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Anwar Shaikh PhD

Ara Khanjian PhD

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Paul Cooney 569-3959

Chapter I

Historical Development

In this chapter we first will discuss the historical development of the calculation methods of the value and price rates of surplus value. Then we will define and discuss production, non production sectors and productive, unproductive labor.

Value Rate of Surplus Value

According to Marx the value of a commodity is equal to the value of raw materials used during the production, plus the depreciation of plant and equipment, plus the amount of living labor required during the production of this product. Marx called the labor required to produce constant capital, which is equal to the raw materials and the depreciated machinery, "dead" labor. It is "dead" labor, because the raw materials and the depreciated machinery were produced in the past. The labor used up during the production of the product Marx called "living" labor. Therefore we could say that the value of a product is equal to the amount of "dead" and "living" labor required for its production.

After calculating the labor values of each product, we need to determine the size of the bundle of commodities consumed by the workers. When we multiply the amount of each commodity consumed by the workers by its labor value we will

get the total labor value embodied in the commodities consumed by the workers. Marx called this total labor value, variable capital. It represents the amount of labor time required for the reproduction of the workers.

Similarly when we find out the amount of different commodities which make up the surplus product, then we could multiply each one of these commodities by its labor power and we get the total labor value embodied in these commodities, which Marx called the surplus value.

Therefore, in order to calculate constant capital, variable capital and surplus value, we must first calculate the labor value of each commodity produced in the economy.

Empirically the calculation of the labor values was a difficult task, because of problems involved in calculating the amount of "dead" labor required for the production of a product. The mathematical knowledge during Marx's period wasn't enough to solve this problem. However, economists and mathematicians who lived after Marx formulated the necessary methods and subsequently calculated labor values.

The first person who made a contribution in this area was a Russian mathematical economist, Vladimir Karpovich Dmitriev, who lived from 1868 to 1913. In his essay "The theory of value of David Ricardo"[1] Dmitriev asks, "how is it possible to calculate the amount of labor expended for the production of a given economic good from the very beginning of history, when man managed without capital, down to the present time."[2]

Dmitriev showed that during the calculation of total labor expended for the production of a commodity we don't need to look the past or the beginning of history. The total labor embodied in a commodity represents present labor and not past labor.

Dmitriev answered this question by developing a system of equations.[3] One of these equations is represented by

Na = la + 1/m1*N1 + 1/m2*N2 + ... + 1/mg*Ng Equation (1)

where Na is the amount of direct and indirect labor required to produce one unit of product a. The term "indirect" labor, that Dmitriev is using corresponds to the term "dead" labor that Marx is using, and similarly the term "direct" labor corresponds to "living" labor.

la is the direct labor required for the production of one unit of a.

1/m1 represents the fraction of capital good K1 consumed during the production of product a.

N1 represents the amount of direct and indirect labor required for the production of capital good K1. Therefore the amount of direct and indirect labor required to replace the fraction of capital good K1 consumed during the production of product a is 1/m1*N1.

During the production of product a different "technical" capital goods K1, K2, ..., Kg are being used. The explanation of the other terms of equation (1) is similar to the explanation of 1/m1*N1.

In equation (1) la, m1, m2, ..., mg are given by the technical conditions of the production process. therefore in equation (1) we have (g+1) unknowns, Na, N1, N2, ..., Ng. In order to solve equation (1) Dmitriev generates g other equations. Each equation represents the direct and indirect labor requirement, N1, N2, ..., Ng, for the production of "technical capital" goods K1, K2, ..., Kg. Having (g+1) unknowns and (g+1) equations Dmitriev is able to solve the system of equations, "we obtain a system of (g+1) equations with (g+1) unknowns (Na, N1, N2, ..., Ng) which is always adequate for the determination of N, giving the required sum of labor expended on the production of the product a. Therefore, without any digressions into the prehistoric times of the first inception of technical capital, we can always find the total sum of the labor directly and indirectly expended on the production of any product under present-day production conditions, both of this product itself and of those capital goods involved in its production."[4]

The calculation of the direct and indirect labor time was formalized and generalized into direct and indirect input requirements by Wassily Leontief.[5]

During early 1920's Leontief was a student in Russia, and in 1925 he published his first ideas.[6] It is quite probable that as a student Leontief was influenced and was familiar with the work of Dmitriev who had died in 1913.

The input-output model is conceptually close to the

planning technique of material balances that Soviet planners were using since the 1920's. They use this planning technique to generate plans where the planned net output is consistent with planned gross output, or where there are no significant bottlenecks.[7]

The I-O tables, which have sections on intermediate consumption, final demand, and value added provide a more detailed picture of the economy than the Keynesian framework which is exclusively based on final demand and value added.

There are significant similarities between the I-O model and the schemes of reproductions of Marx. According to Morishima "Moreover, Marx's theory of reproduction is very similar to Leontief's input-output analysis. (or more correctly, we should say conversely that Leontief reproduced Marx as well as Walras in a pragmatic way.)".[8]

Some of the assumptions of the two models are similar, such as both models assume that no substitution among inputs is possible in the production of any product. And the level of output uniquely determines the level of each input required. This similarity is interesting because some intermediate microeconomic textbooks call L shape isoquants Leontief isoquants,[9] while other textbooks, such as Layard's and Walters' call them Marx-Leontief isoquants.[10]

Oskar Lange, using a very simple economy, shows the similarities between the two methods in an interesting way. He divides the economy into two sectors, and describes it first

through the schemes of reproduction and then through an input-output table.[11]

Similar to Marx, Lange divides the whole economy into two departments: department I representing the production of means of production and department II representing the production of consumer goods. He starts with an aggregated, two sector, Leontief input-output table and transforms this I-O table into a Marxian scheme of reproduction with two departments. In order to generate this result Lange makes some strong assumptions, such as the assumption that each sector has a homogeneous destination which is not observable in a real economy.

A more recent example is that of Michel Juillard who built a reproduction scheme based on the U.S. benchmark I-O tables, without making the strong assumptions of Lange and Morishima.[12] In the first part of his paper, Juillard shows that the expended reproduction presented by Morishima could be considered as a particular case of Leontief's dynamic input-output model.

When we discuss the input-output model we use mainly three different tables or matrices: the input-output table or the transactions table, the technical coefficient matrix, usually called matrix A, and the Leontief inverse matrix, $(I-A)^{-1}$.

One part of the I-O table contains the dollar amounts of intermediate inputs used by the sectors. Another part of the

I-O table represents the final demand and a third part represents the value added.

The technical coefficient matrix A, includes input-output coefficients. They are obtained by dividing the entries in a column of an input-output table, which are an industry's inputs (Xij), by that industry's output (Xj).

$a_{ij} = X_{ij}/X_j$

Each input coefficient aij shows the requirement for a particular input i, per unit of a particular output j. A column of coefficients then gives a detailed quantitative description of the technique of production used by a sector, a sort of recipe for its output, with specifically enumerated inputs as ingredients. As an input-output coefficient table includes a column of input-output coefficients for every sector, it gives a comprehensive structural description of the entire economy for a particular year.

In the Leontief inverse $(I-A)^{-1}$ matrix each element bij incorporates the direct and indirect effects of final demand on production;

bij is the amount of product i required to produce one unit of final demand of product j (this represents the direct effect) + the amount of product i required by other inputs in producing one unit of final demand of product j (this represents the indirect effect).

Thus element bij of the Leontief inverse shows the total output of sector i needed to meet a unit of final demand for

sector j. The matrix is obtained by subtracting the technical coefficient matrix A from the identity matrix and then inverting the result.

One important feature of the $(I-A)^{-1}$ matrix is that, as long as the input coefficients remain the same, the inverse matrix $(I-A)^{-1}$ will not change. Therefore only one matrix inversion needs to be performed during computations.

The Leontief inverse is used in the well known equation;

$X = (I-A)^{-1} Y$ equation (2)

Y is the net production matrix or final demand.

X is the gross production matrix or total output.

Equation (1) could be derived in the following way;

$X = AX + Y$ equation (3)

AX indicates the amount of each industry's output which is used for production.

Equation (3) states that part of the total output X is used for production AX and the remaining part is used for final demand Y. Now we have to ask the following question; given $Y > 0$, can we find $X > 0$ satisfying equation (3).

Equation (3) will have non-negative solutions if all column sums of the coefficient matrix A are less than 1. In other words a sufficient condition for the existence of a solution is that all the industries have positive value added. Another test for the existence of non-negative solutions is the Hawkins-Simon test. This test says that the system will be viable if all principal minors of $(I-A)^{-1}$ are positive. This

implies that the production of one unit of product i should not use more than one unit of product i as direct or indirect input.

Manipulating equation (3) we get;

$Y = X - AX$ equation (4)

When we add the identity matrix I we get;

$Y = IX - AX$ equation (5)

$Y = (I-A)X$ equation (6)

Dividing both sides of equation (6) by (I-A) we get equation (2).

With the development of equation (2) Leontief provided the technical framework to calculate labor values. However his discussion was in terms of employment and employment coefficients, but did not discuss labor values. The calculation of labor values was analyzed by: Morishima and Seton,[13] and by Morishima.[14] In his book Morishima discussed comprehensively the calculation of labor values from I-O tables .

He showed that employment multipliers calculated by mainstream economists, using input-output tables, represent labor values of commodities, "It is clear from the second definition of value that values are not more than the employment multipliers discussed by Kahn and late by Keynes, which can be calculated from Leontief's input-output table."[15]

$lv = l(I-A)^{-1}$ equation 2a

where lv represents labor values.

l is the vector of labor coefficients.

A is the coefficient matrix.

Morishima also demonstrated that "the value of national product equals total employment."[16] In other words the value of value added or final demand of the national economy is equal to the total employment of the production sectors.

Morishima's and Seton's contribution to the discussion of labor values is that they formally demonstrated that as long as we have the necessary data, it is empirically feasible to calculate labor values by using input-output tables, "Thus the accounting in terms of value is 'observable', since it is no more than the calculation in terms of employment. It is now concluded that in an economy where assumptions (a)-(f) hold, values can be calculated unambiguously if necessary empirical data are available."[17]

Once a theoretical framework was available to calculate labor values, the focus of the attention shifted to empirical problems, specifically the type of data that we should use in order to carry out our calculations. Shaikh made a significant contribution in this respect.[18] His arguments affected not only the methods of calculating the value rate of surplus value, but also the price rate of surplus value. Shaikh's method was adopted for the calculation of the rate of surplus value by Amsden, Moseley, and Graham.[19]

Shaikh argued that NIPA's and I-O tables, which are conceptually integrated with NIPA's, are based on Keynesian

categories. Therefore, while they are suitable for mainstream economic models, they are not suitable for Marxian research.

Shaikh initiated a systematic analysis and transformation of NIPA categories, and I-O tables such as value added, final demand, consumption, etc. He discussed NIPA and I-O sectors and made major adjustments with the treatment of some of these sectors, such as trade, rental, finance, government, etc. Also he emphasized the importance of differentiating production from non production sectors and productive from unproductive labor.

After making all the necessary theoretical adjustments Shaikh developed methods to calculate variable capital, constant capital, and surplus value both in value and in price forms. First he developed a method to calculate the annual price rate of surplus values by using adjusted NIPA's.[10] Then he developed a method to calculate the rates of surplus values by using adjusted I-O tables.[21] And finally he developed a method where both I-O tables and NIPA's were used.[22]

The next step was the painstaking task of compiling the necessary data base to calculate the Marxian categories. During the past several years a group of students and teachers, mostly from the Graduate faculty of the New School, and Shaikh being the central figure worked on compiling the data base. Among them Michel Juillard, who before joining the New School worked and compiled data for Wassiley Leontief at the Institute for Economic Analysis, played a crucial role.

Although a data base can always be improved and refined, a comprehensive and reasonably satisfactory Marxian data base is taking shape at the New School. Chapter 3 of this dissertation is making a modest contribution to that data base, specifically with respect to the employment and employee compensation data for the I-O tables.

Shaikh is using this data base to calculate Marxian categories. He aggregated I-O tables and adjusted both I-O tables and NIPA's such that they became suitable for Marxian research. Then he calculated annual rate of surplus value. For those years where there are benchmark I-O tables, Shaikh was able to use adjusted NIPA's and aggregated, adjusted I-O tables interchangeably, because they were compatible with each other.[23]

This dissertation, based on Shaikh's theoretical model of calculating Marxian categories and using the Marxian data base of the New School, calculates the value and price rates of surplus value.

In the U.S. during the past 13 years, Edward N. Wolff published many articles and lately a book on measuring the rate of surplus value and the rate of profit.[24] He developed methods to calculate price and value rates of surplus value. However his methods of calculating surplus value differs with many respects from Shaikh's methods, such as the calculation of variable capital, and the calculation of value added. In chapter 5 of this dissertation we will discuss Wolff's methods

in detail.

Julie Graham calculated the value rate of surplus value following Shaikh's method, however the data base that she is using is significantly different from ours, especially with respect to the I-O tables, employment and employee compensation data.[25]

Outside the U.S. Okishio and Nakatani made a contribution to the calculation of the value rate of surplus value.[26] First they developed a method and then they measured the value rate of surplus value in Japan. They argued that in general, we need imported intermediate goods to produce a product, and then they ask the following question "How should we treat this matter to calculate unit value of each commodity?"[27]

The answer that they give to this question is much different from our answer, because in Japan like in the European countries there are much more elaborate I-O tables. In Japan and in the European countries, each cell of the intermediate goods section of an I-O table contains two elements. One number reflects the amount of domestically produced good i used during the production of good j, and the other number reflects the amount of imported good i used during the production of good j. In other words each I-O table has two square matrices which represents the intermediate inputs: one domestically produced intermediate goods and another imported intermediate goods.

