TRANSITION FROM INFLATION TO PRICE STABILITY

Peter M. Garber

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ABSTRACT

This paper provides a detailed discussion of the real phenomena that materialized in the stabilization period which followed the German hyper-inflation. Significant real dislocations arose after the monetary reform; and these can be attributed to a government policy which subsidized heavy industry through the inflation tax proceeds. The "credibility problem" appears not to have been a significant factor in the post-reform dislocation.

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The accelerating inflation rates of the past decade have elicited
proposals to implement monetary policies which will eventually stabilize the
price level. There seems to be a general agreement that the steady-state
costs of the current inflation rate are high and that the rate should be
reduced.[1] However, that additional substantial real costs may arise because
of the transition has led some economists to prescribe monetary policies aimed
at reducing such costs through a gradual reduction of the inflation rate.[2]
Other economists, believing that the transition costs may be low, suggest
policies designed rapidly to move to price stability.[3]

The nature of the transition costs has strong implications for the kind
of research input required for policy decisions intended to reduce inflation.
If transition costs are low, then one should seek to attain price stability
immediately, without requiring any additional knowledge about the steady-state
costs of various inflation rates. If the transition is costly, then there is
a tradeoff between transitional costs and steady-state costs. Since only
vague notions about the relative magnitudes of these costs exist, a large-
scale, time-consuming research effort would have to precede any serious policy
recommendation.[4]

Since there are many theories producing as many different predictions
about the effects of transitional policies, sifting through them requires an
examination of historical episodes which display transitions from inflation
to price stability.[5] Of the recent empirical studies concerning the real
effects of such policy shifts, Sargent's (1980) examination of the post-World
War I hyperinflations is most provocative.[6] Sargent argues that these extreme

inflations were brought to sudden ends without substantial negative real effects. This finding suggests that the transitional costs of a sudden change to a price stabilizing policy may be quite low relative to the efficiency losses arising from current inflation rates. If true, this builds added confidence in a recommendation immediately to end the inflation, perhaps obviating the need to study more intensely the magnitude and nature of transition costs before making a policy recommendation.

In this paper I will provide a detailed discussion about the real phenomena which followed the German stabilization. I reach conclusions that are different from those of Sargent; there is substantial evidence of large scale negative real effects in the aftermath of the German hyperinflation.[7] Such effects were probably due more to the extreme nature of the inflation and its other attendant distortions than to the nature of its termination. The costs that did arise were due to a policy of subsidizing the capital goods industry through the inflation tax revenue. When this source of revenue was terminated, a major reallocation of resources among industries was required; it was the reallocation that generated the transitional costs. Thus, the allocative effects of monetary deceleration had little to do with the price or expectational stickiness that can be found in current discussions. Rather, they stemmed from a close relationship between the inflation and other governmentally imposed distortions. Regardless of their source since the costs did arise, the German case cannot serve as evidence that there may be an easy escape from the current lack of confidence in particular transitional policy recommendations.

The German Case

In analyzing the monetary reforms of the post-World War I hyperinflations, Sargent (1980) emphasized common features which emerged in the successful price stabilizations. Basic reforms were the central banks' refusals to supply governments' credit demands and governments' changes of fiscal policy to regimes in which debt would be backed by future taxes. The implementation of these policies triggered sudden shifts from extreme inflation to price stability.[8] These cases provide dramatic evidence that economies can achieve rapid shifts to stable prices.

However, in addition Sargent, citing data on industrial production or unemployment, suggests that these reforms were accomplished with small transitional costs. In this section I will present evidence which indicates that large transitional costs materialized in the German case, assuming the form of industrial production declines and unemployment increases. The economic decline which I will describe did not appear in the immediate aftermath of the reform, the period which Sargent examined; rather, beginning an era called the "Rationalization Period," it arose 1-1/2 years after the November, 1923 reform. Intuition suggests that transition costs should occur immediately after a reform and persist until the stable-price steady state has been attained. I will argue that this intuition should be suspended in the German case; a number of factors postponed the German transition.

The section is subdivided into two subsections. In the first I will describe the organization of industry and of output in both the inflationary period and the rationalization period. In the second I will examine the factors which postponed the transitional costs; also I will both measure the length of time that the lack of "credibility" was important and present evidence indicating that agents fully believed in the price stabilization policy before the transitional costs materialized. In my opinion, this evidence implies that agents' correctly predicting and recognizing new policy regimes is not sufficient to prevent large transitional costs. In the second subsection I also will gauge the extent of the transitional costs and suggest that the transition was still in progress when the German economy was overwhelmed by the Great Depression.

The Organization of Output and Industry

To determine how the structure of the German economy changed in moving toward a stable-price steady state, it is necessary first to study the structure that prevailed during the inflation. The development of the German economy was molded not only by the inflationary money creation policy, but also by a portfolio of other policies which were tied intimately to the inflation.

One of the inefficiencies that arises in an inflationary period stems from the reduction in real balances; capital and labor resources must be substituted from other activities to replace money. The economy's capacity both to consume and produce is reduced. Although the reduction of real balances impinges on all transactions, I will confine the following simple discussion to its effects on production in order to focus the exposition.

In Figure I, the curve DAC is a production possibility frontier associated with a stable price level.
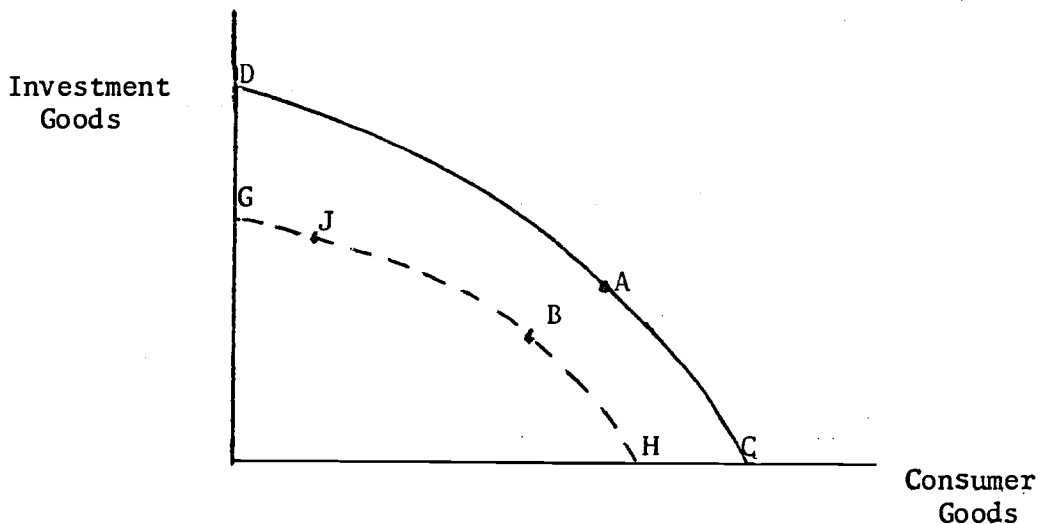

