Review of Economic Dynamics 24 (2017) 14–24

Contents lists available at ScienceDirect

Review of Economic Dynamics

www.elsevier.com/locate/red

A coordination approach to the essentiality of money ☆

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ARTICLE INFO

Article history:
Received 9 February 2015
Received in revised form 30 November 2016
Available online 14 December 2016

JEL classification:
E40
D83

Keywords:
Money
Credit
Beliefs
Coordination

ABSTRACT

The essentiality of money is commonly justified on efficiency grounds, i.e., money achieves socially desirable allocations which could not be achieved by alternative technologies of exchange. In this paper we argue that what makes money achieve such allocations is its ability to overcome coordination frictions. Intuitively, the fact that money is a permanent record of past production implies that an agent is willing to produce in exchange for money even if he believes that many of his future partners will not accept money.

1. Introduction

Monetary theorists justify the importance of money on the fact that money allows to achieve socially desirable allocations. An implication of this view is that a model where money is essential requires limitations on agents' abilities to monitor each other.[1] It is still an open question through the extent of the limitations on monitoring which are necessary to render money relevant. For instance, in order to ensure that money is essential, models of money that serve as workhorse to much work on monetary theory, such as Kiyotaki and Wright (1993), Trejos and Wright (1995), Shi (1995), and Lagos and Wright (2005), simply assume that agents cannot monitor each other.

In this paper, we propose an alternative rationale for the importance of money. We argue that money is essential because it is better suited to overcome coordination frictions. In a nutshell, we consider a decentralized economy where autarky is the only equilibrium outcome in the absence of money or monitoring, the latter being modeled as a technology which allows an agent to observe the most recent action of his current partner. We first show that money is inessential if we assume away the problem of coordinating in the use of a medium of exchange. We then show that if we are explicit

☆ We would like to thank the associate editor and two anonymous referees for their comments and suggestions. We also thank Braz Camargo, Tai-Wei Hu, Neil Wallace, and Randy Wright as well as various seminar and conference participants. Both authors gratefully acknowledge financial support from CNPq.

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[1] Kocherlakota (1998) shows that any monetary allocation can be replicated by a monitoring technology which keeps track of past actions. Kocherlakota and Wallace (1998), and Cavalcanti and Wallace (1999) obtain that money is essential if monitoring is sufficiently limited. A relatively recent trend of papers based on Lagos and Wright (2005) combines money and monitoring. Examples are Berentsen et al. (2008), Telyukova and Wright (2008), Sanches and Williamson (2010), and Williamson (2012).

http://dx.doi.org/10.1016/j.red.2016.12.002
1094-2025/

about this coordination friction, there exists a region of parameters where agents always coordinate in the use of money but can never coordinate in the use of monitoring.

We are interested in the following question: which technology of exchange, money or monitoring, is less likely to be disrupted by a coordination failure? To deal with this question, we follow the literature on dynamic coordination games and relax the assumption that agents are always free to form any belief as to what other agents will do. We do so by assuming that the economy experiences different states over time and there are remote states where the fundamentals of the economy are such that an agent's optimal action does not depend on his belief about the behavior of other agents.[2] We first consider the economy with money but without monitoring and assume the existence of remote states where an agent strictly prefers to accept money and remote states where he strictly prefers not to accept money. We then consider the economy with monitoring but without money and assume there are remote states where an agent strictly prefers to produce to his partner and remote states where he strictly prefers not to produce. The idea is to use the existence of the remote states to pin down rationalizable outcomes in states which are not remote.

We first show that, irrespective of the technology of exchange, there is a unique rationalizable outcome: outside the remote states, either exchange always takes place, or it never takes place. Whichever outcome emerges depends on the fundamentals of the economy. More interestingly, we show that there exists a region of parameters where exchange takes place under money but it does not take place under monitoring. The broader message we want to convey is that the need to coordinate may render money-like objects essential purely for coordination reasons. That is, the resilience of money may be simply due to the fact that it is relatively easy to coordinate in its use.

The intuition for our result can be summarized as follows. In the presence of coordination frictions, the decision of an agent on whether to produce depends on his belief as to when he will receive the fruits of his current effort. A key parameter impacts this decision: the ability of the agent to keep a record of his current effort. The benefit of money as a coordination device is that, since money is a permanent record of past production, an agent is willing to produce in exchange for money even if he believes that many of his future partners will not accept money. In contrast, the benefit of a monitoring technology which only keeps track of recent actions critically depends on the belief that the fruits of effort will be readily available. This limited monitoring works perfectly and renders money inessential if we take as given that all other agents will always coordinate in the use of the monitoring technology. However, monitoring can be dominated by money if we are explicit about the coordination problems involved in the use of a particular technology of exchange.

Our paper is closely related to Araujo and Guimaraes (2014), which also consider coordination in the use of money in a decentralized economy along the lines of the economy considered here. We complement their paper by introducing monitoring. Our paper is also related to Camera and Casari (2014) and Duffy and Puzzello (2014). The experimental evidence in these papers emphasizes the role of money as a coordinating device, since money is used even if it is dominated by social norms of cooperation such as gift-exchange.

The paper is organized as follows. In the next section, we present a benchmark environment where money is inessential. In section 3, we extend the environment and characterize the rationalizable outcomes under monitoring and under money. Section 4 compares monitoring and money and section 5 concludes.

2. Benchmark environment

Time is discrete and the economy is populated by a unit continuum of agents with a common discount factor $\beta \in (0,1)$. To motivate a need for exchange, we assume that an agent likes the good produced by any other agent but does not like the good he produces himself. We introduce trade frictions by assuming that agents meet in pairs and at most one good can be produced in a meeting. For tractability, we let goods be indivisible, with the utility of consumption given by u, and the cost of production given by c, with $\beta u > c$.

At any point in time an agent is either passive or active. Passive agents make no choice while active agents choose between committing (C) and not committing ($\overline{C}$) to produce if called upon to do so. Active agents randomly meet passive agents. The status of an agent as passive or active depends on the technology of exchange. We consider two alternative technologies: monitoring and money.

Monitoring There exists a technology which allows an active agent to observe the record of his partner, i.e., a label g (good) or b (bad), which reflects the latter's action C (respectively, $\overline{C}$) in the previous period. An agent is passive if he has a record, and he is active if he has no record. In a meeting, the outcome and the future label of an agent depends on the action of the active agent and on the record of the passive agent. Formally, the outcome is determined by a function $f_c : \{C, \overline{C}\} \times \{g, b\} \to \{P, \overline{P}\}$, where P denotes production and $\overline{P}$ denotes no production; while the future label of the active agent is determined by a function $\tau_c : \{C, \overline{C}\} \times \{g, b\} \to \{g, b\}$. A monitoring mechanism is a pair of functions f_c and τ_c such that: (i) $f_c(C, g) = P$ and $f_c(\overline{C}, g) = f_c(\overline{C}, b) = f_c(C, b) = \overline{P}$, (ii) $\tau_c(C, g) = \tau_c(C, b) = g$, and $\tau_c(\overline{C}, g) = \tau_c(\overline{C}, b) = b$. The requirement $f_c(\overline{C}, g) = f_c(\overline{C}, b) = \overline{P}$ ensures that an active agent can always avoid production by choosing $\overline{C}$. In turn, the requirement $f_c(C, b) = \overline{P}$ allows an active agent to punish a passive agent with a bad record, while still keeping a good

[2] The existence of dominant regions is important for equilibrium selection in the literature on dynamic coordination games (e.g., Frankel and Pauzner, 2000 and Burdzy et al., 2001) and in the global games literature (e.g., Morris and Shin, 2003).