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Method

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FORECASTING GROSS NATIONAL PRODUCT AND EMPLOYMENT DURING THE TRANSITION PERIOD

AN EXAMPLE OF THE 'NATION'S BUDGET' METHOD

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1 INTRODUCTION AND SUMMARY

THE PURPOSE OF THIS PAPER is to illustrate a method of forecasting gross national product, employment, and unemployment. During 1945 the writer, as chief of the Fiscal Policy and Program Planning Division of the Office of War Mobilization and Reconversion, obtained from various economists 'projections' of output, income, and employment during the transition period. Using these judgments as points of reference, two projections concerning the period to mid-1947 — referred to in this paper as 'more' and 'less favorable' — were prepared immediately after VJ Day. Of the judgments received, few lay outside the range of estimates spanned by these two projections.

The two projections are presented in Tables 1 and 2, and actual data are presented in Table 3 for comparison.[1] The more favorable projection, the most probable single forecast, greatly overestimates the level of unemployment up to the date this introduction was written (February 1946) for three main reasons:

The possibility that many demobilized members of the armed forces would 'take a rest' before seeking work was overlooked. Since November 1945 the civilian labor force has been temporarily reduced by between 1.5 and 2.0 million persons on this account alone, and unemployment has presumably been reduced by a smaller amount. In addition, the speed of withdrawal of other war-workers from the labor force was underestimated somewhat.

[1] After completion of this manuscript, data through the first half of 1946 were inserted in Table 3.

TABLE 1

Expenditures for Gross National Product: More Favorable Projection

ANNUAL RATES, SEASONALLY ADJUSTED (billions of first-half-of-1945 dollars)

	1940	1 9 4 5				1 9 4 6				1 9 4 7	
		1st Half	6/30–8/15	8/16–9/30	4th Q	1st Q	2nd Q	3rd Q	4th Q	1st Q	2nd Q
Gross national product	124.4	206.2	199.4	180.5	164.6	161.8	165.2	166.3	166.6	169.0	171.1
Government expenditures	21.0	100.7	92.4	73.5	55.5	49.0	43.5	40.2	35.2	32.7	30.7
Federal war expenditures	3.4	87.0	78.1	58.4	39.7	32.6	26.5	22.5	17.0	14.0	11.5
Federal nonwar expenditures	9.4	6.3	6.8	7.5	8.0	8.3	8.6	8.9	9.2	9.4	9.7
State & local expenditures	8.2	7.4	7.5	7.6	7.8	8.1	8.4	8.8	9.0	9.3	9.5
Private capital formation	18.0	4.5	6.0	8.9	12.8	13.3	17.1	19.6	22.2	24.1	25.9
Construction											
Nonfarm residences	3.1	.5	.6	.6	.8	1.1	1.6	2.1	2.7	3.4	3.9
Other, private	2.5	1.5	1.7	1.7	2.0	2.2	2.5	3.1	3.5	3.9	4.2
Producer durable equipment	7.5	4.4	4.8	5.2	6.0	7.0	8.0	9.0	10.0	11.0	11.5
Net inventory change	3.1	–.7	...	2.0	4.0	2.0	3.0	3.0	3.0	2.5	2.5
Net exports	1.8	–1.2	–1.1	–.6	0.0	1.0	2.0	2.5	3.0	3.5	4.0
Consumer expenditures	85.4	101.0	101.0	98.1	96.2	99.5	104.6	106.5	109.2	112.2	114.5
Durable goods	10.6	7.2	7.4	8.6	9.0	10.5	13.0	14.5	16.0	17.0	18.0
Nondurable goods	46.8	62.0	61.8	58.8	57.7	58.2	58.9	58.5	58.6	60.0	60.4
Services (excl. rent)	20.5	25.8	25.8	24.6	23.5	24.8	26.6	27.4	28.4	28.9	29.7
Rent	7.5	6.0	6.0	6.0	6.0	6.0	6.1	6.1	6.2	6.3	6.4
Disposable income	93.8	139.6	136.5	127.5	119.9	120.9	122.5	121.7	121.8	124.8	125.9
EMPLOYMENT AND LABOR FORCE (millions) *											
Civilian employment	46.3	51.6	50.8	49.0	46.1	46.5	49.4	50.4	51.1	52.0	52.5
Armed forces	.6	12.2	12.2	11.8	10.8	8.2	5.3	3.8	3.4	3.2	3.0
Unemployment	7.7	.8	1.1	3.1	6.3	8.1	7.4	7.4	6.7	5.9	5.6
Labor force	54.6	64.6	64.1	63.9	63.2	62.8	62.1	61.6	61.2	61.1	61.1

