STATEMENT OF

RODNEY J. BOSCO

NAVIGANT CONSULTING, INC.

ON THE

"THE FUTURE OF MONEY: COIN PRODUCTION"

BEFORE THE

HOUSE FINANCIAL SERVICES SUBCOMMITTEE
ON DOMESTIC MONETARY POLICY & TECHNOLOGY

UNITED STATES HOUSE OF REPRESENTATIVES

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Mr. Chairman and Members of the Subcommittee, my name is Rodney Bosco and I am a Director in the Disputes and Investigations practice at Navigant Consulting, Inc. ("Navigant"). I am pleased to testify today concerning our coin system, its cost drivers, and an analysis we conducted recently that identified approximately $200 million in annual cost savings if the United States moved to a steel-based composition for our vended nickel, dime, and quarter.

Navigant is an international consulting firm that provides independent, objective analysis of and opinions on accounting, financial and economic issues. Our report was commissioned by Jarden Zinc Products, North America's leading plated coin blank producer and a licensee of the Royal Canadian Mint's multi-ply plated steel technology. We acknowledge the significant assistance of the Royal Canadian Mint ("RCM") and Worthington Industries in the preparation of our analysis.

As the Subcommittee examines ways to make our coins less expensively, and awaits the United States Mint's recommendations on alternative metals later this year, our work has led us to three major conclusions which I want to share with you today.

(1) Adoption of a multi-ply plated steel composition for the vended five-cent, dime and quarter-dollar coins will reduce the per-unit raw material costs of these coins by 84% to 89%, based on recent prices of copper, nickel and low-carbon steel during the United States Mint's 2011 fiscal year. Applied to average historical production of these denominations, raw material cost savings on an annual basis would be approximately $200 million.

(2) Parallel adoption of an alloy recovery program – in which the United States Mint collects and replaces copper-nickel alloy coins in circulation with multi-ply plated steel coins and salvages the copper and nickel material from the retired coins – has the potential to generate over $2 billion in additional revenue for the United States Mint.

(3) Losses reported by the United States Mint associated with penny production have led some to suggest retiring the penny as a means of eliminating such losses. We have found that ending production of the penny would not completely eliminate the losses, as a portion of the United States Mint's fabrication, distribution, and selling, general and administrative ("SG&A") costs assigned to the penny are fixed and will continue to be incurred. Indeed, the United States Mint's total losses from circulating coin production could worsen from current levels depending on the extent to which elimination of the penny increased demand for the nickel, which is also currently produced at a loss.

These findings, which are discussed in more detail below, provide insights into the policy and economic issues associated with United States Mint coin production.

1. RAW MATERIAL COST SAVINGS FROM CONVERTING UNITED STATES VENDED COINAGE TO MULTI-PLY PLATED STEEL

Navigant examined the potential raw material cost savings the United States Mint could achieve through the substitution of copper- and nickel-coated steel blanks for the compositions currently in use. Multi-ply plated steel compositions have been successfully used by the RCM to manufacture circulating coinage for Canada, as well as for more than two dozen nations, for over a decade.

A. The Royal Canadian Mint's Experience with Transitioning from Alloy-based Coins to Multi-Ply Plated Steel Coins

Prior to 2000, the RCM's circulating coins were comparable to current United States coins in that they were made from copper and nickel (see Figure 1). However, Canadian circulation coins now employ a less costly primary material – low carbon steel.[1] The changes made by the RCM, including financing costs related to new fabrication techniques, have resulted in significantly lower unit production costs across all denominations.

Figure 1: Base Metal Content of Circulating Coins in Canada (1982-1999) and the United States (current) [2]

Canada (1982-1999)	Five-Cent	Dime	Quarter-Dollar
Copper	75.00%	0.00%	0.00%
Nickel	25.00%	99.90%	99.90%
Total	100.00%	99.90%	99.90%

United States (current)	Five-Cent	Dime	Quarter-Dollar
Copper	75.00%	91.67%	91.67%
Nickel	25.00%	8.33%	8.33%
Total	100.00%	100.00%	100.00%

Since 2000, only 6% of each coin is comprised of semi-precious metals, applied in a 3-ply layered fashion to an all-steel core using an electroplating process.[3] The RCM can alter the order and "recipe" of each layer of copper, nickel, bronze or brass to adjust the coin's color and Electronic Magnetic Signal (used by coin acceptors to discriminate coins inserted into their machines).[4] Testing performed on the coins and reported by the RCM has found them to exhibit other desirable characteristics with regard to wear, durability and appearance.[5]

According to the RCM, the changes made to the production of its circulating coinage saves Canadians $10 million per year on production volumes of approximately 350 million coins.

In addition to producing circulating coins for Canada, the RCM sells circulating coins and blanks utilizing its multi-ply plating process to foreign countries. Since its introduction, 27 countries in addition to Canada have accepted this technology for their coinage needs.[6]

B. Raw Material Cost Savings From Converting United States Vended Coinage to Multi-Ply Plated Steel

Figure 2 compares the per-unit raw material costs of producing each United States vended coin using the United States Mint's current composition and using the RCM's multi-ply plated steel compositions. The potential savings, represented as the difference between the two sets of figures, are substantial — at least 84% for each denomination. For a detailed analysis of the derivation of the per-unit raw material costs under each composition, refer to Section III of our February 6, 2012 report.

Figure 2: Potential Per-Unit Raw Material Cost Savings from Converting United States Circulating Coins to Multi-ply Plated Steel, Fiscal Year 2011 [7]

	Five-Cent	Dime	Quarter-Dollar
Current Composition	$0.0644	$0.0235	$0.0587
RCM Composition	0.0068	0.0037	0.0081
Savings (dollars)	$0.0576	$0.0198	$0.0506
Savings (percent)	89%	84%	86%

In order to estimate the total savings to the United State Mint assuming the per-unit raw material cost savings above, we determined the average production levels of vended coins over the 30-year period 1982-2011. Applying the per-unit cost savings under the alternative composition scenario (as set forth in Figure 2) to each coin's average production level, we calculate the aggregate dollar value of raw material cost savings on an annual basis to be $207.5 million (see Figure 3).

Figure 3: Potential Annual Raw Material Cost Savings from Converting United States Vended Coins to Multi-ply Plated Steel [8]

	Average Production	Cost Savings	
		Per Unit	Total
	(A)	(B)	(A) × (B) (C)
Mean:			
Five-Cent	1,194,895,000	$0.0576	$ 68,825,952
Dime	1,962,359,000	$0.0198	$ 38,854,708
Quarter-Dollar	1,972,734,000	$0.0506	$ 99,820,340
Total	5,129,988,000		$ 207,501,001
Median:			
Five-Cent	1,214,160,000	$0.0576	$ 69,935,616
Dime	1,982,193,000	$0.0198	$ 39,247,421
Quarter-Dollar	1,475,417,000	$0.0506	$ 74,656,100
Total	4,671,770,000		$ 183,839,138

To assess the sensitivity of the cost savings calculation (Figure 3), we prepared the analysis in Figure 4 to show the material costs savings under several different price change assumptions for both copper/nickel and steel. For purposes of this analysis, we used the mean production level over the past 30 years.

Figure 4: Sensitivity of Annual Raw Material Cost Savings (in millions) to Movements in Metal Prices [9]

		Prices of Copper and Nickel				
		Decrease 20%	Decrease 10%	No Change	Increase 10%	Increase 20%
Price of Steel	Decrease 20%	$166.1	$188.2	$210.4	$232.6	$254.7
	Decrease 10%	$164.7	$186.9	$209.0	$231.2	$253.3
	No change	$163.3	$185.5	$207.5	$229.8	$251.9
	Increase 10%	$161.9	$184.1	$206.2	$228.4	$250.5
	Increase 20%	$160.5	$182.7	$204.8	$227.0	$249.1

To assess the sensitivity of the average (mean) production level to the inclusion of particular years we also calculated the median production level of each coin during the benchmark period. The mean and median production levels for the five-cent coin and dime were not significantly different.[10] However, median production for the quarter-dollar over the 30-year benchmark period was significantly less than mean production.[11] As shown in Figure 3, the savings based on median historical production is $183.8 million.

C. Options for the United States Mint to Consider in Changing its Vended Coins to Multi-ply Plated Steel Compositions

As discussed above, the United States Mint can achieve significant cost savings related to its production of vended coins by changing each coin's composition from copper-nickel alloys to multi-ply plated steel. While base metal costs make up the largest portion of production costs,[12] the United States Mint would incur new or additional costs in other parts of its production process in order to implement this change. With the exception of the one-cent coin, we understand the United States Mint operates as a fully-integrated manufacturing operation, handling all aspects of the production process from receiving raw material through the coining of the final product.

We have identified three production options for the United States Mint to consider if it were to change its coin compositions from the current clad- and alloy-based compositions to multi-ply plated steel coins – (1) continue to perform all production operations in-house; (2) purchase "ready-to-strike" blanks of plated steel coins, similar to the process currently employed with the copper-plated zinc penny; or (3) outsource the plating function but keep all other operations in-house.

Given the lack of publicly available data on the detailed operating costs of the United States Mint's operations in general, and coin plating facility operations specifically, we did not

evaluate the relative merits of the options based on expected costs. Rather, we include in our February 6, 2012 report a discussion of the issues, including machinery and equipment, facilities, employees, technology licensing, and production disruptions, which would need to be addressed by the United States Mint in evaluating each option.

2. POTENTIAL ADDITIONAL REVENUE TO THE UNITED STATES MINT FROM IMPLEMENTING AN ALLOY RECOVERY PROGRAM

Since its launch of multi-ply plated steel circulation coins, the RCM has implemented an alloy recovery program that has generated more than $200 million in revenue between 2004 and 2010. The United States Mint could execute a similar program for its current copper and nickel-based five-cent, dime and quarter-dollar coins. It was beyond the scope of our study to estimate with precision the amount of revenue the United States Mint could expect to receive from launching such a program. However, to provide insight into the potential revenue opportunity we present a scenario based on publicly available information and reasonable assumptions.

In Figure 2 we report the raw material cost associated with the five-cent ($0.0644), dime ($0.0235) and quarter-dollar ($0.0587) coins during fiscal year 2011. The average annual production of each coin over the period 1982 through 2011 is presented in Figure 3. Combining these two sets of information results in a reasonable measure of the revenue, on a per-coin basis, that the United States Mint could receive from retrieving, extracting and selling the copper and nickel material through an alloy recovery program ($0.0466 per unit). Our calculation, set forth in Figure 5, assumes that the shares of coins retrieved will mirror their relative unit production quantities over the past 30 years.

Figure 5: Average Per-Coin Raw Material Cost of Producing Five-Cent, Dime and Quarter-Dollar Coins, Based on Fiscal Year 2011 Spot Prices [13]

	Average Production	Material Cost Per Unit	Material Cost Total
			(A) × (B)
	(A)	(B)	(C)
Five-Cent	1,194,895,000	$0.0644	$ 76,949,541
Dime	1,962,359,000	$0.0235	$ 46,120,080
Quarter-Dollar	1,972,734,000	$0.0587	$ 115,894,896
Total	5,129,988,000		$ 238,964,517
Average material cost per coin minted			**$ 0.0466**

The actual number of coins reclaimed through an alloy recovery program will depend on the United States Mint's ability to access inventories of circulating coins under the control of (a) the Federal Reserve Banks and (b) private coin recycling companies, as well as the effectiveness of campaigns designed to encourage the redemption of coin holdings removed from circulation. Between 1982 and 2011, 153.9 billion five-cent, dime and quarter-dollar coins were produced (equal to average annual unit coin production of 5.130 billion, as shown in Figure 5, multiplied by 30 years). If one-third of these coins were recovered through an alloy recovery program, the United States Mint's additional revenue could be $2.4 billion (equal to 51.3 billion coins multiplied by $0.0466). This calculation assumes that current material prices do not significantly change.

The United States Mint would incur costs to implement and run an alloy recovery program, including the possible production of replacement coins out of multi-ply plated steel. Consistent with our assessment of the costs to change from the current composition of vended coins to multi-ply plated steel composition, the United States Mint would be in the best position to determine the costs to implement such a program. Assuming it is patterned after the RCM's program, one would expect that the United States Mint would also earn high margins.

3. IMPACT OF ELIMINATING THE PENNY ON UNITED STATES MINT COSTS AND PROFIT

In a separate report dated April 12, 2012, Navigant was asked to estimate the impact of eliminating production of circulating pennies on losses currently being incurred by the United States Mint. We have found that ending production of the penny would not completely eliminate the losses, and could even increase the overall loss to the United States Mint due to increased production of the nickel and ongoing United States Mint overhead costs.

The United States Mint shipped 4.29 billion pennies (valued at $42.9 million) during fiscal year 2011 at a reported cost of $103.1 million (2.4 cents per coin), resulting in a net loss of $60.2 million. However, eliminating production of the penny would not eliminate this loss, and could even increase the overall loss to the United States Mint if production of the nickel was increased to substitute for no production of the penny.

We analyzed publicly available information on the United States Mint's past and projected operations to identify patterns in costs related to its product offerings. We observed the following:

- Cost reductions from eliminating the purchase of penny blanks will be largely offset by the loss of revenue from shipments to the Federal Reserve Banks (FRB). In other words, the payments received from the FRB ($42.9 million), which offset all but $4.3 million of the cost of penny blanks ($47.2 million), would not be received if the United States Mint eliminated production of the penny.

- The United States Mint's fabrication and distribution costs include fixed components that will continue to be incurred if the United States Mint eliminated the penny. Using FY 2011 balances and prior United States Mint disclosures, we have estimated this fixed component to be approximately $13 million.

- The United States Mint's total SG&A expense is not sensitive to circulating coin demand or total sales. Thus, the $17.7 million in SG&A assigned to the circulating penny in FY 2011would have been reallocated to other products.

- Substitution of loss-generating nickels will offset potential cost reductions from eliminating the penny.

Without the penny, only $4.3 million in net cost reductions would have been likely in 2011, while an additional $25.2 million in cost reductions would have been possible, based on 2006 comments by the Mint regarding the amount of fixed production costs. However, the substitution of nickels for pennies would have resulted in an increased net loss to the Mint of as much as $10.9 million if penny production were not maintained. Our findings are summarized in Figure 6.

Figure 6: Impact of Eliminating the Penny on the United States Mint's FY 2011 Costs and Profit (millions)

	Penny produced?	
	Yes (Actual)	No (Estimate)
Value of Shipments	$ 42.9	$ -
Gross Cost		
Cost of Goods Sold (purchase of penny blanks)	$ (47.2)	$ -
Cost of Goods Sold (fabrication and distribution)	$ (38.2)	$ (13.0)
Sales, General and Administrative (SG&A)	$ (17.7)	$ (17.7)
Profit (loss) before substitution effect	**$ (60.2)**	**$ (30.7)**
Substitution of 914 million Nickels for 4.3 billion Pennies		$ (40.4)
Profit (loss) after substitution effect		**$ (71.1)**

A. Cost Reductions from Eliminating the Purchase of Penny Blanks Will be Largely Offset by Revenue Losses from Shipments to the Federal Reserve Banks

The United States Mint purchases ready-to-strike penny blanks from an outside supplier. In FY 2011, the average price paid was 1.1 cents per blank, according to one press report.[14] The United States Mint shipped 4.29 billion pennies to the FRB in FY 2011,[15] resulting in a cost of $47.2 million. Had the penny not been produced, those costs would not have been incurred. The value of coins shipped to the FRB is revenue to the United States Mint. Thus, the value of the 4.29 billion pennies shipped to the FRB in FY 2011 was $42.9 million.[16] Had the penny not been produced, those revenues would not have been received.

The net reduction in cost had the penny not been produced in FY 2011 is equal to $47.2 million in cost less $42.9 million in revenue, or $4.3 million.

B. The United States Mint's Fabrication and Distribution Costs Include Fixed Components that Will Continue to be Incurred if the United States Mint Eliminated the Penny

Cost of Goods Sold, which comprise costs to fabricate and distribute coins, include outlays that do not decrease with reductions in production volume. In fact, the United States Mint itself has described in past Annual Reports how "fixed production costs" are spread over units produced:

- "When production volumes decline because of lower demand, fixed production costs are spread over fewer units. This offsets any per-unit gains from lower base metal costs. For example, the per-unit metal cost of a nickel fell about $0.0154 from $0.0815 in FY 2007 to $0.0661 in FY 2008. However, the per-unit fixed production costs increased $0.0082, resulting in only a small decline in the nickel overall unit cost. Similarly, the penny unit cost fell slightly from FY 2007 because of higher per-unit vendor fabrication costs offset lower per-unit metal costs. The unit costs for dime and quarter denominations increased in FY 2008 because of higher per-unit fixed production costs."[17]

- "When production volumes decline because of lower demand, production costs are spread over fewer units….The dime coin unit cost increased about 1.3 cents in FY 2009 largely because the 1.8 cent increase in per-unit production cost offset the 1.0 cent reduction in per-unit metal cost….Slight increases in per-unit production and SG&A costs did not offset the 3.1 cent decline in the five-cent coin's per-unit metal cost."[18]

The United States Mint has acknowledged that a portion of penny production costs are also fixed. In response to a question posed in a 2006 Congressional hearing, the United States Mint responded as follows:

> "**Question**: Do you have the ability to calculate how much the Mint would lose if we were to eliminate the penny and make more nickels?
>
> **Answer**: …the fixed costs associated with production of the penny would have to be absorbed by the remaining denominations of circulating coins. The total amount of fixed costs to be absorbed would be approximately $10.1 million over a fiscal year of production."[19]

The United States Mint's commentary can be seen graphically in Figure 7 (for the penny) and Figure 8 (for the nickel, dime and quarter), which compares shipments and per-unit non-raw material costs from FY 2002 through FY 2011. The lines cross at FY 2007, the year before the onset of the demand declines discussed by the Mint.[20] Shipments and per-unit costs diverge after FY 2007,[21] confirming the existence of fixed costs in the production process.