We can't adopt Okishio's and Nakatani's method, because

in the U.S. we don't have matrices of imported intermediate goods. Much less information is available, and we just have vectors of imported goods in U.S. tables. Therefore the method we have adopted is somewhat different. It is discussed in more detail in chapter IV and in Appendix A.

Price Rate of Surplus Value

With respect to the measurement of the price rate of surplus value, the discussion was focused on empirical issues. What kind of data should we use and how should we adjust the published data to make it suitable for the calculation of the price rate of surplus value, the rate of profit and other variables. The discussions and the issues involved with the transformation of NIPA and BEA I-O tables into a data base which is suitable for Marxian research applies to the measurement of both value and price rates of surplus value.

The key publication with regards to the price rate of surplus value is Shaikh's unpublished article of 1978, where he focused on adjusted NIPA's to generate the Marxian categories. In the second part of the paper he applied the method that he presented to calculate the price rate of surplus value. Later Shaikh refined the basic method of calculation, and he introduced I-O tables to calculate the price rate of surplus value.[28]

Prior to Shaikh other economists such as Gillman and Mage had calculated the price rate of surplus value, however they had major weaknesses.[29] The scope of Gillman's study was too limited, since he only used data from the manufacturing industries to calculate the rate of surplus value. Mage didn't define surplus value and constant capital adequately. For example he didn't considered wages and material costs of the trade sector or indirect business taxes as part of surplus value.[30]

A number of Marxian economists have basically adopted Shaikh's method, introducing minor changes. Amsden calculated the price rate of surplus value in 51 countries around the world.[31]

She used United Nations' annual yearbooks of industrial, labor and national account statistics, instead of input-output tables. She divided countries into 3 groups: countries with high levels of per capita income, countries with intermediate levels of per capita income and poor countries. Then she compared and discussed the pattern of the price rate of surplus value among these three groups.

Moseley calculated the price rate of surplus value, in the U.S.[32] During his calculations he used NIPA and BLS annual estimates, not input-output tables. Moseley strongly argued that the right way to calculate variable capital and surplus value is to calculate them in money form. He criticized Wolff, because Wolff was calculating the value rate of surplus value.

This dissertation will demonstrate that Moseley's argument is not valid, because the rate of surplus value can be calculated accurately both in price and value forms.

Productive and Unproductive Labor

During the measurement of the rate of surplus value we will use terms such as productive, unproductive, production, and non production. We will define these terms in this section, which is merely a summary of a much more detailed exposition in Shaikh and Tonak (1988).

We can divide economic activities into four categories: First, production, where new use values are created; second, distribution, where use values are used to distribute use values, such as trading activities; third, social maintenance and reproduction, where use values are used to maintain and reproduce the social order, such as judiciary system and security guards; and fourth, personal consumption, where use values are used for personal consumption, such as eating and drinking.

We can also subdivide each of the first three activities above into three basic social forms under which they can be conducted: first, they can be undertaken for direct use, second, for sale or revenue, and third, for profit. In the case of production, a carpenter could produce chairs for his/her personal use. This activity would represent production

for direct use. When a carpenter produces chairs and sells them for personal revenue, then he/she is producing for revenue. Finally a carpenter could be employed by a furniture company and produce chairs for capitalists. This activity represents production for profit. The production for sale or revenue is associated with petty commodity type of production, while production for profit is associated with capitalist mode of production.

In the case of distribution, when charitable organizations distribute clothing and food, it is distribution for direct use. Sales associated with petty commodity production is distribution for revenue. Retail and wholesale activities associated with the capitalist mode of production are distribution for profit.

Based on this discussion, we can define the criterion for production activities. This criterion is the creation of new use values. When an activity creates new use values, that activity is considered production, and when an activity doesn't create new use value, then it is considered non production.

Labor could be associated with nine different economic activities. There are three types of production labor: labor engaged in production for direct use, for revenue or for profit. There are six types of non production labor: labor engaged in distribution for direct use, for revenue or for profit and labor engaged in social maintenance for direct use,

for revenue or for profit. From all these nine types of labor only one type of labor is productive of surplus value, which is labor engaged in production for profit.

The criterion for labor which is productive, of surplus value are:

- Productive labor is engaged in production. Therefore he/she creates or transforms use values.

- Productive labor is wage labor and is exchanged as variable capital and therefore he/she is employed by capitalists.

Distribution labors or social maintenance labors couldn't be productive labor, because they are not producing. They are distributing, transferring some objects of social use from one set of possessors to another, or they are utilizing objects of social use, use values, to maintain and reproduce the existing social order.

Therefore, only a production labor, labor which creates new use values, could be a productive labor. However, not every production labor is a productive labor, because as we mentioned earlier there are three types of production and only those working for a capital are considered productive of surplus value. Only a productive worker produces surplus value. A distribution worker working for a capitalist doesn't create surplus value but distributes it. On the other hand, a production worker who produces for revenue produces value but not surplus value, and the distribution worker working within

the petty commodity production system distributes value but doesn't distribute surplus value.

It is important to note that the concept of productive labor has nothing to do with necessary and unnecessary labor, good versus bad, or physical vs non physical. All activities which generally are reproduced in a mode of production are necessary for that mode of production. Therefore, if we equate productive labor with necessary labor, then most activities, even eating and drinking, could be considered productive because they are necessary.

The production of weapons is bad, but it is productive of profit. While the distribution of use values to the poor is morally commendable, but it is not productive of profit. With respect to physical and non physical, a song sung by a singer could be considered non physical, however, it is a use value. Therefore a singer who is working within the circuit of capital is considered productive.

Today, in every industrialized or underdeveloped capitalist country, besides production for capital, there is also production for revenue. However, in the U.S., the size of production for revenue relative to the production for capital is very small. Therefore, in this dissertation we assume that all production, distribution and social maintenance occur within the sphere of capital. In third world countries, this assumption would be unjustified to make, because the size of petty commodity production is often significant.

Footnotes Chapter I

1. Dmitriev, 1974. Originally published in Russia in 1904.
2. Ibid., p. 43.
3. Ibid., p. 44.
4. Ibid., p. 44.
5. Leiontief, 1976. Originally published in 1941.
6. Lange, 1962, p. 219.
7. Montias 1959, Treml 1967.
8. Morishima, 1973, p. 3.
9. Sher and Pinola, 1981, p. 57-8.
10. Layard and Walters, 1978, p.265-266.
11. Lange, 1962, p. 214-224.
12. Juillard 1985, Lang 1962, Morishima 1973.
13. Morishima and Seton, 1961.
14. Morishima, 1973.
15. Ibid., p. 18.
16. Ibid., p. 19.
17. Ibid., p. 20.
18. Shaikh, 1978, 1980. Shaikh, Tonak, Kazanas, Graham, 1985. Shaikh and Tonak, 1988.
19. Amsden 1981, Moseley 1982, Graham 1984.
20. Shaikh, 1978.
21. Shaikh, Tonak, Kazanas, Graham, 1985.
22. Shaikh, and Tonak, 1988.
23. Ibid.

24. Wolff, 1987.

25. Graham, 1984.

26. Okishio and Nakatani, 1985.

27. Ibid., p. 3.

28. See Shaikh, 1980. Shaikh, Tonak, Kazanas, Graham 1985.

29. Gillman 1958, Mage 1963.

30. Mage, 1963, p. 164-167.

31. Amsden, 1981.

32. Moseley, 1982, 1985, 1986.

CHAPTER II

The General characteristics of the theoretical model

In this chapter we will build an economic model with four different stages. We start with a level of abstraction where the economy is represented by a few major economic sectors.[1]

We will use this model to test our methods of calculating the value and price rates of surplus value. We start with a very simple economy and calculate the rates of surplus value. Once we see that our methods are not false, we move to another level of abstraction with a complex economy and test the same methods of measuring the rate of surplus value that we used before. If again the tests show that our methods are not wrong, we move to another stage, with an even more complex economy.

We continue this process until we reach the fourth level of abstraction where the model becomes complex enough to include the necessary economic sectors that we use for the calculation of the rates of surplus value. We test our methods of calculation for the fourth time with this most developed stage of our model.

At the first level of abstraction we have a simple economy with two major sectors: production and circulation. The production section represents three sectors: machines, corn and gold. In this model there are only two inputs: machines and labor.

At the second stage of our model we divide the circulation into trade and building rentals sectors. At the

third stage model we add to the second model royalties paid by the producers. At the fourth stage of our model we add royalties paid by consumers.

Throughout this model, when discussing different levels of abstraction we will always divide the total output into the same amounts of constant capital, c, variable capital, v, and surplus value, s. Thus the numerical values of c, v and s will stay the same as we move from model one to model four. This device will help us to verify the accuracy and consistency of our theoretical results.

The discussion of each stage of the model has five parts.

1) writing the equations which represent the division of value in each sector,

2) using these equations to build a corresponding input-output table,

3) calculating 2 value rates of surplus value using the value added and final demand sides of the I-O table,

4) calculating 2 price rates of surplus value using the value added and final demand sides of the I-O table,

5) comparing the results and see if our methods of calculation are accurate.

In all these models we assume that the value of one dollar is one hour of labor time. The aim of this assumption is to make the discussion simple. We can change the value of one dollar without affecting the results of the model.

Based on this assumption, the surplus value in value and

price terms should then be equal. And the variable capital in value and price terms should also be equal. Therefore in each model the value and price rates of surplus value should be the same. If they are not the same then that will imply that there is a mistake in our method of calculation. In other words, in the context of this theoretical model, where the price of 1 hour of labor time is equal to 1 dollar, in order to verify that the method of calculating rates of surplus value is correct it is necessary that the price and value rates are equal.

The discussion of the first level of abstraction of our model will be relatively longer than the other ones, because the other levels are based on the first level.

Stage 1; Production and Trade

Sector 1; machines

During the production process 30 unit of machines, M, and 60 hours of living labor, LL, are used, resulting in an output of 60 machines.

30M + 60LL ---> 60M eq (1)

One dollar is the equivalent of 1 hour of abstract labor. Thus 1$=1hr.

The value of one machine, 1vm, is 2 hours. Thus 1vm=2hrs/ma. The value of constant capital is 2hrs multiplied by 30, which is equal to 60hrs.

The rate of surplus value,s/v is 2, while the living labor, which is the sum of variable capital, and surplus value, (s+v) is equal to 60hrs. When we solve the two equations;

$$s/v = 2 \qquad \text{and} \qquad (s+v) = 60 \text{ hrs}$$

we get the values of v and s.

Now we can write equation (1) in value terms,

$$60c + 20v + 40s = 120\text{hrs} \quad \text{eq (2)}$$

thirty machines represents 60 hours. The 60 hours of living labor represents 20 hours of variable capital,v and 40 hours of surplus value,s. And the 60 machines produced represents 120 hrs.

In price terms the 60c, 20v, and 40s represent \$60c, \$20v, \$40s.

For the sake of illustration we decide that from the \$40 of surplus value only \$10 is appropriated as a profit by the capitalist of the production sector. The remaining \$30 of the surplus value is used in circulation. We could choose other numbers and the basic results of the model will not be affected.

Now we can write equation (2) in price terms.

$$\$60c + \$20v + \$10P = \$90 \quad \text{eq (3)}$$

With the \$30 which is used in the circulation the capitalist buys 6 units of machines and 18 hours of living labor LL.

$$6M + 18LL \quad \text{eq (4)}$$

For the 6M the capitalist pays $12 while for the 18 hrs of LL the capitalist pays only $6 and the remaining $12 out of $30 is appropriated as a profit by the capitalist of the circulation sector.

Now we can write equation (4) in price terms.

$12c + $6v + $12P eq (5)

It is purely coincedental that the sum of $6v and $12 of profit should be equal to the living labor of the trade sector, 18LL. The living labor could have been 24LL, or 28LL. All that is necessary is that constant capital, variable capital and profit of the trade sector should be equal to $30, which is the gross, trading margin. It is "gross" and not "net" trading margin, because it represents the operating expenses plus profits.

Rewriting all the five equations we get.

Production	Circulation (Trade)
30M + 60LL -->60M	6M + 18LL
60c + 20v + 40s =120hrs	
$60c + $20v + $10P = $90	$12c + $6v + $12P =$30

The producer's are producing 60M and are getting only $90. Thus the producer's price is 90/60 $/machin =3/2 $/ma .

The mark up is 30/60 $/ma = 1/2 $/ma .

Producer's price + mark up = purchaser's price.

$3/2 + $1/2 = 2 $/ma .

According to the same logic the following equations can be written for the corn and gold sectors.

Production		Circulation (trade)
corn	6M + 78 -->90 Corn	6M + 36LL
value	12c + 26v + 52s =90hrs	
price	$12 + $26v + $22P =$60	$12c + $12v + $6P =$30

lvc=1hr/corn, producer's price=$2/3, mark up=$1/3,

Gold	0M + 72LL --> 72 Gold	6M + 54LL
value	0c + 24v + 48s =72hrs	
price	$0c + $24v + $12P =$36	$12c + $18v + $6P =$36

lvg=1hr/gold, producer's price=$1/2, mark up=$1/2.

