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Labor market frictions and optimal steady-state inflation

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ABSTRACT

In central theories of monetary non-neutrality, the Ramsey optimal steady-state inflation rate varies between the negative of the real interest rate and zero. This paper explores how the interaction of nominal wage and search and matching frictions affect the policy prescription. We show that adding the combination of such frictions to the canonical monetary model can generate an optimal inflation rate that is significantly positive. Specifically, for a standard U.S. calibration, we find a Ramsey optimal inflation rate of 1.16 percent per year.

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1. Introduction

In leading theories of monetary non-neutrality, the policy prescription for the optimal steady-state inflation rate varies between the negative of the real interest rate (the Friedman rule) and zero (price stability); see [Schmitt-Grohé and Uribe \(2010\)](#), for an overview. In this paper we explore a new channel where the interaction of nominal wage and labor market search and matching frictions affects the planner's trade-off between the welfare costs and benefits of inflation. We show that the combination of such frictions can in fact generate a Ramsey optimal inflation rate that is significantly positive. Importantly, this is the case even in the presence of a monetary friction, which drives the optimal inflation rate towards the Friedman rule of deflation.

The mechanism we have in mind arises in a model with search frictions when nominal wages are not continuously rebargained and some newly hired workers enter into an existing wage structure.¹ In this case, we show in a stylized model that inflation not only affects real-wage profiles over a contract spell, but also redistributes surplus between workers and firms, since incumbent workers impose an externality on new hires through the entry wage. Specifically, this affects the wage-bargaining outcome through the workers' outside option and hence the expected present value of total labor costs for a match as well as firms' incentives for vacancy creation. We derive a Hosios condition for the stylized model and show that the Ramsey planner has incentives to increase inflation if employment and vacancy creation are inefficiently low in order to push the economy towards the efficient allocation.

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¹ Data supports that a non-negligible share of newly hired workers enter into an existing wage structure. First, micro-data evidence on wages does not indicate that wages are more sensitive to labor market conditions at the beginning than later in the span of a match (once the variation in the composition of firms and match quality over the cycle is controlled for); see [Gertler and Trigari \(2009\)](#). Secondly, survey evidence, like [Bewley \(1999, 2007\)](#) for the U.S. and the study performed within the Eurosystem Wage Dynamics Network (WDN), reported by [Galuscak et al. \(2012\)](#), present strong evidence that the wages of new hires are tightly linked to those of incumbents.

It is worth noting that this incentive vanishes at an efficient allocation, as in [Thomas \(2008\)](#) where the calibration is chosen so that the Hosios condition holds, and hence that search and wage setting externalities cancel out in steady-state (and the reverse occurs if employment is inefficiently high). Moreover, the model of [Erceg et al. \(2000\)](#) does not feature this mechanism either, since there is no extensive margin on the labor market in that model and hence the Ramsey planner has no leverage on job creation through the channel outlined above. However, and similar to our model, the [Erceg et al. \(2000\)](#) model features a markup in wage-setting where the actual markup can be different from the flexible price markup because of [Calvo \(1983\)](#)-style wage stickiness. The planner has incentives to tilt the real-wage profile in order to lower the actual markup and increase labor input. Note though, since the model lacks a leverage on job creation there is much less of a motive for the planner to use this channel and the effect of using inflation to affect the average markups in the economy is tiny.² The mechanism also vanishes if search frictions vanish since the Ramsey planner loses any leverage over vacancy/job creation. Thus, models without an extensive margin on the labor market lack the mechanism described here. Furthermore, the Ramsey planner loses the ability to affect real-wage costs via inflation if all new workers get to rebargain their wage. In this case, the full effect of inflation on entry wages is internalized in the wage bargain, and firm and worker surpluses, as well as real wage costs, become neutral to inflation.

Overall, the key insight from the stylized model is that if both search and wage-setting externalities are present, there is an incentive for the Ramsey planner to vary the inflation rate to increase welfare through its effect on job creation and unemployment.