Figure 7: Coins Shipped and Per-Unit Non-Raw Material Cost of Goods Sold, Fiscal Years 2002-2011 (Penny) [22]

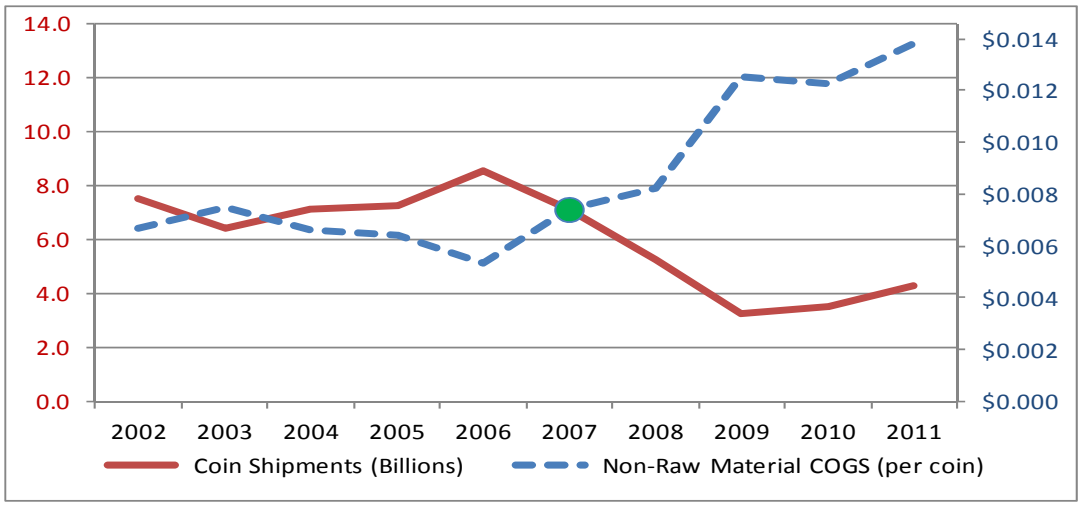
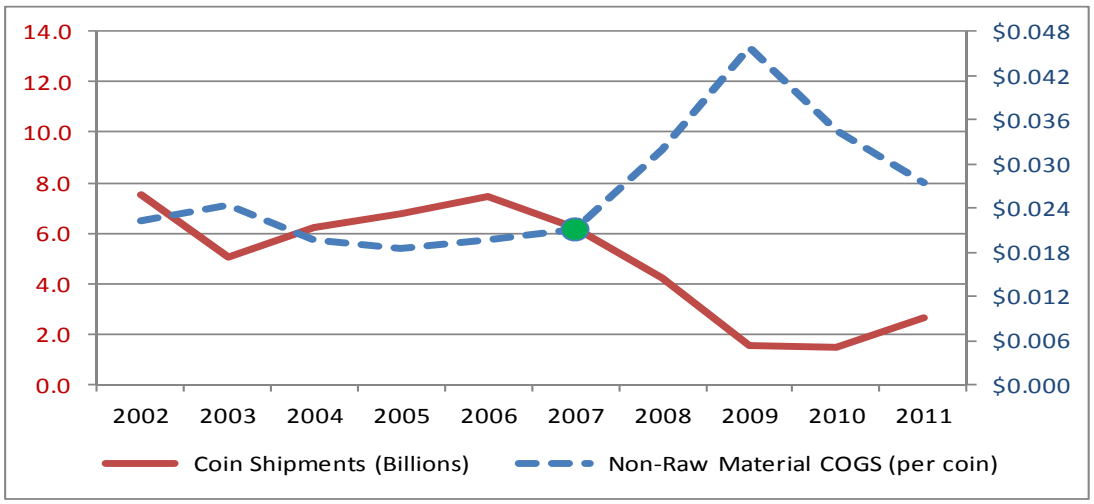


Figure 8: Coins Shipped and Per-Unit Non-Raw Material Cost of Goods Sold, Fiscal Years 2002-2011 (Nickel, Dime and Quarter) [23]



The United States Mint has not reported the fixed costs incurred in FY 2011 to produce the penny. However, insight may be gleaned by linking Mr. Lebryk's statement above to the United States Mint's costs at that time. In FY 2005 and FY 2006, non-raw material costs associated with the penny were $46.5 million and $45.2 million, respectively.[24] The $10.1 million in fixed costs cited by Mr. Lebryk represent 21.7% (FY 2005) and 22.3% (FY 2006) of the non-raw material costs, resulting in average fixed costs of 22% over the two years. We applied this average to the non-raw material costs of penny shipments incurred by the United States Mint in FY 2011 ($59.3 million)[25] and estimated fixed costs of $13.0 million for FY 2011 in the production of the penny. As production of the penny in FY 2011 was significantly less than in either FY 2005 or FY 2006, it is possible that fixed costs as a percent of total non-raw material costs in FY 2011 could be higher than we have calculated.

Cost of Goods Sold for penny shipments during FY 2011 was $85.4 million. Purchases of ready-to-strike blanks totaled $47.2 million (see Section I), leaving $38.2 million as the amount attributable to fabrication and distribution operations executed by the United States Mint. The fixed cost analysis performed above suggests that potential fabrication and distribution cost reductions from the United States Mint eliminating the penny would have been $25.2 million ($38.2 million less $13.0 million) in FY 2011.

C. The United States Mint's Total SG&A Expense Is Not Sensitive to Circulating Coin Demand or Total Sales

For FY 2011, the United States Mint assigned $17.7 million of SG&A expense to circulating pennies, equal to 0.41 cents for each penny shipped.[26] This was in stark contrast to prior years – a total of $5.1 million in SG&A had been assigned to circulating penny production for the nine-year period FY 2002 through FY 2010.[27]

Since FY 2004, the United States Mint's published financial statements do not report the individual expense items and amounts included in SG&A. However, we examined historical financial information reported by the United States Mint over the past decade (FY 2002 through FY 2011) and found that total SG&A expense is not sensitive to either the amount of total sales or the relative contributions of circulating and numismatic products.

Our findings are graphically depicted in Figures 9 and 10. In Figure 9 we compare SG&A to total sales from all products – annual sales grew by more than 170 percent while SG&A expense stayed relatively constant. In Figure 10 we compare SG&A to the distribution of total sales among circulating coins (lower bars) and numismatic products (upper bars) – circulating coins fell from 76% of total sales in 2002 to 16% in 2011 while SG&A stayed relatively constant.

Figure 9: Total SG&A Expense and Total Sales, Fiscal Years 2002-2011 [28]

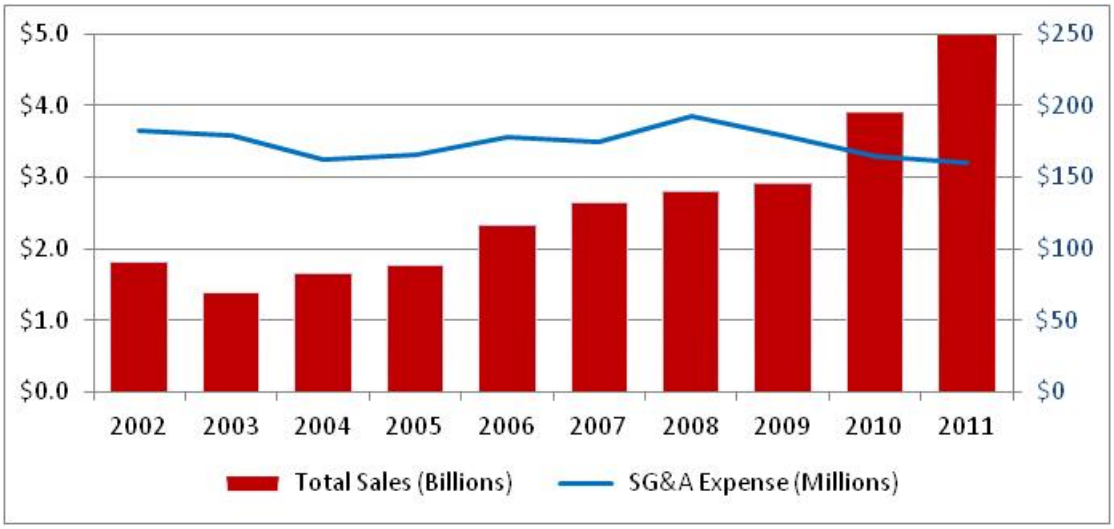
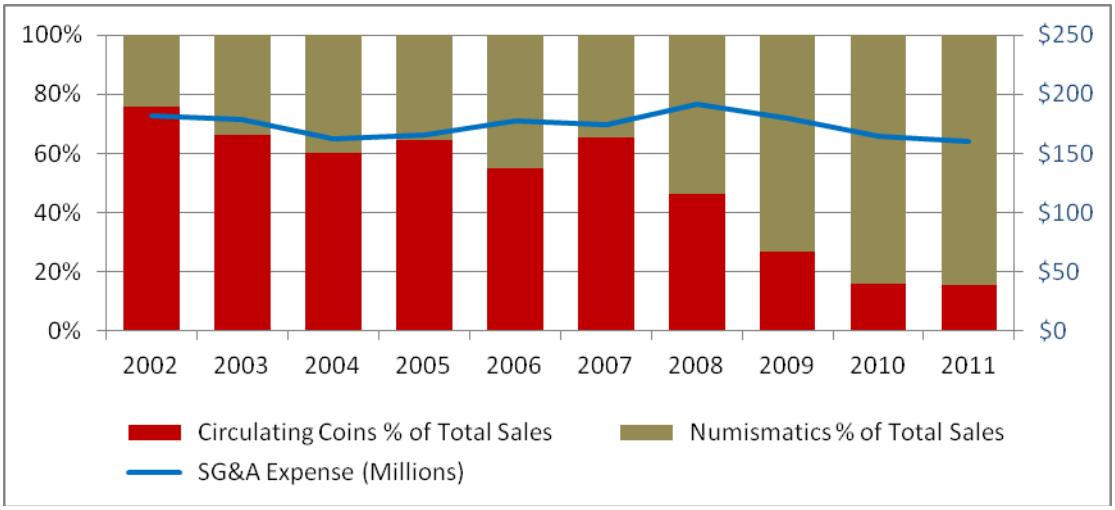


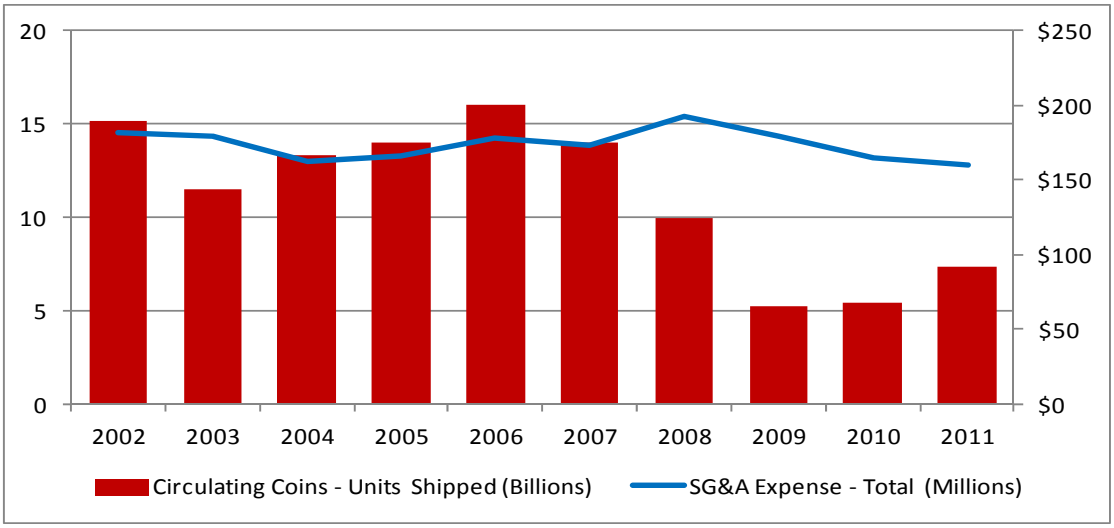
Figure 10: Total SG&A Expense and Composition of Sales, Fiscal Years 2002-2011 [29]



In Figure 11 we compare total SG&A to the number of circulating coins shipped. While total SG&A stayed relatively constant throughout the period, there were three years in which circulating coin shipments fell by an amount comparable to the United States Mint's current (FY 2011) volume of penny shipments (4.3 billion coins):

- In FY 2003, relative to FY 2002, SG&A fell 2% while circulating coin shipments fell by 3.6 billion coins or 24%
- In FY 2008, relative to FY 2007, SG&A rose 10% while circulating coin shipments fell by 4.0 billion coins or 29%
- In FY 2009, relative to FY 2008, SG&A fell 7% while circulating coin shipments fell by 4.8 billion coins or 48%

Figure 11: Total SG&A Expense and Circulating Shipments, Fiscal Years 2002-2011 [30]



We conclude that eliminating the penny would not generate significant reductions in the United States Mint's SG&A expenses. Instead, it would simply result in the United States Mint reallocating SG&A expenses to other circulating coins and numismatic products.

D. Substitution of Nickels for Pennies Would Offset Potential Cost Reductions

In a House Subcommittee hearing held in July 2006, acting United States Mint director David Lebryk was asked about the potential substitution effects that may occur if the penny were eliminated – specifically, what additional losses would the United States Mint incur if more nickels were demanded.[31] The question was likely prompted by Mr. Lebryk's statement that current production costs for the nickel exceeded the coin's face value.[32] Mr. Lebryk responded that the United States Mint was unable to model the potential substitution effect but acknowledged the potential for such substitutions by presenting a graph displaying "estimates of potential costs based on various scenarios."[33]

A scenario posed by Mr. Lebryk in his response envisioned nickel production doubling.[34] In FY 2011, the United States Mint shipped 914 million circulating nickels at an average Cost of Goods Sold of $0.0942,[35] resulting in a loss of $0.0442 ($0.0942 less $0.05) for each nickel shipped.[36] If Mr. Lebryk's scenario were applied to FY 2011 cost and shipment data, the United States Mint would have incurred a substitution-related loss of $40.4 million (914 million × $0.0442). In contrast, we have identified a total of $29.5 million in possible net cost reductions if penny production had been eliminated. Thus, if Mr. Lebryk's substitution scenario were to occur, eliminating the penny would likely have resulted in increased net costs to the United States Mint, relative to the current state, of $10.9 million.

4. SUMMARY AND CONCLUSION

The key findings of our overall work conducted to date are as follows:

- By changing the compositions of the nickel, dime and quarter-dollar coins from copper-nickel alloys to multi-ply plated steel, the United States Mint would incur significantly lower raw materials costs – approximately $200 million per year based on average historical production levels. Multi-ply plated steel compositions have been successfully used by the Royal Canadian Mint to manufacture circulating coinage for Canada, as well as for more than two dozen nations, for over a decade.

- By implementing a parallel alloy recovery program that collects and replaces copper-nickel alloy coins in circulation with multi-ply plated steel coins and salvages the copper and nickel material from the retired coins, the United States Mint could earn over $2 billion in additional revenue based on modest recovery levels.

- Elimination of the penny would not eliminate government losses since the United States Mint's fabrication, distribution, and SG&A costs include fixed components that will continue to be incurred whether or not the United States Mint produces the penny. Additionally, eliminating the penny could increase the overall loss to the United States Mint if production of the nickel was increased to substitute for elimination of the production of the penny.

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[1] "Technical Proposal on Multi-ply Technology by the Royal Canadian Mint," Royal Canadian Mint, pp. 3, 9.

[2] <http://www.mint.ca/store/mint/learn/5-cents-5300006>; <http://www.mint.ca/store/mint/learn/10-cents-5300008>; <http://www.mint.ca/store/mint /learn/25-cents-5300010>; and <http://www.usmint.gov /about_the_mint/?action=coin_specifications>.

[3] Ibid, pp. 4-5.

[4] Ibid, pp. 4 and 7.

[5] Ibid, pp. 5-6.

[6] Royal Canadian Mint, Annual Report 2010, p. 14.

[7] Source: Rodney J. Bosco and Kevin M. Davis, "Potential Benefit to the United States Mint from Changing the Metallic Content of its Vended Coins to Multi-Ply Plated Steel," February 6, 2012, Figure 18 (Per Unit Cost Savings).

[8] Yeoman, pp. 134-136, 157-158, 174-185 and <http://www.usmint.gov/about_the_mint/coin_production /index.cfm?action=production_figures&allCoinsYear=2011#starthere> (Average Production); and "Potential Benefit to the United States Mint from Changing the Metallic Content of its Vended Coins to Multi-Ply Plated Steel," February 6, 2012, Figure 18 (Per-unit Cost Savings).

[9] Yeoman, pp. 134-136, 157-158, 174-185 and <http://www.usmint.gov/about_the_mint/coin_production /index.cfm?action=production_figures&allCoinsYear=2011#starthere> (Average Production); and "Potential Benefit to the United States Mint from Changing the Metallic Content of its Vended Coins to Multi-Ply Plated Steel," February 6, 2012, Figure 18 (Per-unit Cost Savings). The prices of copper, nickel and steel were adjusted from their fiscal year

2011 averages (“No Change”) by 10% or 20%, as noted in the column and row headings, for purposes of this sensitivity analysis.

[10] Per “Potential Benefit to the United States Mint from Changing the Metallic Content of its Vended Coins to Multi-Ply Plated Steel,” February 6, 2012, Figure 19 (Potential Raw Material Cost Savings), the mean and median values for the nickel and the dime differed by less than 2.0%.

[11] Per “Potential Benefit to the United States Mint from Changing the Metallic Content of its Vended Coins to Multi-Ply Plated Steel,” February 6, 2012, Figure 19(Potential Raw Material Cost Savings),, median production for the quarter was 25.2% less than mean production.

[12] United States Mint, 2011 Annual Report, p. 10.

[13] Yeoman, pp. 134-136, 157-158, 174-185 and <http://www.usmint.gov/about_the_mint/coin_production /index.cfm?action=production_figures&allCoinsYear=2011#starthere> (Average Production); and “Potential Benefit to the United States Mint from Changing the Metallic Content of its Vended Coins to Multi-Ply Plated Steel,” February 6, 2012, Figure 18 (Per-unit Cost Savings).

[14] Chris Isidore, “Obama wants cheaper pennies and nickels,” CNNMoney.com, February 15, 2012.

[15] United States Mint, 2011 Annual Report, page 11.