Detailed Description of I-O Table 1

Based on these equations we can construct an I-O table with three production sectors, one circulation sector, a final demand section with two columns, one for consumption and one for inventories, and a value added section with two rows , one for wages and one for profits. See the I-O table 1, and the detailed discussion which follows.

First row: The machine sector is producing 60 machines. The unit producer's price is $3/2. Thus the total output is $90, which is by construction the sum of the elements of the first row.

The machine sector is using 30 machines during production (see equation 1). At the producer's price, $3/2, 30 machines correspond to $45 which is the first element in the first row. The second amount, $9, reflects the use of 6 machines by the

I-O Table 1

Calculation of Value Rate of Surplus Value at Stage 1

	Mach	Corn	Gold	Trade	Cons.	Invest.	Total
Mach	45	9	0	27	0	9	90
Corn	0	0	0	0	60	0	60
Gold	0	0	0	0	36	0	36
Trade	15	3	0	9	66	3	96
Wages	20	26	24	36	0	0	106
Profits	10	22	12	24	0	0	68
Total	90	60	36	96	162	12	456

corn sector. The gold sector doesn't use any machines and so the third element is zero. The trade sector is using 18 machines, 6 machines by the machine sector, 6 by the corn and 6 by the gold. The remaining 6 machines are added to inventories.

Second row: 90 units of corn are produced at $2/3, (which is the unit producer's price), so the total output is $60, which is used by the consumption sector.

Third row: 72 units of gold are produced at $1/2 per unit producer's price, the total output is $36, which is used by the consumption sector.

Fourth row: This row reflects the trading mark up on inputs and output. At this level of abstraction we have divided the economy into production and trade sectors. The trade sector is not a production sector because there is no new use value created. The trade sector takes use-values and transfers them to other sectors. If the trade sector buys a car for $10,000 and sells it for $13,000, then according to I-O methodology only $3,000, the gross trading margin, would be included in the trade sector . The gross trading margin represents operating expenses of the trade sector plus profits.

The machine sector is using 30 machines during production and the mark up on machines is $1/2. Thus the machine sector is paying $15 mark up for the 30 machines. The corn sector is paying $3 mark up for the 6 machines that it is using during

the production. The trade sector is using 18 machines, and so the mark up is $9.

The fifth element of this row is $66, which is the mark up paid by the consumers. Consumers are buying 90 units of corn. The mark up for corn is $1/3. Thus consumers are paying $30 mark up for corn that they are consuming. At the same time consumers are using 72 units of gold. The mark up on gold is $1/2. Thus consumers are paying $35 mark up for gold. The sum of the two $30 + $36 is $66.

Fifth row: This row reflects the wages paid by each sector. Note that the trade sector reflects trading activities related with all the three sectors, machines, corn and gold.

Sixth row: This row reflects the profits.

The sum of wages and profits, the fifth and sixth rows, is equal to the value added, while the sum of consumption and inventories is equal to the final demand. Both value added and final demand are equal to $174. Value added reflects national income, while final demand reflects gross national product.

All the inputs of the trade sector plus the value added of the trade sector should be part of marxian value added in money terms VA^m. When we include the intermediate goods consumed by the trade sector in the VA^m, we might have the impression that there is double counting, but this is not the case.

We will realize that there is no double counting when we examine the existing I-O tables. These tables, which include

the separate trade sector, are in producer's prices. The total of each column and row represents total output of that sector in producers prices. If we eliminate the trade row and distribute the trade margins to the appropriate sectors then we will have totals reflecting purchaser's prices which are higher than producer's prices, since by definition,

Purchaser's price = Producer's price + Trade margin.

And when we eliminate the row and column representing the trade sector, the final demand and value added will increase by the amount of the intermediate goods used by the trade sector. The profit of production sectors will increase by the total of the trade sector.

Calculation of the Rate of Surplus Value

We can calculate the rate of surplus value either using units of money or using units of labor time. In each case we can use two different methods, first using the use or final demand side of an I-O table, second using the output or value added side of an I-O table.

Therefore, there are four different ways of calculating the rate of surplus value, and by using I-O table 1 we will calculate the rate of surplus value in four different ways.

Value Rate of Surplus Value

First we will use the output or value added side of the table. In order to calculate the rate of surplus value we have to calculate variable capital V, Marxian value added VA^ and surplus value SV. However once we know V and VA^ we can get SV by just subtracting V from VA^. Therefore the concern is to calculate V and VA^.

VA^ is relatively easy to calculate, because it is equal to the number of hours of total productive labor, Lp. Variable capital,V is equal to the value of commodities consumed by the productive workers.

V = lv * Conpp

Where lv is the number of hours of direct and indirect labor required to produce one dollar of product i.

And Conpp is the column vector of production outputs consumed by the productive workers.

We will arrive at Conpp by splitting up the consumption column of the I-O table twice. However, before dividing the consumption column we will eliminate the value added row elements in the consumption column, because these elements are always zero, and do not affect our calculations. In table 1, the consumption column Con, without the VA rows, is a (4,1) column vector;

$$Con = \begin{vmatrix} 0 \\ 60 \\ 36 \\ 66 \end{vmatrix}$$

First we will divide the consumption column Con such that we get two (4,1) column vectors. One representing the consumption of the productive workers, Conp and the other representing the consumption of unproductive workers and profit earners, Conu.

$$Con = \begin{vmatrix} & \\ Conp & Conu \\ & \end{vmatrix}$$

We will divide Con by using a ratio, R, which we will get by dividing the wages of the productive workers by the total of the consumption column, Con. In this model we assume, for simplicity in exposition, that all workers in the production sectors are productive.

Wages of productive workers Wp = \$20+\$26+\$24

Wp = \$70

Column total of the consumption column Con=\$162

R = 70/162

Conp= R*Con

$$Conp = (70/162)*\begin{vmatrix} 0 \\ 60 \\ 36 \\ 60 \end{vmatrix} = \begin{vmatrix} 0.0 \\ 26.0 \\ 15.5 \\ 28.5 \end{vmatrix}$$

We could calculate the consumption of unproductive workers and profit earners Conu, by deducting Conp from Con.

$$Conu = Con - Conp = \begin{vmatrix} 0 \\ 60 \\ 36 \\ 60 \end{vmatrix} - \begin{vmatrix} 0.0 \\ 26.0 \\ 15.5 \\ 28.5 \end{vmatrix} = \begin{vmatrix} 0.0 \\ 34.0 \\ 20.5 \\ 31.5 \end{vmatrix}$$

Second, in order to calculate Conpp, we should divide the consumption vector of the productive workers,Conp.

$$Conp = \begin{vmatrix} Conpp \\ \\ Conpu \end{vmatrix}$$

Where Conpu represents purchases by productive workers from non-production sectors.

Based on table 1 $Conpp = \begin{vmatrix} 0.0 \\ 26.0 \\ 15.5 \end{vmatrix}$ and $Conpu = [28.5]$

After all these divisions of the consumption column Con, we obtain;

$$Con = \begin{vmatrix} & \\ Conp & Conu \\ & \end{vmatrix} = \begin{vmatrix} & \\ Conpp & Conu \\ & \end{vmatrix} = \begin{vmatrix} 0.0 & 0.0 \\ 26.0 & 34.0 \\ 15.5 & 20.5 \\ 28.5 & 31.5 \end{vmatrix}$$

Once we know the bundle of production goods consumed by the productive workers, Conpp, then we should calculate the number of hours of direct and indirect labor required to produce each unit of this bundle. In other words, we should calculate the labor values of these commodities, lv.

$lv = l[I - Ap]^{-1}$

where l is the production labor coefficient, and is equal to hours of production labor in production sector i, divided by total output of sector i in $.

Ap is the coefficient matrix of the production sectors.

In our numerical example, labor coefficients of machine sector lm, corn sector lc, and gold sector lg are equal to;

lm = (60hrs/$90) = 2/3 hrs/$

lc = (78hrs/$90) = 13/10 hrs/$

lg = (72hrs/$36) = 2 hrs/$

Thus l = [2/3, 13/10, 2] hrs/$

$$Ap = \begin{vmatrix} 45/90 & 9/60 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{vmatrix} = \begin{vmatrix} 1/2 & 3/20 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{vmatrix}$$

substituting l and Ap in eq I we get

lv=[4/3, 3/2, 2] hrs/$

Once we have lv and Conpp we can calculate variable capital V.

$$V = lv * Conpp = [4/3, 3/2, 2] * \begin{vmatrix} 0.0 \\ 26.0 \\ 15.5 \end{vmatrix}$$

V = (4/3 * 0) + (3/2 * 26) + (2 * 15.5)

V = 70 hrs

Lp, total productive labor, is given by the equations of the model;

Lp = 60 hrs + 78 hrs + 72 hrs

Lp = 210 hrs

SV = Lp - V

SV = 210 - 70 = 140 hrs

SV/V = 140/70 = 2

The value rate of surplus value calculated from the value added side is equal to two, which is what we assumed during construction of this example. This establishes that our value

side calculations correctly recover the true v, s, s/v.

Second we will use the use or final demand side of the I-O table to calculate the value rate of surplus value.. In this case instead of calculating VA^ and V we have to calculate Marxian final demand FD^ and V. The calculation of V does not change. Therefore we just have to calculate FD^.

For the calculation of final demand in value form, FD^, we will focus on the production sectors' rows, because only production sectors produce value. From the production sectors' rows we will take the entries which correspond to the trade sectors' column and the final demand and form a matrix FD1. This matrix is represented by the numbers within the broken line in table 1.

$$FD1 = \begin{vmatrix} 21 & 0 & 9 \\ 0 & 60 & 0 \\ 0 & 36 & 0 \end{vmatrix}$$

When we take the sum of each row of FD1 we get a column vector FD2.

$$FD2 = \begin{vmatrix} 36 \\ 60 \\ 36 \end{vmatrix}$$

We will get the Marxian final demand in value terms FD^, when we multiply FD2 by lv, the labor value of the commodities.

FD^ = lv*FD2 = (4/3*36) + (3/2*60) + (2*36)

FD^ = 48 + 90 + 72 = 210 hrs

SV = FD^ - V = 210 70 = 140 hrs

SV/V =140/70 = 2

The FD^ is equal to the VA^, 210 hrs. Surplus value calculated both on the final demand side and on the value added side are identical, 140 hrs, and the rates of surplus values are the same, 2. This result shows that our methods used to calculate the value rate of surplus value from the FD and VA sides are consistent with each other.

Price Rate of Surplus Value

We can calculate the price rate of surplus value by either using the use side of the I-O table or the output side. Both should generate the same result.

When we use the use side of an I-O table we should calculate Marxian final demand in money form FD^m and variable capital in money form Vm. And when we deduct Vm from FD^m we get surplus value in money form SVm.

Vm is equal to the column sum of the consumption vector of the productive workers, Conp.

Total Conp = 0 + 26 + 15.5 + 28.5 = $70

FD^m is equal to the column sum of the final demand columns plus the sum of the intermediate inputs of the non production sector, in this case the trade sector, mt. These elements are represented by the numbers within the broken line region of table 2.

FD^m = mt + (C + I)

FD^m = (27 + 9) + [(60 + 36 + 66) + (9 + 3)]

FD^m = $210

SVm = FD^m - Vm = 210 - 70 = $140

SVm/Vm = 140/70 = 2

We should obtain the same results when we use the output side of an I-O table. In this case we should calculate Marxian value added in price form VA^m and variable capital in price form Vm. Variable capital is assumed equal to the wages of the productive workers.

Vm = $20 + $26 + $24 = $70

Vm is also equal to the consumption of the productive workers, since we are assuming that workers consume all their income. VA^m is equal to the conventional value added of the production sectors, plus the intermediate inputs and value added of the trade sector. These elements are represented by the numbers within the dotted line region of table 2.

VA^m = (30 + 48 + 36) + 96 = $210

Surplus value in money form is equal to;

SVm = VA^m - Vm = $210 - $70 = $140

The rate of surplus value is equal to;

SVm/Vm = 140/70 = 2

Using this simple I-O table we have calculated the rate of SV four times, twice in value form and twice in price, and all four of them gave the same magnitude. These results show that at this level of abstraction our methods of calculating the rate of surplus value are accurate.

I-O Table 2

Calculation of Price Rates of Surplus Value at Stage 1

	Mach	Corn	Gold	Trade	Cons.	Invest.	Total
Mach	45	9	0	27	0	9	90
Corn	0	0	0	0	60	0	60
Gold	0	0	0	0	36	0	36
Trade	15	3	0	9	66	3	96
Wages	20	26	24	36	0	0	106
Profits	10	22	12	24	0	0	68
Total	90	60	36	96	162	12	456

Stage 2; Production ,Trade and Rent.

At this second stage of our model we are adding the rental sector which is not a production sector and is similar to the trade sector. The rental sector is a non production sector, because there is no new use value produced, but just temporary transfer of ownership. In the trade sector, when a wholesaler sells a good for $1,000 to a retailer and the retailer sells it for 1,500, then the trading margin of that product is $500. The producer's price is $1,000, while the purchaser's price is $1,500.

We will argue that building and equipment rent is similar to the trade margin. The main difference is that commodity rent is a trade margin paid over a period of time. This becomes clear when instead of buying a car we lease a car. If we buy the car for $12,000, and if the dealer pays $10,000 to the car company, then the trade margin is $2,000. Now if the dealer pays $10,000 to the car company and leases the car for $2,400 per year and if the car lasts 5 years, then the total purchaser's price will be $12,000, and the trading margin for a year will be $400. During the car's lifetime the trading margin will again become $2,000. Therefore we can consider rent as a margin paid in installments.

