



Land prices, lending to companies and job creations

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The fluctuations of the value of land held by French firms present a very similar pattern to those of both investment and employment. This Rue de la Banque presents a model in which firms face imperfect labour and credits markets. Due to a collateral constraint for credit, the market value of land in firms' balance sheets plays an important role in determining how much they can borrow, and thus affects their investment levels and hiring decisions. The empirical results confirm the predictions of the theoretical model. Fluctuations in land prices had an impact on the business cycle and on the dynamics of the labour market in France.

This edition of *Rue de la Banque*¹ looks first at the different relationships between the land assets held by firms and the labour market in France. It then goes on to provide a brief summary of the principal characteristics of the underlying model. Lastly, we compare the model's predictions with the empirical results.

What do we know about the links between the market value of land in a firm's balance sheet and the labour market?

In a market where borrowing is constrained by collateral requirements, the value of the assets in a firm's balance sheet will influence its ability to obtain funding from a credit institution. An increase in the value or quantity of a firm's assets will relax its borrowing constraint, thereby increasing its ability to invest and hire new employees.

Various microeconomic studies of firm-level balance sheet data have confirmed the positive correlation between the market value of firms' real estate holdings and their levels of investment and hiring.

Using balance sheet and employment data for French firms, for example, Chaney *et al.* (2013) show that the market value of real estate assets has a sizeable impact on employment and investment. Their study suggests that the 2002-2006 rise in French real estate prices accounted for some 10% of aggregate jobs growth over the period, via the impact on the value of collateral. Similar results have also been obtained for a sample of US public corporations: Chaney *et al.* (2012) show that a USD 1 increase in the value of a real estate asset leads to a USD 0.06 rise in investment. In addition, a recent study of French aggregate series by Insee, the national statistics office, concludes that the market value of land has had a significant and positive impact on building investment fluctuations since the beginning of the 1990s.

In the rest of this article, we focus on firms' land holdings as it has been shown that house prices are largely driven by the price of land.²

¹ This paper summarises Kaas, Pintus and Ray (2014).

² This result, which has been observed for French data, has also been shown to be true for US data (see Davis and Heathcote, 2007).

C1 Market value of NFC land holdings; real NFC investment; indicator of labour market tightness in France

(standard deviation in %)

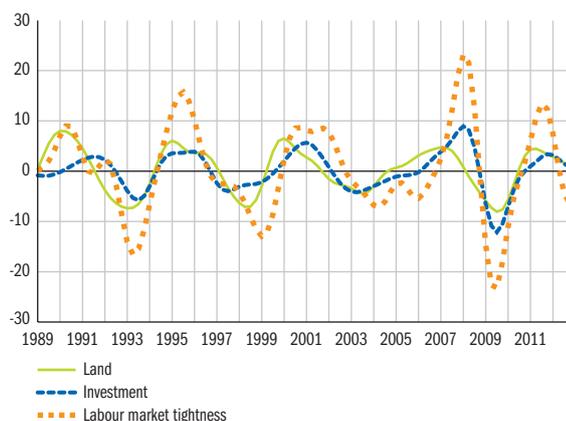


Chart 1 shows the cyclical components of non-financial corporations' (NFCs) real investment and land value, and of a labour market tightness indicator (the ratio of job vacancies to jobseekers at national level). All three indicators are positively correlated.

We estimate the cyclical components of the following variables: land value, business investment, the number of job vacancies and of unemployed, a labour market tightness indicator (the ratio of vacancies to unemployment) and outstanding credit liabilities. Table 1 shows the correlation coefficients for these variables along with a measure of their volatility (standard deviations relative to output). All the variables presented show greater volatility than output, particularly labour market tightness which is nine times more volatile than output. This is comparable to the findings for US data

(Shimer, 2005). Moreover, land prices, investment, job vacancies and labour market tightness are positively correlated with output, whereas the number of unemployed is negatively correlated with output.

How can we formalise the mechanisms at play?

We construct a model that incorporates a collateral constraint on borrowing – as in Kiyotaki and Moore (1997) – and labour market matching frictions – similar to Mortensen and Pissarides (1999). We then use this model to examine the dynamic relationships between French NFCs' land value, their levels of investment and their demand for labour.

The model looks at three representative agents: firms, households and the government which levies taxes on wages in order to pay unemployment benefits.

The firms' owners hold and accumulate capital, buy or sell land, hire workers, and borrow in international credit markets. Firms pay an adjustment cost when they make changes to their capital or headcount. They are also subject to borrowing constraints for the financing of their investments i.e. their total borrowing plus interest cannot exceed a certain limit, defined as a share of the market value of the assets pledged as collateral. As a result, firms' land holdings not only contribute to the production process, they also serve as collateral for loans from investors.

This collateral function of land plays an important role in the overall dynamic predicted by our model. A firm's ability to borrow and therefore to invest and create jobs is in part determined by expectations of future land prices.