[16] Id.

[17] United States Mint, 2008 Annual Report, page 29.

[18] United States Mint, 2009 Annual Report, page 30.

[19] Coin and Currency Issues Before Congress: Can We Still Afford Money?, Hearing Before the Subcommittee on Domestic and International Monetary Policy, Trade and Technology of the Committee on Financial Services, U.S. House of Representatives, One Hundred Ninth Congress, Second Session, July 19, 2006.

[20] Shipments in FY 2007 were lower than in FY 2006, but within the range of prior years.

[21] The same pattern was observed, separately, for the nickel, the dime, and the quarter.

[22] Source: Rodney J. Bosco and Kevin M. Davis, “Impact of Eliminating the Penny on the United States Mint’s Costs and Profit in Fiscal Year 2011,” April 12, 2012, Appendix A-1.

[23] Source: “Impact of Eliminating the Penny on the United States Mint’s Costs and Profit in Fiscal Year 2011,” April 12, 2102, Appendix A-2.

[24] Source: “Impact of Eliminating the Penny on the United States Mint’s Costs and Profit in Fiscal Year 2011,” April 12, 2012, Appendix A-1. FY 2005 was the last full fiscal year prior to Mr. Lebryk’s July 2006 testimony, which occurred during FY 2006.

[25] Source: “Impact of Eliminating the Penny on the United States Mint’s Costs and Profit in Fiscal Year 2011,” April 12, 2012, Appendix A-1.

[26] United States Mint, 2011 Annual Report, page 11.

[27] United States Mint, Annual Report, 2002 through 2011. In FY 2011 the United States Mint changed the method it uses to allocate SG&A expense among its products from a gross margin basis to a gross cost basis. (United States Mint, 2011 Annual Report, page 10)

[28] Sources: “Impact of Eliminating the Penny on the United States Mint’s Costs and Profit in Fiscal Year 2011,” April 12, 2102, Appendix B-1 (total sales) and Appendix B-2 (total SG&A expense).

[29] Sources: “Impact of Eliminating the Penny on the United States Mint’s Costs and Profit in Fiscal Year 2011,” April 12, 2012, Appendix B-1 (shares of total sales) and Appendix B-2 (total SG&A expense).

[30] Sources: “Impact of Eliminating the Penny on the United States Mint’s Costs and Profit in Fiscal Year 2011,” April 12, 2012, Appendix B-1 (circulating coin shipments) and Appendix B-2 (total SG&A expense).

[31] Coin and Currency Issues Before Congress: Can We Still Afford Money?

[32] Testimony of David A. Lebryk, July 19, 2006.

[33] Coin and Currency Issues Before Congress: Can We Still Afford Money?

[34] Coin and Currency Issues Before Congress: Can We Still Afford Money?

[35] United States Mint, 2011 Annual Report, page 11.

[36] The Mint also assigned SG&A of $16.1 million, or $0.0176 per coin shipped, to the nickel. For the reasons set forth in Section III, we have assumed that increased demand for nickels will not result in additional SG&A expense.

NAVIGANT

POTENTIAL BENEFITS TO THE UNITED STATES MINT FROM CHANGING THE METALLIC CONTENT OF ITS VENDED COINS TO MULTI-PLY PLATED STEEL

PURSUANT TO "THE COIN MODERNIZATION, OVERSIGHT, AND CONTINUITY ACT OF 2010" (PUBLIC LAW 111-302)

Rodney J. Bosco
Kevin M. Davis

February 6, 2012

Abstract

Since 1792, the United States Mint has been responsible for the manufacture and distribution of sufficient volumes of circulating coins to facilitate the nation's daily transactions of goods and services. The first American legal tender coins were made from precious metals (gold and silver) and designed to establish their monetary value based on the intrinsic value of the material contained in them. Apart from periods of occasional material shortages, the United States Mint maintained the intrinsic value standard for its circulating coinage into the 20th century.

Between 1933 and 1970 the United States transitioned its legal tender coinage from precious metals to "semi-precious" metals such as copper and nickel. The change to a fiat money standard was intended to give the United States Mint greater supply flexibility to meet the needs of a growing economy. It also allowed the United States Mint to earn a profit (called "seigniorage") on its production of circulating coins, which is used by the United States government to reduce its requirement to borrow money from the public to finance the national debt.

Between 2002 and 2006 prices for copper and nickel climbed more than fourfold. In 2006 the United States Mint disclosed that the cost of producing the five-cent coin exceeded the coin's face value. In July 2007 the Secretary of the Treasury asked Congress to enact legislation authorizing changes to the composition of circulating coins. The "Coin Modernization, Oversight, and Continuity Act of 2010" authorized the Secretary of the Treasury to conduct tests and solicit input from independent research facilities and current or potential suppliers as to the use of alternative metallic materials in circulating coins.

This study provides insights into the potential raw material cost savings the United States Mint could achieve through the substitution of copper- and nickel-coated steel blanks for the compositions currently in use. Multi-ply plated steel compositions have been successfully used by the Royal Canadian Mint to manufacture circulating coinage for Canada, as well as for more than two dozen nations, for over a decade.

Key findings of this study, based upon analyses conducted to date, include the following:

(1) Adoption of a multi-ply plated steel composition for the five-cent, dime and quarter-dollar coins will reduce the per-unit raw material costs of these coins by 89% (five-cent), 84% (dime) and 86% (quarter-dollar), based on recent prices of copper, nickel and low-carbon steel.

(2) Applied to long-term average annual historical production of these denominations, raw material cost savings on an annual basis range from $183.8 million to $207.5 million, depending on the extent to which the United States Mint continues its successful rotating design program for its circulating quarter-dollar coins.

(3) Parallel adoption of an alloy recovery program that collects and replaces copper-nickel alloy coins in circulation with multi-ply plated steel coins and salvages the copper and nickel material from the retired coins, has the potential to generate over $2 billion in additional revenue for the United States Mint.

Adoption of multi-ply plated steel coin compositions by the United States Mint could be handled through total in-house production, out-sourced production up to the receipt of "ready-to-strike" planchets or a combination of these two options with a third-party handling the plating process. Given that detailed cost data for the United States Mint's current operations and for the operation of a coin plating facility is not available for public inspection and analysis, our study does not include an evaluation of the merits of the options based on expected net cost savings. Rather, we include in our report a discussion of the issues — including machinery and equipment, facilities, employees, technology licensing, and production disruptions — that will need to be addressed by the United States Mint in evaluating each option.

The adoption of multi-ply plated steel compositions in vended coins may have impacts on certain industries and/or organizations that rely on these coins to conduct their activities. For example, when the Royal Canadian Mint planned the release of its multi-ply plated steel coins it worked closely with Canada's vending industry to address their concerns. The identification of industries and organizations within the United States that may be impacted, and the related impacts thereon, are beyond the scope of this report.

This report was commissioned by Jarden Zinc Products, North America's leading plated coin blank producer and licensee of the Royal Canadian Mint's multi-ply plated steel technology. The authors also gratefully acknowledge the significant contributions of the Royal Canadian Mint and Worthington Industries.

Section I – Evolution of Metal Compositions Used in United States Vended Coins

The United States Mint was established by an Act of Congress on April 2, 1792.[1] Since 1793, the United States Mint has manufactured and distributed coins to support the nation's commerce (hereafter, "circulating coins").[2] The United States Mint operates as a bureau within the Department of the Treasury.[3] Regulations pertaining to the coining of money, including circulating coins, are effectuated through Acts of Congress.[4]

A. The First Circulating Coins Were Tied to an Intrinsic Value Standard

The Coinage Act of 1792 authorized the manufacture of coinage based on "dollars"[5] or fractions thereof. Coins with a value in excess of one dollar were to be made of gold, while coins with a value between one dollar and "one twentieth" of a dollar were to be made of silver.[6] The remaining coins – cents and half cents – were to be made of copper,[7] a semi-precious metal. The dollar coin was defined to be "of the value [in silver] of a Spanish milled dollar as the same is now current….", while the amount of silver in the lower denominations was set in proportion to their relative currency value.[8] Thus, the first United States legal tender coins were designed to tie their monetary values to the "intrinsic value" of the precious metal contained in them. While technically based on a silver standard, the Coinage Act of 1792 also established a proportional value of silver to gold, by weight, of 15:1.[9] This linking of silver and gold values effectively placed the new United States legal tender coinage on a bi-metal standard.

A series of Congressional Acts during the mid 19th century moved United States legal tender coinage from a bi-metal standard to a gold standard. In 1834, Congress changed the legal exchange ratio between silver and gold from 15:1 to 16:1.[10] In 1849, Congress authorized production of a gold dollar coin.[11] In 1853, the legal tender status of sub-dollar silver coins, previously unlimited, became limited to obligations up to five dollars.[12] In 1866, Congress authorized the United States Mint to begin production of a new five-cent coin comprised of an alloy of copper (75%) and nickel (25%).[13] The Coinage Act of 1873 ended production of the silver half-dime and the silver dollar, and ended the free coinage of silver (which allowed silver producers to have their bullion coined); it also granted, for the first time, legal tender status to non-precious metal based coins.[14] In 1874, the legal tender status of silver dollars became restricted to obligations of up to five dollars.[15] Collectively the Acts served to demonetize silver, moving the United States to a de-facto gold standard for its monetary system. Despite these changes, most denominations of circulating coins continued to be made from gold or silver.

B. Transition of Coin Compositions from Gold/Silver to Copper/Nickel

A banking crisis during the early 1930s led Congress to enact legislation authorizing the President to direct the withdrawal of gold, in all its tradable forms, from the United States economy.[16] On April 5, 1933, President Franklin D. Roosevelt issued Executive Order 6102, which prohibited "the withdrawal and withholding of gold coin, gold bullion or gold certificates from the recognized and customary channels of trade." It also directed persons to deliver their gold holdings to authorized agents of the Federal Reserve System, where the holdings were exchanged for their equivalent value in other currency. The United States Mint ceased production of circulating gold coins in 1933.[17]

By the early 1960s, worldwide silver consumption was outpacing new silver production.[18] The resulting global shortage of the precious metal posed a long-term supply risk to the United States Mint regarding its ability to produce silver-based circulating coins. As a consequence, on June 3, 1965 President Lyndon Johnson proposed to Congress to authorize the removal of silver from United States circulating coins.[19] The Coinage Act of 1965, signed into law by President Johnson on July 23, 1965,[20] directed the United States Mint to (a) remove silver from the dime and quarter-dollar coins and substitute a "clad" or layered composition of copper and nickel, and (b) reduce the silver content of the half-dollar coin from 90% to 40%.[21] In 1971 silver was removed from the circulating half-dollar coin, replaced with the same clad composition as the dime and quarter-dollar coins.[22]

By moving to semi-precious metals as the basis for its circulating coinage, the value of which was less than the face value of the coins, the United States Mint was able to increase the amount of profit or "seigniorage"[23] earned from its operations. The seigniorage is used by the United States to reduce the amount of money it would otherwise borrow from the public to finance the national debt.[24]

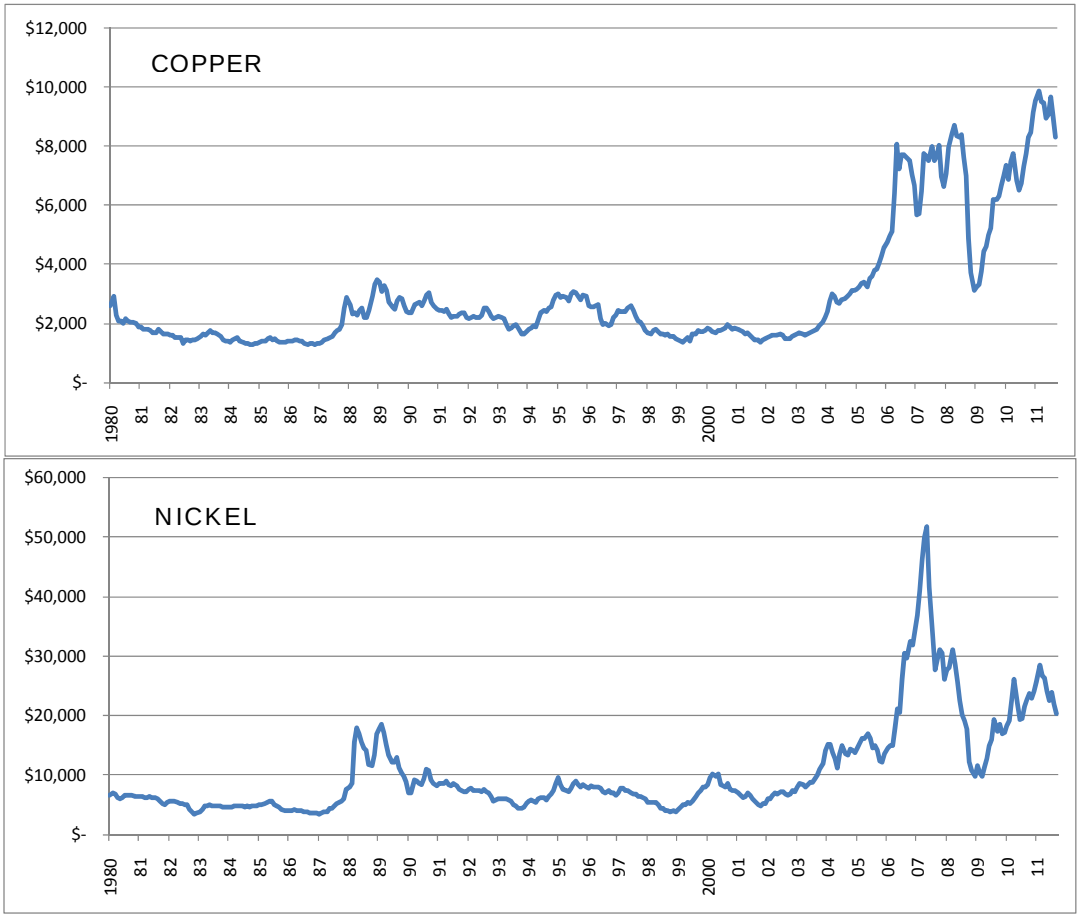
C. Semi-Precious Metal Five-Cent Coins Become Unprofitable to Produce

In 2002 prices for copper and nickel began to increase. Within five years, prices had risen more than fourfold. The average price levels for each metal, expressed in dollars and on an index basis (relative to fiscal year 2002), are shown in Figure 1.[25] The five-cent coin has been particularly hard hit by rising metal costs given its composition of 75% copper and 25% nickel. During the United States Mint's 2011 fiscal year (October 2010 through September 2011), the price of nickel was more than twice that of copper. Figure 2 provides a graphical depiction of the surge in monthly average prices of each metal during the period 2002 through 2011, relative to the previous two decades.[26]

Figure 1: Annual Average Spot Price per Metric Ton for Copper and Nickel, Fiscal Years 2002-2011

	Copper		Nickel	
Fiscal Year	Average Price	Index (2002=100)	Average Price	Index (2002=100)
2002	$1,528.99	100	$ 6,278.13	100
2003	1,652.64	108	8,302.13	132
2004	2,605.25	170	13,408.09	214
2005	3,373.84	221	15,117.51	241
2006	6,039.99	395	19,068.39	304
2007	7,098.21	464	38,063.18	606
2008	7,786.78	509	25,720.37	410
2009	4,478.95	293	13,026.23	207
2010	7,043.74	461	20,292.75	323
2011	9,104.04	595	24,206.76	386

Figure 2: Monthly Average Spot Price per Metric Ton for Copper and Nickel, January 1980-September 2011



In the United States Mint's 2006 Annual Report, director Edmund Moy noted that, "…by the fourth quarter, steeply rising metal prices had pushed the cost of manufacturing the one-cent and 5-cent coins above face value."[27] In its 2011 Annual Report the United States Mint stated, "The unit cost for…[the] nickel denomination[] remained above face value for the sixth consecutive fiscal year."[28] Financial data from the United States Mint supporting these observations for the five-cent coin are provided in Figure 3 below.[29]

Figure 3: Unit Cost of Producing and Distributing Circulating Five-Cent Coins, Fiscal Years 2006-2011 (in dollars)

	2006	2007	2008	2009	2010	2011
Cost of Goods Sold	$0.0592	$0.0949	$0.0877	$0.0579	$ 0.0916	$0.0938
Sales, General & Administrative	0.0001	-	-	0.0014	-	0.0176
Distribution to Federal Reserve Banks	0.0004	0.0004	0.0006	0.0010	0.0006	0.0004
Total Expenses	$0.0597	$0.0953	$0.0883	$0.0603	$ 0.0922	$0.1118

On a gross shipment basis, the United States Mint has lost more than $171 million over the past six years producing the five-cent coin. (See Figure 4)[30]

Figure 4: Losses from Circulating Five-Cent Coins, Fiscal Years 2006-2011 (in millions of dollars)

	2006	2007	2008	2009	2010	2011	Total
Value of Shipments	$ 72.6	$ 64.4	$ 32.3	$ 10.3	$ 17.9	$ 45.7	$ 243.2
Cost of Goods Sold	(87.1)	(122.9)	(57.1)	(12.2)	(33.1)	(86.1)	(398.5)
Sales, General & Administrative	(0.1)	-	-	(0.3)	-	(16.1)	(16.5)
Seigniorage	$ (14.6)	$ (58.5)	$ (24.8)	$ (2.2)	$ (15.2)	$ (56.5)	$(171.8)

Rising material prices have also negatively impacted the seigniorage the United States Mint earns on its shipments of dime and quarter-dollar coins to the Federal Reserve Banks. Between 2003 and 2011 such seigniorage has been reduced by more than $577 million. This is shown in Figure 5 (dime) and Figure 6 (quarter-dollar).[31]

Figure 5: Reduction in Seigniorage from Circulating Dimes, Fiscal Years 2003-2011

