This paper offers an excellent survey of recent empirical work studying the comovement between prices, costs, and nominal shocks. In addition, it presents interesting new evidence that sheds light on the mechanisms that account for the sluggish response of prices to nominal shocks. The authors’ main focus is on how consumer prices of imported goods react to nominal exchange rate changes.

The paper is organized around two themes. The first theme is that real rigidities play an important role in accounting for the observation that retail prices are sticky. Two observations lead to this conclusion. First, imported-good prices react little to movements in nominal exchange rates even for firms that reset their prices. Second, reset-price inflation (a measure of the rate at which firms would like to change their prices absent nominal rigidities) is persistent.

The second part of the paper attempts to decompose the sluggish response of retail prices to nominal shocks into two components: a markup adjustment and cost rigidities. The authors argue that markup adjustments play a relatively minor role. Rather, stickiness in wholesale prices accounts for the bulk of the stickiness in retail prices. Again, several observations lead to this conclusion. First, quantitative studies by Klenow and Willis (2006) and Burstein and Hellwig (2007) find that models with markup variation cannot jointly account for the comovement of quantities and prices in the data. Moreover, nominal rigidities alone cannot generate much variation in markups since prices are quite flexible in the retail price data. Second, empirical studies of micro price data on retail prices and wholesale costs find that retail price stickiness is primarily driven by stickiness in wholesale costs: while wholesale prices are sticky, retail prices tend to respond quickly to changes in wholesale costs. (See the work of Goldberg and Hellerstein [2008], Nakamura and...
I. Are Real Rigidities Important?

The authors’ first finding is that real rigidities account for the bulk of stickiness of prices in the data. They define real rigidities as “mechanisms that dampen price responses of firms because of factors such as strategic complementarities in price setting, real wage rigidity, and the dependence of costs on inputs prices that have yet to adjust, among others.” In other words, real rigidities are anything other than nominal rigidities (menu costs that prevent nominal prices from changing too often) that generate a sluggish response of prices to shocks. Hence, when the authors argue that “real rigidities” account for the bulk of stickiness of prices in the data, they really mean that nominal rigidities play a minor role. Since prices change frequently in the data, and since even those prices that change do not seem to react much to nominal exchange rate changes, these findings reinforce the conclusions of much earlier work.

I briefly review here some evidence from my own work with Patrick Kehoe in which we document a similar pattern using international bilateral price data. We show in Kehoe and Midrigan (2007) that models with nominal rigidities imply a tight relationship between the degree to which a good’s price is sticky and the extent to which that good’s relative price fluctuates across countries. For example, a simple version of the Calvo model predicts that the international relative price of good $i$ evolves according to

$$q_{it} = \lambda_i q_{it-1} + \lambda_i \Delta e_t,$$

where $q_{it}$ is the real exchange rate of good $i$, $\lambda_i$ is equal to one minus the frequency with which the price of good $i$ changes, and $\Delta e_t$ are changes in the nominal exchange rate. This expression shows that when $\lambda_i$ is lower, so that prices are more flexible, real exchange rates for that particular good are less volatile and less persistent. In contrast, as $\lambda_i$ increases toward unity, real exchange rates track nominal exchange rates closely.

We use sectoral price data from the U.S. Bureau of Labor Statistics (BLS) and Eurostat to test these predictions of the model. We use data for the United States, Austria, Belgium, France, and Spain on the frequency with which prices adjust for 66 consumption goods (sectors).
These data are derived from primitive data on the prices of specific items used by the BLS and the European countries’ statistics institutes in order to construct data on the consumer price index. We also use monthly data on good-level real exchange rates for the European countries in our sample against the United States.

Figure 1, reproduced from Kehoe and Midrigan (2007), shows how the sticky price model accounts for the persistence (as measured by the serial correlation) of sectoral real exchange rates in the data. Notice that while the model predicts that persistence increases one for one with stickiness, $\lambda_i$, the data show a much weaker relationship. In particular, the model predicts that goods with flexible prices are characterized by little persistence in real exchange rates, while in the data all goods have a very volatile real exchange rate, pretty much regardless of how frequently their prices change. Thus, nominal rigidities alone cannot account for the persistence of real exchange rates in the data.

Clearly, the model’s predictions can be brought closer in line with the data by introducing variable markups or factors that dampen the
response of costs to nominal shocks. For example, a version of the model with sticky wages in which wages change once every 1.5 years can indeed account for the relationship between the persistence of real exchange rates and the frequency of price changes in the data. In this model, however, sticky costs (i.e., real rigidities), rather than sticky prices (menu costs), account for the bulk of the variation in real exchange rates. Goldberg and Hellerstein (2008) and Nakamura and Zerom (2010) reach similar conclusions, using an alternative methodology and data.

The authors argue in Section IV of their paper that the high persistence of reset-price inflation they document in the import price data is evidence of large real rigidities at this level in the supply chain. In contrast, they interpret the evidence of Bils, Klenow, and Malin (2009) that reset-price inflation for retail prices is much less persistent as evidence against the importance of real rigidities at the retail level.

