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Optimal monetary policy with endogenous entry and product variety ☆

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ABSTRACT

Deviations from long-run price stability are optimal in the presence of endogenous entry and product variety in a sticky-price model in which price stability would be optimal otherwise Long-run inflation (deflation) is optimal when the benefit of variety to consumers falls short of (exceeds) the market incentive for creating that variety—the desired markup; Price indexation exacerbates this mechanism. Plausible preference specifications and parameter values justify positive long-run inflation rates. However, short-run price stability (around this non-zero trend) is close to optimal, even in the presence of endogenously time-varying desired markups that distort the intertemporal allocation of resources.

1. Introduction

A recent, fast growing literature argues that changes in the range of available product varieties contribute significantly to economic dynamics and movements in prices over time spans usually associated with the length of business cycles (Bilbiie et al., 2012; Broda and Weinstein, 2010, and references therein). This paper investigates whether endogenous entry and product variety generate optimal deviations from price stability in a dynamic, stochastic, general equilibrium model with imperfect price adjustment. We study Ramsey-optimal monetary policy in a second-best environment in which lump-sum taxes are not available and inflation is the only instrument of policy. Therefore, our paper contributes to a large literature that seeks to describe optimal monetary policy in fully articulated, general-equilibrium models with nominal and real rigidities, using the tools of modern public finance (e.g. Khan et al., 2003; Adão et al., 2003).[1]

Producer entry in our model takes place that subjects to sunk costs in the expectation of future monopoly profits. On the consumer side, entry is motivated by (general homothetic) preferences that exhibit a taste for variety. Price adjustment is costly, as producers incur a quadratic adjustment cost to change their prices (Rotemberg, 1982). This generates a Phillips curve that relates the markup to producer price inflation. The central bank may try to use inflation to influence markups,

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[1] Lucas and Stokey (1983) started off the literature on Ramsey-optimal fiscal and monetary policy. Chari et al. (1991) study optimal fiscal and monetary policy under flexible prices and extend the model to include capital. Other early applications to sticky price models include King and Wolman (1999), Schmitt-Grohé and Uribe (2004), and Siu (2004).

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with the goal of closing the inefficiency wedge between the marginal rate of consumption–leisure substitution and the marginal product of labor. Furthermore, when the benefit of variety to consumers and the market incentive for product creation (the markup) are not aligned, an additional distortion occurs: if the former exceeds the latter there is too little entry, and vice versa (Bilbiie et al., 2008a). The central bank will use inflation to align markups (which govern entry incentives) with the benefit of variety. When preferences are such that the elasticity of substitution between varieties depends on their number, time-variation in desired markup introduces a dynamic dimension to the distortions in labor supply and product creation by generating a misallocation of resources across time and states of nature (Bilbiie et al., 2008a). The central bank can thus in principle use inflation to smooth the intertemporal path of the markup.[2] The objective of this paper is to study how these distortions and possible objectives for the central bank shape the optimal conduct of monetary policy.

Our results are twofold, pertaining to long-run and short-run inflation. Significant deviations from long-run price stability can be optimal, and their sign and magnitude depend on the balance of market incentives for entry and welfare benefit of variety. When the flexible-price market outcome results in too much entry (the net markup is higher than the benefit of variety), the central bank uses its leverage over real activity: the optimal path of producer price inflation has a positive steady-state level, which erodes the markup and precludes suboptimal entry. Long-run deflation occurs when the market provides too little entry, for deflation boosts entry by increasing markups. Optimal long-run inflation is zero if and only if preferences are such that the incentive for product creation by firms and the benefit of variety to consumers are perfectly balanced: for instance, when the utility aggregator takes the specific constant elasticity of substitution (C.E.S.) form introduced by Dixit and Stiglitz (1977-henceforth, C.E.S.-D.S.). Importantly, optimal deviations from long-run price stability generated by departing from this knife-edge scenario can be quantitatively significant: depending on the value of the parameter that measures the benefit of variety, the optimal inflation rate ranges from an annualized 4 percent to an annualized -8 percent; the numbers are even larger under price indexation.