Figure I

A cost of inflation can be depicted as a movement from A, the efficient output combination with a zero inflation rate, to B, the efficient output

combination when the inflation rate is high. Such a cost forms a component of that which is measured by the usual triangle under the real balance demand curve. In essence, the production possibility curve shifts inward with the destruction of real balances. If these production possibility frontiers were homothetic, there would be no change in the ratios of different goods produced, providing that the inflation did not affect relative prices. However, an increasing inflation rate may automatically trigger other distortions through its association with the economy's other institutional arrangements. Fischer and Modigliani (1978) and Fischer (1980) studied these automatic distortions, suggesting that they may substantially increase the costs of steady state inflation. Such distortions may manifest themselves through a relative price shift; in the context of Figure I, the relative price of investment goods may rise, moving the composition of output from B to J.

I will now argue that such automatic distortions did affect the relative prices and structure of the German economy; then I will discuss the sources of these distortions. In Table I, I present evidence that substantial movements in relative prices occurred in the German inflation; causing production to shift toward investment goods.[9] The entries in the table are the ratio of the wholesale price index to the cost of living index. Included in the WPI are both investment goods and goods destined for consumption, so the ratio probably understates the order of magnitude of the relative price shift between consumer goods and investment goods. In the first half of 1921, there was a very mild deflation, so the relative price that prevailed from January to July can be interpreted as the relationship that might prevail with a stable

price level. The inflation resumed in August 1921, continuing at increasing rates until November 1923. Immediately, the ratio of the WPI to the CLI substantially increased, more than doubling in a number of months in 1922 and 1923. When the inflation ended, the ratio immediately fell to the level which had prevailed in the first half of 1921, remaining there for the next two years.

Again, to focus the exposition, let us assume that the Stolper-Samuelson theorem is applicable. Then there should be a predictable relationship among movements in goods relative prices, outputs, relative factor prices, absolute factor incomes, and factor intensity changes in each industry. In partiuclar, if the investment goods industry was relatively capital intensive, this shift in the relative price of goods should have been associated not only with a rise in the rent/wage ratio but also with a decline in the absolute income of labor. There is some indication that the investment goods industry was capital intensive.[10] Table II, with data on the number of persons employed in each industry, indicates to some extent that resources flowed into investment goods industries during the inflation and into consumer goods industries after the reform.[11] In Table III, I present some evidence on the movement of real wages. During the hyperinflation these declined substantially, rising steadily after the reform. Numerical evidence on the return to capital is not as readily available as wage data. However, the accounts of the period seem to indicate that profits were very large during the inflationary period, especially in the investment goods industries.[12] New investment flowed into the capital goods industry along with labor. Both Bresciani-Turroni (pp. 201-2) and Graham (p. 242) discuss the expansion of plant that proceeded during the inflation. Due to the very

Table 1

Ratio of Wholesale Price Index to Cost of Living Index

Date	1921[1]	1922[1]	1923[1]	1924[2]	1925[3]
Jan.	.97	1.43	1.91	.89	.94
Feb.	.95	1.34	1.62	.94	.94
Mar.	.94	1.46	1.33	.94	.93
Apr.	.94	1.43	1.38	.94	.92
May	.94	1.32	1.67	.92	.93
June	.94	1.31	1.95	.89	.92
July	.91	1.45	1.53	.93	.90
Aug.	1.14	1.92	1.24	.94	.90
Sept.	1.20	1.64	1.23	1.00	.91
Oct.	1.30	1.97	1.49	.93	.90
Nov.	1.51	1.98	.85	.94	.92
Dec.	1.41	1.67	.81	.97	.91

[1] Source: Statistisches Reichsamt, Zahlen zur Geltentwerturg, P. 21, p. 33. The CLI used in all years is that which excludes housing, which was price controlled. The index in gold was multiplied by 100 and divided into the WPI.

[2] Source: Statistisches Reichsamt, Jahrbuch für das Deutsche Reich, 1924, p. 260, p. 265. Indexes are for end of month.

[3] Source: Statistisches Reichsamt, Jahrbuch für das Deutsche Reich, 1925 p. 238, p. 301. A new computation method was used by the Statistiches Reichsamt to compute these indices.

Table II

Employment in Capital Goods and Consumer Goods Industries*

Year	Capital Goods Industries		Consumer Goods Industries	
	Persons Employed	%	Persons Employed	%
1907	5,960,973	71.5	2,375,177	28.5
1913	6,732,354	70.4	2,829,632	29.6
1919	5,628,566	73.8	1,993,907	26.2
1922	7,277,795	72.3	2,787,565	27.7
1923	6,262,079	73.5	2,253,159	26.5
1924	6,143,302	68.7	2,800,780	31.3
1925*	6,036,000	57.0	4,577,000	43.0

Source: 1907-1924, Vierteljahrshefte zur Konjunkturforschurg, 1926, Heft 2, p. 47.

*Source: Vierteljahrshefte zur Konjunkturforschurg, 1927, Heft 4, p. 18. The
organization producing the 1925 data was different from that which
produced the data prior to 1925. Hence, there is some discrepancy.

The employment figures reported by this source are 6.7 million in
the capital goods industry and 5.9 million in the consumer goods
industry. The 1926 source does not account for the category
"Wohnung, Kultur, Luxus." Since the 1927 source includes this
category among consumer goods I have subtracted the workers in
this group (1.98 million) from the consumer goods total for 1925.
In addition, the earlier source includes paper and leather goods
among consumer goods while the later source includes them among
capital goods. Hence, for 1925, I have moved the workers in
these categories (631 thousand) into consumer goods.

Table III

Index of Weekly Real Wages

(1913 = 100)

Date	Skilled Workers	Unskilled Workers
April, 1922	71.9	93.4
July	71.5	93.8
October	54.8	70.7
November	51.3	65.9
December	61.6	80.3
January 1923	48.7	63.6
February	63.5	82.2
March	78.7	102.0
April	74.1	96.0
May	65.1	84.2
June	65.1	84.0
July	48.0	62.0
August	67.2	86.4
September	61.2	78.2
October	52.0	64.8
November	53.3	66.0
December	69.9	85.0
January 1924*	81.2	95.4
February	81.7	94.0
March	83.4	91.9
April	90.4	96.9
May	96.8	104.3
June	101.2	108.1
July	101.9	108.6
August	102.5	109.3
September	102.7	109.3
October	104.2	111.3
November	106.5	114.5
December	109.8	117.7
January 1925	110.7	119.0
February	111.9	120.2
March	114.6	122.9
April	117.8	125.6
May	120.6	128.2
June	122.6	130.4
July	125.4	133.2
August	126.8	135.2
September	128.2	136.4
October	128.8	136.9
November	131.2	139.4
December	131.3	139.5

Sources: 1922-23 data are from Statistisches Reichsamt, Zahlen zur Geldentwertung in Deutschland, p. 42.

