



Price Dispersion in the Housing Market: The Role of Bargaining and Search Costs

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Abstract

This paper develops a matching model *à la* Pissarides (2000) in order to explain a basic fact of housing markets: price dispersion. The variance in house prices is basically due to both the *ex-ante* heterogeneity of the parties (i.e., bargaining power, tastes, asymmetric information) and the search costs of buyers and sellers. In fact, sellers and buyers spend time and money before concluding the deal. Furthermore, the house price is substantially determined by bargaining between the parties. These factors affect the selling price and lead to price dispersion. This simple theoretical model is able to take these distinctive features of the housing markets into account.

Keywords: house prices, price dispersion, bargaining power, search frictions

JEL Classification: R0, R31, R21, D40, D83

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1. Introduction

Price dispersion (or volatility) refers to the phenomenon of selling the same product in near locations at the same time but at different prices. Although price dispersion research is more commonly found in studies of non-durable consumption goods,¹ price dispersion studies on durable and re-saleable goods such as real estate are also growing rapidly (Read, 1991; Gabriel *et al.*, 1992; Baharad and Eden, 2004; Leung *et al.*, 2006; Yiu *et al.*, 2005, 2006, 2008; and Wong *et al.*, 2006, 2007). Real estate is in fact the most important durable consumption good and one of the most important asset for most household portfolios (Leung, Leong and Wong, 2006). Furthermore, its decentralized market makes it possible to observe the dispersion of prices directly, since most transactions of real estate come from re-sales between individual buyers and sellers (transactions in the housing markets are in fact dominated by a second-hand market). Hence, it should not be surprising that price dispersion can also exist in the housing market (Leung, Leong and Wong, 2006).

According to the literature, the variance in house prices cannot be attributed completely to the heterogeneous nature of real estate. In fact, it is widely recognised that a significant part of house price dispersion is basically due to the *ex-ante* heterogeneity of buyers and sellers (i.e., bargaining power, tastes, asymmetric information) and their sustained search costs (see e.g. Maury and Tripier, 2010). Indeed, sellers and buyers spend time and money (for advertising vacancies and making the effort to visit the greatest number of houses) before concluding the deal. Furthermore, the house price is substantially determined by bargaining between the parties.² These factors affect the selling price and lead to price dispersion, since for different bargaining powers and search costs the selling price will be different.

Recently, from a theoretical point of view, there has been much focus on formulating the housing market through the use of labour market search and matching models (see e.g. Wheaton, 1990; Albrecht *et al.*, 2007; Caplin and Leahy, 2008; Diaz and Jerez, 2009; Maury and Tripier, 2010; Genesove and Han, 2010; Lisi, 2011). It has, in fact, been acknowledged that housing markets clear not only through price but also

¹ A detailed literature review on price dispersion can be found in Baye *et al.* (2006).

² A major drawback of the hedonic house price theory is that bargaining has no impact on price because this theory assumes perfect competition (Quan and Quigley, 1991; Habito *et al.*, 2010; Harding *et al.*, 2003a; Harding *et al.*, 2003b; Cottleer and Gardebroek, 2006). Search frictions and the bargaining power of the parties rationalise market non-clearing even in the presence of flexible prices.

through the time that a buyer and a seller spend on the market. Consequently, the search and matching approach is completely consistent even with this type of market. The main aim of this paper is to develop a search and matching model *à la* Pissarides (2000) for the housing market that explains price dispersion. In particular, we develop a decentralised long-run equilibrium model with *ex-ante* heterogeneous buyers and sellers, based on both the bargaining and the costly search activity that characterises the housing market. The proposed work takes the distinctive features of the considered market into account, where the formal distinction between buyer and seller becomes very subtle. In the model, in fact, a seller can become a buyer and *vice versa*. Indeed, most houses are bought by those who already own one, and most houses are sold by those wanting to buy another house (Janssen *et al.*, 1994); indeed, buyers today are potential sellers tomorrow (Leung, Leong and Wong, 2006).

In this model, price dispersion comes from two sources: first, the bargaining power of the parties, since different bargaining powers lead to different selling prices for two similar houses; second, the search costs of sellers and buyers, since the *ex-ante* heterogeneity of the parties implies different search costs and thus individuals obtain different values from a conclusive transaction. Obviously, an increase in the bargaining power of the seller (buyer) increases (decreases) the selling price. Furthermore, we find that an increase in the buyer's search cost (i.e. the search effort) increases the selling price, as does an increase in the seller's search cost (advertising vacancies). This latter result is not completely intuitive.