Fiscal Year	Raw Material Cost per Coin (spot price basis) Actual (A)	2002 Level (B)	Difference (A) - (B) (C)	Coins Shipped (millions) (D)	Reduction in Seigniorage (C) × (D) (E)
2003	$ 0.0050	$ 0.0044	$ 0.0006	1,888	$ 1,207,576
2004	0.0080	0.0044	0.0036	2,570	9,213,771
2005	0.0099	0.0044	0.0055	2,748	15,130,759
2006	0.0162	0.0044	0.0118	3,023	35,658,531
2007	0.0220	0.0044	0.0176	2,247	39,515,263
2008	0.0210	0.0044	0.0167	1,070	17,852,460
2009	0.0118	0.0044	0.0074	358	2,652,197
2010	0.0185	0.0044	0.0141	887	12,519,056
2011	0.0235	0.0044	0.0191	1,403	26,849,267
Total					$ 160,598,880

Figure 6: Reduction in Seigniorage from Circulating Quarter-Dollars, Fiscal Years 2003-2011

Fiscal Year	Raw Material Cost per Coin (spot price basis) Actual (A)	2002 Level (B)	Difference (A) - (B) (C)	Coins Shipped (millions) (D)	Reduction in Seigniorage (C) × (D) (E)
2003	$ 0.0125	$ 0.0109	$ 0.0016	2,442	$ 3,902,473
2004	0.0199	0.0109	0.0090	2,244	20,105,759
2005	0.0247	0.0109	0.0138	2,743	37,748,478
2006	0.0404	0.0109	0.0295	3,007	88,662,051
2007	0.0549	0.0109	0.0440	2,711	119,152,135
2008	0.0526	0.0109	0.0417	2,510	104,678,954
2009	0.0294	0.0109	0.0185	965	17,870,863
2010	0.0462	0.0109	0.0353	252	8,890,705
2011	0.0587	0.0109	0.0478	323	15,451,488
Total					$ 416,462,905

As depicted in Figure 2, prices of both metals declined between mid-2007 and late 2008. However, since then copper prices have surged once more – exceeding the 2007 peak in seven of the past 10 months (as of September 2011).[32] With copper currently serving as the primary material in five-cent (75.00%), dime (91.67%) and quarter-dollar (91.67%) coins,[33] its procurement has become a significant non-controllable cost for the United States Mint. This was recognized by the United States Mint in 2005, when it commenced a comprehensive coinage material study of "cost effective alternative materials for circulating…coin denominations."[34] By 2010, the United States Mint was calling for Congressional action to address this issue:

> "Changing the composition of coins to less expensive alternative materials could generate significant cost savings and mitigate further reductions in seigniorage should metal market prices escalate…. The compositions of five-cent, dime, quarter-dollar and half-dollar coins are codified by statute. Any authority to change the composition of these denominations requires [Congressional action]."[35]

D. Congressional Consideration of Alternative Metal Compositions for Circulating Coins

The United States Mint had been calling for legislative relief well before the release of its 2010 Annual Report. On July 19, 2006, Acting Director David Lebryk testified before the House Subcommittee on Domestic and International Monetary Policy Trade and Technology. In his opening address Lebryk stated that the United States Mint "look[ed] forward to working with Congress on this issue [coin costs]."[36] On July 30, 2007, the Secretary of the Treasury wrote a letter to Congress seeking legislation to be enacted authorizing the Secretary of the Treasury to make changes to the composition of circulating coins.[37]

Congress considered three bills to address the Secretary of the Treasury's request. The first two bills – the *Coinage Materials Modernization Act of 2007* and the *Coin Modernization and Taxpayer Savings Act of 2007* – proposed granting the Secretary of the Treasury broad authority to determine the weight and composition of all circulating coinage.[38] Neither bill made it out of committee.[39] The third bill, the *Coin Modernization and Taxpayer Savings Act of 2008*, directed the United States Mint to adopt plated steel compositions for the one-cent and five-cent coins but granted the Secretary of the Treasury the authority to modify such compositions under certain conditions.[40] Although passed by the House on May 8, 2008, no major action was taken by the Senate.[41]

On September 22, 2010, The *Coin Modernization, Oversight, and Continuity Act of 2010* was introduced.[42] This bill would authorize the Secretary of the Treasury to conduct research and development on alternative metallic compositions for United States circulating coinage but would not authorize the Secretary of the Treasury to make any changes.[43] The Secretary of the Treasury would also be required to report to Congress on the United States Mint's production costs, cost trends and possible new metallic materials or technologies for the production of circulating coins, as well as provide detailed recommendations for any proposed content changes.[44] The bill passed both houses of Congress and was signed into law by President Barack Obama on December 14, 2010.[45]

Section II – The Royal Canadian Mint's Experience with Transitioning from Alloy-based Coins to Multi-Ply Plated Steel Coins

In its 2005 Annual Report, the United States Mint noted that it was planning to invest in a research and development program that would "explore new manufacturing, metal fabrication and finishing techniques that will improve its manufacturing operations…."[46] As part of that effort, the United States Mint would "explore what other mints are doing around the world."[47] In Section II we examine the experience of the Royal Canadian Mint ("RCM").

A. Material Cost Savings Achieved by Changing Coin Compositions

Prior to 2000 the RCM's coin compositions were comparable to current United States coin compositions in that they were made from copper and nickel (see Figure 7 below). However, Canadian circulation coins now employ a less costly primary material. The composition changes made by the RCM, including financing costs related to new fabrication techniques, have resulted in significantly lower unit production costs across all denominations.

Figure 7: Base Metal Content of Circulating Coins in Canada (1982-1999) and the United States (current) [48]

Canada (1982-1999)	Five-Cent	Dime	Quarter-Dollar
Copper	75.00%	0.00%	0.00%
Nickel	25.00%	99.90%	99.90%
Total	100.00%	99.90%	99.90%

United States (current)	Five-Cent	Dime	Quarter-Dollar
Copper	75.00%	91.67%	91.67%
Nickel	25.00%	8.33%	8.33%
Total	100.00%	100.00%	100.00%

In 2000, the RCM made a significant change to its circulating coinage, replacing most of the copper and nickel with a low-carbon steel alloy.[49] Only 6% of each coin's composition is now comprised of semi-precious metals – applied in a 3-ply layered fashion to the outside of an all-steel core using an electroplating process.[50] The RCM can alter the order and "recipe" of each layer of copper, nickel, bronze or brass to

adjust the coin's color and Electronic Magnetic Signal (used by coin acceptors to discriminate coins inserted into their machines).[51] Testing performed on the coins and reported by the RCM has found them to exhibit other desirable characteristics with regard to wear, durability and appearance.[52]

According to the RCM, the changes made to the production of its circulating coinage saves Canadians $10 million per year. A press release issued in October 2001 by the RCM quantified annual production cost savings under an assumed average volume of each denomination.[53] In its 2000 Annual Report, the RCM disclosed annual debt service payments related to its construction of a plating facility, which had a total construction cost of $30.3 million.[54] Using these sources we calculated a Net Annual Savings of $10,575,602 (see Figure 8), consistent with the RCM's claims.

Figure 8: Cost Comparison: Nickel Alloy vs. Multi-ply Plated Steel, Canadian Circulating Coins

	Projected Annual	Nickel Alloy		Multi-ply Plated Steel		Cost Savings	
Coin	Production	Unit Cost	Annual Cost	Unit Cost	Annual Cost	Dollars	Percent
			(A) × (B)		(A) × (D)	(C) - (E)	(F) ÷ (C)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
5-cent	95,660,000	$ 0.0360	$ 3,443,760	$ 0.0113	$ 1,080,958	$ 2,362,802	69%
10-cent	141,800,000	$ 0.0350	$ 4,963,000	$ 0.0070	$ 992,600	$ 3,970,400	80%
25-cent	112,400,000	$ 0.0910	$ 10,228,400	$ 0.0150	$ 1,686,000	$ 8,542,400	84%
Total	349,860,000		$ 18,635,160		$ 3,759,558	$ 14,875,602	80%
Annual financing costs for plating facility:							
Principal						$ (3,100,000)	
Interest						$ (1,200,000)	
Net Annual Savings						$10,575,602	

In addition to producing circulating coins for Canada, the RCM sells circulating coins and blanks utilizing its multi-ply plating process to foreign countries. Since its introduction, 27 countries in addition to Canada have accepted this technology for their coinage needs.[55] With sales of 1.1 billion coins and blanks in 2010, the RCM had a 9.5% share of the foreign circulation coinage market.[56]

B. Additional Revenues from Reclaiming Old-Composition Coins

Beginning in 2003, the RCM launched an Alloy Recovery Program ("ARP"). Under the program, old-composition coins are reclaimed from circulation and melted, with the recovered alloy material sold to metal dealers at market prices. The RCM replaces the reclaimed coins with new-composition coins so that day-to-day commercial transactions continue uninterrupted.[57] Through 2010, the RCM has received over $200 million in revenue from the ARP, as shown in Figure 9 below.[58] While the profit from such operations is not reported by the RCM, it has been characterized as a "high-margin" business.[59]

Figure 9: Revenue Earned by the Royal Canadian Mint from its Alloy Recovery Program, 2004 – 2010

Year	Revenue
2004	$ 8.0
2005	11.2
2006	19.4
2007	35.8
2008	55.4
2009	51.4
2010	22.6
Total	$ 203.8

Section III – Raw Material Cost Savings from Converting United States Vended Coinage to Multi-ply Plated Steel

In this section we calculate the current raw material costs and the alternative raw material costs associated with having the United States Mint adopt the RCM's coin compositions for the circulating five-cent, dime and quarter-dollar denominations. We have examined the costs of each metal on a spot market basis; that is, the price from the mine as recorded by a trading market such as the London Metal Exchange. As such, the price does not include costs associated with processing, fabrication, packaging and transport that would be performed by a vendor prior to the material being received by the United States Mint. The time frame for our analysis is the United States Mint's most recently-completed fiscal year, which ended on September 30, 2011.

As shown in Figure 7, the United States Mint currently uses copper and nickel for its five-cent, dime and quarter-dollar coins. Using weight and composition data published by the United States Mint, it is possible to determine, for each denomination, the amount of each metal used to make a single coin. This is shown in Figure 10.[60]

Figure 10: Material Inputs for United States Vended Coins on a Per-Unit Basis (Current Composition)

	Five-Cent		Dime		Quarter-Dollar	
Metal	Percent of Total	Quantity (grams)	Percent of Total	Quantity (grams)	Percent of Total	Quantity (grams)
		(A) x 5.000		(C) x 2.268		(E) x 5.670
	(A)	(B)	(C)	(D)	(E)	(F)
Copper	75.00%	3.750	91.67%	2.079	91.67%	5.198
Nickel	25.00%	1.250	8.33%	0.189	8.33%	0.472
Total		5.000		2.268		5.670

The United States Mint does not disclose the contract prices it pays for the flat rolled coils of base metals used in the minting of its circulating coinage. However, in recent Annual Reports the United States Mint has published charts that show spot prices for copper and nickel over time and uses these charts to explain changes in its production costs vis-à-vis prior years.[61] Therefore, for purposes of our study, which seeks to estimate potential material cost savings to the United States Mint through the substitution of lower cost metals relative to its current costs, we believe spot prices serve as a reliable proxy measure.

Spot prices are published daily on a "per metric-ton" (or 1,000 kilogram) basis;[62] market analysts also publish average prices on a weekly and monthly basis.[63] The United States Mint purchases material as needed throughout the year to satisfy demand for circulating coins by the Federal Reserve Banks.[64] Assuming that purchases occur in a uniform manner throughout the year, we have calculated, for copper and nickel, the average spot market price during fiscal year 2011 as the average of the monthly-average prices for October 2010 through September 2011. These averages ($9,104 for copper; $24,207 for nickel) are shown in Figure 1.

In order to place the quantity and price data on the same scale, we divided the quantities shown in Figure 9 by one million to obtain a per-metric ton equivalent. The product of quantity and price, summed across the two base metals, yields the raw material cost, on a per-unit basis, for each denomination. This is shown in Figure 11.[65] We note that the raw material cost for the five-cent coin, $0.0644, exceeds its face value.

Figure 11: Raw Material Cost for United States Vended Coins on a Per-Unit Basis, Fiscal Year 2011 (Current Composition)

	Five-Cent	Dime	Quarter-Dollar
Copper:			
Weight (Metric Tons)	0.000003750	0.000002079	0.000005198
Price per Metric Ton	$ 9,104.04	$ 9,104.04	$ 9,104.04
Total Copper Cost	$ 0.0341	$ 0.0189	$ 0.0473
Nickel:			
Weight (Metric Tons)	0.000001250	0.000000189	0.000000472
Price per Metric Ton	$ 24,206.76	$ 24,206.76	$ 24,206.76
Total Nickel Cost	$ 0.0303	$ 0.0046	$ 0.0114
Total Material Cost	$ 0.0644	$ 0.0235	$ 0.0587

Having determined the per-unit raw material costs under the United States Mint's current coinage compositions, we turn to the calculation of per-unit raw material costs under an alternative composition based on the RCM's multi-ply plated steel compositions. In Figure 10 we determined the amount of copper and nickel required to make a single unit of each denomination by multiplying the coin's total weight by each metal's composition percentage – information published by the United States Mint. However, while the composition percentages under the RCM's multi-ply plated formulation are known, the total weights of the modified coins are not known and must be calculated.

Substituting steel for copper and nickel while maintaining each coin's current diameter and thickness will result in a lower weight, as steel is less dense than copper and nickel. In order to determine how much lighter each RCM-composition United States coin will be, the volume of raw material used in each coin must be calculated. The United States Mint's published coin specifications do not include volumes. However, given the total weight and metal composition of the current coins, as well as the densities of each metal, the volume of each coin can be estimated. This is shown in Figure 12.

Figure 12: Volume (in cubic centimeters) of United States Vended Coins [66]

	Material	Five-Cent		Dime		Quarter-Dollar	
Metal	Density	Weight	Volume	Weight	Volume	Weight	Volume
	(grams/cc)	(grams)	(cc)	(grams)	(cc)	(grams)	(cc)
			(B) ÷ (A)		(D) ÷ (A)		(F) ÷ (A)
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
Copper	8.930	3.750	0.420	2.079	0.233	5.198	0.582
Nickel	8.880	1.250	0.141	0.189	0.021	0.472	0.053
Total		5.000	**0.561**	2.268	**0.254**	5.670	**0.635**

Once the volumes of each coin are known, the weights of the RCM-composition United States coins can be determined. The calculations are shown in Figure 13 (five-cent), Figure 14 (dime) and Figure 15 (quarter-dollar). Note that for each denomination the shares of the coin's total weight (shown in column B) are per the RCM's specifications.

Figure 13: Weight of United States Circulating Five-Cent Coin Using RCM Composition [67]

Material	Density	Share of Weight	Average Density	Volume	Total Weight
	(grams/cc)	(percent)	(grams/cc)	(cc)	(grams)
	(A)	(B)	(A) x (B) (C)	(D)	(C) x (D) (E)
Steel	7.872	94.50%	7.439		
Copper	8.930	3.50%	0.313		
Nickel	8.880	2.00%	0.178		
		100.00%	7.930	0.561	4.449

Figure 14: Weight of United States Circulating Dime Using RCM Composition [68]

Material	Density (grams/cc)	Share of Weight (percent)	Average Density (grams/cc)	Volume (cc)	Total Weight (grams)
	(A)	(B)	(A) x (B) (C)	(D)	(C) x (D) (E)
Steel	7.872	92.00%	7.242		
Copper	8.930	5.50%	0.491		
Nickel	8.880	2.50%	0.222		
		100.00%	7.955	0.254	2.021

Figure 15: Weight of United States Circulating Quarter-Dollar Using RCM Composition [69]

Material	Density (grams/cc)	Share of Weight (percent)	Average Density (grams/cc)	Volume (cc)	Total Weight (grams)
	(A)	(B)	(A) x (B) (C)	(D)	(C) x (D) (E)
Steel	7.872	94.00%	7.400		
Copper	8.930	3.80%	0.339		
Nickel	8.880	2.20%	0.195		
		100.00%	7.934	0.635	5.038

Having determined the weights of the RCM-Composition United States vended coins, the amount of each metal that would be used to produce a single five-cent coin, dime and quarter-dollar can be determined. This is shown in Figure 16.

Figure 16: Material Inputs for United States Vended Coins on a Per-Unit Basis (RCM Composition) [70]

	Five-Cent		Dime		Quarter-Dollar	
Metal	Percent of Total	Quantity (grams)	Percent of Total	Quantity (grams)	Percent of Total	Quantity (grams)
	(A)	(A) x 4.449 (B)	(C)	(C) x 2.021 (D)	(E)	(E) x 5.038 (F)
Copper	3.50%	0.156	5.50%	0.111	3.80%	0.191
Nickel	2.00%	0.089	2.50%	0.051	2.20%	0.111
Steel	94.50%	4.204	92.00%	1.859	94.00%	4.736
Total		4.449		2.021		5.038

Likewise, after converting the gram-denominated material weights to their metric ton equivalents, the cost associated with each material in each coin can be calculated as the product of quantity and price. This is shown in Figure 17.

Figure 17: Raw Material Cost for United States Vended Coins on a Per-Unit Basis, Fiscal Year 2011 (RCM Composition) [71]

	Five-Cent	Dime	Quarter-Dollar
Copper:			
Weight (Metric Tons)	0.000000156	0.000000111	0.000000191
Price per Metric Ton	$ 9,104.04	$ 9,104.04	$ 9,104.04
Total Copper Cost	$ 0.0014	$ 0.0010	$ 0.0017
Nickel:			
Weight (Metric Tons)	0.000000089	0.000000051	0.000000111
Price per Metric Ton	$ 24,206.76	$ 24,206.76	$ 24,206.76
Total Nickel Cost	$ 0.0022	$ 0.0012	$ 0.0027
Steel:			
Weight (Metric Tons)	0.000004204	0.000001859	0.000004736
Price per Metric Ton	$ 774.00	$ 774.00	$ 774.00
Total Steel Cost	$ 0.0033	$ 0.0014	$ 0.0037
Total Material Cost	$ 0.0068	$ 0.0037	$ 0.0081

Figure 18 compares the per-unit raw material costs of producing each United States vended coin using the United States Mint's current composition and using the RCM's multi-ply plated steel compositions. The potential savings, represented as the difference between the two sets of figures, are substantial — at least 84% for each denomination. Additionally, the percentage figures are of the same order of magnitude as those experienced by the RCM in 2000.[72]

Figure 18: Potential Per-Unit Raw Material Cost Savings from Converting United States Circulating Coins to Multi-ply Plated Steel, Fiscal Year 2011 [73]

	Five-Cent	Dime	Quarter-Dollar
Current Composition	$0.0644	$0.0235	$0.0587
RCM Composition	0.0068	0.0037	0.0081
Savings (dollars)	$0.0576	$0.0198	$0.0506
Savings (percent)	89%	84%	86%

As noted above, the RCM claims that the adoption of its multi-ply plated steel technology saves Canadians $10 million each year, based on a projected level of domestic circulating coin production. The analysis set forth in Figure 8 provides an overall savings estimate (including incremental capital costs) that is consistent with the RCM's claims. While we discuss certain "all in" net savings scenarios in Section IV of this report, we conclude this section by examining, at a high level, the potential raw material cost savings the United States Mint could earn each year by substituting multi-ply plated steel compositions for its current compositions.

