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Factor specificity and real rigidities ☆

Carlos Carvalho [a], Fernanda Nechio [b,*]

[a] Central Bank of Brazil and PUC-Rio, Brazil
[b] Federal Reserve Bank of San Francisco, United States

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ABSTRACT

We develop a multisector model in which capital and labor are free to move across firms within each sector, but cannot move across sectors. To isolate the role of sectoral specificity, we compare our model with otherwise identical multisector economies with either economy-wide or firm-specific factor markets. Sectoral factor specificity generates within-sector strategic substitutability and tends to induce across-sector strategic complementarity in price setting. Our model can produce either more or less monetary non-neutrality than those other two models, depending on parameterization and the distribution of price rigidity across sectors. Under the empirical distribution for the U.S., our model behaves similarly to an economy with firm-specific factors in the short-run, and later on approaches the dynamics of the model with economy-wide factor markets. This is consistent with the idea that factor price equalization might take place gradually over time, so that firm-specificity may serve as a reasonable short-run approximation, whereas economy-wide markets are likely a better description of how factors of production are allocated in the longer run.

1. Introduction

Much of the monetary economics literature tries to make sense of the extent of monetary non-neutrality that is apparent in the data. An important part of this literature does so by resorting to models in which prices (and sometimes wages) are sticky. A problem with bare bone versions of these models is that the degree of price rigidity required to generate substantial non-neutrality is at odds with the microeconomic evidence on the frequency of price changes. However, since Ball and Romer (1990) and Kimball (1995), it is well-known that large real rigidities – which can induce strategic complementarities in price-setting decisions – can generate substantial endogenous persistence in the real effects of monetary shocks, and thus help bridge this gap.

In a series of contributions to our understanding of the sources of real rigidities, Woodford (2003, chap. 3), Sveen and Weinke (2005), and Woodford (2005) argue forcefully that factor specificity matters. Woodford (2003, chap. 3) focuses on

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* Corresponding author.
E-mail addresses: cvianac@econ.puc-rio.br (C. Carvalho), fernanda.nechio@sf.frb.org (F. Nechio).

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firm-specific labor,[1] whereas Sveen and Weinke (2005) develop a model with firm-specific capital.[2] In turn, Woodford (2005) studies a model in which both capital and labor are specific to firms. He shows that capital and labor specificity at the firm level are a powerful source of real rigidities.

The assumption of firm-level specificity contrasts sharply with the (usually unstated) assumption that factors of production can move freely across firms, as in the Real Business Cycle literature. Under standard assumptions about preferences and technology, such economy-wide factor markets tend to induce strategic substitutability in price setting (e.g., Woodford, 2005, chap. 3), and thus generate a small degree of monetary non-neutrality (Chari et al., 2000).

The two aforementioned assumptions about factor markets are, to some extent, unrealistic. It is likely that factor price equalization takes place gradually over time, so that firm-specificity might be a reasonable short-run approximation, whereas economy-wide markets might be a better description of how factors of production are allocated in the longer run.

In this paper, we study whether the *nature* of factor specificity matters. To that end, we develop a multisector model in which both capital and labor are free to move across firms *within* each sector, but cannot move *across* sectors – i.e., factors of production are *sector-specific*. To isolate the role of sectoral specificity, we compare our model with otherwise identical multisector economies with either economy-wide or firm-specific factor markets.

It turns out that it matters a great deal whether factor markets are specific at the firm or at the sector level. Using simplified versions of the three models, we illustrate analytically how the degree of strategic complementarity or substitutability in pricing decisions differ across the three models. As a result of different patterns of pricing interactions within and across sectors, our model with sector-specific factor markets can produce rich aggregate dynamics. Sectoral factor specificity generates *within-sector strategic substitutability* in pricing decisions. This tends to reduce the degree of monetary non-neutrality relative to the case of firm-specific factors. At the same time, sectoral relative price movements generate distributional effects that induce strategic complementarity (or weaken strategic substitutability) in pricing decisions *across sectors* – relative to the model with economy-wide factor markets. As a result of these forces, our sector-specific factor model can produce either more or less monetary non-neutrality than those other two models, depending on parameterization and the distribution of price rigidity across sectors.

Turning back to the fully-specified versions of the three models, our results show that a calibrated version of our model that matches the empirical distribution of price stickiness for the U.S. behaves similarly to an economy with firm-specific factors in the short-run, and later on approaches the dynamics of the model with economy-wide factor markets.

The differences in aggregate dynamics implied by the different assumptions on factor specificity can also be understood through the lens of the underlying New Keynesian Phillips curves. We explicitly derive Phillips curves in our multisector economies with endogenous capital accumulation, under the three alternative assumptions regarding factor specificity.[3]

While the assumption that factors cannot move across sectors is also extreme, our model is motivated by existing empirical evidence that both capital and labor have an important degree of sector (or industry) specificity. For example, Ramey and Shapiro (1998) find that the flow of capital across firms within the same industry is indeed large, while Ramey and Shapiro (2001) provide evidence of significant sectoral specificity of capital, based on an industry case study. Davis and Haltiwanger (1992) and Parent (2000) provide empirical evidence that labor reallocation across sectors/industries is more limited than within sectors. More recently, Hobijn (2012) finds similar results. Autor et al. (2014) show that the intensity of labor reallocation within- versus across-sectors correlates with the level of wages. In particular, looking at the effects of increasing import competition, they find that low-wage workers reallocate primarily within industry, while high-wage workers appear to switch sectors more easily. Dix-Carneiro (2014) estimates the effects of a trade liberalization shock in Brazil using a model with imperfect labor and capital mobility across sectors. He finds that these mobility frictions lead to a slower response of the economy to shocks.

Different forms of input specificity can also be justified on theoretical grounds. In a series of contributions, Caballero (2007), and Caballero and Hammour (1996, 1998, 2000) discuss the possible sources and macroeconomic implications of input specificity. They show that specificity contributes to the slow adjustment of macroeconomic aggregates to shocks in the short and medium run, with resources being underutilized, production suffering from "technological sclerosis," and recessions being excessively sharp in the transition to a new steady state.

Section 2 presents the reference model of our multisector economy with sector-specific factors of production. It also presents the otherwise identical multisector models with either economy-wide or firm-specific factor markets. Section 3 analyses in detail the different patterns of pricing interactions produced by the three models, and presents the underlying new Keynesian Phillips curves. Section 4 follows with a quantitative analysis of the effects of monetary shocks under the three types of factor specificity. The last section concludes.

[1] To be precise, Woodford's (2003, 2005) models feature industry-specific labor coupled with assumptions that make it mathematically equivalent to a particular model with firm-specific labor markets, as will become clear subsequently.

[2] Other papers in the literature, such as Sveen and Weinke (2007a, 2007b) and Altig et al. (2011), also find that firm-specific capital is an important ingredient for understanding the monetary transmission mechanism. Reiter et al. (2013) analyze the role of capital specificity in a model with lumpy (S, s) investment.

[3] For an analysis of the implications of labor specificity for the New Keynesian Phillips Curve (NKPC) in one-sector models without capital accumulation, see the recent survey by Leahy (2011).