When we take out depreciation from the building rental sector, the remaining rent will be similar to the trade

margin. Therefore we are treating building and equipment rent the same way as we are treating the trade sector. This is in contrast to the BEA which treats building and equipment rentals differently than the trade sector in their I-O tables. For this reason, at this stage of our model we are focusing on the discussion of building rental and we are treating it separately, even though conceptually in our model the treatment of building rental is similar to the treatment of the trade sector.

At stage 1 of our model , we assumed that circulation is represented only by the trade sector. Therefore all circulation expenditures and profits were identical to the expenditures and profits of trade sector. At stage 2, circulation now has two components, trade and rent. We arbitrarily assume that 2/3 of circulation expenditures and profits are allocated to trade and the remaining 1/3 to the rental sector. Now the production and circulation equation will be,

	Production	Circulation	
		Trade	Rent
machine	30M + 60LL --> 60M	4M + 12L	2M + 6L
	$60c+$20v+$10P=$90	$8c+$4v+$8P	$4c+$2v+$4P
Corn	6M + 72LL --> 90corn	4M + 24L	2M + 12L
	$12c+$26v+$22P=$60	$8c+$8v+$4P	$4c+$4v+$2P

Gold	0M + 72LL --> 72G	4M + 36LL	2M + 18LL
	$0c +$24v+$12P=$36	$8c+$12v+$4P	$4c+$6v+$2P

Note that at this stage of our model the production equations are identical with the production equations at stage 1. Therefore the amounts of v, s, and production are also identical. All that has changed is that we now have a more complex form of circulation.

Based on these equations and following the procedure of model 1 we can build an I-O table,(see I-O table 3).

The only difference between I-O table 1 and 3 is that the column and row representing trade in table 1 is divided into two columns and two rows in table 3, one for trade and the other for rent.

The first column represents the machine sector. This sector is using 30 machines during production.The producers price is $3/2. Thus B_{11} is $45. Bij is the element of the ith row and jth column. According to the assumptions of our model that we discussed earlier, the circulation cost of one machine is $1/2. Therefore the circulation cost of the machine sector is $15. We already mentioned that at the second stage of our model 2/3 of the circulation cost is used by the trading sector while the other third is used by the building rental sector. Therefore the machine sector, is spending $10 for trading activities, B_{41} and $5 for rent, B_{51} .

The same arguments apply for the other columns

I-O Table 3

Calculation of VAlue Rate of Surplus Value at Stage 2

	Mach	Corn	Gold	Trade	Rent	Cons.	Invest.	Total
Mach	45	9	0	18	9	0	9	90
Corn	0	0	0	0	0	60	0	60
Gold	0	0	0	0	0	36	0	36
Trade	10	2	0	4	2	44	2	64
Rent	5	1	0	2	1	22	1	32
Wages	20	26	24	24	12	0	0	106
Profit	10	22	12	16	8	0	0	68
Total	90	60	36	64	32	162	12	456

representing corn, gold, trade and rent. In the final demand section, based on the earlier description of our model $66 of personal consumption is spent on circulation. At this level of abstraction, where we have trade and rental activities in the circulation sphere, $44 of personal consumption, 2/3 of the $66, is spent on trade, while the remaining $22, 1/3 of the $66, is spent on rental. The same argument applies for the investment and inventories component of the final demand.

The calculation of the rate of SV is almost the same as in stage 1. The calculation of the value rate of SV using the value added side of the I-O table is exactly the same as in stage 1, because l, Ap, lv, R, V and Lp do not change. The rate of SV is 2. However when we use the final demand side we should realize that the trade sector of model 1 is now divided into trade and rental. Therefore when we calculate FD1 and FD2 instead of having

$$FD1 = \begin{vmatrix} 27 & 0 & 9 \\ 0 & 60 & 0 \\ 0 & 30 & 0 \end{vmatrix}$$

$$FD2 = \begin{vmatrix} 27 \\ 0 \\ 0 \end{vmatrix} + \begin{vmatrix} 0 \\ 60 \\ 30 \end{vmatrix} + \begin{vmatrix} 9 \\ 0 \\ 0 \end{vmatrix} = \begin{vmatrix} 36 \\ 60 \\ 36 \end{vmatrix}$$

we will have

$$FD1 = \begin{vmatrix} 18 & 9 & 0 & 9 \\ 0 & 0 & 60 & 0 \\ 0 & 0 & 36 & 0 \end{vmatrix}$$

$$FD2 = \begin{vmatrix}18\\0\\0\end{vmatrix} + \begin{vmatrix}9\\0\\0\end{vmatrix} + \begin{vmatrix}0\\60\\36\end{vmatrix} + \begin{vmatrix}9\\0\\0\end{vmatrix} = \begin{vmatrix}36\\60\\36\end{vmatrix}$$

FD1 is represented by the area within the broken line in table 3.

The rate of surplus value will again be 2, because FD2, lv, FD^, V are the same as in stage 1. The calculation of surplus value in money form is slightly different, however the final magnitude remains the same.

On the value added side VA^m in money form is equal to the value added of the production sectors, plus the intermediate inputs and value added of the trade and rental sectors. These elements are represented by the numbers within the dotted line region of table 4.

VA^m = (30 + 48 + 36) + (64) + (32) = $210

On the final demand side FD^m is equal to the column sum of the final demand columns, plus the sum of the intermediate inputs of the trade and rental sectors. These elements are represented by the numbers within the broken line region of table 4.

FD^m = mr + mt + (C+I)

FD^m = (9+2+1) + (18+4+2) + [(60+36+44+22) + (9+2+1)]

FD^m = $210

Vm = $70

SVm = 210 - 70 = $140

The rate of SV is again 2, because Vm, VA^m and FD^m are exactly the same as in stage 1. Therefore again our methods of

I-O Table 4

Calculation of Price Rates of Surplus Value at Stage, 2

	Mach	Corn	Gold	Trade	Rent	Cons.	Invest.	Total
Mach	45	9	0	18	9	0	9	90
Corn	0	0	0	0	0	60	0	60
Gold	0	0	0	0	0	36	0	36
Trade	10	2	0	4	2	44	2	64
Rent	5	1	0	2	1	22	1	32
Wages	20	26	24	24	12	0	0	106
Profit	10	22	12	16	8	0	0	68
Total	90	60	36	64	32	162	12	456

calculating value and price rates of surplus value are generating accurate and consistent results.

Stage 3; production, trade, Commodity rent and royalties paid by the producers.

At third stage of our model we incorporate royalty payments by the producers into the second stage. Royalties will be paid by capitalists involved in production and circulation. Examples of royalty payments are ground rents, interest payments, and business services such as legal services and advertising.

The main difference between the circulation sphere and royalties is that the circulation sphere is directly involved in the realization of the commodities, while royalties are claims on the revenues and profits of production and circulation sectors.

The capitalists of the production and circulation spheres will transfer some of their profits to the royalty sector as producers' royalty payments.

Let's assume that, in the machine sector, the capitalist in production sphere pays $2 as royalties, such as interest payments, and the capitalists in trade and rent sectors each pay $2 to the royalty sector. The royalty sector with these $6, buys one machine and employs 9hrs of labor

The result is the following equations

Production	Circulation		Royalty
Machines	Trade	Rent	
30M + 60LL -->60M	4M + 12LL	2M + 6LL	1M +9LL
$60c+$20v+(10-2)P	$8c+$4v+(8-2)P	$4c+$2v+(4-2)P	$2c+$3v+$1P

The first numbers in each parenthesis is the level of profits of that sector in model 2. The second number is the royalty payment to the royalty sector, which is being subtracted from the former.

Following the same discussion we can write the equation for the corn and gold sector as follows:

Production	Circulation		Royalty
Corn	Trade	Rent	
6M + 78LL-->90corn	4M +24LL	2M + 12LL	2M + 12LL
$12c+$26v+(10-2)P	$8c+$8v+(4-1)P	$4c+$4v+(2-0)P	$4c+$4v+$2P
Gold			
0M + 72LL-->72G	4M + 36LL	2M + 18LL	0M + 6LL
$0c+$24v+(12-3)P	$8c+$12v+(4-1)P	$4v+$6v+(2-0)P	0c+$2v+$2P

And based on these equations we can build the 5rd I-O table. Basically we will add a new row and a column for the royalty payments, and we will change the level of profits, which are less than the level of profits at stage 2 of our model, because of the royalty payments.

The calculation of the SV in value form using the value

calculating value and price rates of surplus value are generating accurate and consistent results.

Stage 3; production, trade, Commodity rent and royalties paid by the producers.

At third stage of our model we incorporate royalty payments by the producers into the second stage. Royalties will be paid by capitalists involved in production and circulation. Examples of royalty payments are ground rents, interest payments, and business services such as legal services and advertising.

The main difference between the circulation sphere and royalties is that the circulation sphere is directly involved in the realization of the commodities, while royalties are claims on the revenues and profits of production and circulation sectors.

The capitalists of the production and circulation spheres will transfer some of their profits to the royalty sector as producers' royalty payments.

Let's assume that, in the machine sector, the capitalist in production sphere pays $2 as royalties, such as interest payments, and the capitalists in trade and rent sectors each pay $2 to the royalty sector. The royalty sector with these $6, buys one machine and employs 9hrs of labor

The result is the following equations

Production	Circulation		Royalty
Machines	Trade	Rent	
30M + 60LL -->60M	4M + 12LL	2M + 6LL	1M +9LL
$60c+$20v+(10-2)P	$8c+$4v+(8-2)P	$4c+$2v+(4-2)P	$2c+$3v+$1P

The first numbers in each parenthesis is the level of profits of that sector in model 2. The second number is the royalty payment to the royalty sector, which is being subtracted from the former.

Following the same discussion we can write the equation for the corn and gold sector as follows:

Production	Circulation		Royalty
Corn	Trade	Rent	
6M + 78LL-->90corn	4M +24LL	2M + 12LL	2M + 12LL
$12c+$26v+(10-2)P	$8c+$8v+(4-1)P	$4c+$4v+(2-0)P	$4c+$4v+$2P
Gold			
0M + 72LL-->72G	4M + 36LL	2M + 18LL	0M + 6LL
$0c+$24v+(12-3)P	$8c+$12v+(4-1)P	$4v+$6v+(2-0)P	0c+$2v+$2P

And based on these equations we can build the 5th I-O table. Basically we will add a new row and a column for the royalty payments, and we will change the level of profits, which are less than the level of profits at stage 2 of our model, because of the royalty payments.

The calculation of the SV in value form using the value

I-O Table 5

Calculation of Value Rate of Surplus Value at Stage 3

	Mach	Corn	Gold	Trade	Rent	Royalty	Cons.	Invest.	Total
Mach	45	9	0	18	9	9/2	0	9/2	90
Corn	0	0	0	0	0	0	60	0	60
Gold	0	0	0	0	0	0	36	0	36
Trade	10	2	0	4	2	1	44	1	64
Rent	5	1	0	2	1	1/2	22	1/2	32
Royalty	2	9	3	4	2	0	0	0	20
Wages	20	26	24	24	12	9	0	0	115
Profit	8	13	9	12	6	5	0	0	53
Total	90	60	36	64	32	20	162	6	470

I-O Table 6

Calculation of Price Rates of Surplus Value at Stage, 3

	Mach	Corn	Gold	Trade	Rent	Royalty	Cons.	Invest.	Total
Mach	45	9	0	18	9	9/2	0	9/2	90
Corn	0	0	0	0	0	0	60	0	60
Gold	0	0	0	0	0	0	36	0	36
Trade	10	2	0	4	2	1	44	1	64
Rent	5	1	0	2	1	1/2	22	1/2	32
Royalty	2	9	3	4	2	0	0	0	20
Wages	20	26	24	24	12	9	0	0	115
Profit	8	13	9	12	6	5	0	0	53
Total	90	60	36	64	32	20	162	6	470

added side of the I-O table is exactly the same as at stage 1 and 2, because all the variables remain constant.

SV = 140 hrs while V = 70 hrs.

However when we use the final demand side there is a slight change, because now we have a new non production sector, royalty payments. In order to calculate the Marxian final demand FD^, we form a matrix FD1 from the rows of the production sectors of the trade, rental, royalty, consumption and investment columns;

$$FD1 = \begin{vmatrix} 18 & 9 & 9/2 & 0 & 9/2 \\ 0 & 0 & 0 & 60 & 0 \\ 0 & 0 & 0 & 36 & 0 \end{vmatrix}$$

$$FD2 = \begin{vmatrix} 18 \\ 0 \\ 0 \end{vmatrix} + \begin{vmatrix} 9 \\ 0 \\ 0 \end{vmatrix} + \begin{vmatrix} 9/2 \\ 0 \\ 0 \end{vmatrix} + \begin{vmatrix} 0 \\ 60 \\ 36 \end{vmatrix} + \begin{vmatrix} 9/2 \\ 0 \\ 0 \end{vmatrix} = \begin{vmatrix} 36 \\ 60 \\ 36 \end{vmatrix}$$

FD1 is represented by the area within the broken line in table 5.

FD2, lv, V have the same magnitudes as in stages 1 and 2.

SV = 140 hrs, V = 70 hrs, and the rate of SV = 2

The calculation of the money form of the surplus value will be different from the method of stage 2, since we have to take into account the producers' royalty payments.