Production levels of the five-cent coin, dime and quarter-dollar vary widely from year to year. Between 1982 and 2011 production levels changed by less than 10% six times, while changes of 20% or more occurred 19 times.[74] From 1997 to 2000 production more than tripled to an all-time high, followed by declines of 20-29% in each of the following three years.[75] In 2009, production of five-cent coins and dimes fell to their lowest levels since 1955.[76] Thus, our estimate of raw material cost savings has been calculated, and should be viewed, as a long-term average.

We used the 30-year period 1982-2011 as the benchmark for our calculation of average production levels. Applying the per-unit cost savings under the alternative composition scenario (as set forth in Figure 18) to each coin's average production level, we calculate the aggregate dollar value of raw material cost savings on an annual basis, which is equal to $207.5 million. This is shown in Figure 19 below.

Figure 19: Potential Annual Raw Material Cost Savings from Converting United States Vended Coins to Multi-ply Plated Steel [77]

	Average Production	Cost Savings	
		Per Unit	Total
	(A)	(B)	(A) × (B) (C)
Mean:			
Five-Cent	1,194,895,000	$0.0576	$ 68,825,952
Dime	1,962,359,000	$0.0198	$ 38,854,708
Quarter-Dollar	1,972,734,000	$0.0506	$ 99,820,340
Total	5,129,988,000		$ 207,501,001
Median:			
Five-Cent	1,214,160,000	$0.0576	$ 69,935,616
Dime	1,982,193,000	$0.0198	$ 39,247,421
Quarter-Dollar	1,475,417,000	$0.0506	$ 74,656,100
Total	4,671,770,000		$ 183,839,138

To assess the sensitivity of the cost savings calculation (Figure 19), we prepared the analysis in Figure 20 to show the material costs savings under several different price change assumptions for both copper/nickel and steel. For purposes of this analysis we used the mean production level over the past 30 years.

Figure 20: Sensitivity of Annual Raw Material Cost Savings to Movements in Metal Prices [78]

		Prices of Copper and Nickel				
		Decrease 20%	Decrease 10%	No Change	Increase 10%	Increase 20%
Price of Steel	Decrease 20%	$166.1	$188.2	$210.4	$232.6	$254.7
	Decrease 10%	$164.7	$186.9	$209.0	$231.2	$253.3
	No change	$163.3	$185.5	$207.5	$229.8	$251.9
	Increase 10%	$161.9	$184.1	$206.2	$228.4	$250.5
	Increase 20%	$160.5	$182.7	$204.8	$227.0	$249.1

To assess the sensitivity of the average (mean) production level to the inclusion of particular years we also calculated the median production level of each coin during the benchmark period. The mean and median production levels for the five-cent coin and dime were not significantly different.[79] However, median production for the quarter-dollar over the 30-year benchmark period was significantly less than mean production.[80]

The difference between the two measures of average for the quarter-dollar is attributable to the United States Mint's successful quarter-dollar rotating design series. Beginning with the 50 State Quarters Program (1999-2008) and followed by the District of Columbia and U.S. Territories Program (2009) and the America the Beautiful Quarters Program (2010-present), the United States Mint has issued five or six versions of the quarter-dollar each year, differentiated by their reverse image.[81] The interest these Programs have generated – the United States Mint estimates that 147 million Americans collected coins under the 50 State Quarters Program – has led to significantly greater annual production relative to the pre-1999 period.[82] The current Program, which will honor 56 national parks and sites, is scheduled to run through 2021.[83]

By providing both mean and median measures of long-term "average" production it is possible to assess the impact of the United States Mint's rotating design programs on the potential raw material cost savings opportunity. The $207.5 million figure portends continued administration of rotating design programs by the United States Mint, while the $183.8 million figure is more consistent with an eventual return to a single issue set of circulating coins each year.

Section IV – Options for the United States Mint to Consider in Changing its Vended Coins to Multi-ply Plated Steel Compositions

As discussed in Section III, the United States Mint can achieve significant cost savings related to its production of vended coins by changing each coin's composition from copper-nickel alloys to multi-ply plated steel. While base metal costs make up the largest portion of production costs,[84] the United States Mint would incur new or additional costs in other parts of its production process in order to implement this change. Notably, each of the United States Mint's plants would need to be modified to accept and integrate a coin plating facility. With the exception of the one-cent coin, we understand the United States Mint operates as a fully-integrated manufacturing operation, handling all aspects of the production process from receiving raw material through the coining of the final product.

After consulting with industry experts, we have identified three production options for the United States Mint to consider if it were to change its coin compositions from the current clad- and alloy-based compositions to multi-ply plated steel coins:

Option 1 – Continue to perform all production operations in-house;

Option 2 – Purchase "ready-to-strike" blanks of plated steel coins, similar to the process currently employed with the copper-plated zinc penny; or

Option 3 – Outsource the plating function but keep all other operations in-house.

Given the lack of publicly available data on the detailed operating costs of the United States Mint's operations in general, and coin plating facility operations specifically, we did not evaluate the relative merits of the options based on expected costs. Rather, we include herein a discussion of the issues that would need to be addressed by the United States Mint in evaluating each option. Given its extensive institutional knowledge of its operational capabilities, along with its legacy of designing and testing well over a thousand patterns and experimental and trial pieces[85] over the past two centuries, the United States Mint is in the best position to determine cost estimates for each of the options and issues that we raise for consideration.

A. Option 1 – Continue to Perform all Production Operations In-house

Currently, the United States Mint handles the production of its copper-nickel alloy based vended coins – from the receipt of flat rolled coils of metal through coining – within its Philadelphia and Denver plants. If the United States Mint were to move to producing multi-ply plated steel coins, it would need to consider a number of cost issues – including machinery and equipment, facilities, employees, and technology licensing – as well as potential short-term production disruptions. Each of these issues is discussed below.

1. Machinery and equipment – The United States Mint would need to evaluate what new and/or additional production capabilities would be needed. Coins made from a steel core need to be plated after the blanking and plancheting process, a task that is not currently performed by the United States Mint for any of its vended coins. Additionally, the United States Mint would need to evaluate which of its current production machinery and equipment (blanking presses, annealers, upsetting mills, stamping presses, dies, etc.) could be retooled to accept the new metallic compositions (and, if so, the implications for each component's useful life, run rate, and downtime for scheduled maintenance) and which would need to be retired and replaced with new equipment employing compliant technology.

2. Facilities – Once the machinery and equipment issues have been resolved, the United States Mint would need to turn its attention to the adequacy of its current facilities. Specifically, could the changes required to accommodate the fully-integrated production of multi-ply plated steel coins be accomplished within the current space and layout of the United States Mint's Philadelphia and Denver plants? In addition, modifying the existing facilities to accommodate plating work stations or the handling of steel may require capital outlays to comply with environmental and safety regulations including permitting, waste treatment, utilities and power distribution.

3. Employees – Process changes brought on by the adoption of multi-ply plated steel coining technology would require a workforce re-assessment by the United States Mint's facilities managers. Some workers may need to be redeployed from their current duties, necessitating time and expense for training. New skill competencies may be required (particularly with respect to the new plating process), which would result in the United States Mint incurring costs related to hiring and training new personnel. Finally, certain positions could be eliminated, either through the obsolescence of skill sets or reduced headcount needs, resulting in additional severance costs in the short run, to be followed by reduced payroll costs in the long-term.

4. Technology License – As discussed in Section II, the RCM has issued multi-ply plated steel coins since 2000 using a proprietary, patented process. While non-infringing alternatives for manufacturing multi-ply plated steel coins may exist from other sources, adoption of the RCM's technology provides an expedient, proven solution. We are not aware of any reluctance on the part of the RCM to license its technology to the United States Mint, although the costs of acquiring such a license would need to be considered in any cost-benefit analysis under this option.

5. Production Disruptions – Potentially as important as the cost-based issues raised above is the timing associated with transitioning to a new coin production process. Should the United States Mint decide to proceed with a change to its operations, the logistics of such a transition would need to be managed, particularly with regard to the suspension of production lines. In order to reduce the risk of supply shortages, the United States Mint would want to explore the feasibility of shifting production between its two facilities (subject to capacity and conversion constraints) and/or introduce the new alternative metal coins at appropriate intervals during the transition period.

B. Option 2 – Purchase Ready-to-Strike Blanks of Plated Steel Coins

As discussed in the previous section, by changing United States vended coins to plated steel compositions the United States Mint would be faced with the challenge of how to plate the coins prior to the striking process – as it does not currently possess such equipment or expertise in plated coins in its facilities. The current one-cent coin has a copper plated zinc composition, which the United States Mint purchases in ready-to-strike form from an outside supplier. Thus, the United States Mint could contract with one or more suppliers to purchase ready-to-strike blanks of plated steel coins for its vended denominations.

By choosing this option the United States Mint would be able to avoid a number of the transition-related issues discussed above. Machines utilized through the plancheting stage would not need to be retooled or replaced, and its facilities would not need to be expanded or reconfigured to accommodate plating or other new equipment.[86] The United States Mint would not have to acquire a license to utilize the RCM's patented technology. Finally, should the United States Mint choose to retain its existing operations, it would be able to return to the production of alloy- or clad-based circulating coins should the need arise (due to, say, a shortage of coin-grade steel) or should prices of copper and nickel fall to the point where it becomes economically viable once more.

However, with this option there would still be important issues for the United States Mint to address. These include the following:

1. Equipment – By purchasing ready-to-strike blanks, much of the equipment currently used by the United States Mint would no longer be needed. Such equipment could be decommissioned or placed on stand-by status. Costs associated with decommissioning would include removal of the equipment from the premises, performing cleanup of hazards and contaminants, closing utility lines, and storing or dismantling the equipment. If placed on stand-by status, the United States Mint would incur costs related to periodic inspections, maintenance, and operational testing.

2. Employees – Just as equipment would be shuttered pursuant to moving to a partial outsource option, the work force dedicated to or supporting the operation of such equipment would no longer be needed. While this would save payroll related costs in the future, the United States Mint would need to assess any current period severance payments that may be incurred.

3. Supply – We are aware of three producers of multi-ply plated steel coins: the RCM (Canada), Jarden Zinc Products LLC (United States), and Sunshine Minting, Inc. (United States).[87] All three of these companies are suppliers to the United States Mint. The United States Mint would have to assess the current and planned capacity of these suppliers against the current and projected demands of the United States Mint and of those countries that are currently purchasing or contemplating the purchase of plated steel coins from these suppliers.

4. Timing of Transition – While the purchasing of ready-to-strike coins may seem less complex relative to developing the new process in-house, there are still transition issues that the United States Mint would need to address. First, as mentioned above, when would a provider be ready to start to handle the process for the United States Mint? How should the United States Mint sequence the transition – all denominations at the same time or a gradual transition over time? The answer to this last question could be influenced by several of the aforementioned issues, such as employee transition plans and the downsizing of the current facilities.

C. Option 3 – Outsource Plating but Keep all Other Operations In-house

For strategic reasons, the United States Mint may place a high value on maintaining as much of its existing machinery and work force as possible while still wishing to transition to producing multi-ply plated steel coins. One way to achieve that

objective would be for the United States Mint to receive flat rolled coils of steel (as it currently does for its alloy- and clad-based production) and perform all manufacturing steps through creation of the planchets, or rimmed blanks. The United States Mint would then package the planchets and securely transport them to an outside facility that would perform the plating process and subsequently return the planchets to the United States Mint for striking.

The attractiveness of this option relative to the other two alternatives would depend on the findings from the various issue assessments that were discussed above. For example, should it be determined that one or both of the United States Mint's existing facilities cannot accommodate plating equipment without substantial new infrastructure investments, outsourcing the plating function may prove to be economical. Likewise, if it is determined that current suppliers do not have sufficient capacity to manufacture plated steel planchets but they do have sufficient capacity to plate planchets manufactured elsewhere, then the potential additional cost of Option 3 relative to Option 2 may be justified on the basis of the United States Mint being able to ensure an adequate supply of coins to meet expected demand from the Federal Reserve Banks.

Of course, a mid-stream outsourcing of the plating function would entail additional expenses not presently incurred by the United States Mint in its full in-house operation. The planchets would need to be inventoried prior to being released and re-inventoried (including quality inspections) upon their return, with systems designed to handle discrepancies and rejects. Transportation costs would be dependent on the distance travelled, the volume of planchets included in each shipment and fees for insurance. There would also be handling costs associated with the loading and unloading of the planchets at the United States Mint and at the plating facility.

D. Assessment of Options

Given that detailed cost data for the United States Mint's current operations and for the operation of a coin plating facility are not available for public inspection and analysis, we have not evaluated the relative merits of the three options based on expected net cost impacts. However, whichever approach the United States Mint determines is best for the manufacture of vended coins, the decision to use multi-ply plated steel compositions like Canada and other countries will yield significant raw material cost savings. Based on average historical production levels, substitution of multi-ply plated steel compositions for copper-nickel alloys is likely to save the United States Mint approximately $200 million per year in raw material costs.

Section V – Potential Additional Revenue to the United States Mint from Implementing an Alloy Recovery Program

As noted in Section II.B, since its issuance of circulation coins using multi-ply plated steel compositions, the RCM has implemented an alloy recovery program that has generated more than $200 million in additional revenue between 2004 and 2010. Assuming enabling legislation is enacted by Congress, the United States Mint could execute a similar program for its current copper and nickel-based five-cent, dime and quarter-dollar coins. It is beyond the scope of our study to estimate with precision the amount of revenue the United States Mint could expect to receive from launching such a program. However, for the purpose of providing insight into the potential revenue opportunity of such a program, we present a scenario based on publicly available information and reasonable assumptions.

In Figure 11 we calculate the raw material cost associated with the five-cent ($0.0644), dime ($0.0235) and quarter-dollar ($0.0587) coins during fiscal year 2011. The average annual production of each coin over the period 1982 through 2011 is presented in Figure 19. Combining these two sets of information results in a reasonable measure of the revenue, on a per-coin basis, that the United States Mint could receive from retrieving, extracting and selling the copper and nickel material through an alloy recovery program ($0.0466). This calculation is set forth in Figure 21. The calculation assumes that the distribution of coins retrieved through an alloy recovery program will mirror their relative unit production quantities over the past 30 years.

Figure 21: Average Per-Coin Raw Material Cost of Producing Five-Cent, Dime and Quarter-Dollar Coins, Based on Fiscal Year 2011 Spot Prices [88]

	Average Production	Material Cost	
		Per Unit	Total
	(A)	(B)	(A) × (B) (C)
Five-Cent	1,194,895,000	$0.0644	$ 76,949,541
Dime	1,962,359,000	$0.0235	$ 46,120,080
Quarter-Dollar	1,972,734,000	$0.0587	$ 115,894,896
Total	5,129,988,000		$ 238,964,517
Average material cost per coin minted			**$ 0.0466**

The number of coins reclaimed through an alloy recovery program will be dependent on the United States Mint's ability to access inventories of circulating coins under the control of (a) the Federal Reserve Banks and (b) private coin recycling companies, as well as the effectiveness of campaigns designed to encourage the redemption of coin holdings removed from circulation. Between 1982 and 2011, 153.9 billion five-cent, dime and quarter-dollar coins were produced (equal to average annual unit coin production of 5.130 billion, as shown in Figure 19, multiplied by 30 years). If one-third of these coins were recovered through an alloy recovery program, the United States Mint's additional revenue could be $2.4 billion (equal to 51.3 billion coins multiplied by $0.0466). This calculation assumes that current material prices do not significantly change.

We note that the United States Mint would incur costs to implement and run an alloy recovery program, including the possible production of replacement coins out of multi-ply plated steel. Consistent with our assessment of the costs to change from the current composition of vended coins to multi-ply plated steel composition, the United States Mint would be in the best position to determine the costs to implement such a program. Assuming it is patterned after the RCM's program, one would expect that the United States Mint would also earn high margins.

Section VI – Summary of Potential Benefits to the United States Mint from Changing the Compositions of its Vended Coins to Multi-ply Plated Steel

Key findings of this study, based upon analyses conducted to date, include the following:

- By changing the compositions of U.S. nickel, dime and quarter-dollar coins from copper-nickel alloys to multi-ply plated steel, the United States Mint would incur significantly lower raw materials costs – approximately $200 million per year based on average historical production levels. Multi-ply plated steel compositions have been successfully used by the Royal Canadian Mint to manufacture circulating coinage for Canada, as well as for more than two dozen nations, for over a decade.

- By implementing a parallel alloy recovery program that collects and replaces copper-nickel alloy coins in circulation with multi-ply plated steel coins and salvages the copper and nickel material from the retired coins, the United States Mint could earn over $2 billion in additional revenue based on modest recovery levels.

[1] *Coinage laws of the United States, 1792 to 1893*, Third Edition – Revised and Corrected to October 17, 1893. Prepared Under the Direction of the Committee of Finance, U.S. Senate, 1893, pp. 1-6, "Act of April 2, 1792, Establishing a mint and regulating the coins of the United States."

[2] <http://www.usmint.gov/about_the_mint/historianscorner/?action=history>. "Under Rittenhouse, the Mint produced its first circulating coins -- 11,178 copper cents, which were delivered in March 1793."

[3] <http://www.treasury.gov/about/organizational-structure/bureaus>. The Mint was placed under the jurisdiction of the Treasury Department pursuant to the Coinage Act of 1873.

[4] "The Constitution of the United States," Article 1, Section 8, Clause 5.