* These data are conceptually comparable with the *Monthly Report on the Labor Force* data up to June 1945. They are not comparable with the new *MRLF* series which begins in July 1945. In comparing them with the old series, it must be remembered that they are seasonally adjusted, whereas published *MRLF* data are not. See Table 3 below.

TABLE 2

Expenditures for Gross National Product: Less Favorable Projection

	1940	1945				1946				1947	
		1st Half	6/30–8/15	8/16–9/30	4th Q	1st Q	2nd Q	3rd Q	4th Q	1st Q	2nd Q
	ANNUAL RATES, SEASONALLY ADJUSTED (billions of first-half-of-1945 dollars)										
Gross national product	124.4	206.2	199.4	180.5	164.5	161.8	164.0	163.0	160.3	160.0	159.6
Government expenditures	21.0	100.7	92.4	73.5	55.5	49.0	43.5	40.2	35.2	32.7	30.7
Federal war expenditures	3.4	87.0	78.1	58.4	39.7	32.6	26.5	22.5	17.0	14.0	11.5
Federal nonwar expenditures	9.4	6.3	6.8	7.5	8.0	8.3	8.6	8.9	9.2	9.4	9.7
State & local expenditures	8.2	7.4	7.5	7.6	7.8	8.1	8.4	8.8	9.0	9.3	9.5
Private capital formation	18.0	4.5	6.0	8.9	12.8	13.2	16.3	17.2	18.3	19.5	20.7
Construction											
Nonfarm residences	3.1	.5	.6	.6	.8	1.1	1.4	1.6	2.0	2.5	3.0
Other, private	2.5	1.5	1.7	1.7	2.0	2.1	2.4	2.6	2.8	3.0	3.2
Producer durable equipment	7.5	4.4	4.8	5.2	6.0	7.0	8.0	8.5	9.0	9.0	9.0
Net inventory change	3.1	-.7		2.0	4.0	2.0	2.5	2.0	1.5	1.5	1.5
Net exports	1.8	-1.2	-1.1	-.6	.0	1.0	2.0	2.5	3.0	3.5	4.0
Consumer expenditures	85.4	101.0	101.0	98.1	96.2	99.6	104.2	105.6	106.8	107.8	108.2
Durable goods	10.6	7.2	7.4	8.6	9.0	10.5	13.0	14.5	15.0	15.0	15.0
Nondurable goods	46.8	62.0	61.8	58.9	57.7	58.2	58.7	57.9	57.8	58.5	58.4
Services (excl. rent)	20.5	25.8	25.8	24.6	23.5	24.8	26.4	27.0	27.8	28.0	28.4
Rent	7.5	6.0	6.0	6.0	6.0	6.1	6.1	6.2	6.2	6.3	6.4
Disposable income	83.8	139.6	136.5	127.5	119.9	120.9	122.0	120.4	118.8	120.0	119.9
	EMPLOYMENT AND LABOR FORCE (millions) *										
Civilian employment	46.3	51.6	50.8	49.0	46.1	46.5	49.0	49.3	49.0	49.1	48.8
Armed forces	.6	12.2	12.2	11.8	10.8	8.2	5.3	3.8	3.4	3.2	3.0
Unemployment	7.7	.8	1.1	3.1	6.3	8.1	7.8	8.5	8.8	8.8	9.3
Labor force	54.6	64.6	64.1	63.9	63.2	62.8	63.1	61.6	61.2	61.1	61.1

* See note to Table 1.

