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# Financial intermediation in an overlapping generations model with transaction costs

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## ABSTRACT

We analyze an overlapping generations economy where agents interact to share liquidity risk. We show that a pure exchange economy has excessive trade in equilibrium because agents interact to rebalance their portfolios. Intergenerational financial intermediaries reduce the number of interactions because agents only transact when they face liquidity needs. In the absence of asset risk, intermediaries match redemptions with deposits and dividends, and never sell assets. If the economy is subject to transaction costs, the intermediated economy can sustain higher stationary investment and welfare. We also find that dead weight transaction costs can increase welfare because it protects banks from interbank arbitrage and dampens the inherent cyclicity of market economies.

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## 1. Introduction

The main explanations for the existence of financial intermediaries are that they (i) reduce transactions costs, (ii) provide liquidity insurance, (iii) solve asymmetric information inefficiencies, and (iv) align incentives through active monitoring. There now exists a rich literature that investigates how intermediaries share liquidity risk, overcome adverse selection, and alleviate moral hazard.<sup>1</sup> On the other hand, research on how intermediaries reduce transactions costs is conspicuously limited.

Benston and Smith (1976) argue that “the *raison d’être* for the [financial intermediation] industry is the existence of transactions costs”. They interpret transaction costs as costs of transportation, administration, search, evaluation and monitoring, among others. Their main argument is that banks enjoy economies of scale, scope, reputation, and

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<sup>1</sup> The seminal paper addressing the liquidity insurance argument is Diamond and Dybvig (1983). Scale economies in dealing with information asymmetries were conjectured by Leland and Pyle (1977), and modeled by Boyd and Prescott (1986) and Broecker (1990), among others. Diamond (1984) demonstrates how delegated monitoring results in economies of scale in loan supervision. Freixas and Rochet (1997) present a comprehensive review of the traditional banking literature. More recently, He et al. (2008) justify the existence of banks as providers of safe-keeping, and Andolfatto and Nosal (2009) shows that, in the presence of moral hazard, banks are essential in combining money creation and intermediation.

networks in these tasks. There is a large literature that explains transactions costs by information asymmetries or moral hazard.<sup>2</sup> An alternative explanation for transaction cost is coordination and search. In markets with many agents with unverifiable types, finding trading partners comes with delays, mismatching and costs.<sup>3</sup> In this paper we do not consider the causes of the transaction costs, but investigate their consequences on intergenerational risk sharing. In this spirit we assume the simplest of transactions costs: *shoe leather* costs.

Since Baumol (1952), Tobin (1956) and Orr and Mellon (1961), who analyze the tradeoff between holding cash and financial assets due to shoe leather costs, the consequences of such costs have been largely ignored in the micro economic theory literature, despite the fact that processing costs are estimated to account for 3% of the GDP (Humphrey et al., 2000). In less developed economies, transactions costs outside the banking system are considerably higher (Domowitz et al., 2001). Demirguc-Kunt and Levine (1999) find that as market participation increases, transaction costs are reduced, thus causing less developed markets to rely more on banks rather than markets.

In this paper, we use a three dates overlapping generations model in which agents may need to consume before a long term production technology pays a riskless dividend. To share liquidity risk, agents can trade secondary claims for consumption goods in a pure exchange market or alternatively, open accounts with financial intermediaries. This representation, also known as the OG Diamond–Dybvig model, is also studied by Qi (1994), Bhattacharya and Padilla (1996), and Fulghieri and Rovelli (1998), among others.<sup>4</sup>

The distinguishing feature of our model is the existence of transaction costs, which we model as dead weight *shoe leather* costs that are incurred whenever agents interact. Naturally, these costs aim to capture deadweight transaction processing costs such as communication, search, administration, or simply paying attention. Considering shoe leather costs in an OG model with intermediation allows us to understand how banks operate in a perpetual economy, as opposed to the traditional static three period setting.

The key insight is that banks avoid the portfolio rebalancing trades that obtain in the exchange economy. By pooling assets and clientele, intermediaries do not require the rebalancing and dividend-reinvesting trades that individual agents carry out if they only use a market to share liquidity risk.

We show that in the exchange economy, a centrally located market opens where early consumers sell secondary claims to newborns and late consumers. In equilibrium, newborns invest their endowment in a mix of long term and short term claims, and sell long term claims when they become early consumers. Late consumers also trade on their first birthday, as they need to substitute maturing assets for new short term assets. Hence, late consumers travel to the market three times: once for depositing, once for portfolio rebalancing and once for withdrawing.

As an alternative to the exchange, a centrally located financial intermediary may open up. We denote this intermediary a *bank*, although we emphasize that our bank can also be interpreted as an open-end mutual fund or an insurance company, or any other institution that centralizes liquidity and reduces intragenerational transaction costs.

Agents open deposits with a bank, and the bank invests in the technology. In the absence of aggregate risk, the infinitely lived bank never sells assets: because it caters to a large stationary and diversified clientele of overlapping generations, depositor redemptions and new investments exactly equal the incoming dividends and new deposits. In the intermediated economy, all agents only need two trips: one to deposit, and one to withdraw, thus making the intermediated economy superior to the pure exchange economy.

Although our model is simple and our main result is transparent and straightforward, the literature has not yet recognized that banks can reduce portfolio rebalancing transactions. This may be because our key finding crucially depends on the assumption that the economy is of the overlapping generations kind.<sup>5</sup> In a stationary Diamond Dybvig economy, a store of liquid assets is needed and the number of transactions in the intermediated and in the exchange economy is the same. In an overlapping generations economy without aggregate uncertainty, no store of liquid assets is needed, as a secondary market for seasoned assets offers liquidity. In this paper we show that the number of transactions is less in the intermediated economy, and that financial intermediation increases welfare.<sup>6</sup>

This conclusion does not depend on the assumption that only consumers incur shoe leather costs. In fact, our second – and less obvious – finding is that welfare increases further if also banks incur shoe leather costs! This is due to the fact that

<sup>2</sup> We mention Freeman (1988) who considers adverse selection costs in a Diamond–Dybvig model, and Gorton and Pennacchi (1990) who show that uninformed agents can avoid such costs by forming a bank. In a recent paper, Dang et al. (2010) show that agents may favor debt securities to share risk, because these are less information-sensitive.

<sup>3</sup> The search model of Meada (1991) considers three potential trading venues, so that buyers and sellers face a costly coordination problem when choosing a market. Similarly, Zhu (2008) models an economy where market-participants are randomly pairwise matched, so that mismatch costs obtain.

<sup>4</sup> In single generation models, the papers by Diamond Dybvig (1983), Jacklin (1987), Jacklin and Bhattacharya (1988), Hellwig (1994), Alonso (1996), Samartín (2001), Diamond (1997) and von Thadden (1998) among others, analyze the relative degrees of risk sharing provided by banks and markets. For a review of this literature, see Dwyer and Samartín (2009).

<sup>5</sup> While the banking literature knows relatively few OG models, there is a large literature investigating the role of currency and monetary policy in OG settings. Many papers feature spatially separated agents as we do. See, e.g. Bullard et al. (2001), who also provide an overview of this literature. Closest to our paper in this literature is Bhattacharya et al. (1997), who show that random relocation shocks give rise to buffer holding financial intermediaries.

<sup>6</sup> Van Bommel (2008) shows that in a one-shot Diamond Dybvig economy intermediaries can improve welfare by allocating transactions costs to agents with lowest marginal utility of consumption. In the OG economy studied here, transactions costs are avoided altogether, and the welfare increase that comes with intermediation is much more substantial.

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