[5] *Coinage laws of the United States, 1792 to 1893*, pp. 1-6, "Act of April 2, 1792. Establishing a mint and regulating the coins of the United States," Section 9. "Dollar" was defined to be "of the value of a Spanish milled dollar as the same is now current, and to contain three hundred and seventy-one grains and four sixteenth parts of a grain of pure, or four hundred and sixteen grains of standard silver."

[6] Ibid, Section 9. The specifications also provided for different weights depending on whether "pure" or "standard" (i.e., alloy) metals were used.

[7] Ibid, Section 9.

[8] Ibid, Section 9.

[9] Ibid, Section 11.

[10] *Coinage laws of the United States, 1792 to 1893*, pp. 15-16, "Act of June 28, 1834. Concerning gold coins of the United States, and for other purposes." The Act directed the United States Mint to reduce the gold content in gold coins by a uniform 6%, relative to earlier compositions, while the content of silver in silver coins remained constant. This change translated to a revised legal exchange ratio of silver to gold equal to 16:1.

[11] *Coinage laws of the United States, 1792 to 1893*, pp. 25-26, "Act of March 3, 1849. Authorizing the coinage of gold dollars and double eagles."

[12] *Coinage laws of the United States, 1792 to 1893*, pp. 27-28, "Act of February 21, 1853. An act amendatory of existing laws relative to the half dollar, quarter dollar, dime and half dime," Sections 1-2.

[13] *Coinage laws of the United States, 1792 to 1893*, pp. 34-35, "Act of May 16, 1866. An Act authorizing the coinage of five-cent pieces," Section 1; and R.S. Yeoman, *A Guide Book of United States Coins*, 65th ed., Whitman, Atlanta, 2011, p. 126-131. Except for 1942-1945, the composition of the five-cent coin has not changed.

[14] *Coinage laws of the United States, 1792 to 1893*, pp. 36-43, "Act of February 12, 1873. An act revising and amending the laws relative to the Mint, assay offices, and coinage of the United States," Sections 15-17 and 21. Only the silver Trade Dollar (used for international commerce) is mentioned in the legislation, not the domestic silver dollar coin, suggesting the latter has been discontinued.

[15] *Coinage laws of the United States, 1792 to 1893*, p. 59, "Act of June 22, 1874," Section 3586. The generic term "silver coins" is used, which would include the domestic silver dollar coin. The silver dollar was reauthorized and granted full legal tender status pursuant to the Act of February 28, 1878 (p. 64) and discontinued after July 1, 1891 pursuant to the Act of July 14, 1890 (p. 71).

[16] Emergency Banking Relief Act of 1933, Title I, Section 2.

[17] <http://www.usmint.gov/about_the_mint/historianscorner/?action=timeline&century=1900>.

[18] Coinage Act of 1965, Hearings Before the Committee on Banking and Currency, House of Representatives, Eighty-Ninth Congress, First Session on H. R. 8746 (Superseded by H.R. 8926), "A Bill to Provide for the Coinage of the United States," June 4,7, and 8, 1965.

[19] <http://coinhistory.info/usa/usa1965.htm>.

[20] <http://www.presidency.ucsb.edu/ws/?pid=27108>.

[21] Yeoman (p. 204) states that through 1964 the half-dollar coin contained 90% silver by weight. Per the Coinage Act of 1965 (Title I, Section 101(a)), "The half dollar shall have…a core of an alloy of silver and copper such that the whole coin weighs 11.5 grams and contains 4.6 grams of silver…"; i.e., 40% silver.

[22] Yeoman, p. 205.

[23] Seigniorage derived from specie, or metal coins, is defined by the Mint as "the difference between the face value and cost of producing coinage." (2010 Annual Report, p. 2).

[24] "Coins and Currency: How the Costs and Earnings Associated with Producing Coins and Currency Are Budgeted and Accounted For," United States General Accounting Office, GAO-04-283, April 2004, p. 12.

[25] <http://www.imf.org/external/np/res/commod/index.aspx>.

[26] Ibid.

[27] United States Mint, 2006 Annual Report, p. 5.

[28] United States Mint, 2011 Annual Report, p. 10.

[29] Source: unit cost data reported in the United States Mint's Annual Reports for fiscal years 2006-2011.

[30] Source: seigniorage data reported in the United States Mint's Annual Reports for fiscal years 2006-2011.

[31] Source: unit cost data reported in the United States Mint's Annual Reports for fiscal years 2006-2011.

[32] <http://www.ifg.org/external/np/res/commod/index.aspx>.

[33] <http://www.usmint.gov/about_the_mint/?action=coin_specifications>.

[34] United States Mint, 2005 Annual Report, p. 10. See, also, Testimony of David A. Lebryk, Acting Director, United States Mint, Before the House Financial Services Subcommittee on Domestic and International Monetary Policy, Trade and Technology, General Coin Issues and H.R. 5077, "Numismatic Rarities Certainty Act of 2006", July 19, 2006, p. 3: "The ability to keep conversion costs down is critical to our success because of the rising cost of metal and fabrication – costs we cannot control."

[35] United States Mint, 2010 Annual Report, p. 28.

[36] Lebryk, p. 3.

[37] 110th Congress, 2nd Session, H.R. 5512, "Coin Modernization and Taxpayer Savings Act of 2008", Section 2(2).

[38] 110th Congress, 1st Session, H.R. 3330, "Coinage Materials Modernization Act of 2007", Section 2(a); and 110th Congress, 1st Session, H.R. 3956, "Coin Modernization and Taxpayer Savings Act of 2007", Section 2(a).

[39] <http://www.govtrack.us/congress/bill.xpd?bill=h110-3330> and <http://www.govtrack.us/congress/bill.xpd?bill=h110-3956>.

[40] 110th Congress, 2nd Session, H.R. 5512, "Coin Modernization and Taxpayer Savings Act of 2008", Sections 3 and 4.

[41] <http://www.govtrack.us/congress/bill.xpd?bill=h110-5512>.

[42] <http://www.govtrack.us/congress/bill.xpd?bill=h111-6162>.

[43] 111th Congress, 2nd Session, H.R. 6162, "Coin Modernization, Oversight and Continuity Act of 2010", Section 2.

[44] Ibid, Section 3.

[45] <http://www.govtrack.us/congress/bill.xpd?bill=h111-6162>.

[46] United States Mint, 2005 Annual Report, p. 10.

[47] Ibid.

[48] <http://www.mint.ca/store/mint/learn/5-cents-5300006>; <http://www.mint.ca/store/mint/learn/10-cents-5300008>; <http://www.mint.ca/store/mint /learn/25-cents-5300010>; and <http://www.usmint.gov /about_the_mint/?action=coin_specifications>.

[49] "Technical Proposal on Multi-ply Technology by the Royal Canadian Mint," Royal Canadian Mint, pp. 3, 9.

[50] Ibid, pp. 4-5.

[51] Ibid, pp. 4 and 7.

[52] Ibid, pp. 5-6.

[53] "New coins to save Canadians $10 million per year," Canada NewsWire, October 16, 2001. The release also reported production cost savings of $42,157 per year (based on 453,300 coins) for its 50-cent coin.

[54] Royal Canadian Mint, 2000 Annual Report, pp. 27, 31. The plating facility has an annual capacity of 1.2 billion pieces.

[55] Royal Canadian Mint, Annual Report 2010, p. 14.

[56] Ibid, pp. 39-40.

[57] Royal Canadian Mint, 2004 Annual Report, p. 22.

[58] Royal Canadian Mint, Annual Report: 2004 through 2010.

[59] Royal Canadian Mint, 2007 Annual Report, p. 30.

[60] Source: <http://www.usmint.gov/about_the_mint/?action=coin_specifications>.

[61] See United States Mint, Annual Report for 2008 (p. 29), 2009 (p. 29), 2010 (p. 27) and 2011 (p. 10).

[62] See, for example, <http://www.lme.com>. One thousand kilograms is equal to 2,204.62 pounds.

[63] For example, see <http://www.crugroup.com>.

[64] One of the Mint's key performance measures is "cycle time", or the time it takes material to flow through the Mint's processes from receipt of raw material to Federal Reserve Bank order fulfillment. As discussed on page 26 of its 2006 Annual Report, the Mint seeks to "minimize the amount of time required to process raw materials into finished goods by eliminating non-value added steps from the processes and reducing the amount of raw material in inventory."

[65] Source: Figure 8 (Weight) and Figure 1 (Price per Metric Ton).

[66] Source: <http://www.matweb.com> (Material Density); Figure 8 (Weight).

[67] Source: <http://www.matweb.com> (Material Density); <http://www.mint.ca/store/mint/learn/5-cents-5300006> (Share of Weight); Figure 10 (Volume).

[68] Source: <http://www.matweb.com> (Material Density); <http://www.mint.ca/store/mint/learn/10-cents-5300008> (Share of Weight); Figure 10 (Volume).

[69] Source: <http://www.matweb.com> (Material Density); <http://www.mint.ca/store/mint/learn/25-cents-5300010> (Share of Weight); Figure 10 (Volume).

[70] Source: Figure 11 (Five-Cent: Percent of Total, Total Quantity); Figure 12 (Dime: Percent of Total, Total Quantity); and Figure 13 (Quarter-Dollar: Percent of Total, Total Quantity).

[71] Source: Figure 14 (Weight); Figure 1 (Price per Metric Ton – Copper and Nickel); and <http://www.crumonitor.com> (Price per Metric Ton – Steel). The prices shown reflect the average during the Mint's 2011 fiscal year. The quoted steel price (hot-rolled coil, f.o.b. Midwest U.S. local mills) has been increased by $55 per ton to reflect the additional cost associated with the ultra-low carbon IF grade material used for minting coins.

[72] The figures reported in Figure 7 for the RCM reflect all cost impacts, both material (cost savings) and non-material (additional costs).

[73] Source: Figure 9 (Current Composition Material Cost) and Figure 15 (RCM Composition Material Cost).

[74] Yeoman, pp. 134-136, 157-158, 174-185; and <http://www.usmint.gov/about_the_mint/coin_production /index.cfm?action=production_figures&allCoinsYear=2011#starthere>

[75] Yeoman, pp. 134-135, 158, 175-178.

[76] Yeoman, pp. 133-136, 156-158.

[77] Yeoman, pp. 134-136, 157-158, 174-185 and <http://www.usmint.gov/about_the_mint/coin_production /index.cfm?action=production_figures&allCoinsYear=2011#starthere> (Average Production); and Figure 18 (Per-unit Cost Savings).

[78] Yeoman, pp. 134-136, 157-158, 174-185 and <http://www.usmint.gov/about_the_mint/coin_production /index.cfm?action=production_figures&allCoinsYear=2011#starthere> (Average Production); and Figure 18 (Per-unit Cost Savings). The prices of copper, nickel and steel were adjusted from their fiscal year 2011 averages ("No Change") by 10% or 20%, as noted in the column and row headings, for purposes of this sensitivity analysis.

[79] Per Figure 19, the mean and median values for the nickel and the dime differed by less than 2.0%.

[80] Per Figure 19, median production for the quarter was 25.2% less than mean production.

[81] "50 State Quarters® Program Concludes as the Most Successful Coin Initiative in U.S. History," United States Mint, press release, dated December 8, 2008; and <http://www.usmint.gov/mint_programs/atb /?action=factSheet&pf>.

[82] "50 State Quarters® Program Concludes as the Most Successful Coin Initiative in U.S. History," United States Mint, press release, dated December 8, 2008.

[83] <http://www.usmint.gov/mint_programs/atb/?action=factSheet&pf>.

[84] United States Mint, 2011 Annual Report, p. 10.

[85] <http://uspatterns.com>.

[86] The assessment costs associated with these issues would also be eliminated.

[87] "SM&RT Ideas from the Royal Canadian Mint," Currency News, Volume 9, Number 5 (May 2011), p. 4.

[88] Yeoman, pp. 134-136, 157-158, 174-185 and <http://www.usmint.gov/about_the_mint/coin_production /index.cfm?action=production_figures&allCoinsYear=2011#starthere> (Average Production); and Figure 18 (Per-unit Cost Savings).

NAVIGANT

IMPACT OF ELIMINATING THE PENNY ON THE UNITED STATES MINT'S COSTS AND PROFIT IN FISCAL YEAR 2011

Rodney J. Bosco
Kevin M. Davis

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Navigant Consulting, Inc. ("Navigant") was asked to estimate the impact of eliminating production of circulating pennies on costs incurred by the United States Mint (the "Mint").[1] The Mint shipped 4.29 billion pennies (valued at $42.9 million) during fiscal year 2011 at a reported cost of $103.1 million (2.4 cents per coin), resulting in a net loss of $60.2 million. However, eliminating production of the penny would not eliminate this loss, and could increase the overall loss to the Mint if production of the nickel was increased to substitute for no production of the penny.

We analyzed publicly available information on the Mint's past and projected operations to identify patterns in costs related to its product offerings. We observed the following:

- Cost reductions from eliminating the purchase of penny blanks will be largely offset by the loss of revenue from shipments to the Federal Reserve Banks (FRB). In other words, the payments received from the FRB ($42.9 million), which offset all but $4.3 million of the cost of penny blanks ($47.2 million), would not be received if the Mint eliminated production of the penny.

- The Mint's fabrication and distribution costs include fixed components that will continue to be incurred if the Mint eliminated the penny. Using FY 2011 balances and prior Mint disclosures, we have estimated this fixed component to be approximately $13 million.

- The Mint's total Selling, General & Administrative ("SG&A") expense is not sensitive to circulating coin demand or total sales. Thus, the $17.7 million in SG&A assigned to the circulating penny in FY 2011would have been reallocated to other products.

- Substitution of loss-generating nickels will offset potential cost reductions from eliminating the penny.

Without the penny, only $4.3 million in net cost reductions would have been likely in 2011, while an additional $25.2 million in cost reductions would have been possible, based on 2006 comments by the Mint regarding the amount of fixed production costs. However, the substitution of nickels for pennies would have resulted in an increased net loss to the Mint of as much as $10.9 million if penny production were not maintained. Our findings are summarized in Figure 1.

[1] This report was commissioned by Jarden Zinc Products, North America's leading plated coin blank producer and licensee of the Royal Canadian Mint's multi-ply plated steel technology.

Figure 1: Impact of Eliminating the Penny on Mint Costs and Profit in FY 2011 (millions)

	Penny produced? Yes (Actual)	No (Estimate)
Value of Shipments	$ 42.9	$ -
Gross Cost		
Cost of Goods Sold (purchase of penny blanks)	$ (47.2)	$ -
Cost of Goods Sold (fabrication and distribution)	$ (38.2)	$ (13.0)
Sales, General and Administrative (SG&A)	$ (17.7)	$ (17.7)
Profit (loss) before substitution effect	**$ (60.2)**	**$ (30.7)**
Substitution of 914 million Nickels for 4.3 billion Pennies		$ (40.4)
Profit (loss) after substitution effect		**$ (71.1)**

I. Cost Reductions from Eliminating the Purchase of Penny Blanks Will be Largely Offset by Revenue Losses from Shipments to the Federal Reserve Banks

The Mint purchases ready-to-strike penny blanks from an outside supplier. In fiscal year (FY) 2011, the average price paid was 1.1 cents per blank, according to one press report.[2] The Mint shipped 4.29 billion pennies to the FRB in FY 2011,[3] resulting in a cost of $47.2 million. Had the penny not been produced, those costs would not have been incurred.

The value of coins shipped to the FRB is revenue to the Mint. Thus, the value of the 4.29 billion pennies shipped to the FRB in FY 2011 was $42.9 million.[4] Had the penny not been produced, those revenues would not have been received.

The net reduction in cost had the penny not been produced in FY 2011 is equal to $47.2 million in cost less $42.9 million in revenue, or $4.3 million.

II. The Mint's Fabrication and Distribution Costs Include Fixed Components that Will Continue to be Incurred if the Mint Eliminated the Penny

Cost of Goods Sold, which comprise costs to fabricate and distribute coins, include outlays that do not decrease with reductions in production volume. In fact, the Mint itself has described in past Annual Reports how "fixed production costs" are spread over units produced:

[2] Chris Isidore, "Obama wants cheaper pennies and nickels," CNNMoney.com, February 15, 2012.
[3] United States Mint, 2011 Annual Report, page 11.
[4] Id.

- "When production volumes decline because of lower demand, fixed production costs are spread over fewer units. This offsets any per-unit gains from lower base metal costs. For example, the per-unit metal cost of a nickel fell about $0.0154 from $0.0815 in FY 2007 to $0.0661 in FY 2008. However, the per-unit fixed production costs increased $0.0082, resulting in only a small decline in the nickel overall unit cost. Similarly, the penny unit cost fell slightly from FY 2007 because of higher per-unit vendor fabrication costs offset lower per-unit metal costs. The unit costs for dime and quarter denominations increased in FY 2008 because of higher per-unit fixed production costs."[5]

- "When production volumes decline because of lower demand, production costs are spread over fewer units….The dime coin unit cost increased about 1.3 cents in FY 2009 largely because the 1.8 cent increase in per-unit production cost offset the 1.0 cent reduction in per-unit metal cost….Slight increases in per-unit production and SG&A costs did not offset the 3.1 cent decline in the five-cent coin's per-unit metal cost."[6]

The Mint has acknowledged that a portion of penny production costs are also fixed. In response to a question posed in a 2006 Congressional hearing, the Mint responded as follows:

> "**Question**: Do you have the ability to calculate how much the Mint would lose if we were to eliminate the penny and make more nickels?
>
> **Answer**: …the fixed costs associated with production of the penny would have to be absorbed by the remaining denominations of circulating coins. The total amount of fixed costs to be absorbed would be approximately $10.1 million over a fiscal year of production."[7]

The Mint's commentary can be seen graphically in Figure 2 (for the penny) and Figure 3 (for the nickel, dime and quarter), which compares shipments and per-unit non-raw material costs from FY 2002 through FY 2011. The lines cross at FY 2007, the year before the onset of the demand declines discussed by the Mint.[8] Shipments and per-unit costs diverge after FY 2007,[9] confirming the existence of fixed costs in the production process.