TABLE 3

Expenditures for Gross National Product: Actual Data [a]

	1945 3rd Q	1945 4th Q	1946 1st Q	1946 2nd Q	1945 3rd Q	1945 4th Q	1946 1st Q	1946 2nd Q
	ANNUAL RATES (billions of current dollars)				SEASONALLY ADJUSTED (billions of first-half-of-1945 dollars)			
Gross national product	198.2	185.2	182.2	189.6	195.4	179.1	174.4	176.7
Government expenditures	81.0	57.2	39.1	36.0	79.6	52.7	34.5	30.2
Federal war expenditures	66.4	42.6	23.7	19.0				
Federal nonwar expenditures	6.6	6.7	7.1	8.5				
State & local expenditures	7.9	8.0	8.2	8.5				
Private capital formation	11.2	15.0	22.2	31.6	11.1	14.9	21.0	28.6
Construction	2.8	3.6	6.4	7.7	2.7	3.4	5.8	6.8
Producer durable equipment	6.7	8.3	9.5	12.0	6.7	8.3	9.2	11.1
Net inventory change	.3	.8	2.7	4.5	.3	.8	2.6	4.3
Net exports	1.4	2.4	3.7	7.4	1.4	2.4	3.4	6.4
Consumer expenditures	106.0	113.0	120.9	122.0	104.7	111.5	118.9	117.9
Durable goods	7.4	9.0	11.6	13.0				
Nondurable goods	65.1	70.6	75.1	74.0				
Services	33.5	33.3	34.2	35.0				
Disposable income	137.9	136.9	138.0	141.8	136.2	135.1	135.7	137.0
EMPLOYMENT AND LABOR FORCE (millions) [b]								
Civilian employment	49.8	49.5	51.2	52.9				
Armed forces	11.9	8.8	5.0	3.3				
Unemployment	1.3	2.0	2.7	2.6				
Labor force	63.0	60.3	58.9	58.8				

[a] Output and income data in current dollars are Department of Commerce estimates as of December 30, 1946; deflated data in 1944 dollars, by John Kendrick, were shifted to first-half of 1945 prices.
[b] These data are derived from *Monthly Report on the Labor Force* data.

Quarterly averages were derived by interpolation between *MRLF* dates. Rough unofficial adjustments were made to allow for seasonal factors and to put *MRLF* data on a level comparable with the old *MRLF* series, i.e., prior to July 1945, on which the projections were based.

Workers were retained by consumer durable goods industries during the reconversion period — presumably stimulated in part by the fact that until the end of 1945 corporations in excess profits tax brackets could increase their expenditures for labor at a net cost after taxes of only 14.5 percent of the wage bill paid. Employment during the last quarter of 1945 was probably underestimated by not far from one million on this account.

The rise relative to income in consumer expenditures for non-durable goods, especially food, after VJ Day was seriously underestimated.

There were other less important (and in part offsetting) sources of error. The first two are temporary, the third of uncertain duration, and possibly permanent. Largely because of it (and because of the multiplier effect upon income and output) the projected estimates of unemployment will almost certainly considerably overstate the actual level between February 1946 and mid-1947, the terminal date of the forecasts.

These errors are not due, in my judgment, to the method. The projections are therefore presented in the belief that the inaccuracies of forecast do not decrease the value of the paper as an exposition of a method — but rather serve as a warning of pitfalls that must be guarded against.

Though the projections have been referred to above as forecasts, the term is inaccurate in two respects. First, the estimate of governmental expenditures for goods and services does not include any allowance for extraordinary expenditures undertaken to relieve unemployment, since one purpose of the estimates was to show whether any such expenditures might in fact be needed. Second, the unemployment estimate was designed to measure the slack in the economy rather than to forecast recorded unemployment. Had unemployment risen as the projections indicate, productivity would probably have decreased (more than the amount reflected in the estimates) as a result of the private boondoggling which tends to increase with unemployment, such as door-to-door selling, subsistence farming, and the opening of small service shops by persons who would otherwise be unemployed. For this reason the estimates of unemployment are not conceptually entirely comparable with unemployment as recorded by the *Monthly Report on the Labor Force*. Under the conditions forecast, the estimates presented here would be higher than *MRLF* would show.