To quantitatively evaluate the relative strength of this mechanism, we introduce it into a full-fledged model encompassing leading theories of monetary non-neutrality. The model we outline features a non-Walrasian labor market with search frictions as in [Mortensen and Pissarides \(1994\)](#), [Trigari \(2009\)](#) and [Christoffel et al. \(2009\)](#). Moreover, there are impediments to continuous resetting of nominal prices and wages modeled along the lines of [Dotsey et al. \(1999\)](#), where adjustment probabilities are endogenous. Finally, the model features a role for money as a medium of exchange, as in [Khan et al. \(2003\)](#) and [Lie \(2010\)](#).

In the quantitative model, variation in the average inflation rate will have several effects on welfare. First, inflation will affect the opportunity cost of holding money, pushing the optimal inflation rate towards the Friedman rule. Second, because of monopolistic competition and nominal frictions, inflation causes relative price distortions, which drive the optimal inflation rate towards zero. Finally, the mechanism presented above is introduced, i.e., search frictions combined with new hires entering into an existing wage structure, where the inflation rate affects equilibrium real-wage costs and, in turn, job creation.

In a standard U.S. calibration of the model, implying that employment is 1.87 percentage points lower than in the efficient allocation, the Ramsey optimal inflation rate is 1.16 percent per year. Moreover, varying the share of new hires receiving rebargained wages has a substantial effect on the optimal inflation rate. If all newly hired workers receive rebargained wages, thus shutting down the interaction effect between nominal wage frictions and search and matching frictions, the optimal inflation rate is -0.76 percent.³ When none [50 percent, the baseline] (all, as in [Gertler and Trigari, 2009](#)) of the newly hired workers enter into an existing wage structure, the optimal inflation rate is -0.76 [1.16] (1.44) percent. Thus, only a moderate share of new workers entering into an existing wage structure is needed to obtain a significantly positive optimal inflation rate.

When shutting down the monetary distortion and looking at the cashless economy, as analyzed in [Woodford \(2003\)](#), the Ramsey optimal inflation rate increases to 1.51 percent. Thus, the monetary distortion has a moderately negative effect on the optimal policy prescription.

The results reported above are conditional on agents optimally choosing when to change prices and wages. It is then interesting to study the effect of shutting down the endogenous response of the adjustment probabilities to variations in inflation and let the agents face a fixed adjustment hazard. In contrast to [Lie \(2010\)](#), we find that endogenizing adjustment probabilities matters for the quantitative analysis. Specifically, exogenous price and wage adjustment hazards give a Ramsey optimal inflation rate of 3.02 percent, thus an increase of almost two percentage points relative to the case with endogenous adjustment hazards.

All in all, the combination of search and wage-setting externalities within the canonical monetary model introduces an important link between inflation and welfare and hence potentially a large difference in prescribed policy.

For clarity, the quantitative model outlined in this paper does not encompass all mechanisms that can affect the Ramsey optimal steady-state inflation rate. Papers studying the effect of other mechanisms on the Ramsey optimal steady-state inflation are [Schmitt-Grohé and Uribe \(2010\)](#) using inflation as an indirect tax to address tax evasion, [Schmitt-Grohé and Uribe \(2012a\)](#) analyzing foreign demand of domestic currency, [Schmitt-Grohé and Uribe \(2012c\)](#) studying quality bias, [Adam and Billi \(2006\)](#) and [Billi \(2011\)](#) looking into the effect of the zero lower bound, and [Kim and Ruge-Murcia \(2011\)](#) addressing downward nominal wage rigidity. Of these, only a substantial foreign demand of domestic currency and a planner that only cares about the well-being of the home country may lead to a significantly positive inflation rate. Moreover, all of these

² See e.g., [Amano et al. \(2009\)](#) or [Kim and Ruge-Murcia \(2011\)](#).

³ This is the same rate as if all wage contracts are continuously rebargained in the model (not only those of the new hires). These cases are the same due to the fact that wages are not allocative in the search-matching framework we rely on, or more specifically, a relative-wage dispersion across firms does not give rise to a dispersion of labor supply across individuals working at different firms.

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