The rest of the paper is organised as follows: section 2 presents the housing market matching model; while section 3 concludes.

2. The model

2.1 The hypotheses of the model

The market of reference is the homeownership market rather than the rental market. In this way, if a contract is legally binding (as hypothesised) it is no longer possible to return to the circumstances preceding the bill of sale, unless a new and distinct contractual relationship is set up. In matching model jargon this means that the destruction rate of a specific buyer-seller match does not exist.

The economy is populated by N types of sellers (which we indicate with $i = 1, \dots, N$) and by M types of buyers (which we indicate with $j = 1, \dots, M$). “Type” refers to the economic rather than social or personal characteristics of the individual. We indicate with s^i a measure of sellers of type i and with b^j a measure of buyers of type j . Hence, we can think of $\sum s^i = S$ and $\sum b^j = B$ as measures of the stock of sellers and buyers in the economy, respectively. Sellers hold $H \geq 2$ houses of which $H - 1$ are on the market, i.e. vacancies (v) are simply given by $v = (H - 1) \cdot S > 0$, thus assuming a vacancy rate permanently positive (as in Wheaton, 1990). It is therefore possible that a buyer of type j can become a seller of type i , and that a seller of type i can become a buyer of type j .

The expected values of a vacant house (V) and of buying a house (B) are given by:³

$$rV = -a^i + q(\theta) \cdot [P - V] \quad [1]$$

$$rB = -e^j + g(\theta) \cdot [x - B - P] \quad [2]$$

where $\theta \equiv \frac{v}{B}$ is the housing market tightness from the sellers' standpoint,⁴ while $q(\theta)$ and $g(\theta)$ are, respectively, the (instantaneous) probability of filling a vacant house and of finding/buying a home. The popular hypothesis of constant returns to scale in the matching function is adopted (see Pissarides, 2000; Petrongolo and Pissarides, 2001). Hence, the properties of these functions are straightforward: $q'(\theta) < 0$ and $g'(\theta) > 0$.⁵

The terms a^i and e^j represent, respectively, the costs sustained by sellers of type i for the advertisement of vacancies and the effort (in monetary terms) made by buyers of type j to find and visit the largest possible number of houses. If a contract is stipulated, the buyer of type j gets a benefit x from the property (abandoning the home searching value) and pays the sale price P to the seller of type i (who abandons the value of finding another buyer). As in Habito *et al.* (2010), the buyer's benefit x is a positive function of housing characteristics, i.e. it does not depend on the buyer's type.

³ Time is continuous and individuals are risk neutral, live infinitely and discount the future at the rate r . As usual in matching-type models, the analysis is restricted to the stationary state.

⁴ By definition, markets with frictions require that: $0 < \theta < \infty$.

⁵ Standard technical assumptions are assumed: $\lim_{\theta \rightarrow 0} q(\theta) = \lim_{\theta \rightarrow \infty} g(\theta) = \infty$, and $\lim_{\theta \rightarrow 0} g(\theta) = \lim_{\theta \rightarrow \infty} q(\theta) = 0$.

2.2 Equilibrium

The endogenous variables that are determined simultaneously at equilibrium are market tightness (θ) and sale price (P).

The customary long-term equilibrium condition, namely the “zero-profit” or “free-entry” condition, normally used in the matching models (see Pissarides, 2000) yields the first key relationship of the model, in which market tensions are a positive function of price. In fact, using the condition $V = 0$ in [1], we obtain:

$$\frac{a^i}{P} = q(\theta) \quad [3]$$

with $\frac{\partial \theta}{\partial P} > 0$ since $q'(\theta) < 0$. In short, if the price increases, more sellers will stand in the market; hence, it will be more difficult to fill the vacant houses. Consequently, fewer vacancies will be on the market.