The method used in making the projections is essentially the one presented by Arthur Smithies in his article, 'Forecasting Postwar Demand'.[2] Total expenditures for goods and services for each period were divided into two groups, autonomous and induced. The autonomous were those which in that period were judged to be insensitive to the level of gross national product or that could be estimated, to a first approximation, independently of the precise level of gross national product; they are not necessarily autonomous in any causal sense. The induced are those which were to be estimated primarily from the level of gross national product. A function was derived relating the induced expenditures to the level of gross national product (hence implicitly relating them to the level of autonomous expenditures); from this function and the estimate of autonomous expenditures, gross national product was estimated. Civilian employment was then estimated on the basis of estimates of productivity and hours of work. Finally, the labor force and the level of unemployment were estimated, taking into account the influence of the level of demand for labor upon the size of the labor force.

Consumers' expenditures, except on durable goods and rent, were considered to be a function of individuals' disposable income. Disposable income in turn was derived as a function of gross national product under assumed changes in tax structure and unemployment benefit payments.

Governmental expenditures for goods and services, assumed to be the same as in peacetime but expanding after the war, including interest on the public debt, plus the continuing war expenditures on goods and services, were estimated independently of the level of gross national product. Business expenditures for private capital formation, although dependent in part on the general level of business activity and subject to many other specific influences were treated as autonomous factors.

2 Consumers' Expenditures

The first step in computing consumers' expenditures on goods and services was to derive functions relating disposable income

[2] *Econometrica*, January 1945, pp. 1–14.

to gross national product.[3] For each half year, July 1945 to July 1947, three levels of gross national product were assumed: $140, $160, and $180 billion. For each level the corresponding disposable income was computed and a linear function determined by the three points. The estimates of disposable income for each level of GNP were computed by the appropriate deduction from or addition to GNP of the items discussed below:

Corporate profits before taxes were assumed to bear the same linear relation to gross private product during the reconversion period as in 1929–44. (Income originating in government, i.e., wages and salaries of government employees (including the armed forces) plus interest on the public debt, was estimated for each half year and subtracted from gross national product to give gross private product.)

Corporate profits taxes were computed from corporate profits on the basis of wartime experience.[4]

Federal excises and customs were computed on the assumption that wartime excise tax rates would be lowered to their 1942 levels effective February 1946, and effective in 1947 would be further lowered to reduce their yield by $1 billion at the level of $140 billion income payments. Tax returns at the 1942 rates are a function of consumers' expenditures and, therefore, of disposable income.

Business reserves were assumed to remain at 1945 levels minus $.1 billion for each reduction of $5 billion in GNP, plus tax refunds.

Transfer payments include war transfer payments to individuals, such as mustering out pay and dependency allowances, and nonwar transfer payments to individuals, including unemployment benefits. Unemployment benefit payments were computed at $500 per person unemployed, the number unemployed at each level being calculated in the manner explained below.

Corporate undivided profits were computed by assuming that they were 50 percent of total profits after taxes when profits were $8 billion or over and progressively less than 50 percent as profits after taxes fell below $8 billion.

[3] This relation was derived by Bureau of the Budget technicians, who cooperated in all other phases of the estimates also.
[4] It was assumed that the excess profits tax would be reduced to 65 percent effective in 1946 and repealed together with the provision for carryback effective in 1947.

Contributions to social insurance funds at each level of gross national product were estimated by members of the Federal Security Agency staff.

Federal personal taxes and nontax payments were computed for each level of gross national product by assuming that the 'normal' tax would be repealed effective in 1946 and that surtax rates would be lowered sufficiently, effective in 1947, to reduce the yield $2.5 billion (or about 15 percent) at a $140 billion level of income payments. This reduction in yield was estimated to be equivalent to that which would be caused by a reduction of 5 percent in each surtax rate.

State and local personal taxes and nontax payments were assumed to remain at 1945 levels.

The data resulting from these computations are presented in Table 4. (They are now out of date in many respects.) From them the following equations relating disposable income of individuals to gross national product were derived (Y_d = disposable income):

1945, 2d half	$Y_d = 41.8 + .475$ GNP
1946, 1st half	$Y_d = 45.2 + .468$ GNP
1946, 2d half	$Y_d = 43.0 + .473$ GNP
1947, 1st half	$Y_d = 35.4 + .523$ GNP

Using data for 1929–40, technicians of the Business Statistics Unit of the Department of Commerce computed the relation between consumers' expenditures and disposable income shown here. Data are expressed in billions of dollars (T = the year in question).

