

Chicago Fed Letter

What's a penny (or a nickel) really worth?

by François R. Velde, senior economist

On December 14, 2006, the United States Mint announced new regulations to limit the melting and exportation of pennies and nickels. The goal is to prevent a shortage of small change in circulation. This article looks at the problem in historical context and suggests solutions.

The prohibition on melting pennies and nickels is a stopgap measure that at best increases the costs of melting by a small amount.

In this *Chicago Fed Letter*, I examine the reasons behind the United States Mint's recent decision to issue new rules on the melting and exportation of pennies and nickels in the broader context of our small change. These regulations were prompted by recent inquiries the Mint received asking whether melting coins was legal and by other anecdotal reports of "recycling and speculation." What is happening and what is to be done about it?

A brief history of money

In the old days, a commodity was chosen to serve as both the standard to measure value and the medium of exchange. Thus, if silver was the chosen commodity, prices were measured in, say, pounds of silver, and lumps of silver of a standard size (called "coins") were exchanged for goods and services. This is called a commodity money system. In the early Middle Ages, there was only one size of coin; it was called the penny and made of silver with a little copper alloyed for hardness.

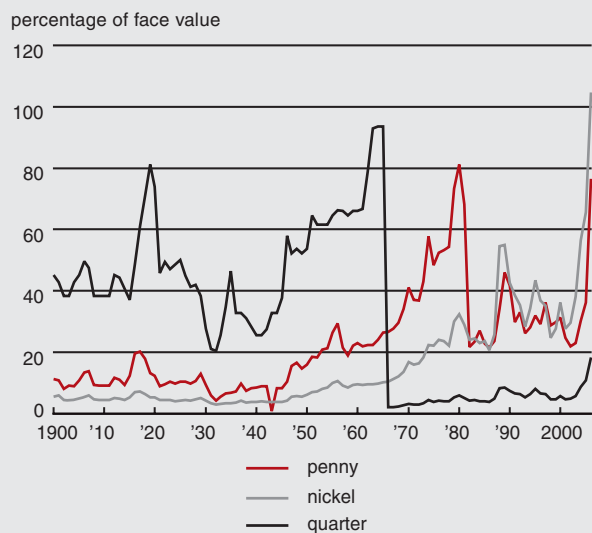
The quantity of money in circulation was determined by two actions: minting and melting. The stock of money increased through minting new coins, which could be done by monetary authorities on their own account or by private individuals taking metal to the mint for conversion into coins. The stock of money decreased through the melting

of coins. If the price of metal in terms of money fell enough, it became profitable to convert metal into money by minting it. Conversely, if that same price rose high enough, it became profitable to convert coins into metal by melting them down. Minting and melting maintained within bounds the value of money relative to metal and to all other goods. Import and export of coins served the same purpose in keeping domestic prices in line with world prices.

Over time, the needs of trade required large silver coins and gold coins. The difficulty of maintaining fixed exchange values between coins of different sizes and different metals had two consequences. One was a process of repeated "debasements" that increased the proportion of copper in small denominations to make its content cheaper, so that by the eighteenth century the penny was made of copper. The other was, after much experimentation, the adoption in the nineteenth century of the gold standard.¹

Under the gold standard, adopted in the U.S. in 1900, the unit of account (the dollar) was embodied in large-denomination gold coins and defined as a fixed quantity of gold. The minting-melting mechanism continued to regulate the value of those coins. But smaller-denomination coins became

1. U.S. coinage's intrinsic value, 1900–2006



NOTE: The data plotted are annual averages.

SOURCES: Author's calculations based on data from the United States Mint and U.S. Department of the Interior, U.S. Geological Survey, <http://minerals.usgs.gov/ds/2005/140/#data>.

fiduciary: Their face value was higher than justified by their intrinsic content. This was possible because the U.S. Department of the Treasury stood ready to exchange subsidiary coinage for gold coins, and conversely, at a fixed rate. Thus, although the value of the silver in a quarter was around ten cents, a quarter was worth 25 cents because the Treasury was always willing to exchange 40 of those silver coins for a gold ten-dollar coin.

This system of coinage remained essentially unchanged until the early 1960s,² when the world price of silver began to rise. By 1963, the value of the silver content of quarters had reached 25 cents, and any further rise would make it worthwhile to melt silver quarters and dimes. In July 1965, Congress passed the Coinage Act, which authorized the minting of quarters and dimes made of copper and nickel. This action was intended not to replace the existing stock of silver quarters and dimes, but to reduce global demand for silver. To prevent the existing coins from disappearing, the Treasury used in succession two means at its disposal. One was to sell its large stockpile of silver at \$1.29 per ounce, the price at which a quarter's content was worth 25 cents. When it ran out of silver, the Treasury used its authority under the

Coinage Act to ban the melting and exportation of dimes and quarters (May 20, 1967). Although the ban resulted in several indictments, it did not prevent the complete disappearance of silver quarters and dimes from circulation, and it was lifted in June 1969.