On the value added side VA^m will be equal to the value added of the production sectors (28+39+33), plus the intermediate inputs and value added of trade (64) and rental (32) sectors, plus royalties paid by the production sectors (2+9+3). These elements are represented by the numbers within the dotted line region of table 6.

VA^m = (28+39+33) + (64) + (32) + (2+9+3) = $210

Vm = $70

SVm = 210 - 70 = $140

On the final demand side FD^m is equal to

FD^m = mt + mr + mry + (C + I)

where mt, mr and mry are purchases of production and non production intermediate inputs except royalty payments, by all non production sectors:trade, rental and royalties respectively. Consumption and investment columns, excluding the royalty row, are represented by (C + I). These elements are represented by the numbers within the broken line region of table 6.

Based on table 6;

mt = (18+4+2) = $24

mr = (9+2+1) = $12

mry = (9/2 + 1 + 1/2) = $6

C = (60+36+44+22) = $162

I = (9/2 + 1 + 1/2) = $6

FD^m = (24 + 12 + 6 + 162 + 6) = $210

Vm = $70

SVm = 210 - 70 = $140

SVm/Vm = 2

Stage 4: Production, trade, rent, royalties paid by producers and royalties paid by consumers.

At this stage we add royalties paid by the consumers onto the previous stage. Both workers and capitalists are considered consumers, therefore both workers and capitalists will pay

royalties in the form of interest, taxes, ground rent, etc. In order to leave our previous numerical magnitudes of v, and s, unchanged, we must have post-royalty real wages unchanged. We will accomplish this by assuming that workers' money wages are now higher exactly by the amount of royalties that the workers are paying royalties. Thus the real wages and v stay the same. This assumption is being employed merely for convenience. The equality of price and value rates of surplus value will still be maintained if we relax this assumption.

In the machine sector the production workers pay $2 royalties while the capitalist as a consumer pays $2. First we deduct $2 from the profits which is $8. This $2 goes to the workers who pay it to the royalty sector. Therefore Vm doesn't change. Then we should deduct another $2 from profits which are paid as royalties by the capitalists consumer.

The equation of the production sector of the machines sector is, $60c + $20v + (8-2-2)P.

Similarly the workers in the trade sector pay $1 royalty and the capitalists also pay $1 royalties. No one else pays royalty in the machine sector. Thus the royalty sector receives $6. With this $6 the royalty sector hires 12 hrs of LL. The total equations of the machine sector are,

Production	Trade	Rent	Royalty I	Royalty II
Machine				
30M + 60LL-->60M	4M + 12LL	2M + 6LL	1M + 9LL	0M + 12LL
60c+20v+(8-2-2)P	8c+4v+(6-1-1)P	4c+2v+2P	2c+3v+1P	0c+4v+2P

added side of the I-O table is exactly the same as at stage 1 and 2, because all the variables remain constant.

SV = 140 hrs while V = 70 hrs.

However when we use the final demand side there is a slight change, because now we have a new non production sector, royalty payments. In order to calculate the Marxian final demand FD^, we form a matrix FD1 from the rows of the production sectors of the trade, rental, royalty, consumption and investment columns;

$$FD1 = \begin{vmatrix} 18 & 9 & 9/2 & 0 & 9/2 \\ 0 & 0 & 0 & 60 & 0 \\ 0 & 0 & 0 & 36 & 0 \end{vmatrix}$$

$$FD2 = \begin{vmatrix} 18 \\ 0 \\ 0 \end{vmatrix} + \begin{vmatrix} 9 \\ 0 \\ 0 \end{vmatrix} + \begin{vmatrix} 9/2 \\ 0 \\ 0 \end{vmatrix} + \begin{vmatrix} 0 \\ 60 \\ 36 \end{vmatrix} + \begin{vmatrix} 9/2 \\ 0 \\ 0 \end{vmatrix} = \begin{vmatrix} 36 \\ 60 \\ 36 \end{vmatrix}$$

FD1 is represented by the area within the broken line in table 5.

FD2, lv, V have the same magnitudes as in stages 1 and 2.

SV = 140 hrs, V = 70 hrs, and the rate of SV = 2

The calculation of the money form of the surplus value will be different from the method of stage 2, since we have to take into account the producers' royalty payments.

On the value added side VA^m will be equal to the value added of the production sectors (28+39+33), plus the intermediate inputs and value added of trade (64) and rental (32) sectors, plus royalties paid by the production sectors (2+9+3). These elements are represented by the numbers within the dotted line region of table 6.

VA^m = (28+39+33) + (64) + (32) + (2+9+3) = $210

Vm = $70

SVm = 210 - 70 = $140

On the final demand side FD^m is equal to

FD^m = mt + mr + mry + (C + I)

where mt, mr and mry are purchases of production and non production intermediate inputs except royalty payments, by all non production sectors:trade, rental and royalties, respectively. Consumption and investment columns, excluding the royalty row, are represented by (C + I). These elements are represented by the numbers within the broken line region of table 6.

Based on table 6;

mt = (18+4+2) = $24

mr = (9+2+1) = $12

mry = (9/2 + 1 + 1/2) = $6

C = (60+36+44+22) = $162

I = (9/2 + 1 + 1/2) = $6

FD^m = (24 + 12 + 6 + 162 + 6) = $210

Vm = $70

SVm = 210 - 70 = $140

SVm/Vm = 2

Stage 4: Production, trade, rent, royalties paid by producers and royalties paid by consumers.

At this stage we add royalties paid by the consumers onto the previous stage. Both workers and capitalists are considered

consumers, therefore both workers and capitalists will pay royalties in the form of interest, business services, ground rent, etc. In order to leave our previous numerical magnitudes of v, and s, unchanged, we must have post-royalty real wages unchanged. We will accomplish this by assuming that workers' money wages are now higher exactly by the amount of royalties that the workers are paying. Thus the real wages and v stay the same. This assumption is being employed merely for convenience. The equality of price and value rates of surplus value will still be maintained if we relax this assumption.

In the machine sector the production workers pay $2 royalties while the capitalist as a consumer pays $2. First we deduct $2 from the profits which is $8. This $2 goes to the workers who pay it to the royalty sector. Therefore Vm doesn't change. Then we should deduct another $2 from profits which are paid as royalties by the capitalists consumer.

The equation of the production sector of the machines sector is, $60c + $20v + (8-2-2)P.

Similarly the workers in the trade sector pay $1 royalty and the capitalists also pay $1 royalties. No one else pays royalty in the machine sector. Thus the royalty sector receives $6. With this $6 the royalty sector hires 12 hrs of LL. The total equations of the machine sector are,

I-O Table 7

Calculation of Value Rate of Surplus value at Stage, 4

	Mach	Corn	Gold	Trade	Rent	Roy.I	Roy.II	Cons.	Invest.	Total
Mach	45	9	0	18	9	9/2	3/2	0	3	90
Corn	0	0	0	0	0	0	0	60	0	60
Gold	0	0	0	0	0	0	0	36	0	36
Trade	10	2	0	4	2	1	1/3	44	2/3	64
Rent	5	1	0	2	1	1/2	1/6	22	1/3	32
Roy. I	2	9	3	4	2	0	0	0	0	20
Roy. II	0	0	0	0	0	0	0	15	0	15
Wages	22	28	26	26	12	9	9	0	0	132
Profit	6	11	7	10	6	5	4	0	0	49
Total	90	60	36	64	32	20	15	177	4	498

Production	Trade	Rent	Royalty I	Royalty II
Machine				
30M + 60LL-->60M	4M + 12LL	2M + 6LL	1M + 9LL	0M + 12LL
60c+20v+(8-2-2)P	8c+4v+(6-1-1)P	4c+2v+2P	2c+3v+1P	0c+4v+2P

Similarly we can write the equations of corn and gold sectors,

Corn				
6M + 78LL-->90M	4M + 24LL	2M + 12LL	2M + 12LL	1M + 6LL
12c+26v+(13-2-2)P	8c+8v+(3-1-0)P	4c+4v+2P	4c+4v+2P	2c+2v+1P
Gold				
0M + 72LL-->72G	4M + 36LL	2M + 18LL	0M + 6LL	0M + 9LL
0c+24v+(9-2-1)P	8c+12v+(3-0-1)P	4c+6v+2P	0c+2v+2P	0c+3v+1P

Based on these equations we can build the corresponding I-O table, (see table 7). In this I-O table we are adding a row and a column for the royalties paid by consumers.

The total royalties paid by consumers is equal to $15. In the consumer royalty row all entries will be 0 except the B_{78} which corresponds to the consumption column.

Also the wages in the I-O table aren't the real wages, because they include the transfers by the capitalists to the workers. The workers will pay back these transfers to the royalty sector.

The calculation of both money and value forms of SV are different in this model. Although the results remain the same

SV = 140hrs, and SVm = $140.

First we will calculate value rate of SV from the value added side. To find out the workers accurate wages we have to deduct from their wages the royalties paid by them, because the capitalists are giving (2+2+2) to the workers and then they are taking them back as royalty payments. Thus (2+2+2) aren't really part of the workers wages.

On the final demand side, we should deduct $15, the royalties paid by the consumers from the total of the consumption column because ", the royalty payments by consumers which appear in the consumption column of an I-O table do not count precisely because they are transfers and not genuine purchases of use values."[2]

Productive workers' total wages are,

wp = (22-2) + (28-2) + (26-2) = $70

Productive workers consumption is $ 70.

Total consumption is ; 177-15 = $162

The ratio R = 70/162 = 35/81

The Ap matrix and l matrix do not change.

Thus the lv is the same, $lv=l(1-Ap)^{-1}$ = [4/3, 3/2, 2] hrs/$

Similarly the column vector of production outputs consumed by the productive workers, Conpp doesn't change.

Thus V = lv * Conpp = 70 hrs.

Total productive labor, Lp = 60hrs + 78hrs + 72hrs = 210hrs

SV = 210-70 = 140 hrs

and SV/V = 140/70 = 2

On the final demand side we have to form matrix FD1, from the rows of the production sectors of the trade, rental, royalty 1, royalty 2, consumption and investment columns.

$$FD1 = \begin{vmatrix} 18 & 9 & 9/2 & 3/2 & 0 & 3 \\ 0 & 0 & 0 & 0 & 60 & 0 \\ 0 & 0 & 0 & 0 & 36 & 0 \end{vmatrix}$$

$$FD1 = \begin{vmatrix} 18 \\ 0 \\ 0 \end{vmatrix} + \begin{vmatrix} 9 \\ 0 \\ 0 \end{vmatrix} + \begin{vmatrix} 9/2 \\ 0 \\ 0 \end{vmatrix} + \begin{vmatrix} 3/2 \\ 0 \\ 0 \end{vmatrix} + \begin{vmatrix} 0 \\ 60 \\ 36 \end{vmatrix} + \begin{vmatrix} 3 \\ 0 \\ 0 \end{vmatrix} = \begin{vmatrix} 36 \\ 60 \\ 36 \end{vmatrix}$$

FD1 is represented by the area within the broken line in table 7.

FD2, lv, and V have the same magnitudes as in stages 1, 2, and 3.

SV = 140 hrs, V = 70 hrs, and the rate of SV = 2.

The method of calculation of the money rate of surplus value is also different from the previous models. On the value added side the VA^m is equal to the profit of the production sectors(6+11+7), plus productive workers' wages(20+26+24), plus intermediate inputs and value added of trade(64) and rental(32) sectors, plus royalties paid by production sectors(2+9+3), plus royalties paid by productive workers(2+2+2). These elements are represented by the numbers within the dotted line region of table 8.

VA^m = (6+11+7)+(20+26+24)+(64+32)+(2+9+3)+(2+2+2)

VA^m = $210

Vm = $70

SVm = VA^m - Vm = 210 - 70 = $140

I-O Table 8

Calculation of Price Rate of Surplus Value at Stage, 4

	Mach	Corn	Gold	Trade	Rent	Roy.I	Roy.II	Cons.	Invest.	Total
Mach	45	9	0	18	9	9/2	3/2	0	3	90
Corn	0	0	0	0	0	0	0	60	0	60
Gold	0	0	0	0	0	0	0	36	0	36
Trade	10	2	0	4	2	1	1/3	44	2/3	64
Rent	5	1	0	2	1	1/2	1/6	22	1/3	32
Roy. I	2	9	3	4	2	0	0	0	0	20
Roy. II	0	0	0	0	0	0	0	15	0	15
Wages	22	28	26	26	12	9	9	0	0	132
Profit	6	11	7	10	6	5	4	0	0	49
Total	90	60	36	64	32	20	15	177	4	498

On the final demand side, FD^m is equal to

FD^m = mt + mr + mry1 + mry2 + (C + I)

where mt, mr, mry1, and mry2 are purchases of production and non production intermediate inputs except royalty payments, by non production sectors, while (C + I) represents final demand columns except for rows which correspond to the royalty payments. These elements are represented by the numbers within the broken line region of table 8.

mt = 18 + 4 + 2 = $24

mr = 9 + 2 + 1 = $12

mry1 = 9/2 + 1 + 1/3 = $6

mry2 = 3/2 + 1/3 + 1/6 = $2

C = 60 + 36 + 44 + 22 = $162

I = 3 + 2/3 + 1/3 = $4

FD^m = 24 + 12 + 6 + 2 + 162 + 4 = $210

Vm = $70

SVm = 210 - 70 = $140

and the rate of SV = 140/70 = 2.