The (generalised) Nash bargaining solution, usually used for decentralised markets, allows the sale price P to be obtained through the optimal subdivision of surplus (S) deriving from a successful match:⁶

$$S = \underbrace{(P - V)}_{\text{capital gain of seller}} + \underbrace{(x - B - P)}_{\text{capital gain of buyer}} \\ \Rightarrow S = x - B \quad [4]$$

The price is obtained by solving the following optimisation condition:

$$P = \operatorname{argmax} \left\{ (P - V)^{\gamma^i} \cdot (x - B - P)^{1 - \gamma^i} \right\} \\ \Rightarrow P = \frac{\gamma^i}{(1 - \gamma^i)} \cdot (x - B - P)$$

where γ^i is the bargaining power of sellers of type i . Knowing that

$$(x - B - P) = \frac{(1 - \gamma^i)}{\gamma^i} \cdot P, \text{ eventually we get:}$$

$$P = \gamma^i \cdot (x - B) \Rightarrow P = \frac{\gamma^i \cdot (rx + e^j)}{r + g(\theta) \cdot (1 - \gamma^i)} \quad [5]$$

Equation [5] is none other than the hedonic price function of the model. In fact, the selling price depends positively on the buyer's benefit x , which in turn depends positively on the housing characteristics.

⁶ Entering into a contractual agreement obviously implies that $S > 0$, i.e. $x > B$, $\forall \theta$. This realistic condition ensures that the price is positive.

Since $g'(\theta) > 0$, as market tensions increase, the sale price decreases; hence, we obtain the second key relationship of the model: $\frac{\partial P}{\partial \theta} < 0$. In short, if the tightness increases, the effect of the well-known congestion externalities on the demand side (see Pissarides, 2000) will lower the selling price.

Finally, it is straightforward to obtain from [3] that when P tends to zero (infinity), θ tends to zero (infinity), as $q(\theta)$ tends to infinity (zero). Consequently, given the negative slope of [5] and the fact that price is always positive, only one long term equilibrium deriving from the intersection of the two curves exists in the model (see point A in *Figure 1*).

===== *Figure 1 about here (now at the end)* =====

2.3 Comparative statics and price dispersion

From [5], the selling price crucially depends on the bargaining power of the seller. In fact, $\gamma^i \rightarrow 0 \Rightarrow P = 0$, and $\gamma^i \rightarrow 1 \Rightarrow P = x + \frac{e^j}{r}$. Since the price can never be negative or null, we assume that $0 < \gamma^i \leq 1$.

Furthermore, the selling price also depends on the search costs of buyers and sellers. In particular, from [5] it is straightforward to obtain that an increase in the search effort of buyers (e^j) increases the selling price. This is an intuitive result. However, a partially counter-intuitive result regards the effect of advertising vacancies on the selling price. In fact, an increase in a^i decreases market tightness, which in turn increases the selling price (see *Figure 2*). In short, an increase in the seller's search cost also leads to an increase in the selling price.

===== *Figure 2 about here (now at the end)* =====

Instead, the impact of interest rate (which might be considered an indicator of uncertainty) on the selling price is a priori ambiguous and depends on: (i) the search effort of buyers; (ii) the bargaining power of sellers; (iii) the buyer's benefit; (iv) the market tightness.

Finally, we consider two similar houses, A and B, which give the same benefit: $x^A = x^B$. In this case, price dispersion in the model comes from:

- a) The bargaining power of sellers (γ^i): different bargaining powers lead to different selling price;
- b) The search costs of sellers (a^i) and buyers (e^j): in fact, since matching occurs between a seller of type i and a buyer of type j , different pairs lead to different search costs, which in turn imply different selling prices.

2.4 Closing the model

In order to close the model in a very simple manner, we normalise the population in the housing market to the unit, i.e. $1 = S + B$. As a result, using the definitions of equilibrium tightness ($\theta = \theta^*$) and vacancies, we obtain the stock of sellers, buyers, and the “natural” vacancy rate:

$$S = \frac{\theta^*}{H - 1 + \theta^*} \quad [6]$$

$$B = \frac{H - 1}{H - 1 + \theta^*} \quad [7]$$

$$v = \frac{(H - 1) \cdot \theta^*}{H - 1 + \theta^*} \quad [8]$$

The “natural” vacancy rate is the optimal share of houses for sale on the market that prevails in long term equilibrium at which sellers make no economic profits (Arnott and Igarashi, 2000; McDonald, 2000).