The 1924-25 data are taken from Vierteljahrshefte zur Konjunkturforschung, 1 Jahrgang, 1926, p. 61. These data are reported in Reichsmarks/week. However, since the 1913 weekly goldmark wage was reported by the Statistisches Reichsamt reference, the index can be computed by forming the ratio of the two wages because 1 Reichsmark = 1 goldmark.

*In International Labour Office (1925), the reported indexes are lower for 1924 (p.79) than reported here. However, the pattern of growth is similar.

low wage-rental ratio the new investment congealed in plants employing labor-intensive techniques.[13]

In addition to the shifts in prices, output composition, and resource allocation, a change in the organization of industry occurred during the inflation.[14] German industry had always been somewhat horizontally integrated; cartels were common prior to the inflation. However, during the inflation industries both integrated vertically and formed enormous combines of wholly disparate firms; the combines controlled vast sectors of the economy.[15] In part, the purpose for constructing such organizations was to avoid the use of money by employing internal accounting and payments systems.[16]

The distortion which, in combination with the inflation, determined this organization of output and industry was the subsidization of the investment goods industry with the inflation tax revenue. The subsidies derived from the money creation assumed a number of forms. First, capital goods industries were supported directly through the government's budget. In addition to government enterprises such as the railway, the government subsidized shipbuilding and electrical power generation.[17] Second, beginning in 1922, the Reichbank began directly to discount the bills of private business. The annual discount rates were 6 percent in July 1922, 18 percent in April 1923, 30 percent in August 1923, and 90 percent in September 1923. The inflation rates prevailing at these dates were at such high levels that only a negligible percentage of a loan's real value ever was repaid.[18] The large combines, organized around the basic capital goods industries, had special access to such loans for financing their commercial activities, thereby effectively receiving large subsidies for their inputs. Some idea of the relative values of the Reichbank loans to the government and to industry

can be gained from Table IV. Finally, the Reichsbank, unable to print
currency fast enough to satisfy demand, licensed a number of institutions,
including private firms, to print "emergency money" in order to meet their
pressing needs for cash. The large combines had an advantage in circulating
such cash in payment for their inputs because of their large size.[19] This
policy subsidized both the formation of large conglomerates and the production
of capital goods.[20]

In summary, the combination of the inflation with other government and
central bank policies caused new capital investment and labor to shift into
the investment goods industries, substantially increased the amount of fixed
capital utilizing labor intensive technology, and produced an environment in
which gigantic, centralized industrial organizations could form and survive.
Also, it shifted the relative prices of goods and factors of production and
destroyed real balances by generating inflationary expectations. That these
expectations and price distortions ended with the reform did not indicate that
the transition from an inflationary environment to a steady-state stable price
environment had also terminated. Rather, the transition continued until the
technical nature of capital, the quantity of capital, and the organization of
industry returned to normal.

The Rentenmark, the Dawes Loan, and the Rationalization of Industry

The Rentenmark

The monetary reform was implemented in November, 1923. Since Sargent
discusses the event extensively, I will review only some relevant details.
A new bank, the Rentenbank, was created with the power to issue Rentenmarks
in limited amounts; the Rentenmark was a new form of paper money but its value
remained close to one goldmark (4.2 goldmarks = $1). Half of the Rentenmarks
(1.2 billion) were loaned to the government to finance its deficits in transition

Table IV

New Discounts of the Reichsbank (Million Goldmarks)[a]

Date	New State Bills Discounted	New Private Bills Discounted	Date	New State Bills Discounted	New Private Bills Discounted[b]
January, 1922	-140.5	-1.46	January, 1924	-	655.0
February	170.4	5.6	February	-	380.0
March	190.4	4.6	March	-	438.0
April	129.8	3.6	April	-	163.0
May	178.5	14.3	May	-	9.4
June	247.4	18.6	June	-	-76.2
July	207.8	32.2	July	-	-146.2
August	169.2	54.8	August	-	-88.5
September	287.5	82.0	September	-	452.0
October	191.6	76.6			
November	108.9	81.5			
December	289.6	99.1			
January, 1923	150.2	97.2			
February	288.1	243.7			
March	322.7	109.2			
April	332.6	122.1			
May*	116.7	66.8			
June*	279.7	78.6			
July*	133.6	42.9			
August*	380.3	59.6			
September*	1160.1	91.7			
October*	384.4	62.1			
November*	90.9	346.3			
December	-	210.3			

Sources: Jan. 1922 - Oct. 1923 Statistisches Reichsamt, Zahlen zur Geldentwertung in Deutschland, p. 52, p. 23.

Nov. 1923 - Economist, Volumes XCVIII, XCIX. From sections on Central Bank returns.
Sept. 1924

[a] 4.2 goldmarks = 1 dollar.

[b] This amount is the sum of the changes in the following asset categories: Advances, Rentenmark Discounts and Advances, Bills of Exchange and Checks, and Rentenmark Bills of Exchange and Checks.

* Prior to May, 1923, new nominal discounted bills were converted to gold values using mid-month exchange rates. From May to November 1923, conversions were performed with end of month exchange rates. Thus, the gold value of these months' new bills may be severely understated.

to a balanced budget; some Rentenmarks (ultimately .8 billion) were loaned to the Reichsbank. The government drastically cut its expenditures and raised taxes. On November 16, the Reichsbank stopped discounting government bills; and the government extinguished its entire debt to the Reichsbank, using part of its Rentenmark loan to repurchase the debt. The Reichsbank announced that after November 22 it would no longer exchange paper marks for emergency money.

However, the Reichsbank, basing its actions on a real bills doctrine, continued to discount private bills at a rapid rate. The real values of its new loans to industry and agriculture in the five months after the reform exceeded those of the loans during the inflation, as indicated in Table IV. The Reichsbank's acquisition of these assets was reflected in an increased circulation of papermarks in addition to the Rentenmarks circulated after the reform. Since the price level and exchange rate were relatively stable after the reform, the added currency represented an increase in real balances.[21] For the period after the reform, total currency in circulation and its components are presented in Table V. Notice that currency in circulation more than doubled in the first six months after the reform.