Consumers' expenditures on nondurable goods = $3.51 - .095 (T - 1935) + .427 Y_d$
Consumers' expenditures on services excl. rent = $4.04 - .003 (T - 1935) + .2 \quad Y_d$

Substituting in the equations relating disposable income to gross national product, we get the following equations:

1945, 2d half	Expenditures on nondurable goods and services	= $34.7 + .298$ GNP
1946, 1st half	" " " " " "	= $36.9 + .294$ GNP
1946, 2d half	" " " " " "	= $35.5 + .297$ GNP
1947, 1st half	" " " " " "	= $31.3 + .329$ GNP

These equations describe normal consumers' expenditures on nondurable goods and services other than rent as a function of gross national product during this period. Variations from the normal pattern during the transition were treated as autonomous factors. During the war expenditures on services were far below 'normal', $6 billion less than in the first half of 1945. It

TABLE 4

Relation between Gross National Product and Disposable Income

By half years, July 1945–June 1947 (billions of first-half-of-1945 dollars, annual rates)

	1945 SECOND HALF			1946 FIRST HALF			1946 SECOND HALF			1947 FIRST HALF		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1 Income from GNP	140.0	160.0	180.0	140.0	160.0	180.0	140.0	160.0	180.0	140.0	160.0	180.0
2 Fed. corporate taxes	5.4	8.6	11.4	4.4	7.6	10.2	4.9	6.9	10.5	5.8	7.5	8.9
3 Fed. excise & customs taxes	5.7	6.1	6.3	4.8	5.4	5.8	4.2	4.8	5.2	4.0	4.5	4.8
4 State & local business taxes	7.4	7.9	8.3	7.4	7.9	8.3	7.4	7.9	8.3	7.4	7.9	8.3
5 Business reserves	10.4	10.8	11.2	9.6	10.0	10.4	9.6	10.0	10.4	9.2	9.6	10.0
6 Net national income (1 − 2 − 3 − 4 − 5)	111.1	126.6	142.8	113.8	129.1	145.3	113.9	130.4	145.6	113.6	130.5	148.0
7 Fed. transfer payments	15.1	12.3	9.7	14.9	12.0	9.0	14.1	10.9	7.7	12.9	9.7	6.4
8 State & local transfer payments	1.1	1.0	.9	1.1	1.0	.9	1.1	1.0	.9	1.1	1.0	.9
9 Corporate undivided profits	2.0	2.8	4.0	3.6	4.5	5.0	3.9	4.9	5.4	4.0	5.1	5.5
Contributions to:												
10 Fed. social insurance funds	2.6	2.9	3.2	2.5	2.8	3.2	2.3	2.6	2.9	2.1	2.4	2.8
11 State & local insurance funds	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4
12 Income payments to individuals (6 + 7 + 8 − 9 − 10 − 11)	122.3	133.8	145.8	123.3	134.4	146.6	132.5	134.4	145.5	121.1	133.3	146.6
13 Fed. personal taxes & nontax payments	12.1	14.3	16.5	10.7	12.7	15.2	11.4	13.6	15.4	9.6	12.1	14.0
14 State & local personal taxes & nontax payments	1.9	1.9	2.0	1.9	1.9	2.0	1.9	1.9	2.0	1.9	1.9	2.0
15 Disposable income (12 − 13 − 14)	108.3	117.6	127.3	110.7	119.8	129.4	109.2	118.9	128.1	109.6	119.3	130.6
16 Profits before taxes	10.5	15.0	19.6	11.9	16.5	21.1	12.8	17.4	22.0	14.0	18.5	23.0

Assumption: Relatively optimistic capital formation, revised tax legislation.

Col. 1, 4, 7, and 10, on the assumption that GNP = $140 billion; col. 2, 5, 8, and 11, that GNP = $160 billion; col. 3, 6, 9, and 12, that GNP = $180 billion.

was assumed that part of the deficiency was caused by a shortage of labor and facilities, which cannot be made up immediately; that the deficiency will be made up by the fourth quarter of 1946; and that expenditures will be $0.5 billion above the function in the second quarter of 1947.