We started with a simple model where there were three production sectors and only one non production sector, trade. We calculated the rate of surplus value in four different ways and every time we obtained the correct result. Then we included other sectors in our model such as, rental and royalty payments. However everytime our model consistently generated four identical rates of surplus value. Based on these tests we can

argue that our methods of calculating the value and price rates of surplus value are accurate and consistent.

Footnotes Chapter II

1. This theoretical model is based on Shaikh, Tonak, Kazanas, and Graham, 1985, where they discuss the correspondence between I-O tables published by the Bureau of Economic Analysis, and Marxian categories.
2. Ibid., p. 19.

Part II

CHAPTER III

Employment and Employee Compensation Estimates

In the second part of this dissertation we are going to use our method, which we developed in the first part, to calculate the rates of surplus value in the U.S. In this chapter we will focus on the employment and employee compensation data used for our calculation. In the next chapter we will discuss the computations and the results of our computations.

When we estimate the value rate of surplus value we calculate direct and indirect labor required to produce one dollar's worth of a commodity. In order to calculate the amount of direct and indirect labor, we are obliged to use input-output tables. In the U.S. there are six benchmark year I-O tables: 1947, 1958, 1963, 1967, 1972, and 1977.[1]

During our calculations, in addition to I-O tables, we have to use employment, employee compensation and depreciation data. It is crucial to compile a data base where the I-O tables, the employment and employee compensation vectors and the depreciation matrices are compatible with each other.

We were able to compile a fairly adequate data base for the last 5 benchmark years that we listed above. For the year 1947 we were not able to generate a consistent data set, because data was scarce. Therefore during our calculations we will not use the 1947 I-O table.

During our research we realized that the employment and

employee compensation vectors used by other economists, such as Wolff and Graham could be improved.[2] Therefore we generated new employment and employee compensation vectors. In this chapter we will discuss these vectors, while in appendices we will describe the remaining data base.

One of the main sources used by economists for employment vectors corresponding to the 85 sector I-O tables is "Time Series Data for Input-Output Industries: Output, Price and Employment", Bulletin 2018, published by the Bureau of Labor Statistics, BLS.[3] The advantage of Bulletin 2018 is that it provides detailed employment figures such that it is possible to group 3 and 4 digits SIC industries and match them with the corresponding I-O sectors.

The major weakness of Bulletin 2018, which is based on BLS data, is that I-O tables redefine some activities from one industry to another, while data based on BLS do not reflect these redefinitions. In some I-O sectors these redefinitions are rather substential. A major redefinition occured for the "auto repair" sector. Input-Output tables consider "automotive repair performed by shops primarily engaged in the sale of automobiles (auto dealers) or parts" as part of the auto repair sector, while BLS and NIPA consider them as part of the retail trade sector.[4] Therefore employment, output etc. of the I-O auto repair sector is much larger, almost the double of BLS figures. Clearly employment data based on 2018 is not sufficiently consistent or compatible with the I-O sectors.

"Employment and Earning, United State, 1909-84, Bulletin 1312-12" published by BLS is often used for data on wages and salaries corresponding to the 85 sector I-O table.[5] The major weakness of Bulletin 1312 is that it is not disaggregated enough to generate an adequate mapping between SIC and I-O sectors for the level of disaggregation we are working with. Therefore economists are forced to make ad hoc mappings between the sectors available in Bulletin 1312 and the I-O sectors.[6]

Given the problems with the data sources mentioned above it is important to emphasize that during our calculations, it is imperative to have compatible employment and employee compensation data, which correspond to the IO sectors and reflect the adjustments and redefinitions of the IO tables.

Coughlin was able to generate such estimates for 1967, by using NIPA data and other data sources, particularly Census data. The same approach was adopted by Jane-Ring F. Crane for 1972 I-O table and by Robert Yuskavage for 1977 I-O table.[7] This data was then able to be used for our analysis after some minor modifications which will be described at the end of this chapter. The contribution of this chapter is to estimate compatible employment and employee compensation vectors, which correspond to the 1958 and 1963 I-O tables.

Unlike the last three I-O tables, the 1958 and 1963 tables don't disaggregate the value added. Therefore these I-O tables do not provide estimates for employee compensation.

There are no published articles, similar to Coughlin's, Crane's, or Yuskavage's, where we can find employment and employee compensation estimates for 1958 and employment estimates for 1963.

For the 1963 I-O table Alfred J. Walderhaug had calculated employee compensation estimates.[8] However, we will not use Walderhaug's estimates because of two reasons.

First, the conventional BEA I-O tables allocate all construction work done in the economy by sectors other than construction to the construction sector. So construction work performed in the chemical industry would be transferred to the construction sector. This is called force account construction, FAC, adjustment.[9]

The effect of FAC adjustment is that the employment of the construction sector will increase while the employment of all the other affected sectors will decrease. Employment data based on NIPA, Censuses, and BLS are not adjusted for FAC. Therefore in order for the employment estimates to be compatible with the IO tables, Coughlin, Crane, and Yuskavage adjusted employment data for FAC. Walderhaug also had adjusted the employee compensation estimates for force account construction, by transferring employee compensation of construction workers working in economic sectors other than the construction sector to the construction sector.

Therefore we don't need to adjust the employee compensation estimates for FAC, because the I-O tables that we

are using treat construction work done outside the construction sector the same way as NIPA and BLS do. Our I-O tables are adjusting the conventional I-O tables and reversing the treatment of FAC by reallocating construction workers working outside the construction sector back to the other economic sectors (see appendix A).

If we use Walderhaug's compensation estimates with our I-O tables then we should reverse his adjustment for FAC by reallocating all workers working outside the construction sector to the corresponding I-O sectors. In order to reverse Walderhaug's treatment of FAC we need data on the employee compensation of construction workers working outside the construction sector. However unlike the case of 1967, 1972, and 1977 we don't have data on FAC for 1963 and 1958. We could decide to estimate data on FAC for 1963 by making some assumptions, such as using information on FAC from 1967, which is available, but these kinds of assumptions will lead to additional calculation errors.

Second, there is no available employment vector for the 1963 I-O table, therefore we are forced to estimate an employment vector. It is reasonable to expect that there will be some small differences between our method of calculation and Walderhaug's. And for 1963 there will be some inconsistency between the employment vector that we are estimating and the employee compensation vector that Walderhaug is estimating. Therefore if we use Walderhaug's

employee compensation vector and our employment vector, the small calculation differences and inconsistencies that exist between Walderhaug's and our methods could affect the measurements of price and value rates of surplus values, and their differences. The use of incompatible employment and employee compensation vectors generate inadequate value rates of surplus value and could affect the difference between price and value rates of surplus value, because during the measurement of value rate of surplus value, we use both employment and employee compensation data, while during the measurement of price rate of surplus value we use only employee compensation estimates.

When there is an inconsistency in the calculation of employment and employee compensation estimates, then there will be differences between price and value rates of surplus value, due to calculation problems, which we would like to eliminate or minimize. On the other hand, if we calculate employee compensation and employment vectors using our method of calculation then the employment and compensation data will be exactly compatible and we will eliminate the possibility of additional sources of errors.

Summarizing our discussion we could state that for 1967, 1972, and 1977 there are consistent, employment and employee compensation data for the I-O tables. For 1963 there is no similar employment vector. However there is an employee compensation vector, which we will not use. For the 1958 I-O

table there are no compatible employment and employee compensation vectors. Therefore our task is to estimate employment and employee compensation vectors, which are consistent with the 1958 and 1963 I-O tables.

Method of Generating 1958, 1963 Employment and Employee Compensation Vectors

We are going to estimate employment and employee compensation vectors for the 1958 and 1963 I-O tables based on Peter Coughlin's method.

The estimation method of employment and employee compensation vectors are quite similar. Therefore first we will discuss the method of calculating employment estimates in detail and later we will briefly discuss the calculations of the employee compensation vectors.

It could be argued that the most accurate method of calculating employment estimates for an IO table would be to use the same sources that were used to compile the table itself. However, it is extremely difficult, since a very large number of sources are used and some of them are private unpublished sources.

For instance, constructing the 1972 IO table 116 publications were used from seventeen major data sources. To give an idea about the enormous amount of sources, we listed the major data groups and the corresponding number of

publications:

1) Bureau of the Census : 20 different censuses.

2) U.S. Dept of Agriculture: 12 different publications.

3) U.S. Dept of Commerce (other than Census):7 publications.

4) U.S. Dept of Defense : 2 publication.

5) Executive Office: 2 publications.

6) U.S. Dept of Health, Education & Welfare:6 publications.

7) U.S. Dept of Interior: 9 publications.

8) U.S. Dept of Labor: 7 publications.

9) U.S. Dept of Transportation: 4 publications.

10) U.S. Dept of the Treasury: 4 publications.

11) Interstate Commerce Commission: 4 publications.

12) U.S. Federal Communications Commission: 2 publications.

13) U.S. International Trade Commission: 2 publications.

14) U.S. Federal Power Commission: 4 publications.

15) U.S. Federal Reserve Board: 2 publications.

16) U.S. Civil Aeronautics Board: 1 publication.

17) Principal private sources: 28 publications.[10]

The alternative, to the practicably impossible task of using all these sources, is to use a comprehensive data base, which covers the whole economy and then to adjust this initial data base so as to improve compatibility with the IO tables as much as possible. This was the procedure followed by Coughlin in constructing employment and employee compensation estimates for the 1967 table.[11]

We will use Peter Coughlin's method to calculate estimates of employment and employee compensation for the I-O tables of 1958 and 1963, because industry definitions and conventions of the 85 sector I-O tables for 1958 and 1963 are almost the same as the industry definitions of the 1967 I-O table.

The only conceptual difference between the 1967 table and the previous tables is the treatment of mobile homes. In the 1963 study, mobile homes were considered recreational vehicles, while in the 1967 study they were treated as housing. The most significant difference between the 1958 table and those in 1963, and 1967 is the publication of substantially more disaggregated tables for the latter 2 years. In addition to the 87 sector I-O tables for 1963 there are 367 and 478 industry level tables and for 1967, 367 and 484 sectors tables.[12]

Coughlin used NIPA employment and employee compensation figures as the starting point for the estimation of the employment and employee compensation vectors. This choice makes sense for a number of reasons. First, NIPA covers the whole economy. It divides the economy into 66 sectors and provides employment and employee compensation for these sectors.[13] Second, conceptually the IO table is integrated with the National Income and Product Accounts. The value added of the IO table represents national income, depreciation, and Indirect business taxes, while the final demand of the IO

represents the Gross national product. Therefore at the aggregate level the total employment and employee compensation of the IO table should be equal to the estimates of NIPA. Third, employee compensation includes wages, salaries, and wage supplements. NIPA provides estimates of employee compensation for the 66 economic sectors, while other data sources, such as Census payroll figures only provide estimates on wages and salaries.

In order to make NIPA data compatible with I-O classifications, we will make three types of adjustments to the NIPA estimates. First we will discuss the estimition of the employment vector.

The Estimation of the Employment Vector

The First Type of Adjustment

Input-output mining and manufacturing employment and employee compensation numbers are based on Census data, while the total I-O employment and the total I-O employee compensation figures are equal to NIPA's because I-O tables are conceptually integrated with NIPA in the sense that the total of the value added of an I-O table is equal to the total value added of NIPA. Similarly the total final demand of an I-O table is equal to the total final demand of NIPA.[14]

At the 2 digit SIC level there are significant discrepancies between Census and NIPA estimates. These differences are due to the differences in the classification

of establishments. The Census data is organized and compiled uniformly at a national level, while the Unemployment Insurance data, which is the basis for NIPA estimates, is compiled at a state level. Each state UI agency will classify a reporting establishment at their discretion. It is difficult to make sure that every state agency will classify establishments according to the appropriate categories uniformly.[15]

Let N represent the NIPA mining and manufacturing employment vector and CE the Census mining and manufacturing employment vector. The elements of N are different from those of CE, and the total of Census figures is different from the NIPA's total.

$\sum Ni = \sum CEi$ where i represents an economic sector.

Our task is to generate an employment vector which is based on Census estimates and has a total employment equal to that of the NIPA's. We will generate this vector by first adjusting the Census estimates CE.

Percentage discrepency between the totals of N and CE is equal to:

$$\sum i[(Ni - CEi) / Ni]*100$$

We will adjust CE such that an element of the adjusted Census employment vector, CE'i, is equal to:

$$CE'i = CEi + CEi * \sum i[(Ni - CEi) / CEi]$$

and $\sum CE'i = \sum Ni$

Now we have a mining and manufacturing employment vector

CE', which is compatible with the I-O tables. Each employment estimate CE'i is based on Census figures, and the total employment, $\sum$CE'i is equal to the NIPA's.

We will adjust the NIPA employment vector, N, such that the adjusted NIPA employment vector N' is identical with CE'.

N'i = Ni + [CE'i - Ni]

Obviousely N'i =CE'i

N' represents the outcome of the first type of adjustment. The numerical calculation of the first type of adjustment is presented in Appendix B, tables 25 and 26.

The Second Type of Adjustment

The second type of adjustment deals with the various levels of aggregation. Adjusted NIPA mining and manufacturing estimates are at the 2-digit SIC level,[16] while 85 sector I-O tables are based on 3-digit SIC industries. Therefore the 25 2-digit level adjusted NIPA mining and manufacturing industries should be disaggregated into 58 three digits level I-O sectors.