The effects of this post-reform monetary policy on the price level can be determined by Table VI. After an initial decline in prices, the inflation resumed in the spring of 1924 at a substantial annual rate. This new inflation so alarmed the Reichsbank that it suddenly stopped its discounting of new private bills after the first week in April, 1924.[22]

Expectations and "Credibility"

The effect of this policy shift on inflationary expectations can be determined by examining the interest rates for day money, month money, and gold bonds in Table VII. The rates for day money and month money were nominal; those for the gold bonds were real since the bonds and their coupons were denominated in gold.[23] Although there were differences with the term and risk

Table V

Currency in Circulation*

(in million Rentenmarks)[1]

Date (End of Month)	Total[2]	Reichsbank Notes	Railroad Emergency Money	Rentenmarks	Gold Loans	Fixed Value Railroad Emergency Money	Emergency Gold Loans	Coins
November, 1923	1484.1	400.3	114.8	501.0	216.4	35.4	216.2	-
December	2271.2	496.5	109.0	1049.1	240.0	141.9	234.7	-
January, 1924	2275.7	483.6	64.6	1196.3	240.0	144.2	146.0	1.0
February	2632.1	587.9	51.1	1563.8	207.9	144.2	71.4	5.8
March	2823.3	689.9	26.6	1760.3	146.6	123.6	50.4	25.9
April	2817.6	777.0	8.0	1708.8	111.0	93.2	41.4	85.2
May	2917.0	926.9	3.5	1728.5	24.0	70.6	25.0	138.5
June	3128.6	1097.3	-	1771.6	-	55.5	9.5	194.7
July	3299.7	1211.0	-	1803.4	-	37.1	1.0	247.2
August	3534.7	1391.9	-	1832.4	-	19.9	-	290.5
September	3707.6	1520.5	-	1853.1	-	7.2	-	326.8
October	3823.8	1780.9	-	1715.1	-	-	-	327.8
November	3897.4	1863.2	-	1677.4	-	-	-	356.3
December	4159.1	1941.4	-	1835.1	-	-	-	383.0
January, 1925	4077.3	1901.3	-	1730.4	-	-	-	395.7
February	4250.1	2106.2	-	1736.1	-	-	-	407.7
March	4337.2	2308.0	-	1611.2	-	-	-	418.0
April	4358.1	2447.2	-	1430.2	-	-	-	430.8
May	4606.3	2601.7	-	1551.4	-	-	-	453.3
June	4608.1	2464.4	-	1671.7	-	-	-	472.1
July	4715.9	2522.5	-	1701.3	-	-	-	492.1
August	4808.2	2585.4	-	1712.6	-	-	-	510.2
September	4878.2	2637.1	-	1713.2	-	-	-	528.0
October	4883.7	2794.2	-	1542.6	-	-	-	546.9
November	4799.3	2756.9	-	1480.3	-	-	-	562.1
December	5001.8	2944.4	-	1475.7	-	-	-	581.7
January, 1926	4675.1	2640.1	-	1450.2	-	-	-	584.8
February	4749.2	2814.6	-	1335.4	-	-	-	599.2
March	4874.4	3150.0	-	1108.4	-	-	-	616.0
April	4859.2	3076.8	-	1156.8	-	-	-	626.2
May	4880.6	2868.9	-	1373.1	-	-	-	638.6
June	4997.6	2963.2	-	1387.8	-	-	-	646.6

cont'd.

cont'd.

Table V

Currency in Circulation*

(in million Rentenmarks)[1]

Date (End of Month)	Total[2]	Reichsbank Notes	Railroad Emergency Money	Rentenmarks	Gold Loans	Fixed Value Railroad Emergency Money	Emergency Gold Loans	Coins
July, 1926	5118.7	3096.4	-	1363.4	-	-	-	658.9
August	5144.4	3218.2	-	1260.0	-	-	-	666.2
September	5294.1	3240.5	-	1369.2	-	-	-	684.4
October	5325.4	3313.1	-	1317.6	-	-	-	694.7
November	5257.2	3366.2	-	1199.0	-	-	-	692.0
December	5623.4	3710.1	-	1164.0	-	-	-	749.3

[1] 1 Rentenmark = 1 goldmark = 1 Reichsmark = 1 trillion paper marks

[2] Total excludes private bank notes.

*Source: November, 1923 - December, 1924, Statistisches Reichsamt, Jahrbuch für das Deutsche Reich, 1924/25, p. 313.

, January - December, 1925. _____, Jahrbuch für das Deutsche Reich, 1925, p. 325.

, January - December, 1926. _____, Jahrbuch für das Deutsche Reich, 1926, p. 358.

Table VI

Price Indexes, 1924-1925[1]

(1913 = 100)

Date[2]	Wholesale Price Index	Cost of Living[3] Index
December, 1923	120.0	142.8
January, 1924	114.8	129.0
February	118.0	126.0
March	120.8	128.0
April	124.6	133.0
May	120.2	131.0
June	112.6	127.0
July	118.5	128.0
August	120.9	128.0
September	131.5	132.0
October	128.5	138.0
November	129.0	136.9
December	134.5	137.8
January, 1925	143.5	152.0
February	142.7	151.9
March	141.3	152.2
April	138.6	151.4
May	139.0	149.7
June	140.9	153.2
July	142.8	158.9
August	144.3	159.5
September	144.4	159.1
October	143.1	157.3
November	141.6	154.7
December	139.8	154.4

[1]The jump in the indices between December, 1924 and January, 1925 is due to the introduction of a new computation method for both indices.

[2]End of month for 1924. Monthly average for 1925.

[3]Excludes housing.

Sources: Statistisches Reichsamt, Jahrbuch für das Deutsche Reich, 1924/25, p. 260, p. 265.

_____, Jahrbuch für das Deutsche Reich, 1925, p. 259, p. 301.

Table VII

Interest Rates[1]

Date	Day Money	Month Money	5% Gold Bonds	Date	Day Money	Month Money	5% Gold Bonds
January, 1924	87.6	28.3	7.8	January, 1926	7.1	9.0	7.5
February	34.9	22.6	7.8	February	6.0	7.4	7.0
March	33.1	30.0	9.2	March	5.7	6.8	6.6
April	45.5	44.5	10.5	April	4.6	6.0	6.1
May	27.8	44.3	12.8	May	4.8	5.9	6.1
June	22.6	32.6	13.3	June	4.8	5.8	6.2
July	16.8	22.9	11.2	July	5.0	5.8	6.1
August	17.1	18.8	9.3	August	5.0	5.9	6.0
September	15.0	16.8	8.3	September	5.1	6.2	6.0
October	14.1	14.4	8.4	October	5.0	6.3	5.9
November	13.0	13.8	8.3	November	4.8	6.4	5.8
December	11.1	12.6	8.3	December	6.0	7.4	5.5
January, 1925	10.0	11.3	7.4	January, 1927	4.3	6.3	5.4
February	10.6	11.9	7.4	February	5.4	5.9	5.3
March	9.0	11.3	7.2	March	5.1	7.3	5.4
April	8.5	10.1	7.3	April	5.8	7.1	5.5
May	8.8	10.5	7.4	May	6.3	7.6	5.6
June	8.8	10.7	7.8	June	6.0	8.2	5.8
July	9.5	10.9	8.0				
August	9.0	10.8	8.3				
September	8.9	10.8	8.2				
October	9.4	10.8	8.0				
November	8.5	10.7	8.2				
December	8.2	10.3	8.2				

[1]Annual percentage rates.