[5] United States Mint, 2008 Annual Report, page 29.
[6] United States Mint, 2009 Annual Report, page 30.
[7] Coin and Currency Issues Before Congress: Can We Still Afford Money?, Hearing Before the Subcommittee on Domestic and International Monetary Policy, Trade and Technology of the Committee on Financial Services, U.S. House of Representatives, One Hundred Ninth Congress, Second Session, July 19, 2006.
[8] Shipments in FY 2007 were lower than in FY 2006, but within the range of prior years.
[9] The same pattern was observed, separately, for the nickel, the dime, and the quarter.

Figure 2: Coins Shipped and Per-Unit Non-Raw Material Cost of Goods Sold, Fiscal Years 2002-2011 (Penny) [10]

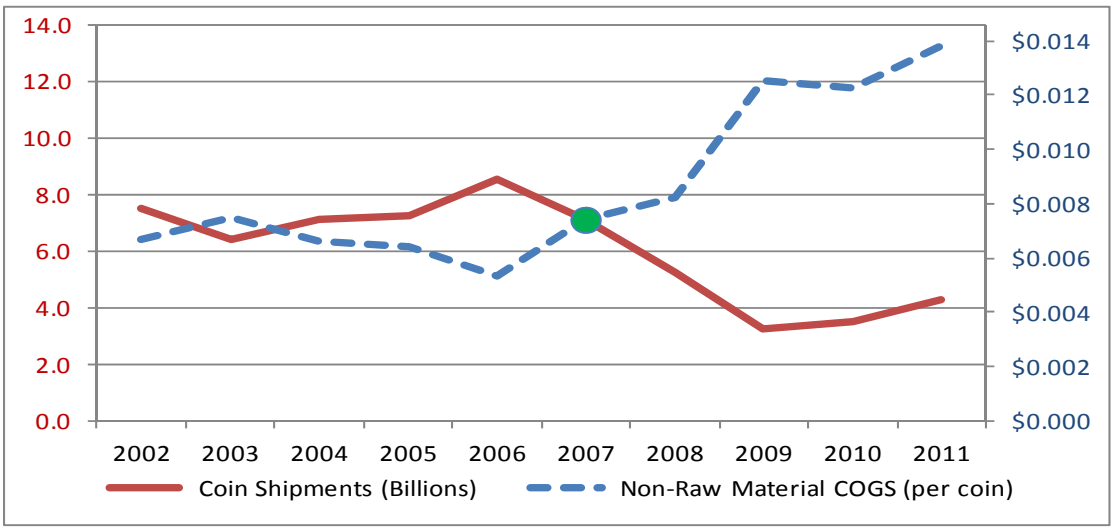
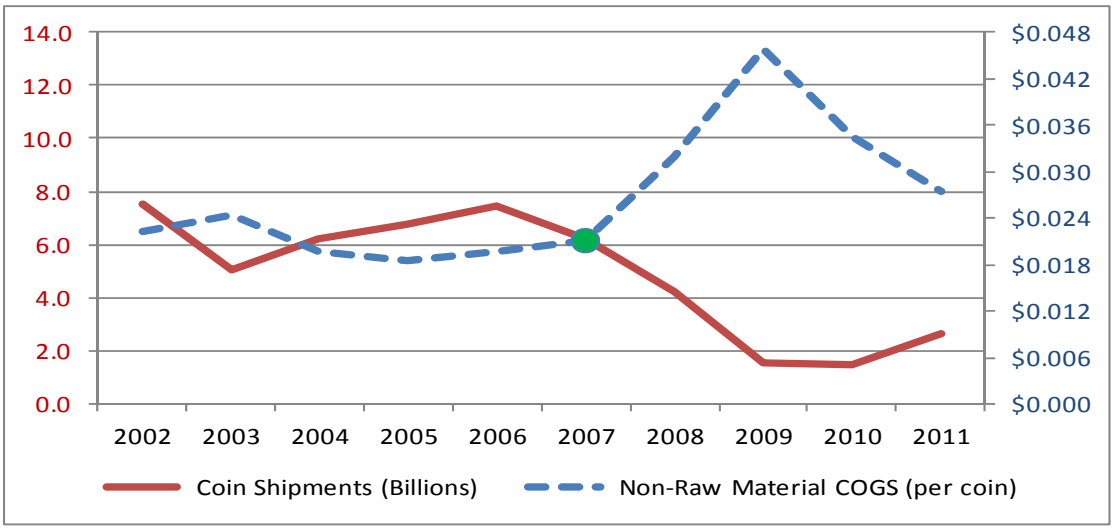


Figure 3: Coins Shipped and Per-Unit Non-Raw Material Cost of Goods Sold, Fiscal Years 2002-2011 (Nickel, Dime and Quarter) [11]



The Mint has not reported the fixed costs incurred in FY 2011 to produce the penny. However, insight may be gleaned by linking Mr. Lebryk's statement above to the Mint's costs at that time. In FY 2005 and FY 2006, non-raw material costs associated with the penny were $46.5 million and $45.2 million, respectively.[12] The $10.1 million in fixed costs cited by Mr. Lebryk represent 21.7% (FY 2005) and 22.3% (FY 2006) of the non-raw material

[10] Source: Appendix A-1.
[11] Source: Appendix A-2.
[12] Source: Appendix A-1. FY 2005 was the last full fiscal year prior to Mr. Lebryk's July 2006 testimony, which occurred during FY 2006.

costs, resulting in average fixed costs of 22% over the two years. We applied this average to the non-raw material costs of penny shipments incurred by the Mint in FY 2011 ($59.3 million)[13] and estimated fixed costs of $13.0 million for FY 2011 in the production of the penny. As production of the penny in FY 2011 was significantly less than in either FY 2005 or FY 2006, it is possible that fixed costs as a percent of total non-raw material costs in FY 2011 could be higher than we have calculated.

Cost of Goods Sold for penny shipments during FY 2011 was $85.4 million. Purchases of ready-to-strike blanks totaled $47.2 million (see Section I), leaving $38.2 million as the amount attributable to fabrication and distribution operations executed by the Mint. The fixed cost analysis performed above suggests that potential fabrication and distribution cost reductions from the Mint eliminating the penny would have been $25.2 million ($38.2 million less $13.0 million) in FY 2011.

III. The Mint's Total SG&A Expense Is Not Sensitive to Circulating Coin Demand or Total Sales

For FY 2011, the Mint assigned $17.7 million of SG&A expense to circulating pennies, equal to 0.41 cents for each penny shipped.[14] This was in stark contrast to prior years – a total of $5.1 million in SG&A had been assigned to circulating penny production for the nine-year period FY 2002 through FY 2010.[15]

Since FY 2004, the Mint's published financial statements do not report the individual expense items and amounts included in SG&A. However, we examined historical financial information reported by the Mint over the past decade (FY 2002 through FY 2011) and found that total SG&A expense is not sensitive to either the amount of total sales or the relative contributions of circulating and numismatic products.

Our findings are graphically depicted in Figures 4 and 5. In Figure 4 we compare SG&A to total sales from all products – annual sales grew by more than 170 percent while SG&A expense stayed relatively constant. In Figure 5 we compare SG&A to the distribution of total sales among circulating coins (lower bars) and numismatic products (upper bars) – circulating coins fell from 76% of total sales in 2002 to 16% in 2011 while SG&A stayed relatively constant.

[13] Source: Appendix A-1.
[14] United States Mint, 2011 Annual Report, page 11.
[15] United States Mint, Annual Report, 2002 through 2011. In FY 2011 the Mint changed the method it uses to allocate SG&A expense among its products from a gross margin basis to a gross cost basis. (United States Mint, 2011 Annual Report, page 10)

Figure 4: Total SG&A Expense and Total Sales, Fiscal Years 2002-2011 [16]

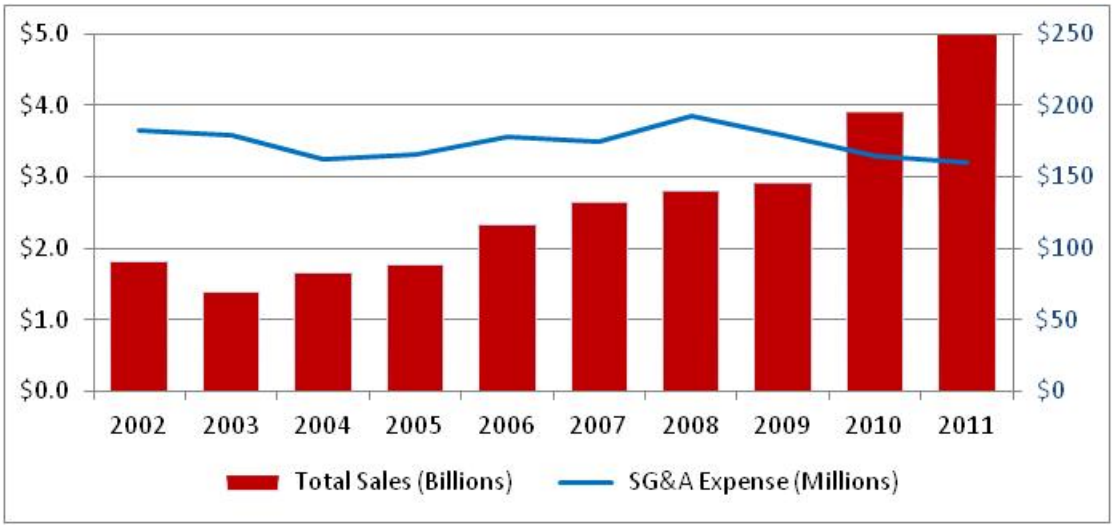
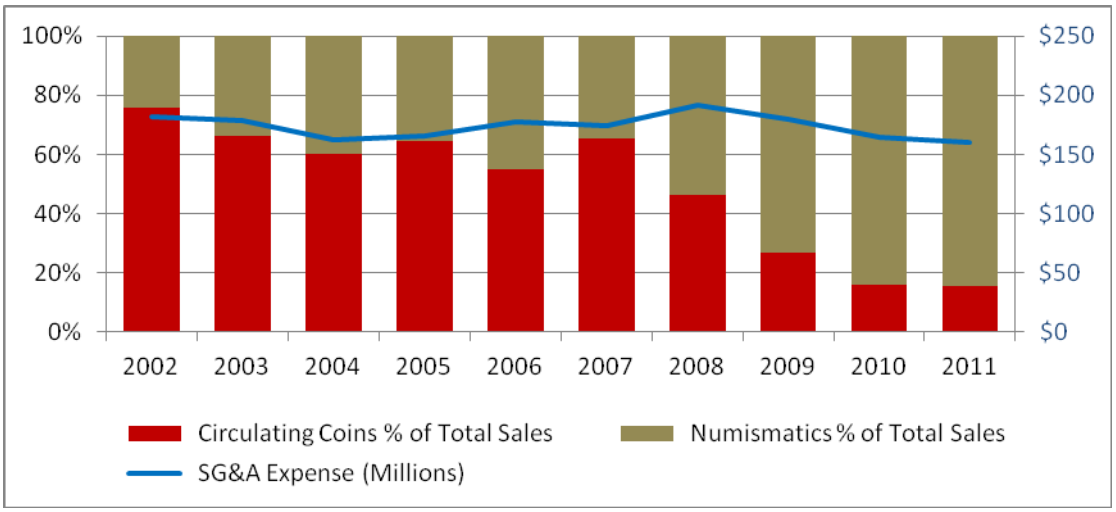


Figure 5: Total SG&A Expense and Composition of Sales, Fiscal Years 2002-2011 [17]

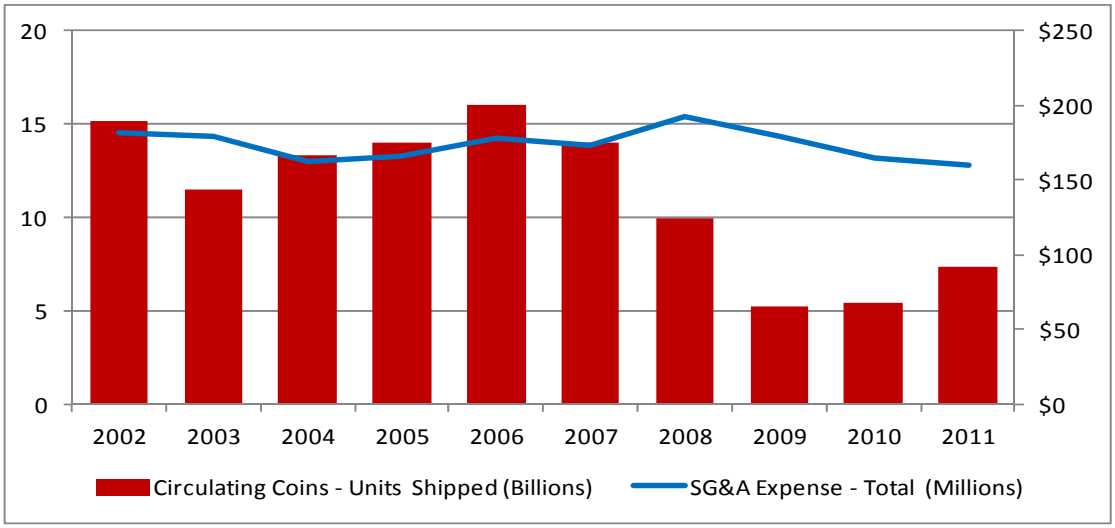


[16] Sources: Appendix B-1 (total sales) and Appendix B-2 (total SG&A expense).
[17] Sources: Appendix B-1 (shares of total sales) and Appendix B-2 (total SG&A expense).

In Figure 6 we compare total SG&A to the number of circulating coins shipped. While total SG&A stayed relatively constant throughout the period, there were three years in which circulating coin shipments fell by an amount comparable to the Mint's current (FY 2011) volume of penny shipments (4.3 billion coins):

- In FY 2003, relative to FY 2002, SG&A fell 2% while circulating coin shipments fell by 3.6 billion coins or 24%
- In FY 2008, relative to FY 2007, SG&A rose 10% while circulating coin shipments fell by 4.0 billion coins or 29%
- In FY 2009, relative to FY 2008, SG&A fell 7% while circulating coin shipments fell by 4.8 billion coins or 48%

Figure 6: Total SG&A Expense and Circulating Shipments, Fiscal Years 2002-2011 [18]



We conclude that eliminating the penny would not generate significant reductions in the Mint's SG&A expenses. Instead, it would simply result in the Mint reallocating SG&A expenses to other circulating coins and numismatic products.

IV. Substitution of Nickels for Pennies Would Offset Potential Cost Reductions

In a House Subcommittee hearing held in July 2006, acting Mint director David Lebryk was asked about the potential substitution effects that may occur if the penny were eliminated – specifically, what additional losses would the Mint incur if more nickels were demanded.[19] The question was likely prompted by Mr. Lebryk's statement that current

[18] Sources: Appendix B-1 (circulating coin shipments) and Appendix B-2 (total SG&A expense).
[19] Coin and Currency Issues Before Congress: Can We Still Afford Money?

production costs for the nickel exceeded the coin's face value.[20] Mr. Lebryk responded that the Mint was unable to model the potential substitution effect but acknowledged the potential for such substitutions by presenting a graph displaying "estimates of potential costs based on various scenarios."[21]

A scenario posed by Mr. Lebryk in his response envisioned nickel production doubling.[22] In FY 2011, the Mint shipped 914 million circulating nickels at an average Cost of Goods Sold of $0.0942,[23] resulting in a loss of $0.0442 ($0.0942 less $0.05) for each nickel shipped.[24] If Mr. Lebryk's scenario were applied to FY 2011 cost and shipment data, the Mint would have incurred a substitution-related loss of $40.4 million (914 million × $0.0442). In contrast, we have identified $4.3 million in net cost reductions in Section I, along with $25.2 million in non-raw material related Cost of Goods Sold net reductions in Section II, for a total of $29.5 million in possible net cost reductions if penny production had been eliminated. Thus, if Mr. Lebryk's substitution scenario were to occur, eliminating the penny would likely have resulted in increased net costs to the Mint, relative to the current state, of $10.9 million.

[20] Testimony of David A. Lebryk, July 19, 2006.
[21] Coin and Currency Issues Before Congress: Can We Still Afford Money?
[22] Coin and Currency Issues Before Congress: Can We Still Afford Money?
[23] United States Mint, 2011 Annual Report, page 11.
[24] The Mint also assigned SG&A of $16.1 million, or $0.0176 per coin shipped, to the nickel. For the reasons set forth in Section III, we have assumed that increased demand for nickels will not result in additional SG&A expense.

Non-Raw Material Cost of Goods Sold - Penny

Fiscal Year	Coins Shipped (millions) (A)	Non-Raw Material Cost Per Coin (B)	Non-Raw Material Cost Total (million $) (A) × (B) (C)
2002	7,520	$ 0.0067	$ 50.5
2003	6,430	$ 0.0075	$ 48.1
2004	7,130	$ 0.0066	$ 47.0
2005	7,220	$ 0.0064	$ 46.5
2006	8,500	$ 0.0053	$ 45.2
2007	7,084	$ 0.0074	$ 52.3
2008	5,272	$ 0.0082	$ 43.4
2009	3,218	$ 0.0125	$ 40.2
2010	3,487	$ 0.0123	$ 42.7
2011	4,289	$ 0.0138	$ 59.3

Source: Coins shipped: United States Mint, Annual Report, 2002-2011.
Non-Raw Material Cost (per coin): Appendix A-3.

