have been the case. This is done in Tables 11 and 12 which also reproduce the relevant columns of Table 6 and 7 for comparison. The new counterfactual/scenario results are also summarised in Figures 20 and 21.

Table 9: 1994-2002 Macro counterfactual
(elasticity of new construction=2, see Table 6)
Potential impact on the regional mismatch by 2002

Base	NORTH	SOUTH	UK
Working Age Population	20.399	15.979	36.378
FTE Employment	12.876	11.490	24.366
FTE Employment Rate	0.631	0.719	0.670
GVA	375.751	372.979	748.730
Productivity	29.182	32.461	30.728
Counterfactual	NORTH	SOUTH	UK
Working Age Population	20.367	16.011	36.378
FTE Employment	12.876	11.513	24.389
FTE Employment Rate	0.632	0.719	0.670
GVA	375.751	373.721	749.472
Productivity	29.182	32.461	30.730
% Difference from base:			
Working Age Population	-.156	.199	.000
FTE Employment	.000	.199	.094
GVA	.000	.199	.099

Note that UK GVA does not equal the sum of north and south because of an allowance for extra-regio (continental shelf, & HM forces and diplomats overseas)

Table 10: 2003-2016 Macro simulation
(elasticity of new construction=3 by 2016, see Table 7)
Potential impact on the regional mismatch by 2016

Base	NORTH	SOUTH	UK
Working Age Population	20.183	17.039	37.222
FTE Employment	12.932	12.563	25.495
FTE Employment Rate	0.641	0.737	0.685
GVA	509.225	568.200	1077.425
Productivity	39.377	45.228	42.260
Counterfactual	NORTH	SOUTH	UK
Working Age Population	19.186	17.192	36.378
FTE Employment	12.932	12.676	25.608
FTE Employment Rate	0.674	0.737	0.704
GVA	509.225	573.314	1082.539
Productivity	39.377	45.228	42.273
% Difference from base:			
Working Age Population	-.760	.900	.000
FTE Employment	.000	.900	.443
GVA	.000	.900	.475

Note that UK GVA does not equal the sum of north and south because of an allowance for extra-regio (continental shelf, & HM forces and diplomats overseas)

Table 11: Impact of assuming an elasticity of 2 for investment in new housing for 1994-2002 on the economy in 2002

	No Impact on Potential GVA (from Table 6)	Easing of Regional Mismatch Increases Potential GVA
Private New Construction	125.2	126.1
Total Private Residential Investment	36.9	37.2
GDP	0.9	1.0
Manufacturing Output	1.1	1.2
Household Spending	0.4	0.5
Employment	1.2	1.3
Exchange Rate	0.3	0.4
House Prices	-1.2	-1.1
Housing Stock	1.6	1.6
Base Rate	0.3	0.3
Inflation	0.1	0.1
GG Net Borrowing (% GDP)	-0.6	-0.6

All figures are percentage difference from actual except base rate, inflation and general government net borrowing which are differences from actual.

Table 12: Impact of assuming an elasticity of investment in new housing which gradually increases to 3 between 2004 and 2016: impact on the economy in 2016

	No Impact on Potential GVA (from Table 6)	Easing of Regional Mismatch Increases Potential GVA
Private New Construction	406.3	416.8
Total Private Residential Investment	77.4	79.4
GDP	0.5	0.8
Manufacturing Output	0.5	0.9
Household Spending	-1.5	-0.9
Employment	1.2	1.5
Exchange Rate	-1.8	-1.5
House Prices	-12.4	-12.2
Housing Stock	8.3	8.5
Base Rate	1.0	0.6
Inflation	0.1	0.0
GG Net Borrowing (% GDP)	-0.6	-0.8
Current Account (% GDP)	0.2	0.1

All figures are percentage difference from actual except base rate, inflation and general government net borrowing which are differences from actual.