The new pennies of 1982

The provisions of the Coinage Act were used once more, this time to protect the penny. The peg to gold had ended in August 1971.

Many prices were rising, and on April 1, 1974, the price of copper reached a record \$1.40 per pound. At the time, 154 pennies contained one pound of copper. The public's demand for pennies rose to suspiciously high levels. The Treasury concluded that people were preparing to melt pennies, and it announced the ban (April 18, 1974). A few months later, Public Law 93-441 (31 U.S.C. 5112(c)) granted to the Secretary of the Treasury the power to change the proportion of zinc and copper in pennies. But copper prices stayed around \$0.60 per pound in subsequent years, and the ban was lifted in June 1978 without any further action. After copper prices hit another record of \$1.44 per pound on February 12, 1980, the Treasury briefly considered another ban. Then, it opted instead to change the composition of the penny. The Mint started making copper-coated zinc pennies in January 1982.

Most people don't know that all pennies are not the same. Lincoln's profile has been unchanged since 1909. But if you take a penny dated 1983 or later and scratch its surface, you will see the shiny white zinc underneath the copper coating. As for the nickel, its size and composition haven't changed since 1866. The effort to maintain the outward appearance of the coinage

suggests the importance of habits in our attitudes toward coinage and currency.

The current situation

In late 2004, the price of copper rose above \$1.50 per pound and has not come below that level since. Other commodities have surged as well, notably zinc and nickel. Figure 1 shows how the intrinsic content of quarters, nickels, and pennies as a percentage of the coins' face value has changed over time. As of January 9, 2007, the content of a zinc penny is worth 6% less than its face value; the pre-1982 penny and the nickel are 72% and 24% above face value, respectively.³

These values do not accurately measure the profit to be made by melting down the coins. It would be necessary to subtract melting and refining costs (scrap copper is worth about 20% less than high-grade copper). Also, collecting and shipping costs would be relatively larger for the smaller denominations, since digging a penny or a nickel out of a sofa requires the same effort. This probably explains why pre-1982 pennies have not disappeared yet. Still, nickels and pennies remain close to their melting point (hence, the new regulations).

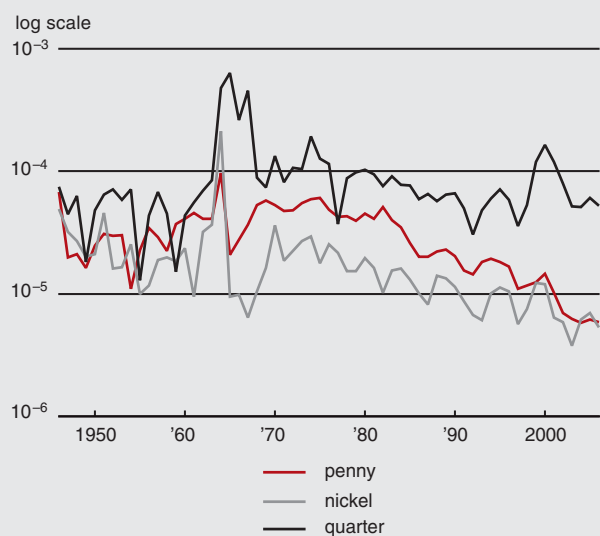
The prohibition on melting is a stopgap measure that at best increases the costs of melting by a small amount—the probability of being caught times the penalties imposed, or the storage and time costs of hoarding the coins until the regulations are repealed. History shows that when coins are worth melting, they disappear.

What is to be done?

In our current (fiduciary) system, the stock of tokens we use in transactions, and their value, is determined not by minting and melting—as under the old (commodity) system—but by the monetary authority's policy. In this respect, there is no difference between notes and coins. The value of a dollar bill has nothing to do with its alternative uses as wallpaper or insulating material. The same should be true of pennies and nickels, which are like notes, only made of something more durable than paper.

Whenever the value of a coin reaches the floor set by its intrinsic content, it

2. Ratio of U.S. coin production to GDP, 1946–2006



NOTE: GDP means gross domestic product.

SOURCES: Author's calculations based on data from the United States Mint and U.S. Bureau of Economic Analysis.

needs to be debased, that is, made of a cheaper material. Figure 1 shows for all coins a general upward trend over time; every time the value comes close to 100%, it becomes necessary to change the composition, which has the effect of abruptly lowering the value of the intrinsic content.