Source: Vierteljahreshefte zur Konjunkturforschung 1926/27, Heft 2, p. 92 and 1927, Heft 3, p. 112.

associated with these assets, the difference between the nominal and real rates should reflect at least the order of magnitude of the anticipated inflation rate. In the spring of 1924, the differential in interest rates indicates an anticipated annual inflation rate of 20-30 percent. Within eight months after the Reichsbank imposed its credit restrictions, the difference fell to a level reflecting a negligible anticipated inflation rate.

These interest rate differences can also be used to address the question of the "credibility" of the central bank's new policy. Even in the winter of 1924 agents apparently believed that prices would rise at low annual percentage rates relative to those that had prevailed in the hyperinflation. Given that prices had risen at rates of 500 percent per week in October 1923, the 1924 interest rates indicate a dramatic and rapid shift in agents' beliefs about monetary policy.[24] Agents also learned rapidly about the final shift to the stable price policy. It seems reasonable to claim that agents in the German economy believed in a stable price policy regime by April 1925. Thus, the length of time during which "credibility" may have been an issue was at most 1-1/2 years, starting in November 1923.

Real Effects of Reform and Credit Stringency

While 1922 was by all accounts a boom year, industrial production in 1923 was depressed, as shown in Table VIII. In the last half of 1923, unemployment grew substantially as indicated in Table X. It is difficult to isolate the cause of this depression in output. In January 1923, the French and Belgians occupied the Ruhr, the industrial heartland of Germany; and the "Passive Resistance" that ensued disrupted production both in the Ruhr and in the rest of the country. Simultaneously with the advent of the reform, the "Passive Resistance" ended. Therefore, the revival of output in early 1924 can be attributed either to the end of the inflation or to the end of the Ruhr struggle.

Table VIII

Index of Industrial Production
(1913 = 100)

Year	Index of Production
1920	61
1921	77
1922	86
1923	54
1924	77
1925	90
1926	86
1927	111

(1928 = 100)

	1924	1925	1926	1927	1928	1929
January	51.2	83.1	71.8	91.4	98.8	95.2
February	58.3	85.4	72.2	92.0	102.0	90.9
March	64.0	86.5	72.5	96.0	105.0	99.0
April	76.0	86.8	72.3	98.8	104.7	108.3
May	59.1	86.9	75.0	103.2	103.0	109.1
June	70.6	85.3	77.0	101.9	103.0	109.8
July	69.3	83.4	76.1	101.2	104.4	104.7
August	68.2	81.6	80.2	102.4	102.3	103.3
September	72.7	82.7	83.0	104.4	102.2	101.8
October	76.1	80.4	85.9	104.4	98.1	101.3
November	81.0	81.2	90.4	105.9	84.6	100.1
December	82.0	75.6	90.7	100.0	91.9	95.5

Sources: Annual data are taken from Graham, p. 287. Graham took the data from Bulletin de la Statistique Generale de la France.

Monthly data are from Vierteljahreshefte zur Konjunkturforschung, 1929, 4 Jahrgang, Heft 4, Teil A. p. 43.

Table IX

German Population Statistics, 1925

1)	Total Population		62,349,000
2)	Employed		31,113,000
	a) Farming and Forestry	9,762,000	
	b) Industry	12,598,000	
	c) Business & Transport	5,384,000	
	d) Service	3,369,000	
3)	Union Members		3,635,000

Source: Vierteljahrshefte zur Konjunkturforschung, (1927, Heft 4, p. 20, p. 128), (1926, Heft 2, p. 56).

Table X

Union Members Fully Unemployed (Percent)

1) Yearly Average

    1912 - 2.0
    1913 - 2.9
    1914* - 3.2
    1920 - 3.8
    1921 - 2.5
    1922 - 1.5

    *First half.

2) By Month

	1923	1924	1925	1926	1927	1928	1929
January	4.2	26.5	8.1	22.6	16.5	11.2	19.4
February	5.2	25.1	7.3	22.0	15.5	10.4	22.3
March	5.6	16.6	5.8	21.4	11.5	9.2	16.9
April	7.0	10.4	4.3	18.6	8.9	6.9	11.1
May	6.2	8.6	3.6	18.1	7.0	6.3	9.1
June	4.1	10.5	3.5	18.1	6.3	6.2	8.5
July	3.5	12.5	3.7	17.7	5.5	6.3	8.6
August	6.3	12.4	4.3	16.7	5.0	6.5	8.9
September	9.9	10.5	4.5	15.2	4.6	6.6	9.6
October	19.1	8.4	5.8	14.2	4.5	7.8	10.9
November	23.4	7.3	10.7	14.2	7.4	9.5	13.7
December	28.2	8.1	19.4	16.7	12.9	16.7	20.1

Sources: 1912-1923 - The Workers Standard of Life in Countries with
          Depreciated Currency, P. 21.

          Vierteljahrshefte zur Konjunkturforschung, (1926, Heft 1, p. 60),
                (1927, Heft 4, p. 123), (1928, Heft 1, Teil B, p. 73),
                (1928, Heft 4, Teil B, p. 71).

Table XI

Persons Collecting Unemployment Compensation

(Thousands)

	1924	1925	1926	1927	1928	1929
January	--	593	2031	1827	1333	2246
February	--	540	2056	1696	1238	2461
March	--	466	1942	1121	1011	1899
April	572	320	1781	870	729	1126
May	402	233	1744	649	629	808
June	426	195	1741	540	611	723
July	526	197	1652	453	564	710
August	588	231	1548	404	574	726
September	513	266	1394	355	577	749
October	435	364	1308	340	671	889
November	437	673	1370	605	1030	1200
December	536	1499	1749	1188	1702	1774

Source: Vierteljahrshefte zur Konjunkturforschung, (1926/7,
Heft 2, p. 99), (1927, Heft 2, p. 122), (1928, Heft 2,
Teil B, p. 85), (1929, Heft 4, Teil B, p. 71).

Statistisches Jahrbuch für das Deutsche Reich, 1927.

Industrial production rapidly approached its 1922 levels until the stable price regime began in earnest in April 1924. At that point output collapsed to the rate prevailing early in the year and unemployment increased. Also, large numbers of firms went bankrupt in the summer of 1924, as shown in Table XII.