When preferences are such that the desired markup depends upon the scale of the economy (number of firms) and is higher than the benefit of variety, the degree of goods market regulation (which is irrelevant under C.E.S. preferences, because the scale itself is irrelevant) becomes an important determinant of the optimal long-run inflation rate. A higher entry cost reduces the steady-state number of firms, makes consumers less willing to substitute among their goods and increases desired markups; this creates more scope for using inflation in order to lower markups and discourage welfare-inefficient entry. Plausible preferences and parameter values justify the positive inflation targets adopted by central banks throughout the industrialized world (see Table 1 in Schmitt-Grohé and Uribe, 2011, for a summary).

In the short run, however, approximate price stability (around a possibly non-zero optimal trend) is a robust policy prescription. In particular, the volatility of inflation under Ramsey policy is small for all the preferences considered: the central bank uses its leverage over real activity in the long run, but not in the short run.[3] The welfare costs (in units of steady-state consumption) of perfectly stabilizing prices relative to following Ramsey-optimal policy can indeed be sizeable. Since the volatility of inflation under Ramsey policy is negligible, it can be concluded that most of the welfare cost of targeting a constant level of prices is due to the "long-run" component, i.e. to failing to adopt the Ramsey steady-state level of inflation as the central bank's target. Therefore, our conclusion is that the introduction of endogenous entry and preferences for variety more general than C.E.S.-D.S. can dramatically alter the long-run policy prescriptions obtained under fixed variety, but not the short-run implications. Lastly, we also quantify the temptation facing policymakers to renege on the optimal policies, and discuss how this is affected by the presence of endogenous entry and variety.

Our results contribute to a large and growing literature on optimal monetary policy and inflation by studying a hitherto unexplored motive for non-zero optimal inflation. To isolate the contribution of the novel feature considered here (entry and variety), our analysis abstracts from other, well understood features—e.g. government spending and monetary distortions—that have been shown to result in optimal deviations from price stability.[4] In such an environment, price stability is optimal or at least close to optimal in many models: the monetary authority does not use inflation (a distortionary tax) to try to close the constant

[2] A different theory of endogenous desired markups with entry relies upon strategic interactions coming for instance from Cournot competition, as in Portier (1995) and Cook (2001). As discussed at length in Bilbiie et al. (2012), the "demand-based", translog-preferences model of endogenous markups used here differs from these "supply-based" explanations along two main dimensions, both of which are related to the empirical evidence pertaining to entry. First, evidence points to the fact that the vast majority of entering and exiting firms are small, which casts doubt on their ability to exert a significant influence on aggregate markups. Second, it is *product* creation and destruction by *existing* firms, rather than entry and exit by new firms, that drives the overall quantitative contribution of extensive margins to explaining aggregate fluctuations; it is therefore difficult to argue that strategic interactions drive markups down with entry, in a view of the world where entry is understood in the larger sense of product creation by already existing firms. Finally, a recent paper by Lewis and Poilly (2012) compares the empirical performance of the two frameworks by estimating the dynamic general equilibrium models on aggregate data. They find that while the translog model is a good fit of the data, in the "strategic interactions" model there is no evidence of a "competition effect" (whereby markups decrease with the number of firms); that model turns out to be statistically equivalent to the C.E.S. model.

[3] This result is consistent with standard tax smoothing arguments made in the dynamic public finance literature (see Golosov and Tsyvinski, 2006, for a review): the Ramsey planner tries to smooth inefficiency wedges over time, which results in our framework in a path for its instrument (inflation) that is close to constant. This mechanism operates in the Ramsey-optimal *fiscal* policy analysis of Chugh and Ghironi (2011), in a flexible-price model similar to ours. There, the Ramsey planner ends up choosing a smooth tax rate on dividends, for the same reason. Indeed, inflation in our framework resembles an indirect tax on dividends (see Bilbiie et al., 2008b).

[4] In particular, the presence of government spending has been shown to imply optimal deviations from price stability in a variety of economic environments. This conclusion arises in the Ramsey-optimal policy exercises of Khan et al. (2003), whose model features staggered pricing and monetary and real distortions, and Adão et al. (2003), whose model features predetermined prices. The same conclusion emerges in the linear-quadratic environment