In the more favorable pattern it was assumed that expenditures for nondurable goods would be $2 billion above the function throughout the period because of deferred demand and accumulated savings. In the less favorable pattern it was assumed that, because of increased maintenance of expenditures out of savings when unemployment is greater, consumers' expenditures on nondurable goods would be $2.5 billion above the function for the last quarter of 1946 and the first half of 1947.

Through the first half of 1947, consumers' expenditures on durable goods were assumed to be limited largely by supply, although for many individual items demand will limit the sales. Throughout the period the entire group was treated as autonomous. During the first half of 1946 the expenditures for consumer durables as a whole are below the normal relation. Expenditures rise above the normal relation in the third quarter of 1946 and are $3 billion above it by the second quarter of 1947 in the more favorable model and $1 billion above it in the less favorable model. The estimate of consumers' expenditures on durable goods in the favorable model is consistent with sales to consumers at an annual rate of 4.5 million automobiles in the third quarter of 1946 and of 6 million automobiles in 1947.

3 GOVERNMENTAL EXPENDITURES

Governmental expenditures for goods and services, estimated by members of the Bureau of the Budget staff, include only the normal expenditures for public works, and do not allow for emergency public works, which would presumably be undertaken to meet serious unemployment.[5]

4 PRIVATE GROSS CAPITAL FORMATION

The bases for estimating private gross capital formation are even less firm than those for the other sectors of the economy.

[5] In case of serious unemployment, some types of public construction could be undertaken — in general construction other than building — that would not compete for scarce materials.

Consequently, the differences of opinion on the probable mag-
nitude of the expenditures are greatest here. In the more favor-
able model for each category an estimate of expenditures at or
close to the largest that seemed defensible at the time was used.

A high degree of business confidence was assumed and a will-
ingness on the part of business men to use their accumulated
reserves for large new investment expenditures on plant and
equipment. In the less favorable model it was assumed that the
high level of unemployment in the first half of 1946 would have
a dampening effect on new investment, that the construction
industry would not be able to organize for as much residential
and nonresidential building as was assumed in the more favor-
able model, and that as business activity fell off, inventory ac-
cumulation would be less.

The estimate of total private construction was based upon
forecasts of construction activity made by analysts of the De-
partment of Commerce and of the Bureau of Labor Statistics.
Both forecasts assumed that the sole bar to construction ex-
penditures would be the ability of the construction industry to
reorganize and expand its output rapidly.

The demand for business plant and equipment cannot be
judged without evaluating business needs at the war's end.
'Plant and equipment' includes all private construction other
than housing and all equipment used in business. Many persons
think of manufacturers as the chief purchasers of plant and
equipment, but before World War II only one-fourth of all in-
vestment in plant and equipment was made by manufacturing
industries; three-fourths were by wholesalers and retailers,
service trades, railroads, public utilities, farmers, etc.

During the war billions of dollars were expended for plant and
equipment in war industries, but such expenditures by other
industries were severely limited by the controls of the War Pro-
duction Board. Analysts disagree concerning the extent of the
deficiencies that have developed. No conclusive evidence from
which to form a final quantitative judgment was available, but
existing information justified the belief that demand for plant
and equipment during the transition years will be substantially
above prewar levels. The following analyses and surveys pointed
in this direction.

A Department of Commerce analysis of purchases of plant and equipment before and during the war indicates that in some manufacturing industries, and in many other fields, construction during the war was much less than in the several prewar years.[6] This is true of food products; textiles; apparel; leather products; pulp, paper, and printing; stone, clay, and glass; and lumber products, which accounted for 44 percent of all manufacturing construction before the war. It is true also of commercial construction and of miscellaneous private community facilities. The value of wartime farm construction just equaled that before the war.

The analysis indicates also that during the war purchases of business vehicles (automobiles, trucks, and buses), of many types of manufacturing machinery, and of miscellaneous subsidiary machinery and equipment were much smaller than before the war.[7] Since the industries whose purchases were curtailed during the war will have a postwar business far greater than in 1940, an unusual demand for plant and equipment seems certain.