T1 Correlation and relative volatilities

	Output	Land	Investment	Vacancies	Unemployment	Labour market tightness	Credit liabilities
Output	1.00	0.46	0.79	0.69	-0.65	0.84	0.35
Land		1.00	0.57	0.76	-0.40	0.65	0.10
Investment			1.00	0.71	-0.69	0.88	0.38
Vacancies				1.00	-0.47	0.84	0.06
Unemployment					1.00	-0.87	-0.77
Labour market tightness						1.00	0.52
Credit liabilities							1.00
Standard deviation relative to output	1.00	3.87	3.30	5.23	4.68	8.93	2.94

Notes: The series based on balance sheet and income statement data are calculated for NFCs; all statistics are based on quarterly variables over the period 1978-2011, except credit liabilities (since 1996), vacancies and market tightness (since 1989).

Households use their wage income to finance their consumption. The equilibrium wage is determined through bilateral negotiations, with firms seeking to maximise the value derived from paying an extra wage, and workers seeking to maximise the satisfaction differential between having a job and being unemployed. The result will depend on the respective bargaining skills of the worker and the firm.

In our model, unemployment results from a combination of job destructions (at a given rate) and the job search difficulties encountered by the unemployed (i.e. matching frictions between jobseekers and vacancies). The optimal number of positions created by a firm plays a key role in determining labour market dynamics: the higher the anticipated value to be gained from hiring an additional worker, the higher the optimal number of positions. The job value of the additional worker is discounted in order to compare income at different dates.

Financial shocks³ or shocks to land prices are transmitted to the labour market via two channels. First, as capital and labour complement each other, all other things being equal, the marginal productivity of labour will increase when investment increases. Thus, when a firm's borrowing capacity rises and hence its ability to invest, the value to be derived from hiring an additional worker will also tend to increase, leading to higher job creations. Secondly, a relaxation in borrowing constraints increases the discount factor and hence the discounted job value of an additional worker, leading to a rise in the firm's optimal number of positions.

Can the model replicate the observed dynamics?

The model parameters are calibrated such that, in steady state,⁴ the ratios of capital, debt and land value to output are equal to their long-term averages.⁵ Moreover, in steady state, the unemployment rate, the quarterly job finding rate and the quarterly job separation rate correspond to the average values observed for these parameters in France.

In our model, productivity shocks and financial shocks do not produce the same level of volatility as in the data. In particular, they do not produce sufficient land price volatility. In contrast, shocks to demand, which

directly affect prices, are able to reproduce the relative volatilities and correlations observed in the French data (see Table 1), which suggests that fluctuations in land prices played a key role in business cycle and labour market dynamics in France.

Next, we estimate a vector autoregressive model (VAR). This allows us to look at the dynamic relationships between firms' land value, job vacancies, unemployment and investment following a land price shock, and compare the results of our theoretical model with those obtained from an empirical analysis of French data.

Chart 2 shows the impulse response functions (the reaction predicted by the empirical results) following a land price shock. The shock has significant and long-lasting effects: it first has a positive impact on labour demand and business investment, and a negative impact on the number of unemployed; then labour demand and investment fall below their equilibrium level (unemployment rises above its equilibrium level), reflecting an overreaction of the agents to the land price shock.

Note that the theoretical model's predictions regarding the short-term fluctuations after an exogenous shock to demand for land (see Chart 3) are similar to those obtained in the empirical analysis.

The model is therefore able to reproduce the dynamics, relative volatilities and co-movements of land value, investment and the main variables of the French labour market.

By establishing that fluctuations in the price of land holdings affect French labour market dynamics, this study also contributes to the existing literature on labour market volatility and cyclicity.