Non-Raw Material Cost of Goods Sold per Coin - Nickel, Dime and Quarter

Fiscal Year	Coins Shipped				Non-Raw Material COGS							Per Coin (Nickel, Dime & Quarter)
					Per Coin			Total				
	Nickel	Dime	Quarter	Sum	Nickel	Dime	Quarter	Nickel	Dime	Quarter	Sum	
	(millions)				(dollars)			($ millions)				(dollars)
	(A)	(B)	(C)	(A)+(B)+(C) (D)	(E)	(F)	(G)	(A) × (E) (H)	(B) × (F) (I)	(C) × (G) (J)	(H)+(I)+(J) (K)	(K) ÷ (D) (L)
2002	1,302	2,633	3,616	7,551	$ 0.0173	$ 0.0145	$ 0.0299	$ 22.55	$ 38.27	$ 108.08	$ 168.90	$ 0.0224
2003	744	1,884	2,418	5,046	$ 0.0184	$ 0.0149	$ 0.0335	$ 13.71	$ 28.06	$ 80.98	$ 122.75	$ 0.0243
2004	1,392	2,569	2,242	6,203	$ 0.0185	$ 0.0134	$ 0.0277	$ 25.71	$ 34.55	$ 62.16	$ 122.42	$ 0.0197
2005	1,418	2,669	2,656	6,743	$ 0.0167	$ 0.0123	$ 0.0258	$ 23.61	$ 32.90	$ 68.59	$ 125.10	$ 0.0186
2006	1,452	3,019	3,004	7,475	$ 0.0131	$ 0.0135	$ 0.0292	$ 19.04	$ 40.87	$ 87.74	$ 147.66	$ 0.0198
2007	1,289	2,247	2,711	6,247	$ 0.0211	$ 0.0141	$ 0.0304	$ 27.20	$ 31.79	$ 82.52	$ 141.51	$ 0.0227
2008	647	1,070	2,510	4,227	$ 0.0269	$ 0.0167	$ 0.0411	$ 17.44	$ 17.82	$ 103.12	$ 138.37	$ 0.0327
2009	207	358	965	1,530	$ 0.0258	$ 0.0346	$ 0.0539	$ 5.34	$ 12.40	$ 51.98	$ 69.73	$ 0.0456
2010	359	887	252	1,498	$ 0.0404	$ 0.0274	$ 0.0514	$ 14.51	$ 24.32	$ 12.95	$ 51.79	$ 0.0346
2011	914	1,403	323	2,640	$ 0.0298	$ 0.0243	$ 0.0351	$ 27.24	$ 34.09	$ 11.32	$ 72.65	$ 0.0275

Source: Coins Shipped: United States Mint, Annual Report, 2002-2011.
Non-Raw material COGS (per coin): Appendix A-3.

Appendix A-2

Non-Raw Material Cost of Goods Sold per Coin
By Denomination and Fiscal Year

Fiscal Year	Penny			Nickel		
	Cost of Goods Sold [1]	Raw Material	Non-Raw Material	Cost of Goods Sold [1]	Raw Material	Non-Raw Material
	(A)	(B)	(A) - (B) (C)	(D)	(E)	(D) - (E) (F)
2002	$ 0.0087	$ 0.0020	$ 0.0067	$ 0.0309	$ 0.0136	$ 0.0173
2003	$ 0.0095	$ 0.0020	$ 0.0075	$ 0.0350	$ 0.0166	$ 0.0184
2004	$ 0.0092	$ 0.0026	$ 0.0066	$ 0.0450	$ 0.0265	$ 0.0185
2005	$ 0.0097	$ 0.0033	$ 0.0064	$ 0.0482	$ 0.0315	$ 0.0167
2006	$ 0.0121	$ 0.0068	$ 0.0053	$ 0.0596	$ 0.0465	$ 0.0131
2007	$ 0.0167	$ 0.0093	$ 0.0074	$ 0.0953	$ 0.0742	$ 0.0211
2008	$ 0.0142	$ 0.0060	$ 0.0082	$ 0.0883	$ 0.0614	$ 0.0269
2009	$ 0.0162	$ 0.0037	$ 0.0125	$ 0.0589	$ 0.0331	$ 0.0258
2010	$ 0.0179	$ 0.0056	$ 0.0123	$ 0.0922	$ 0.0518	$ 0.0404
2011	$ 0.0200	$ 0.0062	$ 0.0138	$ 0.0942	$ 0.0644	$ 0.0298

Fiscal Year	Dime			Quarter		
	Cost of Goods Sold [1]	Raw Material	Non-Raw Material	Cost of Goods Sold [1]	Raw Material	Non-Raw Material
	(G)	(H)	(G) - (H) (I)	(J)	(K)	(J) - (K) (L)
2002	$ 0.0189	$ 0.0044	$ 0.0145	$ 0.0408	$ 0.0109	$ 0.0299
2003	$ 0.0199	$ 0.0050	$ 0.0149	$ 0.0460	$ 0.0125	$ 0.0335
2004	$ 0.0214	$ 0.0080	$ 0.0134	$ 0.0476	$ 0.0199	$ 0.0277
2005	$ 0.0222	$ 0.0099	$ 0.0123	$ 0.0505	$ 0.0247	$ 0.0258
2006	$ 0.0297	$ 0.0162	$ 0.0135	$ 0.0696	$ 0.0404	$ 0.0292
2007	$ 0.0361	$ 0.0220	$ 0.0141	$ 0.0853	$ 0.0549	$ 0.0304
2008	$ 0.0377	$ 0.0210	$ 0.0167	$ 0.0937	$ 0.0526	$ 0.0411
2009	$ 0.0464	$ 0.0118	$ 0.0346	$ 0.0833	$ 0.0294	$ 0.0539
2010	$ 0.0459	$ 0.0185	$ 0.0274	$ 0.0976	$ 0.0462	$ 0.0514
2011	$ 0.0478	$ 0.0235	$ 0.0243	$ 0.0938	$ 0.0587	$ 0.0351

[1] Includes Distribution to Federal Reserve Banks.

Source: Cost of Goods Sold: United States Mint, Annual Report, 2002-2011.
Raw Material: Appendices A-4 through A-7.

Material Cost of U.S. Circulating Coins - Penny

Fiscal Year		Copper	Zinc	Total
2011:	Amount of material (MT)	0.0000000625	0.0000024375	
	Average cost per MT	$ 9,104.04	$ 2,297.80	
	Material cost per coin	$ 0.0006	$ 0.0056	$ 0.0062
2010:	Amount of material (MT)	0.0000000625	0.0000024375	
	Average cost per MT	$ 7,043.74	$ 2,135.13	
	Material cost per coin	$ 0.0004	$ 0.0052	$ 0.0056
2009:	Amount of material (MT)	0.0000000625	0.0000024375	
	Average cost per MT	$ 4,478.95	$ 1,403.71	
	Material cost per coin	$ 0.0003	$ 0.0034	$ 0.0037
2008:	Amount of material (MT)	0.0000000625	0.0000024375	
	Average cost per MT	$ 7,786.78	$ 2,245.49	
	Material cost per coin	$ 0.0005	$ 0.0055	$ 0.0060
2007:	Amount of material (MT)	0.0000000625	0.0000024375	
	Average cost per MT	$ 7,098.21	$ 3,639.43	
	Material cost per coin	$ 0.0004	$ 0.0089	$ 0.0093
2006:	Amount of material (MT)	0.0000000625	0.0000024375	
	Average cost per MT	$ 6,039.99	$ 2,626.48	
	Material cost per coin	$ 0.0004	$ 0.0064	$ 0.0068
2005:	Amount of material (MT)	0.0000000625	0.0000024375	
	Average cost per MT	$ 3,373.84	$ 1,250.22	
	Material cost per coin	$ 0.0002	$ 0.0030	$ 0.0033
2004:	Amount of material (MT)	0.0000000625	0.0000024375	
	Average cost per MT	$ 2,605.25	$ 1,001.52	
	Material cost per coin	$ 0.0002	$ 0.0024	$ 0.0026
2003:	Amount of material (MT)	0.0000000625	0.0000024375	
	Average cost per MT	$ 1,652.64	$ 788.20	
	Material cost per coin	$ 0.0001	$ 0.0019	$ 0.0020
2002:	Amount of material (MT)	0.0000000625	0.0000024375	
	Average cost per MT	$ 1,528.99	$ 777.25	
	Material cost per coin	$ 0.0001	$ 0.0019	$ 0.0020

Note: Material specifications are listed in grams. A metric ton (MT) equals 1,000,000 grams.

Source: <http://www.usmint.gov/about_the_mint/?action=coin_specifications>; and <http://www.imf.org/external/np/res/commod/index.aspx>.

Material Cost of U.S. Circulating Coins - Nickel

Fiscal Year		Copper	Nickel	Total
2011:	Amount of material (MT)	0.0000037500	0.0000012500	
	Average cost per MT	$ 9,104.04	$ 24,206.76	
	Material cost per coin	$ 0.0341	$ 0.0303	$ 0.0644
2010:	Amount of material (MT)	0.0000037500	0.0000012500	
	Average cost per MT	$ 7,043.74	$ 20,292.75	
	Material cost per coin	$ 0.0264	$ 0.0254	$ 0.0518
2009:	Amount of material (MT)	0.0000037500	0.0000012500	
	Average cost per MT	$ 4,478.95	$ 13,026.23	
	Material cost per coin	$ 0.0168	$ 0.0163	$ 0.0331
2008:	Amount of material (MT)	0.0000037500	0.0000012500	
	Average cost per MT	$ 7,786.78	$ 25,720.37	
	Material cost per coin	$ 0.0292	$ 0.0322	$ 0.0614
2007:	Amount of material (MT)	0.0000037500	0.0000012500	
	Average cost per MT	$ 7,098.21	$ 38,063.18	
	Material cost per coin	$ 0.0266	$ 0.0476	$ 0.0742
2006:	Amount of material (MT)	0.0000037500	0.0000012500	
	Average cost per MT	$ 6,039.99	$ 19,068.39	
	Material cost per coin	$ 0.0226	$ 0.0238	$ 0.0465
2005:	Amount of material (MT)	0.0000037500	0.0000012500	
	Average cost per MT	$ 3,373.84	$ 15,117.51	
	Material cost per coin	$ 0.0127	$ 0.0189	$ 0.0315
2004:	Amount of material (MT)	0.0000037500	0.0000012500	
	Average cost per MT	$ 2,605.25	$ 13,408.09	
	Material cost per coin	$ 0.0098	$ 0.0168	$ 0.0265
2003:	Amount of material (MT)	0.0000037500	0.0000012500	
	Average cost per MT	$ 1,652.64	$ 8,302.13	
	Material cost per coin	$ 0.0062	$ 0.0104	$ 0.0166
2002:	Amount of material (MT)	0.0000037500	0.0000012500	
	Average cost per MT	$ 1,528.99	$ 6,278.13	
	Material cost per coin	$ 0.0057	$ 0.0078	$ 0.0136

Note: Material specifications are listed in grams. A metric ton (MT) equals 1,000,000 grams.

Source: <http://www.usmint.gov/about_the_mint/?action=coin_specifications>; and <http://www.imf.org/external/np/res/commod/index.aspx>.

Material Cost of U.S. Circulating Coins - Dime

Fiscal Year		Copper	Nickel	Total
2011:	Amount of material (MT)	0.0000020790	0.0000001890	
	Average cost per MT	$ 9,104.04	$ 24,206.76	
	Material cost per coin	$ 0.0189	$ 0.0046	$ 0.0235
2010:	Amount of material (MT)	0.0000020790	0.0000001890	
	Average cost per MT	$ 7,043.74	$ 20,292.75	
	Material cost per coin	$ 0.0146	$ 0.0038	$ 0.0185
2009:	Amount of material (MT)	0.0000020790	0.0000001890	
	Average cost per MT	$ 4,478.95	$ 13,026.23	
	Material cost per coin	$ 0.0093	$ 0.0025	$ 0.0118
2008:	Amount of material (MT)	0.0000020790	0.0000001890	
	Average cost per MT	$ 7,786.78	$ 25,720.37	
	Material cost per coin	$ 0.0162	$ 0.0049	$ 0.0210
2007:	Amount of material (MT)	0.0000020790	0.0000001890	
	Average cost per MT	$ 7,098.21	$ 38,063.18	
	Material cost per coin	$ 0.0148	$ 0.0072	$ 0.0220
2006:	Amount of material (MT)	0.0000020790	0.0000001890	
	Average cost per MT	$ 6,039.99	$ 19,068.39	
	Material cost per coin	$ 0.0126	$ 0.0036	$ 0.0162
2005:	Amount of material (MT)	0.0000020790	0.0000001890	
	Average cost per MT	$ 3,373.84	$ 15,117.51	
	Material cost per coin	$ 0.0070	$ 0.0029	$ 0.0099
2004:	Amount of material (MT)	0.0000020790	0.0000001890	
	Average cost per MT	$ 2,605.25	$ 13,408.09	
	Material cost per coin	$ 0.0054	$ 0.0025	$ 0.0080
2003:	Amount of material (MT)	0.0000020790	0.0000001890	
	Average cost per MT	$ 1,652.64	$ 8,302.13	
	Material cost per coin	$ 0.0034	$ 0.0016	$ 0.0050
2002:	Amount of material (MT)	0.0000020790	0.0000001890	
	Average cost per MT	$ 1,528.99	$ 6,278.13	
	Material cost per coin	$ 0.0032	$ 0.0012	$ 0.0044

Note: Material specifications are listed in grams. A metric ton (MT) equals 1,000,000 grams.

Source: <http://www.usmint.gov/about_the_mint/?action=coin_specifications>; and <http://www.imf.org/external/np/res/commod/index.aspx>.

Material Cost of U.S. Circulating Coins - Quarter

Fiscal Year		Copper	Nickel	Total
2011:	Amount of material (MT)	0.0000051980	0.0000004720	
	Average cost per MT	$ 9,104.04	$ 24,206.76	
	Material cost per coin	$ 0.0473	$ 0.0114	$ 0.0587
2010:	Amount of material (MT)	0.0000051980	0.0000004720	
	Average cost per MT	$ 7,043.74	$ 20,292.75	
	Material cost per coin	$ 0.0366	$ 0.0096	$ 0.0462
2009:	Amount of material (MT)	0.0000051980	0.0000004720	
	Average cost per MT	$ 4,478.95	$ 13,026.23	
	Material cost per coin	$ 0.0233	$ 0.0061	$ 0.0294
2008:	Amount of material (MT)	0.0000051980	0.0000004720	
	Average cost per MT	$ 7,786.78	$ 25,720.37	
	Material cost per coin	$ 0.0405	$ 0.0121	$ 0.0526
2007:	Amount of material (MT)	0.0000051980	0.0000004720	
	Average cost per MT	$ 7,098.21	$ 38,063.18	
	Material cost per coin	$ 0.0369	$ 0.0180	$ 0.0549
2006:	Amount of material (MT)	0.0000051980	0.0000004720	
	Average cost per MT	$ 6,039.99	$ 19,068.39	
	Material cost per coin	$ 0.0314	$ 0.0090	$ 0.0404
2005:	Amount of material (MT)	0.0000051980	0.0000004720	
	Average cost per MT	$ 3,373.84	$ 15,117.51	
	Material cost per coin	$ 0.0175	$ 0.0071	$ 0.0247
2004:	Amount of material (MT)	0.0000051980	0.0000004720	
	Average cost per MT	$ 2,605.25	$ 13,408.09	
	Material cost per coin	$ 0.0135	$ 0.0063	$ 0.0199
2003:	Amount of material (MT)	0.0000051980	0.0000004720	
	Average cost per MT	$ 1,652.64	$ 8,302.13	
	Material cost per coin	$ 0.0086	$ 0.0039	$ 0.0125
2002:	Amount of material (MT)	0.0000051980	0.0000004720	
	Average cost per MT	$ 1,528.99	$ 6,278.13	
	Material cost per coin	$ 0.0079	$ 0.0030	$ 0.0109

Note: Material specifications are listed in grams. A metric ton (MT) equals 1,000,000 grams.

Source: <http://www.usmint.gov/about_the_mint/?action=coin_specifications>; and <http://www.imf.org/external/np/res/commod/index.aspx>.

Revenue by Line of Business
(Millions of Dollars)

Fiscal Year	Numismatic Products			Circulating Coins	Total	Circulating Share of Total
	Bullion	Other [1]	Sum			
	(A)	(B)	(A) + (B) (C)	(D)	(C) + (D) (E)	(D) ÷ (E) (F)
2002	$ 186.7	$ 253.3	$ 440.0	$ 1,364.2	$ 1,804.2	76%
2003	$ 235.4	$ 234.9	$ 470.3	$ 916.1	$ 1,386.4	66%
2004	$ 315.7	$ 341.2	$ 656.9	$ 993.5	$ 1,650.4	60%
2005	$ 270.7	$ 355.4	$ 626.1	$ 1,144.8	$ 1,770.9	65%
2006	$ 536.6	$ 514.9	$ 1,051.5	$ 1,271.9	$ 2,323.4	55%
2007	$ 356.1	$ 551.5	$ 907.6	$ 1,727.8	$ 2,635.4	66%
2008	$ 948.8	$ 557.2	$ 1,506.0	$ 1,294.5	$ 2,800.5	46%
2009	$ 1,694.8	$ 440.0	$ 2,134.8	$ 777.6	$ 2,912.4	27%
2010	$ 2,855.4	$ 413.1	$ 3,268.5	$ 618.2	$ 3,886.7	16%
2011	$ 3,471.4	$ 721.7	$ 4,193.1	$ 776.9	$ 4,970.0	16%

[1] Includes collectible coins and national medals.

Source: United States Mint, Annual Report, 2002-2011.

SG&A Expense by Line of Business
(Millions of Dollars)

Fiscal Year	Numismatic Products			Circulating Coins	Total
	Bullion	Other [1]	Sum		
	(A)	(B)	(A) + (B) (C)	(D)	(C) + (D) (E)
2002	$ 1.6	$ 58.1	$ 59.7	$ 122.4	$ 182.1
2003	$ 1.4	$ 69.6	$ 71.0	$ 107.9	$ 178.9
2004	$ 0.6	$ 73.1	$ 73.7	$ 88.9	$ 162.6
2005	$ 0.8	$ 78.8	$ 79.6	$ 85.9	$ 165.5
2006	$ 1.4	$ 81.5	$ 82.9	$ 94.6	$ 177.5
2007	$ 1.6	$ 78.9	$ 80.5	$ 93.5	$ 174.0
2008	$ 8.4	$ 86.7	$ 95.1	$ 97.0	$ 192.1
2009	$ 12.1	$ 69.2	$ 81.3	$ 98.1	$ 179.4
2010	$ 21.8	$ 64.7	$ 86.5	$ 78.2	$ 164.7
2011	$ 26.8	$ 64.7	$ 91.5	$ 63.4	$ 154.9

[1] Includes collectible coins and national medals.

Source: United States Mint, Annual Report, 2002-2011.