3. Conclusions

This paper develops a matching model *à la* Pissarides (2000) in order to explain a basic fact of housing markets: price dispersion. The variance in house prices is basically due to both the *ex-ante* heterogeneity of the parties (bargaining power, tastes, asymmetric information) and the search costs of buyers and sellers. In fact, sellers and buyers spend time and money (for advertising vacancies and making the effort to visit the greatest number of house) before concluding the deal. Furthermore, the house price is substantially determined by a deal between the parties. These factors affect the selling price and lead to price dispersion. This simple theoretical model is able to take these distinctive features of the housing markets into account.

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Figures

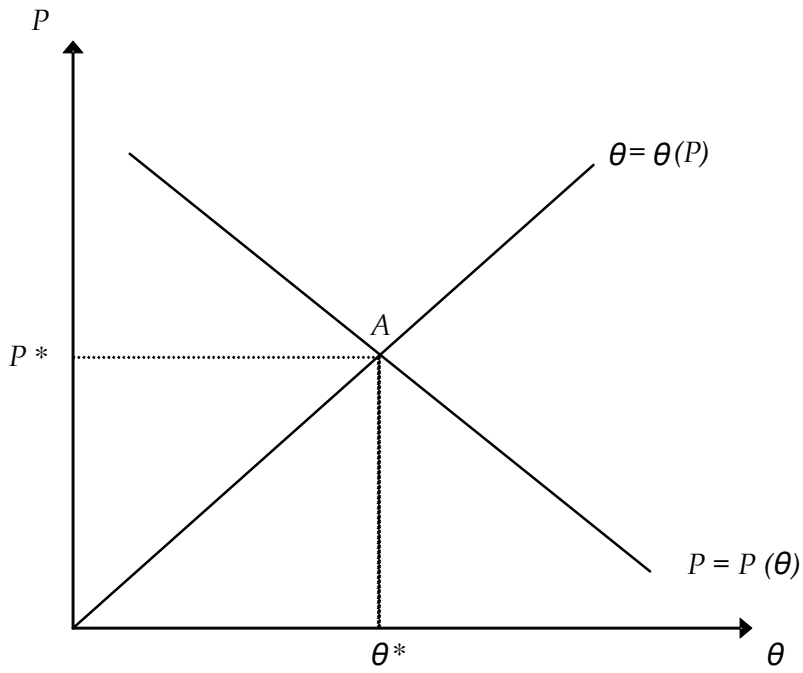


Figure 1. Equilibrium

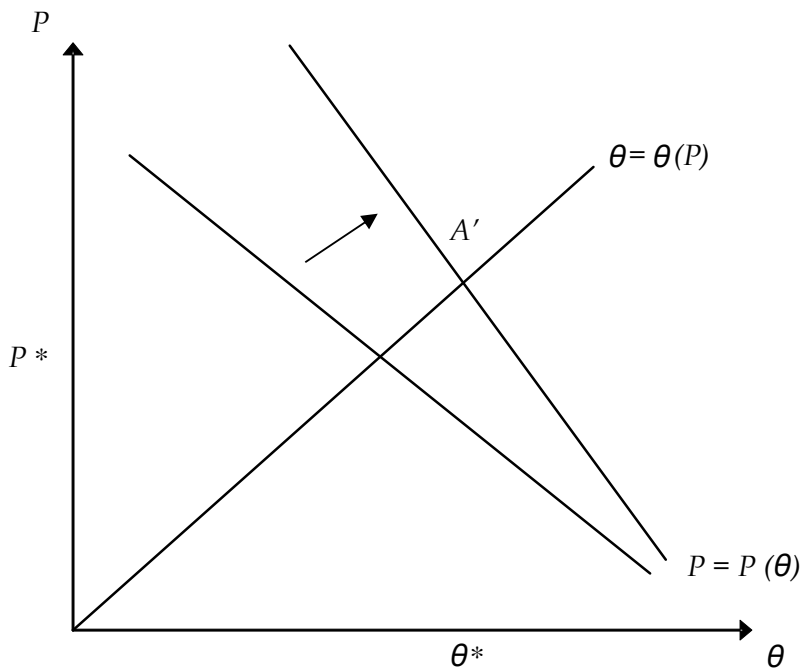


Figure 2. Increase in the search costs of sellers (advertising vacancies)