Figure 20: Elasticity of private new construction equals 2 1994-2002 – with easing of regional mismatch (% difference from base)

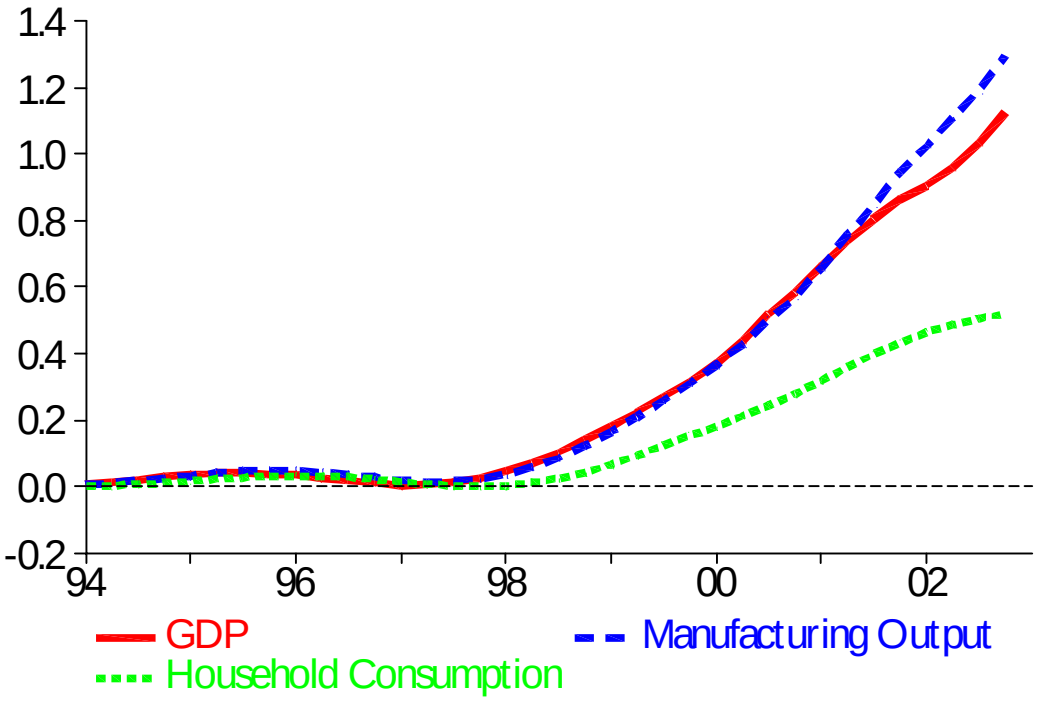
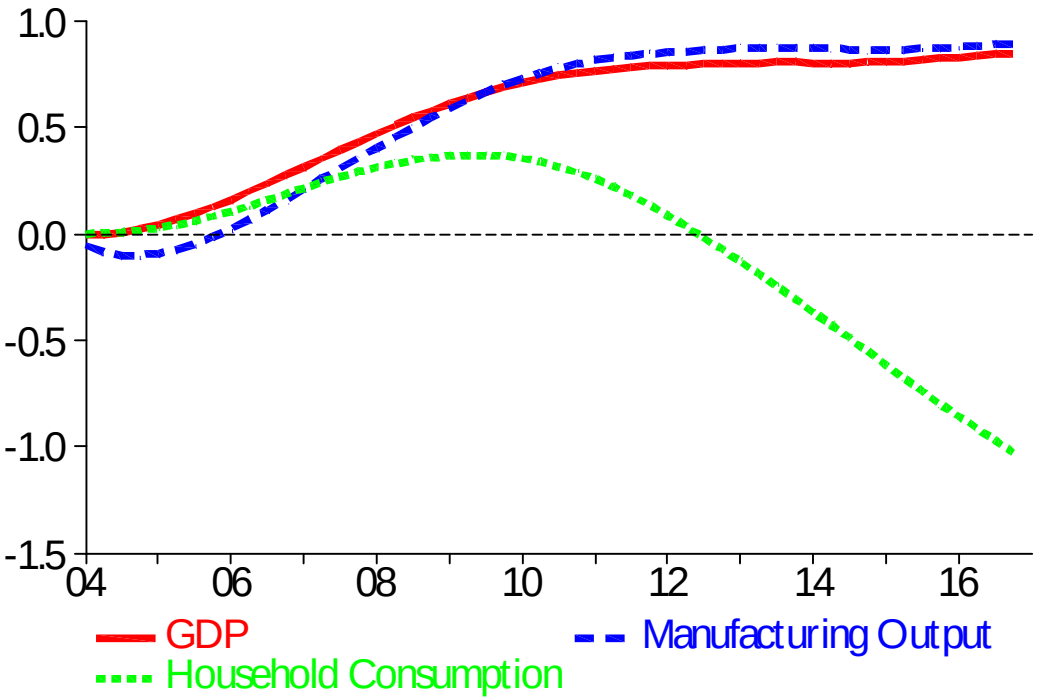