The first cycle after the monetary reform had a period of eight months and a fairly large amplitude. During the cycle agent's expectations of inflation seem to have been correct, and the composition of output began to shift with the relative price shift. Real wages rose steadily, attaining their 1913 level by the summer of 1924. However, the technical nature of capital and the organization of industry did not substantially change in this cycle. The labor intensive machinery and the industrial structure spawned by the inflation survived through the continued financing of the Reichsbank; and the months of credit restriction in the spring and summer of 1924 were not sufficient to remove them.[25]

The Dawes Loan

The revival from the Reichsbank's credit restrictions began in the fall of 1924 with the influx of foreign credits made available by the Dawes Loan. At this time the Reichsmark replaced the papermark as the legal tender money and the Reichsbank resumed new discounts of private bills.[26] The Dawes Plan required Germany to place legal restrictions on the Reichsbank to insure the stability of the new currency and fixed a schedule and method for reparations payments.[27] Also, an official loan of 800 million gold marks was made to Germany in 1924; and substantial private foreign loans and direct investment flowed into the country.[28]

These foreign loans stimulated a reduction in unemployment and a recovery of production that peaked in May 1925, an expansion of nine months. Writers on this period share the common opinion that the loans served once again to

Table XII

Number of Bankruptcies

Year	Monthly Average Number of Bankruptcies
1913	815
1919	83
1920	109
1921	257
1922	84
1923	22

	1922	1923	1924	1925	1926	1927	1928
January	140	24	31	760	2013	473	753
February	123	17	41	700	1920	457	706
March	151	30	68	744	1871	537	778
April	107	45	138	660	1302	403	619
May	95	32	322	755	1046	451	702
June	91	35	579	709	913	407	765
July	81	18	1173	797	701	418	663
August	59	13	855	718	493	395	547
September	45	9	817	887	467	355	551
October	43	15	520	1139	485	455	691
November	34	8	599	1320	453	582	687
December	39	17	572	1598	427	605	

Source: Annual data and monthly data for 1922-23, Graham, p. 280.

Monthly data, 1924-28: Flink, p. 122, p. 165, p. 169, p. 173, p. 197.

postpone the reorganization of capital and industry to states consistent
with a steady state stable price environment, though the mechanism through
which this delay occurred is not clear.[29]   For a period of six months in this
interregnum, unemployment reached much lower levels than at any time during
the next ten years.

The Rationalization of Industry

The transition to the economic structure associated with a stable price
regime began finally in the summer of 1925. A number of huge combines
constructed during the inflation collapsed at this time; the most notable
liquidation was that in June, 1925 of the enormous organization formed by
Stinnes. The industrial reorganization was not confined only to the large
combines; vast numbers of firms formed in the inflation were forced into
bankruptcy at this time, as shown in Table XII.[30]

From peak to trough industrial production declined by 20 percent in less
than a year as shown in Figure II. Unemployment reached 22 percent of union
members by 1926 and did not fall below 10 percent until the second quarter of
1927.

However, output did not decline as much as employment, and it recovered
much more rapidly. This resulted from the second aspect of rationalization,
the transformation of plant and equipment to techniques reflecting a greater
capital intensity. With the rise in real wages, much of the vast labor intensive
physical investment installed in the inflation proved to be inefficient. Large
amounts of recently contructed capital which had negative marginal productivity
were scrapped, especially in the mining, steel, shipbuilding, cement, and
machinery industries.[31]   The closing of inefficient plant and reorganization of
methods within the remaining plant rapidly increased labor productivity,
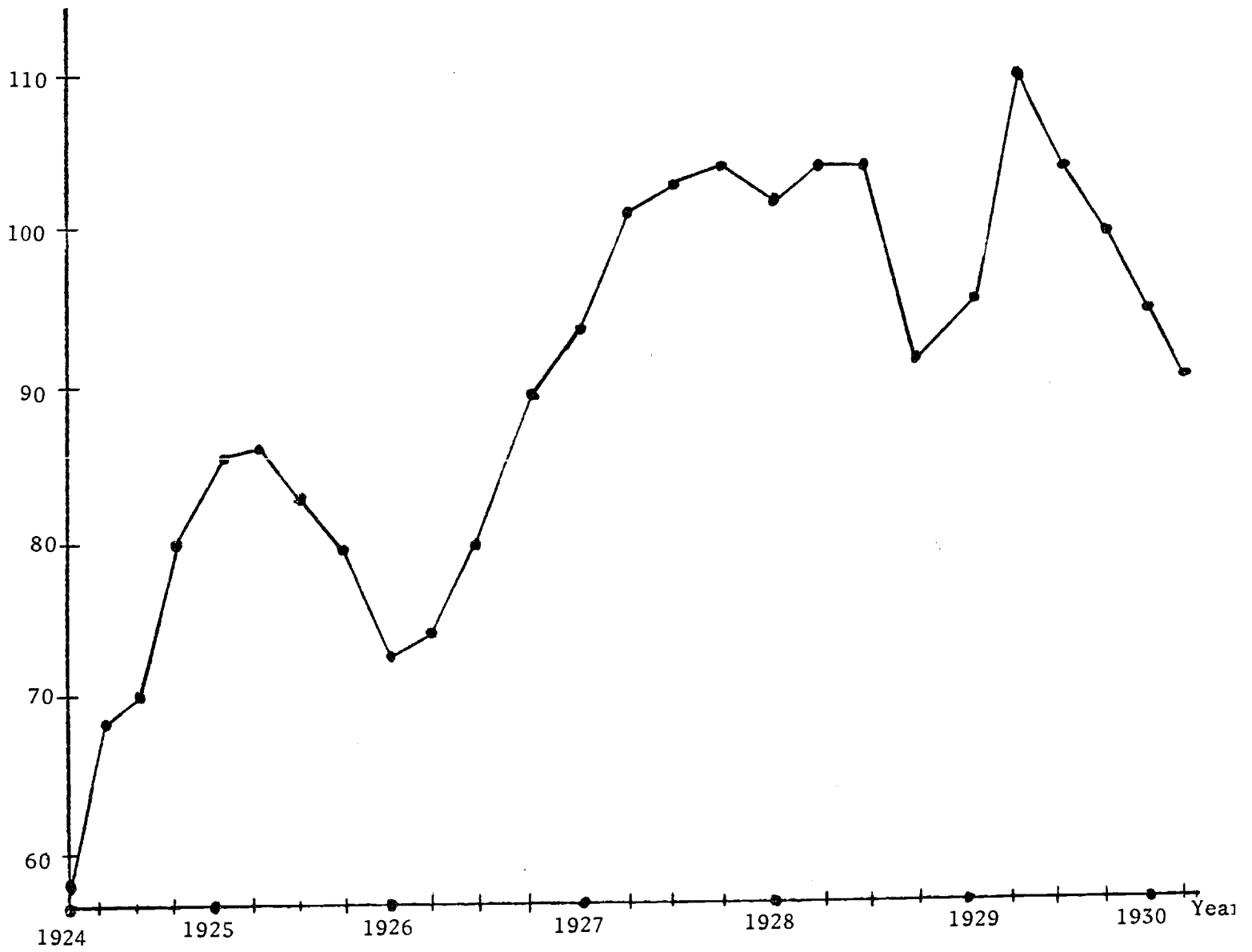allowing output to increase faster than the fall in unemployment during the