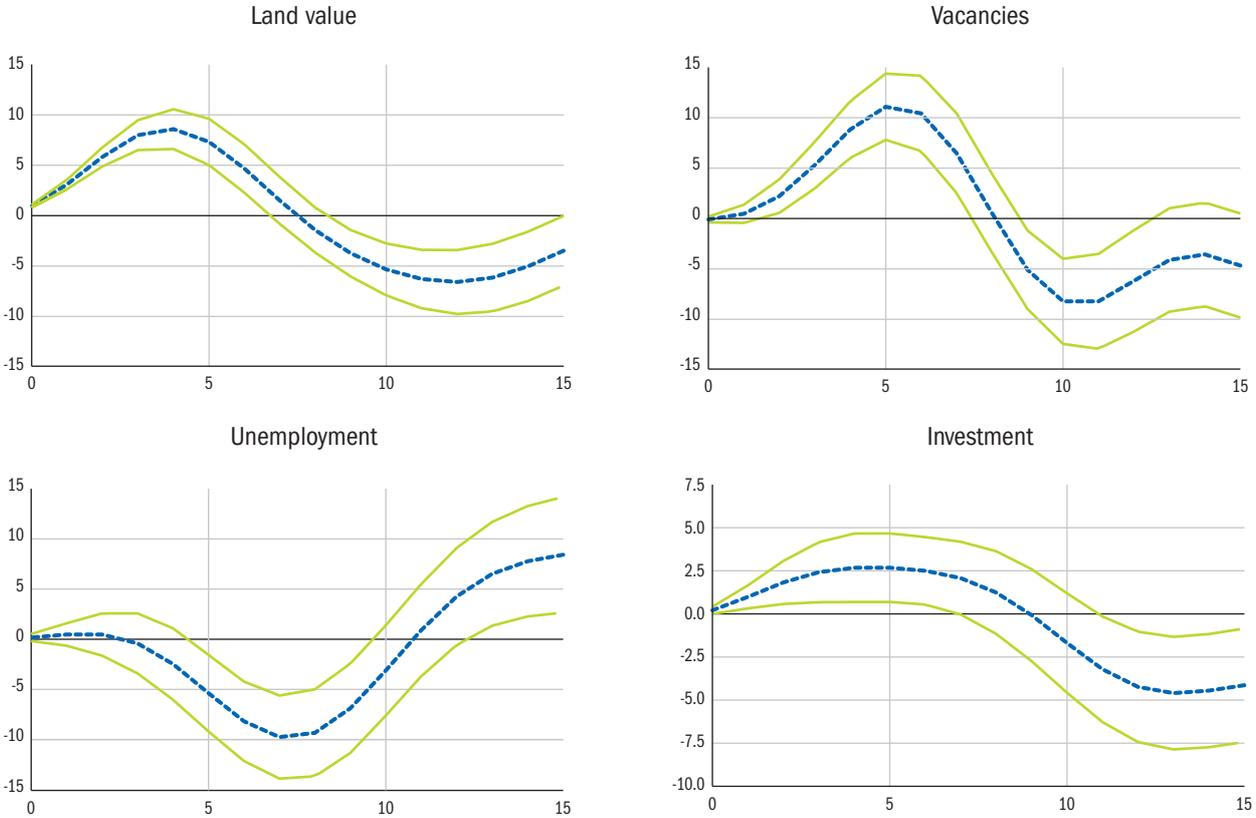
³ A financial shock corresponds to an exogenous change in the share of a firm's asset value that can be pledged to a credit institution as collateral.

⁴ This corresponds to the long-term state of the economy.

⁵ When calibrated using observed French data, the model is locally indeterminate when the parameter defining the debt-to-land value ratio is above a certain threshold. As a result, the dynamics of land prices can also depend on non-fundamental shocks such as self-realising prophecies (sunspots). See section 5 of the working document cited in footnote 1.

C2 Simulation of the empirical model: impulse response functions to a one-standard-deviation land price shock

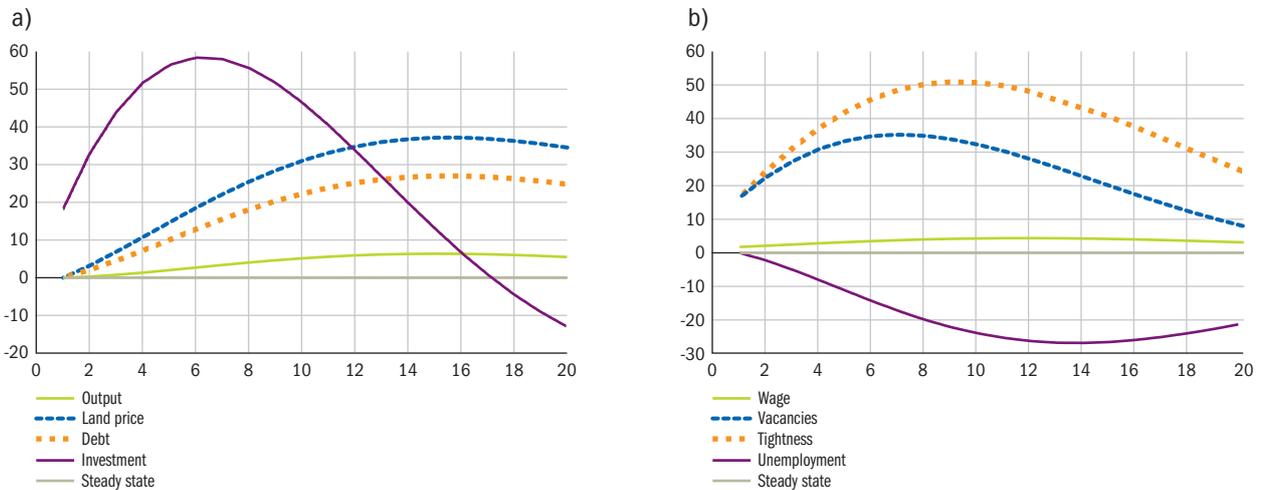
(deviation from steady state, % per quarter)



Note: The dotted lines are 95% confidence intervals.

C3 Simulation of the theoretical model: impulse response functions

(deviation from steady state, % per quarter)



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