Figure 21: Elasticity of private new construction reaches 3 by 2016 – with easing of regional mismatch (% difference from base)



As might be expected given the muted potential impact on UK GVA calculated in Table 9, the new counterfactual results shown in Table 11 are not that different from the old. In the case of the simulation results over the 2004-2016 period shown in Table 12, however, the results are rather more marked with GDP being 0.8 per cent higher than base by 2016 compared with 0.5 per cent when no allowance is made for an easing of the regional mismatch. This serves to illustrate the point that any process that involves adjustment through internal migration will be slow and, hence, will take time to build up bit it can eventually become quite significant.

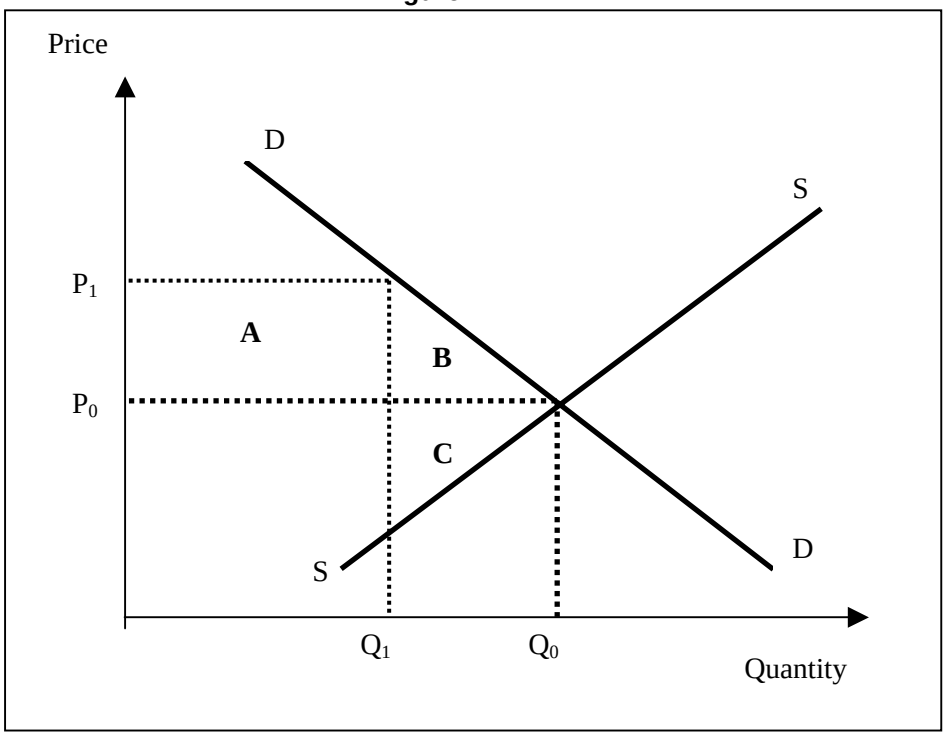
3. Estimating the welfare loss due to restrictions on housing supply

3.1 MEASURING ECONOMIC WELFARE

Figure 22 shows a stylised representation of the housing market in any particular year[6], where P_0 is the average price achieved and Q_0 is the turnover in that year if the market clears and where there are no restrictions on housing supply. The demand for housing is represented by the line D-D and supply by the line S-S. If, for some reason, market restrictions on supply meant that turnover was Q_1 rather than Q_0, the average price achieved would be P_1 rather than P_0.

If we assume that P_1 and Q_1 are representative of the current housing market and that P_0 and Q_0 are representative of what the market would look like in the absence of any restrictions on supply, we can calculate the cost to buyers and to the economy as a whole of the restrictions on supply.

Figure 22



Consumer surplus is a measure of the benefit to consumers of housing market transactions over an above that reflected by the price paid. In the unrestricted supply case this is represented by the area under the demand curve (DD) and above the price P_0. If supply restriction increases the price to P_1 then the consumer surplus is reduced by an amount equal to the area of rectangle[7] A and triangle B. To estimate the total welfare change, we need to look at the deadweight loss, which takes into account the gain to suppliers (who in this case

[6] This could also be interpreted in terms of stocks rather than flows.
[7] For ease of exposition and calculation we have made the demand and supply curves linear though in reality this may not be the case.

include existing owners) from higher prices. The suppliers' surplus will increase by an amount equal to the area of rectangle A less the area of rectangle C. This means that the deadweight loss is equal to the sum of the areas of triangles B and C.