In contrast to the mining and manufacturing sectors, in the 85 sector IO tables, transportation, trade, finance, services, and government sectors are much more aggregated than the NIPA's. Therefore, in these sectors we will either aggregate NIPA estimates, such as services, or we will use NIPA's aggregate estimates such as transportation, trade, and government(See table 9).

Table 9 represents industry classification of the NIPA's and I-O tables. In general in manufacturing a NIPA sector corresponds to many I-O sectors, while in the services many NIPA sectors correspond to an I-O sector.

Our task is to adjust NIPA sectors, such that they correspond to the I-O sectors. Therefore we need to disaggregate NIPA mining and manufacturing sectors and aggregate NIPA services sectors. Aggregating services sectors is the easy step because the numbers are available and we just sum them up. Disaggregating NIPA mining and manufacturing sectors is much more difficult, because we need additional data, which NIPA doesn't provide.

For example BEA I-O sector 24,"Paper and allied products except containers and boxes", and sector 25,"Paperboard containers and boxes", correspond to NIPA's "Paper and allied products" sector. Somehow we must breakdown NIPA's "paper and allied products" sector into two I-O sectors, 24 and 25. We will disaggregate NIPA's " paper and allied products" by calculating the ratio or the percentage of this NIPA sector which is allocated to I-O sector 24 and the ratio which is allocated to the I-O sector 25. We will calculate these ratios by using Census of mining and manufacturing employment data.

According to the Census of Manufactures in 1958, 374.2 thousand workers were employed in I-O sector 24 and 181.2 thousand in I-O sector 25 (see appendix B, table 27). The combined employment of I-O sectors 24 and 25, according to the

Census of Manufactures was 555.4 thousand. Based on these numbers we calculate two ratios R1 and R2.

R1 = 24 / (24+25) R2 = 25 / (24+25)

Table 9

Correspondence Between NIPA, I-O Sectors and SIC Codes

NIPA sector names	BEA I-O sec.	SIC codes
Agriculture		
Farms	1,2	1
Agricul. services, forestry & fish.	3,4	7 to 9
Mining		
Metal mining	5,6	10
Coal mining	7	11,12
Oil & gas extraction	8	13
Nonmetallic minerals, except fuel	9,10	14
Construction	11,12	15 to 17
Manufacturing		
Food and Kindred products	14	20
Tobacco manufactures	15	21
Textile mill products	16,17	22
Apparel & other textile products	18,19	23
Lumber & wood products	20,21	24
Furniture and fixtures	22,23	25
Paper and allied products	24,25	26
Printing and publishing	26	27
Chemicals and allied products	27 to 30	28
Petroleum and coal products	31	29
Rubber & miscellaneous plastic prod.	32	30
Leather and leather products	33,34	31
Stone, clay & glass products	35,36	32
Primary metal industries	37,38	33
Fabricated metal products	39 to 42	34
Machinery, except electrical	43 to 52	35
Electric and electronic equipment	53 to 58	36
Motor vehicles and equipment	59	371
Other transportation & ordnance	60,61,13	37-371,19
Instruments and related products	62,63	38
Misc. manufacturing industries	64	39
Transportation, Commu. & utilities		

Transportation	65	40 to 47
Telephone and telegraph	66	481,7,9
Radio & television broadcasting	67	483
Electric, gas, & sanitary services	68	49
Wholesale and retail trade	69	50 to 59
NIPA sectors	BEA I-O sec.	SIC codes
Finance, insurance & real estate		
Finance and insurance	70	60 to 64,67
Real estate	71	65,66
Services		
Hotels	72	70
personal services	72	72
Miscellaneous repair services	72	76
Business services	73	73
Legal services	73	81
Miscellaneous professional serv.	73	89
Auto repair, services & garages	75	75
Motion pictures	76	78
Amusement & recreation services	76	79
Health services	77	80
Educational services	77	82
Social services & membership org.	77	83,86
Government enterprises		
Federal government enterprises	78	---
State government enterprises	79	---
Rest of the world	83	---
Household industry	84	---

Where 24 and 25 represent Census employment estimates of I-O sectors 24 and 25 respectivly.

Based on Census of Manufactures' employment estimates we obtain,

I-O sector 24, 374.2 thousands workers

I-O sector 25, 181.2 thousands workers

I-O sectors 24+25, 555.4 thousands workers

R1 = 374.2 / 555.4 = .67

R2 = 181.2 / 555.4 = .33

Then we take adjusted NIPA employment estimate for "paper and allied products" sector, 570.24 thousands, which we generated through the first type of adjustment, and multiply this adjusted NIPA estimate by R1(.67) and R2(.33). The result is two employment estimates for I-O sectors 24 and 25.

Based on adjusted NIPA estimates we get;

I-O sectors 24+25, 570.24 thousands workers

I-O sector 24 570.29 * .67 = 384.23 thousands workers

I-O sector 25 570.29 * .33 = 186.06 thousands workers

Basicaly we are disaggregating adjusted NIPA estimates derived from the first type of adjustments by using Census figures (see appendix B tables 27).

The third Type of Adjustment

With respect to the third type of adjustment, there are three types of redefinitions and classification changes; Force account construction or FAC, manufacturers sales offices or MSO and "other" redefinitions.

1) Force account construction adjustment, FAC, is dealing with the classification of construction workers not in the construction sector as we discussed above.

2) The second type of redefinitions are adjustments related with manufacturers sales offices, MSO's. Input-output tables redefine workers who are working in the sales offices of the manufacturing industries from the wholesale trade sector to the corresponding manufacturing industry. The result is that the employment of the wholesale trade sector will be reduced while the employment of each manufacturing sector will increase.[17]

3) The third type of redefinitions are specific to pairs of economic sectors. Some categories of workers will be redefined from one economic sector to another. Most of these redefinitions occur in construction, trade, and services. These redefinitions are listed in the Definitions and Conventions of the 1967 I-O table, and of the 1972 I-O table.[18] The Definitions and Conventions of the 1972 I-O table indicate those redefinitions which are new to the 1972 I-O table and those which were also applied in the previous tables.[19]

In order to have an idea about these changes, we will

mention only a few redefinitions and industry classification changes.[20]

Agriculture: I-O tables reclassifie veterinarians from I-O sector 4 to I-O 77, medical and educational services.

Landscaping workers are redefined from construction to I-O sector 4, Agricultural services.

Mining: I-O tables reclassifie oil and gas field services (SIC 138) from I-O 8 Crude petroleum and natural gas to I-O 11 new construction.

Construction: In I-O tables telephone installation workers are part of I-O sector 66, communication. While NIPA estimates which are based on Unemployment Insurance employment statistics program (UI) data, include telephone installation workers in construction. Therefore we must adjust NIPA estimates and transfer telephone installation workers from construction to communication.

Workers in the rental of construction equipment are redefined from construction to I-O 73, miscellaneous business services.

Food and kindred products: Workers working in " cutting and selling purchased carcasses" are redefined from trade sector I-O 69 to I-O 14, Food and kindred products.

Workers in "the sale of bakery products produced on the same premises by retail bakeries," are redefined from trade sector I-O 69 to Food and kindred products.

Chemicals: Workers working in the production of alumina

are shifted from I-O 27 chemicals to I-O 38 primary nonferrous metals manufacturing.

Although there are many other major and minor redefinitions, these examples already give us an idea about the nature of redefinitions.

Obviously finding data for all these numerous specific redefinitions, such as workers working in "the sale of bakery products produced on the same premises by retail bakeries" is difficult. However, all these redefinitions and classification changes are done by Coughlin for the 1967 data. We already mentioned that classifications and definitions of 85 sector I-O tables for 1958, 1963, and 1967 are almost identical. Therefore we will use Coughlin's results to make the third type of adjustment.

Coughlin generates the final employment vector Ec for 1967, which reflects all three types of adjustments, and he also provides a separate vector reflecting FAC employment adjustments. All the elements of the FAC vector are negative except the construction sector, because Coughlin adjusts the employment vector by transfering construction workers employed in sectors other than the construction sector, to the construction sector. The total of the FAC vector is 0, SFACi = 0.[21]

When we subtract the FAC vector from Coughlin's final I-O employment vector, Ec, we arrive at the final I-O employment vector without FAC, Ef.

Ef = Ec - FAC

During our calculations of the rate of surplus value, for the year 1967, we will use Ef, because it is compatible with the I-O tables that we are using.

Coughlin also provides an employment vector E1, which reflects just the first and second types of adjustments. When we divide the final employment vector that we are using, Ef, by E1 we get a vector Er of ratios, which reflects the magnitudes of the third type of adjustment without FAC of each sector.

Er = Ef / E1 and therfore Ef = Er * E1

So, if we know Er and E1, then we could generate Ef without having information about the third type of adjustments, which are difficult to find out.

For 1958 and 1963 we will be able to estimate E1, which incorporates the first two types of adjustments. Then we will use Er of 1967 to generate final employment vectors, Ef, for 1958 and 1963.

$E_f^{58} = E_r^{67} * E1^{58}$ and $Ef^{63} = Er^{67} * E1^{63}$

It is reasonable to use Er^{67} to generate Ef^{58} and Ef^{63}, because the definitions and classifications of 85 sectors I-O tables for 1958, 1963 and 1967 are almost identical. The third type of adjustment is carried out in appendix B, tables 29 and 30.

Employment Vector of Productive Workers

The final I-O employment vector, Ef, that we derived represents all employees of an economic sector. However in each production sector there are productive and unproductive workers such as supervisory and sales workers. Therefore we need two I-O employment vectors for each year. One vector representing all employees of all economic sectors and another vector representing productive workers of the production sectors. We will generate both vectors for all five benchmark years, 1958, 63, 67, 72, and 77.

The best method of calculating the vector of productive workers is to use the same method that we applied to generate the employment vector of all employees. However we can't do that because data on productive workers is scarce and specifically NIPA doesn't distinguish between productive and supervisory workers. The alternative is to determine the ratio of productive workers to all employees for each sector and then to multiply the total employment vector by these ratios.

For the mining and manufacturing sectors we use Census estimates. Censuses provide estimates for all employees and for production workers. When we divide production workers estimates by all employees estimates, we produce a ratio for each sector. Appendix B table 31 presents the calculation of these ratios.

In 1958 Seventy seven percent of the mining sector's

workers were productive workers while 76% of manufacturing workers were productive. These are the averages of mining and manufacturing, which implies that there are individual sectors with higher and lower percentages. Some of the sectors with a higher percentage of productive workers are I-O sector 15, Tobacco manufactures 90%, and I-O sector 16 Broad and narrow fabrics, yarn and thread mills, 91%. Some of the sectors with low productive workers' ratios are I-O sector 30, paints and allied products 56%, and I-O sector 29 Drugs, cleaning and toilet preparations 59%.

Productive workers' ratios for agriculture, construction, transportation, utilities, communication, and services are provided by the "Employment and Training Report of the President."[22] After gathering together the productive workers' ratios of all sectors we will get a vector, Rp. When we multiply this vector of ratios with the productive sectors' final I-O employment vector, we will get the vector of productive workers working in the production sectors.

Estimation of the Employee Compensation Vector

The calculation method of employee compensation for I-O sectors is basically identical with the calculation method of employment estimates. The major difference is related with the first type of adjustment, where we use Census of Mining and Manufactures to adjust NIPA estimates. The first type of

adjustment, during the calculation of employee compensation is slightly more complicated than during the calculation of employment estimates because Census of Mining and Manufactures only provide data on wages and salaries while for I-O tables we need wages, salaries and wage supplements (see appendix B tables 32,33,and 34).

The second and third type of adjustment is identical with the adjustment of employment estimates(see appendix B tables 35,36,37 and 38). After estimating the employee compensation vector for all employees we will generate the employee compensation vector of productive workers by using the same method that we applied for the calculation of productive workers' employment vector.

We will calculate ratios of wages of production workers over wages of all workers of mining and manufacturing sectors by using payroll estimates provided by the Censuses. We will multiply our estimated employee compensation of all workers by these ratios and we get the vector of productive workers.

Some of these ratios are very low. In I-O sector 29, 48% of the wages of all employees were earned by productive workers (see Appendix B, table 39). In I-O sector 30 production workers earned just 47%. These numbers are not surprising, because we already saw that the number of productive workers in these two sectors are just 59% and 56%, of all employees.

It is significant to note that, beside I-O sector 14, in

all other sectors the ratios of productive workers wages over all employees' wages are systematically lower than the ratios of employment of productive workers over employment of all employees. The productive workers of mining and manufactures are earning just 67% of wages of all employees. However, the average employment ratio is .76, which implies that the number of productive workers of mining and manufactures is 76% of the number of all employees of these sectors (See Appendix B table 31).

Based on these numbers we could argue that the average wage of productive workers is lower than the average wage of supervisory employees.

Employment vectors for 1963 are estimated in Appendix B, tables 40 to 45, while employee compensation vectors are estimated in Appendix B, tables 46 to 52.

Employment and Employee Compensation of 1967,1972, & 1977

For the 1967, 1972, and 1977 I-O tables we will use Coughlin's, Crane's and Yuskavage's estimates of employment and employee compensation vectors of all employees and of the productive workers of mining and manufacturing sectors. However we will make two adjustments.

First we will reverse FAC adjustment of employment and employee compensation vectors, because we are reversing FAC adjustment of the BEA I-O tables. We discussed FAC adjustment

in the beginning of this chapter.

Second we should complete their employment and employee compensation vectors of productive workers, such that we get vectors for all the production sectors, and not just mining and manufacturing sectors.

