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When do plastic bills lower the bill for the central bank? A model and estimates for the U.S.☆

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Abstract

We develop an analytical framework that allows central banks to assess whether changing the manufacturing material of their tokens would be beneficial. Applied to the case of the U.S., we find that a complete adoption of plastic notes would save the Fed $140 million per year but would entail a substantial migration cost in case of a "big bang". On the level of individual denominations, we find that the $1 bill would be the most lucrative to replace and that the business case for the $100 bill is thin – suggesting that a partial adoption of polymer would make more sense.

JEL classification: E4; E47

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1. Introduction

Today, more than 30 central banks around the world have partially or fully adopted "plastic" (*i.e.*, polymer) banknotes. The Bank of Canada (BoC) is a recent convert. The BoC issued its

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first plastic note, the C$100 bill, in November 2011 and by the end of 2013 all of its notes will be printed on the new material (Bank of Canada, 2012). The primary driver behind the BoC's switch to polymer was the threat of counterfeiting. But another important advantage of plastic notes is that their lifespan is substantially longer than that of their paper counterparts. This yields considerable savings in ordering, processing, re-distribution, withdrawal and destruction costs. At least that is what Coventry (2001a) claims for the case of Australia – the country that was the first to successfully introduce a polymer banknote (in January 1988). However, these two advantages – improved protection against counterfeiting and higher durability – come with a downside: plastic notes are more costly to produce. As a result, not all central banks are convinced that the bottom line is positive. The Banco Central do Brasil (BCB) is a case in point. In 2000, it launched a trial with a commemorative note of 10 real. In the end, the BCB concluded that there was "insufficient evidence" of the benefits of polymer, and withdrew the notes (Sidney, 2009, p. 11).

For a central bank, calculating the gains of the adoption of a new banknote technology is indeed not that simple. In this paper, we therefore develop a formal framework that allows central banks to map both the cost drivers and the revenue streams that are affected. Our model is general in two senses. First, it can handle all relevant dimensions of the problem. Second, although we focus on banknote printing technologies when illustrating our model, it holds equally well for the replacement of notes by coins, or even for a change in minting technology.

In another contribution, we use our model to estimate the cost savings brought about by the (complete or partial) introduction of plastic banknotes by the U.S. Federal Reserve, the Fed being a rare example of a central bank that releases information on the production costs of its notes. We show that while a complete adoption of plastic notes would entail a drop in monetary seigniorage revenue of roughly 0.2% (because of the higher initial production costs), it would cut by half the annual replacement cost of banknotes, resulting in net savings of $138.4 million per year. These yearly operating gains are to be compared with a one-off migration cost of as much as $3.3 billion in case of a "big bang" (but substantially less in case of a gradual migration).

The remainder of the paper is structured as follows. In Section 2, we first explain how a central bank, by improving the cost effectiveness of its banknote production, can in fact make a contribution to solving the broader problem that is the social cost of cash. In Section 3, we present our theoretical framework. Section 4 is the empirical part of the paper. We describe the data of our case study and simulate how the costs and revenues of the Fed would be impacted by a switch to polymer. We also check whether one of the insights put forward in Menzies (2004) – the only other academic paper on the issue – is borne out by our analysis, as this enables us to present our results from a different perspective. Section 5 concludes.

2. Reducing the social cost of cash: what are the policy options?

Despite the rapid uptake of electronic payment instruments such as the debit card, in most countries cash is still today the dominant form of payment in retail transactions. At the same time, a string of central bank reports show that cash is also the most costly payment instrument for society; see Turján, Divéki, Keszy-Harmath, and Kóczán (2011) for recent evidence on Hungary and a review of earlier studies.[3] To be clear, the social cost of a payment instrument refers to the real resources (capital, labor, raw materials) a society expends in its production. The social cost is computed by adding up the private costs of all parties in the value chain (consumers, merchants,

[3] For the latter, see also Hayashi and Keeton (2012).