3.2 ESTIMATES OF WELFARE LOSS IN THE HOUSING MARKET

We can use actual prices and transactions data together with estimates of the shape of the supply and demand curves to get an estimate of the consumer surplus and the deadweight loss under various assumptions about the effect of the restrictions on housing supply. The alternative assumptions that we have considered are:

a) That the real price of houses would have been constant since 1975 had there been no restrictions on housing supply (the equivalent of a price which is 50 per cent less than the actual in 2001)
b) That the real price of houses would have increased by 1.1 per cent per annum (the EU average) since 1975 had there been no restrictions on housing supply (the equivalent of a price which is 34 per cent less than the actual in 2001)

We use a linear demand curve with an assumption of an elasticity of demand of –0.5[8] and elasticities of total supply of 0.4 and of supply to new buyers of 0.5[9].

Table 13:
Estimates of welfare loss in the housing market in 2001*

	All buyers		**First time buyers**	
Assumption on house prices without supply restrictions:	No increase in real prices since 1975	1.1% p.a. increase in real prices since 1975	No increase in real prices since 1975	1.1% p.a. increase in real prices since 1975
Consumer Surplus Fall (£bn)	91	59	27	18
% GDP	*9.2*	*5.9*	*2.7*	*1.8*
Deadweight Loss (£bn)	15	8	4	2
% GDP	*1.5*	*0.8*	*0.5*	*0.2*

In Table 13, the estimated consumer surplus and the deadweight loss are shown for both the market as a whole and for first time buyers, only under the different assumption about the impact of supply restrictions on prices. The welfare loss to buyers is substantial, being the equivalent of over nine per cent of GDP in 2001 (for the entire market), if the alternative, unrestricted outcome would have been no real price increase since 1975. Some of this loss is appropriated by suppliers (who, in the case of the housing market, may be buyers as well), but the deadweight loss of 1.5 per cent of the equivalent of GDP is still substantial.

[8] This figure is the elasticity at the point of the actual market outcome in 2001. It is based on the estimated coefficients in the house price equation in our UK Quarterly Model. As we have assumed a linear demand curve the elasticity under the unrestricted supply assumption where prices is lower and turnover is higher are –0.2 and -0.28 for cases a) and b) respectively.
[9] The elasticities of supply are purely illustrative assumptions. Were the elasticity to be lower the deadweight loss would be higher and vice versa.

These estimates are sensitive to the assumptions made. Nevertheless they are indicative of the kind of sums involved. Restrictions on housing supply, to some extent, involve a redistribution (from potential buyers to potential sellers), but the overall deadweight loss to the economy is still substantial.

Appendix 1: Alternative equation specifications

Base Interest Rate Equation (1)

$$\Delta FRMB_t = 0.1(INF_t^e - TARGET_t)$$

where:

$$INF_t^e = INF_t + 29.9 \ln(GVA_t / PGVA_t)$$

Alternative Interest Rate Equation (2)

$$\Delta FRMB_t = 0.1(INF_t^e - TARGET_t)$$

where:

$$INF_t^e = INF_t + 24.6 \ln(GVA_t / PGVA_t) + .137\, HPINF_t$$

Base Exchange Rate Equation (1)

$$\ln(REXBOE_t / REXBOE_t^{e,t+1}) = \ln((1 + FRMB_t - .5GFFRMS_t .5USFRMS_t)/400) + u_t$$

where:

$$\ln(REXBOE_t^{e,t+1}) = .554 \ln(REXBOE_{t-1}) + .327 \ln(PDHOCE_t / PDHOCEOE_t) + .006\, OIL_t^e + .171 \ln(FIBUS_t / GDP_t) + .715 \ln(NAFAGGN_t / GDP_t) + . 162 \ln(NAFAHON_t / GDPN_t) + 5.19$$

Alternative Exchange Rate Equation (2)

$$REXBOE_t \quad REXBOE_t^e = \quad + FRMB_t - \quad GFFRMS_t \quad USFRMS_t \quad + {}_1\Delta^4 \quad PH_t \quad PDHHCE_t + {}_2\Delta^4 \quad PH_{t-1} \quad PDHHCE_{t-1} + {}_0 + u_t$$