Figure II

Quarterly Index of Industrial Production

recovery. The rationalization movement continued for a number of years beyond 1925, during which unemployment was always high by previous standards.[32]

Conclusion: Interpreting the German Episode

The German evidence can be interpreted in two different ways. One may conclude that the 1925-6 downturn and the subsequent high unemployment were intimately connected to the inflation and reform, embodying the economy's transition process to a stable price steady state. On the other hand, one may treat these later events as phenomena unconnected to the transition process, presuming that the transition was completed in the first 1-1/2 years after the reform.

While most authors writing about this period agree with the first interpretation, this viewpoint generates the task of explaining why there was a 1-1/2 year delay in observing the transition's negative real effects.[33] Explaining the lag by the credits granted to industry by the Reichsbank and foreign lenders leaves unanswered the question of why industry used these credits to maintain plants and organizations which were inefficient in a stable price environment. In addition to the lag problem, the first interpretation also creates the usual question of whether the transitional monetary policy was optimal. Could some other policy have utilized more of the unemployed resources during the transition? The mere appearance of un-employed resources does not imply that the Reichsbank's policy was sub-optimal.[34] Indeed, it appears to me that the inflation was sailing so fast out of control in the fall of 1923 that the Reichsbank's only choice was to throw out as heavy an anchor as possible, hoping it would catch hold of something solid. The object to which the mark attached itself was the dollar.

Maintaining the second interpretation of the German data leaves one with the problem of why the organization of industry and of production spawned by the inflation collapsed at this time. Also, the downturn was confined to Germany; none of the other industrialized countries experienced a similar cycle in these years.

In general, I consider that the results of this analysis imply that a large burden is involved in studying optimal transitional policies.[35] If the costs of both steady-state inflation and the transition to stable prices are high, then detailed study of the nature of each cost is necessary before reliable policy recommendations can be made. This is a discouraging prospect, filled with the potential for endless disputes. Sargent attempted to cut through this impasse with an observation that a sudden, resolute shift to a stable price monetary regime can shift an economy at once to a stable price steady state at small cost. If it is true that the transition costs are low, then one need not worry about studying the trade-off between transition costs and inflation costs. However, the evidence that I have presented indicates that there may have been large transition costs in the German case.

The German evidence also illuminates another aspect of this cost trade-off issue. As a basis for arguing that the costs of steady-state inflation may be quite high, Fischer and Modigliani (1978) and Fischer (1980) have added distortions in capital markets which worsen as the inflation rate rises. Such distortions may alter the nature of the capital stock from its stable price state, thereby also making the transition costs higher. Therefore, although the steady-state inflation costs may be higher because of these distortions, it may be desirable to implement a slower transition process.

Finally, on a more positive note, it appears from the German evidence that the "credibility" problem was not an important factor in the transition. Inflationary expectations seem to have been consistently correct prior to the realization of the large transitional costs.

Notes

[1]More accurately, a general direction of research has been toward determining the least painful method to reduce the current inflation rates. See e.g., Okun (1978), Taylor (1979), Sargent (1980), Fellner (1979, 1980), McCallum (1980), Gordon (1981).

[2]Working from entirely different frameworks these include Okun (1978), Perry (1978), Fellner (1979), Taylor (1980), Cagan (1980).

[3]Such suggestions are not readily found in the writings of academic economists. They seem confined to some economists in the policy recommendation and forecasting business.

[4]See Lucas (1980) for discussion of this gap in knowledge.

[5]Even very similar theories yield different conclusions about the effect of sudden shifts to non-inflationary policies. For instance, a flexible price model with a Lucas-type supply function would respond to such a change differently in the case of purely rational expectations from the case of Bayesian learning about the new policy.

[6]Gordon (1981) has studied 14 different episodes, including the U.S., Great Britain, Germany, France, and Switerland, in which policies having the effect of reducing the inflation rate were implemented. Examining subsequent movements in prices and real income, he has found fairly large negative real effects, especially for the U.S. cases.

[7]The bulk of Sargent's paper concerns the steps followed to bring about a sudden, successful stabilization rather than the real effects of such steps. With this analysis I have little disagreement.

[8]With this shift in the rate of return on money, there was an increased
demand for real balances which was satisfied in each case by continued rapid
money creation on the part of central banks. These once and for all gains
in revenue were used to finance the governments until they could shift the
public finance regime.

[9]Graham (pp. 197-202) discusses the differential movements in the whole-
sale and cost of living price indices. The Statistisches Reichsamt (1925,
p. 21) also broke the WPI into "Industry Inputs" and "Foods" through 1923.
Data for these categories in 1924 are available in Statistisches Reichsamt,
Jahrbuch fur das Deutsche Reich, 1924, p. 265. The pattern of the
ratio of the "Industry Inputs" price to the CLI price is identical to
that in Table 1. The pattern of the ratio of the "Industry Inputs" price
to the "Foods" price is erratic. High in 1920, this price ratio fell in
1921 and did not begin to rise until the end of 1922. The ratio reached its
highest level in 1923 and declined throughout 1924.

[10]The industries to which I refer as Capital Goods Industries are listed
in the references as "Produktionsmittel industrien." They consist primarily
of heavy industries: coal, electricity generation, steel and metals, chemical
products, construction materials, construction industries, machine construction,
and electrical installations. The consumer goods industries, listed as
"Verbrauchsgüterindustrien", consist of producers of food, drink, clothing,
cleaning, and tobacco. Due to data inconsistencies furniture, glassware,
kitchen utensils and luxury goods are excluded.

Some crude evidence that the investment good industry was capital
intensive is provided in Vierteljahrshefte zur Konjunturforschung, 1927,
Heft 4, p. 18. An attempt was made to measure the amount of capital in
each industry in 1925 by measuring the total horsepower associated with

it. For the investment goods industry, labor employed was 6.7 million persons and available horsepower was 13.6 million. For the consumption goods industry, employment was 5.9 million persons while horsepower was 4.5 million. Interpreting horsepower as capital implies that the investment goods industry was relatively capital intensive, at least in 1925.