Figure 1 also suggests that the problem will not go away on its own. The recent surge in commodity prices has already abated, but it may resume at any time. Furthermore, as long as inflation is positive, the real value of a penny (which is always \$0.01 in nominal terms) will fall relative to goods and services. When zinc replaced copper in the manufacture of pennies in 1982, the respite gained was brief, since zinc was only half as costly as copper. Since then, the real value of the penny (as measured by inflation) has fallen by half. Assuming 2% inflation over the next 20 years, the real value of the penny will fall by another one-third, and it will be threatened again unless its composition is changed.

The Treasury alerted Congress to the problem last May.⁴ To change the metallic composition of coins requires congressional action because current law allows only a combination of copper and zinc for pennies and it specifies the exact composition of the nickel. Other

weekly earnings for wage earners and salaried workers are \$675. Assuming a 40-hour workweek, a penny is worth less than four seconds of most Americans' time; probably much less, judging by the saucers full of pennies next to cash registers everywhere. There is nothing that a single penny can buy anymore. It only functions as a symbolic counter to simulate remainders of a division by five in retail transactions.

Although pennies aren't worth much, we produce a lot of them. Since 1982, the Mint has produced 910 pennies for every man, woman, and child in the U.S. It estimates that 100 billion pennies currently circulate. In the first 11 months of 2006, the Mint used 20,000 tons of zinc, worth nearly \$80 million at current prices, to produce 7.9 billion pennies.

In economic terms, the penny is disappearing on its own. Figure 2 shows the ratio of coin production to economic output, or gross domestic product (GDP). The relative importance of the quarter has been stable, while that of the penny and the nickel have declined steadily.

I have already shown the role of inflation in this trend. Another factor is that, as productivity grows, a penny is worth ever less of our time because we are becoming richer. A third factor is the replacement of cash (coins and notes)

countries, such as Canada, the United Kingdom, and those of the eurozone, have found steel a cheap and convenient substitute for their equivalent denominations. Steel was in fact used for the U.S. penny during World War II and was considered again in the 1970s.

Do we need a one-cent coin?

An alternative to debasing the penny is to "rebase" it.

As a medium of exchange, a penny isn't worth much. Median

by other means of payment, notably electronic alternatives. These factors suggest that, sooner or later, the penny will join the farthing (one-quarter of a penny) and the hapenny (one-half of a penny) in coin museums. Perhaps now is the time.

The problem remains for the nickel, but there is a simple fix that encompasses both coins. If we formally discontinue the one-cent denomination, the existing stock of pennies (a billion dollars' worth of resources sitting in cash registers, jars, and sofas across America) could be recycled as five-cent coins, by simply declaring that pennies are henceforth worth five cents. Rebasement of the penny would at the same time debase the five-cent piece and put it safely away from its melting point. The new value would be instantly established by the Treasury's standing ready to exchange 20 pennies for a dollar bill. The solution is not costless (for example, those vending machines and parking meters that accept nickels would have to be reconfigured to accept pennies), but neither is the alternative of developing and minting a new five-cent piece.

Conclusion

The Treasury recently enacted regulations to limit the melting and exportation of

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pennies and nickels. The goal is to prevent a shortage of small change. The shortage would be due to the fact that pennies and nickels are made of inappropriately expensive material, and there is, or soon will be, a profit to be made from transferring their content to alternative uses.

The new regulations at best forestall the inevitable for a while, and in the meantime the Mint bears added costs of replenishing the stock of pennies and nickels. The traditional solution since

medieval times is to debase the threatened coin, that is, make it of a cheaper material. This cannot be done under current law, and congressional action is required to redesign our coinage. Another solution is to discontinue the one-cent denomination and rebase pennies to be worth five cents.

¹ See Thomas J. Sargent and François R. Velde, 2002, *The Big Problem of Small Change*, Princeton, NJ: Princeton University Press, and François R. Velde, 2002, "Solving the problem of small change," *Chicago Fed*

Letter, Federal Reserve Bank of Chicago, No. 182, October.

² In the 1930s, gold coins were replaced by paper dollars. The parity changed in 1934, and under the post-World War II Bretton Woods system, only foreigners could exchange paper dollars for gold.

³ For quarters and dimes, the intrinsic content is 82% below face value.

⁴ Barbara Hagenbaugh, 2006, "Coins cost more to make than face value," *USA Today*, May 10, available at www.usatoday.com/money/2006-05-09-penny-usat_x.htm.