Available online at www.sciencedirect.com

ScienceDirect

Journal of Economic Theory 164 (2016) 218–229

JOURNAL OF Economic Theory

www.elsevier.com/locate/jet

Monetary exchange and the irreducible cost of inflation

Tsz-Nga Wong [1]

The Bank of Canada, Canada

Received 29 June 2015; final version received 10 February 2016; accepted 14 February 2016

Available online 26 February 2016

Abstract

This paper applies a mechanism design approach to construct a lower bound to the welfare cost of inflation that does not depend on quasi-linear preferences or details of how agents trade. An incentive-feasible trading protocol is derived to minimize the welfare loss subject to frictions rendering money essential. The welfare cost of inflation under this optimal protocol is the lower bound over all pairwise trading protocols of monetary exchange. In general, the first-best is *not* implementable, even under the Friedman's rule, patient agents and the optimal mechanism. Thus, the lower bound depends on fundamentals like preferences and technology. Finally, I estimate the irreducible cost of 10% inflation with the U.S. data from 1900 to 2000.

JEL classification: D82; D83; E40; E50

Keywords: Money; Cost of inflation; Trading mechanism

How large is the social cost of inflation? This paper uses a mechanism design approach to provide a robust answer to this question without relying on quasi-linear preferences or specific trading protocols. The framework is based on a microfounded model of money that distinguishes essential monetary frictions, under which money has a social role. To obtain a conservative so-

E-mail address: rwong@bankfofcanada.ca.

[1] I am grateful for the comments and discussions with Tai-Wai Hu, Guillaume Rocheteau, Neil Wallace, Randy Wright, and Tao Zhu. I also thank the editor Ricardo Lagos, the associated editor, and three anonymous referees for very helpful suggestions. The views expressed in the paper are mine and nothing should be attributed to the Bank of Canada.

http://dx.doi.org/10.1016/j.jet.2016.02.008

cial cost of inflation, I perform the following thought experiment: when monetary exchange is organized to minimize the welfare distortion from the non-essential frictions, how much long-run consumption agents are willing to give up in order not to have inflation in this economy? Thus, the thought experiment results in a lower bound to the inflation cost – as long as money is essential, there is no other way to arrange bilateral trade to further reduce the welfare loss due to inflation in this economy.

Why should we care about the lower bound to the inflation cost? Monetary economists have a long, fruitful history of thought on finding the social cost of inflation. Yet, the findings so far remain inconclusive. Lucas (2000) estimates a money demand curve with the money-in-the-utility function. Calculating the area under the money demand curve, Lucas finds that 10% inflation costs less than 1% consumption. Lagos and Wright (2005), LW hereafter, challenge Lucas' reduced-form finding from the perspective of microfoundation: the money-in-the-utility or cash-in-advance models fail to account for the social benefit that monetary exchanges provide to overcome some essential frictions, which explain the existence of money in the first place. Thus, it understates the social cost that inflation distorts monetary exchanges. Using a model with a microfoundation of money, LW show that 10% inflation can cost up to 5% consumption, multiple to the original Lucas' answer, and several orders of magnitude greater than the cost of business cycle found in the standard setting.

However, LW's result is based on Nash bargaining and varies greatly with different trading protocols. For example, it becomes 1.5% consumption under competitive pricing.[2] Thus, it is useful for policy guidance to know the lower bound to the inflation cost over all possible trading protocols, and after that how the lower bound depends on economic conditions. From a normative perspective, policy guidance based on the lower bound is more robust against price stability – maintaining low inflation should have high priority if we find it costly even at the lower end of the spectrum. However, results from recent studies seem to suggest an uninformative zero lower bound. Hu et al. (2009), HKW hereafter, show that when the inflation rate is low and agents are patient, there also exist some other trading protocols that can implement the first-best and eliminate all the welfare distortion from inflation. Calibrating LW's model under these efficient trading protocols with data, Rocheteau (2012) shows that the cost of 10% inflation can be 0.

I show that the previous result that the first-best is implementable in LW's environment is special. Making use of the recent finding of Wong (forthcoming), I derive the optimal trading protocol in the economy with more general preferences, where HKW's economy is a special case. The class of preferences includes utilities featuring quasi-linearity, CARA, constant-return-to-scale and etc.[3] A key observation is that under the quasi-linearity assumption in HKW, the level of production in some markets does not matter to welfare. Hence, there are extra degrees of freedom to implement the first-best, which are not available generically. Thus, the quasi-linear environment *overstates* the implementation power of mechanism design, and hence *understates* the irreducible cost of inflation, which is inevitably zero in HKW. In general, the first-best is not implementable, and the lower bound to the inflation cost depends on fundamental like preferences and technology, and hence it is informative to policy. Performing the similar estimation as in HKW but with the more general preferences, the model finds that the irreducible cost of inflation is about 1% of consumption.

[2] See a recent survey by Lagos et al. (forthcoming) for a related discussion.

[3] See Wong (forthcoming) for a survey of this class of preferences used in different literatures. Also see Gu et al. (forthcoming) and Gu and Wright (2015) for a general money-and-credit environment using these preferences.