Scattered evidence indicates that farmers will be in the market for plant and equipment in amounts considerably exceeding their prewar purchases, unless farm income is seriously depressed.

A survey of the investment plans of railroads for 'the year following VE Day' indicated plans for investment of $800 million, twice the average for 1937–40.[8]

Before VE Day the Department of Commerce requested a sample of manufacturers to report the amount of new plant and equipment they expected to purchase during the year following victory in Europe and their expected sales. Sales expectations were well below the present level, in fact, they were those to be expected at a level of gross national product of only $150 billion, 25 percent below the 1944 level. Nevertheless, manufacturers

[6] D. Stevens Wilson, 'Wartime Construction and Plant Expansion', *Survey of Current Business*, Oct. 1944. The periods compared are January 1937–June 1940 and July 1940–December 1943.

[7] Manufacturing machinery and 'other machinery and equipment' are not separated in the published data. The statement in the text is based upon unpublished estimates.

[8] D. Stevens Wilson, 'Planned Capital Outlays and Financing', *Survey of Current Business*, July 1945. A parallel survey indicated investment by electric and gas utilities only slightly above the average during 1937–40.

expected to invest $4.5 billion in plant and equipment, 2.5 times the dollar value of their average annual investment in 1929–40. In all probability, manufacturers did not indicate the entire amount of investment they planned in preparation for postwar business, for some must have intended to postpone investment until materials should be readily available. If, as is probable, manufacturers find their sales during early postwar years exceeding their expectations at the time of the survey, they will tend to increase investment.

From these bits of evidence an estimate of total investment in plant and equipment during the transition years was built. It was thought that the expectations of manufacturers might be roughly typical of those for the entire economic system, since, like the economy as a whole, manufacturing contains both industries that accumulated a surplus of plant and equipment during the war and industries that were unable to make deficiencies good. Total investment in plant and equipment in 1929 and also in 1937–40 was about four times that in manufacturing. Since manufacturers plan to invest $4.5 billion, the 4 to 1 ratio suggested that total investment may reach $18 billion. If plans of manufacturers expressed in the survey understate the total they will actually make in preparation for postwar business, and if other investment is proportionately high, the total will be well above $18 billion. Not all will occur in any one year, however, and several billion dollars of needs may be satisfied by the purchase of war surpluses. After allowance for these factors, $15 or $16 billion seemed not an unduly optimistic estimate of total investment in newly produced plant and equipment in the first postwar year during which materials are freely available. Rough guesses concerning the investment by nonmanufacturing industries in which investment has been restricted during the war yielded a'range of estimates whose upper limit is consistent with this total.

The rate of net inventory accumulation was based upon estimates of inventory deficiencies at the war's end and the extent to which a high level of final purchases and continuing shortages would retard the return of the prewar relations between trade inventories and sales. Department of Commerce technicians estimated inventory deficiencies at the end of 1944 on the basis of the relations of (a) manufacturers' value of in-

ventories to gross national product, (b) retailers' and whole-salers' inventories to the disposable income of individuals.

Extrapolations based on these relations indicated an inventory deficiency at the end of 1944 of about $11 billion — $8 billion in manufacturing and about $3 billion in trade inventories — without allowance, on the one hand, for war goods inventories in the hands of manufacturers that will not be usable, and on the other, for surplus materials in the possession of procurement agencies which may be purchased by business enterprises. The Department of Commerce had estimated book value of war inventories in manufacturers' hands at the end of the first quarter of 1945 to be $9.7 billion, $6.7 billion in durable goods industries, $3.0 billion in nondurable.

	DURABLE GOODS INDUSTRIES	NONDURABLE GOODS INDUSTRIES
	($ billion)	
Raw materials and goods in process	5.3	2.0
Finished goods	1.4	1.0
Total	6.7	3.0

The Department of Commerce had also estimated that procurement agencies had on hand in the United States inventories suitable for civilian use with a cost value of $10 billion.

The estimate of net exports was based largely upon judgment concerning the funds likely to be available to finance foreign demands for American goods for relief and rehabilitation. Since these funds will certainly be government loans, the estimate is the same in both models.

