



Land collateral and labor market dynamics in France



Leo Kaas^{a,*}, Patrick A. Pintus^b, Simon Ray^{b,c}

^a University of Konstanz, Germany

^b Aix-Marseille University (Aix-Marseille School of Economics), CNRS & EHESS, France

^c Banque de France, France

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ABSTRACT

The value of land in the balance sheet of French firms correlates positively with their hiring and investment flows. To explore the relationship between these variables, we develop a macroeconomic model with firms that are subject to both credit and labor market frictions. The value of collateral is driven by the forward-looking dynamics of the land price, which reacts endogenously to fundamental and non-fundamental (sunspot) shocks. We calibrate the model to French data and find that land price shocks give rise to significant amplification and hump-shaped responses of investment, vacancies and unemployment that are in line with the data. We show that both the endogenous movements in the firms' discount factor and the sluggish response of the land price are key elements that drive the results.

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1. Introduction

Recent evidence suggests that real estate collateral is an important determinant of firms' employment decisions. Using administrative data for French firms, Chaney et al. (2013) show that shocks to the value of real estate have sizeable effects on employment and investment. The impact of collateral on investment appears to be larger for French firms than for the US firms covered by the Compustat database (Chaney et al., 2012).¹ Moreover, investment appears to be considerably more sensitive to cash-flow variations in France, which suggests that French firms may be more financially constrained. To better understand how the labor market responds to shocks to the firms' collateral value, this paper builds a canonical macroeconomic model with financially constrained firms and search frictions in the labor market. We calibrate the model to France and relate its business-cycle features to those in the data. In particular, we find that the model response to a shock to collateral value features amplification and propagation that are in line with those obtained from a VAR analysis.

Our business-cycle model features collateral constraints and forward-looking land prices as in Kiyotaki and Moore (1997) and Kocherlakota (2000), on the one hand, and labor market frictions similar to Mortensen and Pissarides (1999), on the other hand. Firms hold productive land and capital, and they borrow in an international credit market, using land and (a fraction of) capital as collateral.² In the labor market, firms post vacancies and they are matched with unemployed workers who are hired for production in the subsequent period.

* Corresponding author.

E-mail addresses: leo.kaas@uni-konstanz.de (L. Kaas), patrick.pintus@univ-amu.fr (P.A. Pintus), simon.ray@banque-france.fr (S. Ray).

¹ Specifically, a 1\$ increase in collateral value raises investment for US firms by 0.06\$, whereas the effect for French firms is about three times as large. Of course, the two firm samples are not directly comparable, since Compustat does not cover private (and smaller) firms which are more bank-dependent. Further studies on the role of financial constraints on employment based on US firm-level data are Benmelech et al. (2011) and Chodorow-Reich (2014).

² Our focus on land (as opposed to real estate) builds on Davis and Heathcote (2007), who show that fluctuations in US firms' real estate are largely driven by those in the land value. This is also what we find in French data.

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To uncover the business–cycle relationships between collateral prices, investment and labor market dynamics, we introduce three types of shocks into our model: (i) TFP shocks; (ii) shocks to the collateral constraint (“financial shocks”); and (iii) shocks to the transaction price of land (“land price shocks”). We think of (ii) as any disruptions in financial markets that change the amount of funds channeled from lenders to borrowers. Although shocks (i) (as in, e.g., [Kocherlakota, 2000](#)) and (ii) alone induce endogenous movements in land prices, this amplification channel is quantitatively too small to account for the observed volatility in the data. We think of shock (iii) as a short-cut to describe movements in the demand for land, without making the underlying mechanism explicit. This allows us to distinguish explicitly between those events that change the value of land collateral and other types of financial shocks that directly affect the intermediation between borrowers and lenders, as in the recent literature (e.g., [Kiyotaki et al., 2011](#); [Liu et al., 2013](#); [Justiniano et al., 2013](#)).