I disagree with this interpretation. In particular, although I find the concept of “reset prices” introduced by Bils et al. (2009) (essentially a measure of what prices would have been absent nominal price rigidities) useful in disentangling the role of nominal rigidities, the persistence of reset-price inflation is not a useful measure of real rigidities. In New Keynesian models the persistence of reset-price inflation (or inflation for that matter) is mainly a function of the nature of aggregate shocks and the nature of monetary policy. (See, e.g., Clarida, Gali, and Gertler [1999], who show that under optimal monetary policy the rate of inflation is proportional to the exogenous shocks in the economy and thus inherits the persistence of those shocks.) Browsing table 8 in the Gopinath and Itskhoki paper, one reaches the conclusion that a similar feature characterizes their own model economy. In particular, as they raise the parameter $\Gamma$ that determines the strength of real rigidities from 0 (no real rigidities) to 4 (large real rigidities), the serial correlation of inflation barely changes (it drops from 0.41 to 0.37), as does the persistence of reset price inflation (it drops from $-0.25$ to $-0.28$). Hence, even in the model the authors study, real rigidities have no visible effect on the amount of inflation persistence.

Despite this caveat, I still find the concept of reset price suggested by Bils et al. (2009) useful. In particular, real rigidities are used in the New Keynesian literature because they ensure that the models (i) account for the correlation between prices and nominal shocks and (ii) account for the low correlation between inflation and output in the data. Since these two features of the data are what real rigidities are designed to explain, the relevant questions are (i) what is the correlation between reset prices
and nominal shocks, and (ii) what is the correlation between reset price inflation and output? These latter statistics, in contrast to inflation persistence, are clearly influenced by the degree of real (and nominal) rigidities in the model and can thus be used to disentangle the role of menu costs from other factors.

II. Sources of Real Rigidities

Having established that nominal rigidities account for little of the price stickiness in the data, the authors then go on to search for the relevant mechanisms that account for the sluggish response of prices to nominal shocks. In particular, is the imperfect comovement of prices and nominal shocks accounted for by sticky costs or rather by variable markups? Are these features mostly prevalent at the retail, wholesale, or manufacturer level?

The authors argue that their reading of the literature and their own empirical findings suggest that sticky wholesale prices account for the bulk of the price stickiness of consumer prices in the data. They base their conclusions on the observation that wholesale prices change infrequently in the data and do not comove with change in nominal exchange rates much, whereas retail prices track movements in wholesale prices very well.

I argue that such evidence must be interpreted with care. First, the average wholesale cost that is typically available in the data is not necessarily equal to the retailer’s marginal valuation of those goods. Since retail prices are a markup over the marginal valuation (or cost) of goods, the latter object is the relevant object for empirical analysis. The average acquisition cost may not be necessarily equal to the marginal valuation for a number of reasons. For example, if wholesalers offer non-linear pricing tariffs or if contracts specify both prices and quantities, the buyer may value an additional unit of the good more than the price at which it has actually purchased the other goods. Similarly, quantity adjustment costs may drive a wedge between transacted prices and marginal valuations. Although such wedges would affect the retailer’s pricing decisions, they are not incorporated in the typical measures of wholesale costs used in empirical work. Overall, since statements about costs are really statement about quantities, our understanding of real rigidities would benefit from additional information on quantities.

In work with Oleksiy Kryvtsov (Kryvtsov and Midrigan 2010), we use information on inventories in order to decompose the role of markups and costs in accounting for the sluggish response of consumer prices
to nominal shocks. We show that if costs of production are indeed sticky and markups do not vary much, a model with inventories predicts that retailers would take advantage of the stickiness in costs and strongly accumulate inventories when costs are low. In contrast, in the data, inventories react slowly to such shocks: although inventories are mildly procyclical, they are much less volatile than predicted by models in which sticky costs play an important role. We thus find an important role for variation in markups (rather than sticky costs) in accounting for the behavior of consumer prices. In particular, for models with inventories to match the dynamics of inventories in the data, it must be the case that costs are fairly sensitive to nominal shocks and that variation in markups accounts for the bulk of the stickiness of consumer prices.

III. Conclusions

The observation that prices change very frequently in the data has led economists to conclude that nominal price rigidities are rather unimportant in accounting for the stickiness of prices at the aggregate level. Rather, cost rigidities of various forms play a much more important role in current New Keynesian models of the business cycle. I argue here that such conclusions are premature. First, as pointed out by Kehoe and Midrigan (2010), the high frequency of price changes is not really evidence against the importance of sticky prices: a vast majority of price changes in the data are temporary, and such temporary price changes do not contribute much to the flexibility of the aggregate price level. In fact, we find that a standard menu cost model must have a frequency of price changes of about 12 months for it to reproduce the real effects of money shocks in our model in which prices change once every 4 months, as in the data, but in which we also match the frequency and special nature of temporary price changes in the data. Second, research by Carvalho (2006) and Nakamura and Steinsson (2010) has shown that heterogeneity in the frequency of price changes also amplifies the extent of nominal rigidities. Finally, data on costs must be interpreted with care, since prices in long-term relationships are not necessarily allocative. Contractual agreements, adjustment costs, or nonlinear tariffs generate a disconnect between the observed costs and the true shadow valuation of the good. Since statements about costs are essentially statements about quantities, I argue that a greater focus on the quantity data is necessary in order to disentangle the role of markups and costs in accounting for the dynamics of prices in the data.
References