5 GROSS NATIONAL PRODUCT

Having estimated the autonomous expenditures for each quarter year, it is easy to compute the gross national product and the induced expenditures for the same period, using the equations derived as described in Section 2. For example, in our favorable model for the first quarter of 1946 gross national product is $161.8 billion.

COMPONENT	$ BILLION
Government expenditures	49.0
Private capital formation	13.3
Consumers' expenditures on durable goods	10.5
Rent	6.0
Consumer expenditures on nondurable goods & services (excl. rent)	36.9 + .294 GNP
Variation from normal	−1.5
Gross National Product	114.2 + .294 GNP = $161.8 billion
Consumer expenditures on Nondurable goods	23.9 + .2 GNP + 2 = $58.2 billion
Services (excl. rent)	13.1 + .094 GNP − 3.5 = $24.8 billion

The projections are in first-half-of-1945 prices. In making the estimates for the autonomous items, it was assumed that the prices would be the same as in the first half of 1945, or, in the case of commodities not made in the first half of 1945, at prices which when introduced into the appropriate price indexes would leave them at the first-half-of-1945 level. Essentially this amounts to the assumption that demand for products whose prices are expected to change is inelastic. Actually, changes in price relations would affect not merely demand for individual products, but total demand as well. For example, if the prices of construction and of durable goods advanced moderately, real demand for them in 1946 would probably be reduced little if any, and at the level of unemployment estimated in the projections the increase in income originating in the construction and durable goods industries would probably swell purchases and employment elsewhere. However, in the absence of any real basis for estimating price changes in the transition period, the effect of relative price changes was ignored in this first forecast.

6 EMPLOYMENT AND LABOR FORCE

To estimate employment from output estimates involves judgment concerning the length of the workweek and the level of productivity. Output per manhour during the reconversion period will be subject to many conflicting influences, some tending to increase, others to decrease it. Shortening the workweek, which will reduce fatigue, the withdrawal from the labor force of some less efficient workers, and the return to the civilian labor force of the physically most vigorous segment of the population will all tend to increase productivity. The replacement of worn and obsolete machinery and the introduction of improved techniques will bring even greater increases. On the other hand, the addition of workers in many undermanned trade and service industries will increase employment without increasing output. Temporarily, transitional shifts in personnel and changes in methods and products will lower output per manhour. And the decline in munitions output will reduce total national output with a less than corresponding reduction in manhours of employment, since the value of output per manhour in the munitions industries (as in the peacetime durable goods industries) has undoubtedly been somewhat higher than in the economy as a whole.

Balancing these considerations, it was estimated that absorption of a million workers in agriculture and in making good undermanning in several nonagricultural industries would result in a 2 percent decline in output per manhour, and that output per manhour would fall an additional 4 percent due to the reduction in munitions output and to disturbances associated with the transition to peacetime production and a peacetime labor force. The combined effect of these factors is to reduce civilian output per manhour 6 percent from the first half of 1945 to the third quarter of 1946.

Weekly hours of work in nonagricultural private employment were assumed to fall 10 percent from the first half of 1945 to the fourth quarter of 1946, or from 44.6 to 40 hours per week.

A quarterly index of output per worker, constructed on the basis of these judgments, was applied to the estimate of output per worker in the first half of 1945, obtained by dividing gross national product, minus wage payments to the armed forces and interest on the public debt, by the estimated civilian employment. The resulting estimate of output per worker for each quarter was divided into the adjusted gross national product for the same quarter to give estimated civilian employment.

The number of persons in the armed forces was estimated on the basis of demobilization schedules submitted by the military departments.

The estimated change in the labor force was based on judgment concerning the speed with which the wartime extras would leave the labor market. Unemployment is then a residual figure, though in estimating the speed with which wartime 'extra' workers will leave the labor force, the level of unemployment was taken into account.

COMMENT

W. S. WOYTINSKY

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Mr. Colm's definition of 'full employment' as a situation in which there are at least as many unfilled work vacancies as applicants for jobs is not satisfactory.[1] According to this definition,

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[1] For Mr. Colm's definition, presented originally in discussion, see his reply below.