When we calibrate our model to the French economy, we find that the dynamic response to shocks of type (iii) is especially relevant and exhibits large amplification and hump-shaped responses of vacancies, unemployment and investment. The responses differ notably because the land price shock significantly relaxes the credit constraint and thus takes an impact on the firms' discount factor. We show that the dynamics of the firms' discount factor plays a key role in the response of hiring which is a new amplification channel relative to the existing macro-labor literature. The explanation is that constrained firms react to a relaxation of credit constraints by augmenting current profit income at the expense of future income, which raises the discount factor and induces firms to expand investment and hiring faster.

Besides this channel, the key factor behind the propagation result is that the unique steady-state equilibrium is locally indeterminate, which means that the land price not only depends on fundamentals but also reacts to self-fulfilling beliefs (sunspots). The intuition for this result is a “pecuniary externality” in the collateral constraint: if firms expect the land price to go up in the future, they expect relaxed credit constraints which induces them to borrow and invest more, and hence to demand more inputs which in turn bids up the land price. As a consequence, the initial expectation is fulfilled. In the absence of sunspot shocks, on the other hand, the land price reacts to fundamental shocks in a sluggish fashion. This sluggish adjustment accounts for a slow build up of collateral capacity and hence to a hump-shaped response of investment and vacancies to a (fundamental) land price shock. In contrast, pure sunspot shocks or shocks to the collateral constraint generate dynamics that are at odds with the data. Our paper departs from the literature reviewed below by showing that the dynamics of investment and labor market variables under fundamental shocks to the land price are empirically relevant when the steady state is locally indeterminate.

Our work relates to a recent literature that incorporates financial frictions into macroeconomic models with search frictions in the labor market. In an early contribution, [Wasmer and Weil \(2004\)](#) introduce frictional search in the credit market and obtain a financial accelerator effect, while [Dromel et al. \(2010\)](#) show how unemployment becomes persistent under credit market frictions in a related model. [Petrosky-Nadeau and Wasmer \(2013\)](#) consider a stochastic version of a similar model, generating a dynamic financial multiplier which amplifies the impact of productivity shocks on labor market tightness significantly.

[Monacelli et al. \(2011\)](#) introduce borrowing constraints into a macroeconomic model with labor search frictions; while they argue that these constraints do not directly prevent firms from hiring, they show that higher debt improves firms' bargaining position, which takes a negative (positive) effect on wages (job creation). [Boeri et al. \(2013\)](#) let unconstrained firms choose an optimal level of leverage, together with job creation and job destruction; they show that credit market conditions have an effect on job creation *and* on job destruction. As in our paper, financial conditions take a direct impact on job creation of financially constrained firms in [Petrosky-Nadeau \(2014\)](#) who focuses on the amplification and propagation of productivity shocks but does not consider the dynamics of collateral value.

Closely related to our paper is [Liu et al. \(2013a\)](#) who consider a quantitative macroeconomic model with labor and credit market frictions in which shocks to land prices affect the firms' collateral capacity. Estimating their model to US data, they also obtain labor market amplification of land price shocks, although their model does not generate hump-shaped impulse responses for vacancies. Also, different from our model, they include consumption habits as well as shocks to wage setting and to the matching function.³ On the other hand, multiplicity and self-fulfilling beliefs play a key role in the paper of [Miao et al. \(2013\)](#) who show how a collapsing stock market bubble tightens credit constraints which induces firms to cut on hiring.

The rest of the paper is organized as follows. The next section reviews the role of firms' land collateral for the business cycle in France. [Section 3](#) introduces the model and [Section 4](#) characterizes the dynamic equilibrium. In [Section 5](#), we calibrate the model to France to analyze its business cycle features.

2. Land value and labor market dynamics in france

In this section we discuss the role of firms' land collateral for business cycle dynamics in the French economy. We begin with a descriptive analysis by showing some key correlation and volatility patterns. We then conduct a VAR analysis to understand how shocks to the market value of land held by the firms affect the labor market.

³ Also, unlike our model, households hold land, which contributes to amplification through a “labor channel”, induced by wage rigidities due to non-separable utility between consumption goods and housing services. Such a channel is absent in our model.

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