[11]Bresciani-Turroni (1937, p. 371) cites the same source to make a similar point. He does not include the data for 1919, information which destroys the monotonic rise of labor in the capital goods industry during the inflation. However, there was a large inflation in 1919. Bresciani-Turroni (pp. 198-199) also describes the flow of labor into particular heavy industries, mentioning an opinion at the time that the shift in output composition was without historical precedent.

[12]See Bresciani-Turroni (pp. 196-98) or Graham (p. 11, p. 181, p. 281).

[13]See Angell (1929, pp. 46-7).

[14]In addition to being a monetary experiment, the German inflation was an experiment in the organization of industry. In the course of four years the economy shifted from a rather decentralized to a very centralized organization and back in the absence of underlying technological change. The driving factors were the monetary and subsidy policies of the central bank and government. For some discussion of the details of German industrial organization see National Industrial Conference Board (1931), Brady (1933), or Feldman (1977).

[15]See Angell (pp. 45-54) or Bresciani-Turroni (pp. 203-212).

[16]The structure of management and the nature of entrepreneurship also changed substantially. Production and marketing became secondary activities relative to finance. Financial personnel, with the ability to be creatively short on money during inflation, seem to earn large rents during such periods. See Bresciani-Turroni (pp. 295-298).

[17]Bresciani-Turroni (p. 196); Graham (pp. 306-310).

[18]Bresciani-Turroni (pp. 75-78); Graham (pp. 61-66). By August 1923, a constant value clause was added to the loans made by the Reichsbank to private individuals. A borrower had to repay the nominal principal of a loan plus an additional 80 percent of the depreciation of the principal in terms of sterling. If the depreciation rate of the mark were great enough and the discount rate were low enough, as in the fall of 1923, the loans would still represent a substantial subsidy. However, the borrower did take some risk with these loans; if the exchange rate depreciated faster than the price level rose a borrower could have paid a large real rate.

[19]Bresciani-Turroni (p. 343, p. 209). The Reichsbank exchanged such legally authorized emergency money at a rate of 1 papermark for 1 mark of emergency money. Schacht (1927, p. 106) estimates that the total amount of emergency money in circulation at the end of 1923 equalled the entire Reichsbank note issue.

[20]Why this combination of subsidies should have affected output, relative prices, and wage-rental ratios exactly in this way is unclear. To the extent that the demand for capital goods was subsidized directly, the measured relative market price for capital goods should have risen as in Table 1. The shift in demand to capital goods should have raised the rental rate on existing capital. However, the subsidy should have lowered the rental rate relevant to entrepreneurs as the new capital entered production. The ultimate effect of this policy on the rental-wage ratio is unclear. Also, to the extent that supply of capital goods was subsidized, the measured relative market price should have fallen.

[21]However, real balances were reduced by the gradual withdrawal from circulation of the emergency money, the gold loans, and the foreign currency which had constituted part of the media of exchange during the inflation. See Bresciani-Turroni (pp. 348-9).

[22]For the Reichsbank's viewpoint in making this policy change, see Schacht (pp. 152-162). Schacht states, "Not only the currency, but also the belief in the currency was made stable by this action on the part of the Reichsbank; and the belief was not evoked by long argument and persuasion, but imposed by the act." (p. 157).

[23]For a description of the day money and month money markets, see Northrop (p. 126).

[24]In Flood and Garber (1980) we presented evidence that agents must have been almost certain that a reform would take place just prior to the actual reform in November, 1923. We assumed that the reformed monetary process was non-inflationary for the purpose of our analysis; but the new process could also have been inflationary, as long as it was process consistent.

[25]This is the opinion of Bresciani-Turroni (p. 406) and Schacht (pp. 152-3). See also Flink (p. 124).

[26]The Rentenmarks were phased out during the next 10 years and replaced by Reichsmarks.

[27]Northrop (pp. 28-38) describes in detail the law regulating the Reichsbank. Angell (pp. 61-81) describes the Dawes Plan. See also Flink (pp. 126-49).

[28]The total foreign lending by the end of 1924 was about 1200-1500 million Reichsmarks. See Schmidt (p. 32) or Northrop (p. 176). The official loan was used to pay most of the reparations due for the year 1924-5; see Angell (p. 69).

[29]Among the mechanisms mentioned are positive "psychological factors" (Northrop, p. 176), (Schmidt, p. 32), sales of interests in business firms to foreigners (Schmidt, p. 32), irrational employment of foreign credits and a continued speculative spirit on the part of entrepreneurs (Bresciani-Turroni, p. 406, p. 309), disorganization of the German capital markets and a resulting continuation of the financing of unproductive investment (Flink, p. 153). Flink (pp. 150-171) devotes a chapter to the question. However, the exact mechanism for this postponement remains sketchy.

[30]Bresciani-Turroni (p. 406) contends that most of the bankruptcies occurred in firms formed during the inflation.

[31]Bresciani-Turroni (pp. 388-90); Angell (pp. 82-189).

[32]I do not know if changes in unemployment compensation encouraged this increase, as in the British case.

[33]Bresciani-Turroni quotes from the Report of the Deutsche Bank for 1926: "This crisis is not due to a change in circumstances, but is essentially a phase in the process of deflation which German economic conditions is undergoing after the monetary stabilization."

Graham (pp. 290-91) is not sure whether the 1925-6 downturn should be attributed to the stabilization. Graham is of the opinion that, aside from questions of income distribution, Germany gained on net from the hyper-inflation; so he tends to minimize the connection of this downturn to the inflation. For Bresciani-Turroni's opinion of Graham, see Bresciani-Turroni, (p.401, note).

[34]Nor does it imply that these costs arose from the reform itself. In Flood and Garber (1980) we argue that the reform was endogenous. The inflation had become so extreme in autumn, 1923 that failure to end it immediately would have caused the collapse either of the state or of the monetary economy.

[35]Because of its extreme rates of inflation, there is some doubt that the German episode can greatly illuminate current discussions aimed at reducing a 10-20 percent/year inflation rate. First, the current inflation is not proceeding at such a high rate that it threatens the continued existence of the state or of the monetary economy. Since it is not absolutely imperative that the Fed put an end to the inflation, agents' beliefs about the nature of the money supply process can lag far behind an anti-inflationary shift in policy. Second, there is a different set of institutional arrangements under mild inflation. As an example, the overlapping contract literature is irrelevant for analyzing the real effect of a switch to stable prices from hyperinflation; wage contracts, which had a very short life, were almost continuously re-negotiated. See International Labour Office (pp. 44-73) for a detailed description of such contracts in the German case. The sudden end of the inflation could have had real effects through this channel only for a week or two.

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