For the 1967 we will reverse FAC adjustment without difficulty, because Coughlin provides sufficient data on FAC adjustment both for employment and employee compensation estimates, (see Appendix C, tables 53 and 55).[23]

For the 1972 Crane doesn't provide data on FAC adjustment.[24] Therefore for that year we are obliged to estimate FAC adjustment of employment and employee compensation of each sector, FACi labor and FACi comp. We will estimate them by using the data on FAC adjustment of output of the 1972 I-O sectors, provided by the "Conventions and definitions of 1972 I-O tables"[25]

We will divide FAC adjustment of output of each sector, FACi output, by the total output of that sector, Qi, and we get a ratio.

FACi output / Qi

Then we multiply the employment of sector i, Li, by this ratio and we get FAC labor of this sector.

FACi labor = (FACi output / Qi) * Li

We will calculate FAC of employee compensation, FACi comp, by using the same method.

FACi comp = (FACi output / Qi) * Compi

During this calculations we are assuming that;

FACi labor / Li = FACi output / Qi

and FACi comp / compi = FACi output / Qi

The derivation of employment and employee compensation vectors corresponding to our 1972 I-O table is presented by tables 42 and 45 in Appendix C.

The estimation of employment and employee compensation vectors corresponding to our 1972 I-O table is presented by tables 56 and 57 in Appendix C.

For the 1977 we will reverse FAC adjustment for employment without difficulty, because Yuskavage provides data on FAC adjustment for employment.[26] However he doesn't provide data on FAC adjustment of employee compensation. We will estimate FAC adjustment of employee compensation by using the data on FAC adjustment of employment provided by Yuskavage.

All FAC labor are construction workers. Therefore we assume that they receive wages equal to the workers of the construction sector, sector 11. We know the total compensation of workers working in the construction sector, comp11. We also know total employment of construction sector, L11. When we divide comp11 by L11, we get the wage of a construction worker working in the construction sector.

When we multiply FAC labor of sector i, which is provided by Yuskavage, by the wage of a construction worker working in the construction sector, comp11/L11, we get FACi comp of each sector.

FACi comp = FACi labor * (comp11/L11)

The estimation of employment and employee compensation vectors corresponding to our 1977 I-O table is presented by tables 58 and 59 in Appendix C.

The derivation of employment and employee compensation vectors corresponding to our 1977 I-O table is presented by tables 43 and 46 in Appendix C.

In this chapter we discussed in detail the estimation methods of employment and employee compensation vectors of all employees and of productive workers for the 1958 and 1963 I-O tables. We also discussed the few adjustments that we made to the employment and employee compensation estimates of 1967, 1972, 1977.

Footnotes Chapter III

1. U.S. Dept. of Commerce, BEA, 1965, 1969, 1974, 1979, 1984.
2. Wolff 1987, Graham 1984.
3. U.S. Dept. of Labor, BLS, 1979.
4. U.S. Dept. of Commerce, BEA, 1980, p. 66.
5. U.S. Dept. of Labor, BLS, 1986.
6. Ochoa, 1984, Appendix C.
7. Coughlin 1978, Crane 1982, Yuskavage 1985.
8. Walderhaug, 1973.
9. U.S. Dept. of Commerce, BEA, 1980, p. 46-47.
10. Ibid., p. B3-B7.
11. Coughlin, 1978.
12. U.S. Dept. of Commerce, BEA, 1974b, p. 1.
13. U.S. Dept. of Commerce, BEA, 1966, p. 101.
14. Coughlin, 1978, p. 2.
15. Ibid., p. 7.
16. U.S. Bureau of the Census, 1981a and 1981b.
17. Coughlin, 1978, p. 9.
18. U.S. Dept. of Commerce, BEA, 1974b and 1980.
19. U.S. Dept of Commerce, BEA, 1980, p. 56 - 74.
20. Ibid., p. 56 - 74.
21. Coughlin, 1978, p. 24-27.
22. U.S. Dept. of labor, 1981, Table C-2, p. 212.
23. Coughlin, 1978, p. 28-31.
24. Crane, 1982.

25. U.S. Dept. of Commerce, BEA, 1980, p. 75-77.

26. Yuskavage, 1985, p. 19.

CHAPTER IV

The Rate of Surplus Value in the US

Classification of the I-O Economic Sectors

We will calculate the rate of surplus value using I-O tables of 1958, 1963, 1967, 1972 and 1977. The method of our calculations is based on the method developed in chapter II.

We use adjusted 82 by 88 I-O tables, which have been derived from the conventional I-O tables. The 1958, 1963 and 1967 I-O tables published by the BEA, are significantly different from the 1972 and 1977 I-O tables. If we use these I-O tables, without any adjustments, then part of the differences of the rates of surplus values of different years will be caused by the existing differences in methodology between these I-O tables. We will avoid this problem by using I-O tables, that have been adjusted in order to be comparable with each other. All 5 adjusted I-O tables that we are using have the same sectors and the same structure. Therefore, when we get different rates of surplus values for different years, we can be confident that they are not caused by the different structures of the I-O tables.

The procedures used in homogenizing the structure of the 5 I-O tables, involves the homogenization of the treatments of the imports, eating and drinking places, dummy and special

industries and others. For details of the adjustments see Appendix A.

The first 80 rows represent economic sectors, while the 81st and 82nd rows represent value added and column totals. As with the rows, the first 80 columns represent economic sectors, while the remaining columns represent final demand and row totals. The final demand columns are personal consumption, gross investment, changes in business inventories, exports, imports, federal government purchases and state government purchases. Table 10 represents the correspondence between the sectors of our I-O tables and BEA's 85 sectors I-O tables.

Before beginning our calculations we should split the 80 economic sectors into production and non production sectors. Table 11 aggregates the I-O sectors of table 10 and it indicates the production and non production I-O sectors. Agriculture, sector 1, which is represented by the first 4 sectors in a 87 sector standard I-O table is a production sector. Mining,sectors 2-7, construction, sector 8, and manufacturing, sectors 9-60 are all considered production sectors because they produce use values.

Table 10

Correspondence Between Ours and BEA I-O Sectors

No. & Names of Sectors of Our Adjusted I-O Tables	Corresponding BEA Original I-O Sectors
1. Agriculture	1 to 4
Mining	
2. Iron mining	5
3. Nonferrous metal mining	6
4. Coal mining	7
5. Crude petroleum and natural gas	8
6. Stone and clay mining	9
7. Chemical and fertilizers	10
8. Construction	11, 12
Manufacturing	
9. Ordnance and Accessories	13
10. Food and kindred products	14
11. Tobacco	15
12. Fabrics, yarn and thread mills	16
13. Miscellaneous textile goods & floor coverings	17
14. Apparel	18
15. Miscellaneous fabricated textile products	19
16. Lumber and wood products	20
17. Wooden containers	21
18. Household furniture	22
19. Other furniture and fixtures	23
20. Paper and allied products	24
21. Paperboard, containers and boxes	25
22. Printing and publishing	26
23. Chemicals and allied products	27
24. Plastic and synthetic materials	28
25. Drugs, cleaning & toilet preparations	29
26. Paints and allied products	30
27. Petroleum refining	31
28. Rubber & miscellaneous plastic products	32
29. Leather tanning	33
30. Footwear and other leather products	34
31. Glass and glass products	35
32. Stoner and clay products	36
33. Primary iron and steel manufacturing	37
34. Primary nonferrous metals manufacturing	38
35. Metal containers	39
36. Heating and fabricating metal products	40
37. Screw machine products	41
38. Other fabricated metal products	42

77. Government industry	82
78. Rest of the world	83
79. Household industry	84
80. Inventory valuation adjustment	85

Most of transportation (61) which involves reaching the consumer is production. But if there are detours caused by distribution centers, that portion is considered non production. However we will assume that all transportation is production because the non production portion is relatively small, and is difficult to estimate.

Public utilities (64) such as water, gas and electricity are production. We have already discussed the treatment of trade (65) in the first stage of our model in chapter II and real estate (67) in the second stage of our model. Both sectors are non production. Hotels and repair services with the exception of auto repair (68) are production.

Finance (66) and business services (69), such as legal and advertising are nonproduction sectors, and we will treat them, as royalties. Interest payments are considered royalty payments for access to money. Advertisements are royalties paid for access to the customers, and legal expenses are considered royalty payments to keep and protect surplus value. Royalties, which are non production sectors are discussed in models 3 and 4 of chapter II.

Auto repair and amusements (70,71) are production, since they produce use values. Federal and state enterprises

(73,74), which represent activities such as, public transportation, post office and utilities, are production.

Non-comparable imports (75), are goods produced in other countries with no comparable goods produced in the U.S., such as rubber. This dummy industry's column is empty, because it has no domestic inputs. The row represents the use of non-comparable imports by other sectors. This sector doesn't affect the measurement of surplus value produced in the U.S., and is therefore excluded from our calculations.

Government Industry (77), represents only employee compensation (wages, salaries and wage supplements) of government workers such as workers employed in the public school system or in government agencies and offices. These workers are different from those working in the government enterprises such as postal workers.

In the column of this sector there is just one entry which appears in the employee compensation row of the value added. However the row which corresponds to this sector has very few entries, all of which are in the federal and state government purchases column of the final demand. The row entries represent government employee compensation paid by the federal and state governments. Therefore government employee compensation appear twice. Once in the value added and once in the final demand.

We will ignore the government industry sector during our

calculations, because it artificially inflates the gross product. On the value added side, government employee compensation is paid out of taxes taken from the wages and profits of the other sectors. Therefore, for total value added they are counted twice. Once through the wages and profits, which includes taxes of the other sectors and once through the value added row of the government industry column.

During our calculations we will use gross wages and profits which already include income tax, corporate tax and other taxes. Therefore we will ignore government industry in order to avoid double counting. However if during our calculations we use wages and profits net of taxes, then we should take into account the government industry sector.

On the final demand side, again government employee compensation is counted twice. Once through the government industry row, where the total amount of government employee compensation appears in the federal and state government columns, and once in the personal consumption expenditures column as the purchases of different products and services by the government employees.

The Rest of the world (78), is a dummy industry, which represents earnings of U.S. residents working in the U.S. for foreign governments or international organizations, and earnings of U.S. residents working in other countries plus earnings of U.S. residents from foreign investments. From this

total we deduct earnings of foreign workers working in the U.S. and earnings of foreign residents from domestic investments. We could also say that the rest of the world industry consists of services produced by factors of production owned by U.S. residents to foreign residents minus services produced by factors of production owned by foreign residents to U.S. residents.[1]

Almost all of the rest of the world, 99% for 1972, consists of property type income and the remaining is employee compensation. NIPA and I-O tables include the rest of the world sector because they present economic activities of U.S. residents in the U.S. and outside. The concept of GNP includes the rest of the world, ROW.

$$GNP = GDP + ROW$$

GDP is equal to the gross production of goods and services in the U.S. We will use GDP instead of GNP, because we are measuring the amount of surplus value produced within the boundaries of the U.S. Therefore, in our calculations we will ignore the rest of the world sector.

Household industry (79), consists only of employee compensation of workers employed by households, such as baby sitters, cooks, drivers, personal affairs managers.[2] Therefore in the column of this industry, there will be a single entry. In the row of this industry, again there will be a single entry, which is located in personal consumption expenditure of

the final demand.

These workers are production workers, because they are creating use values. However they are not productive of surplus value, because they are the direct producers and they are selling their services directly to the consumer, similar to a petty commodity producer. They are creating values, however they are not generating surplus value, because they are not working for capital. Therefore, we will ignore this sector during our calculations of surplus value. This is the only sector within an I-O table, which violates one of our assumptions from chapter one, that all activities in the U.S. occur within the circuit of capital.

Inventory valuation adjustment, IVA (80), is a dummy industry, which has a single entry in its column in the property-type income row of value added. The row which corresponds to this sector also has a single entry in the change in business inventories column of the final demand. The purpose of this sector is an accounting adjustment.

Input output tables are conceptually based on NIPA's and in NIPA's goods and services are valued at their current period prices, while the value of inventories reported by businesses are based on book values. The role of IVA is to adjust the values of inventories reported by businesses, such that they match with the NIPA's accounting framework. We will include IVA in our calculations because it affects the

calculation of the profit and surplus value in money form.[3]

Most of our calculation will focus on the first 74 sectors, and for the calculation of the value rate of surplus value, we take out the four non production sectors, trade, rent, finance and business services resulting in 70 production sectors.

Calculation of the Rate of Surplus Value

We will use the final mapping of our theoretical model that we developed in chapter II to calculate the rate of surplus value. Based on our model we will split up the I-O sectors into three groups, which during the calculations will be treated differently: First the production sectors which are sectors 1 to 64, sector 68, and sectors 70 to 74. Second the non-production sectors of trade (65) and real estate (67) and third the non-production sectors of finance (66) and business services (69), which are treated like royalties in our model.

Two elements which will be used during our calculation and which didn't appear in our model of chapter II are depreciation and inventory valuation adjustment, sector 80. In this chapter we have already discussed the treatment of IVA. Depreciation in the standard I-O tables is included in the property type income of the value added of each sector. However, in a Marxian framework the cost of producing a

commodity is equal to the direct or living labor cost plus cost of materials used during the production plus the depreciation of fixed capital. Therefore, in order to calculate Marxian value added in price form, VA^m, we must deduct the depreciation of all production sectors from the total value added of the corresponding sector.

We also need to know the depreciation of the real estate sector, in order for the rental payments to become similar to the trade margins we must deduct depreciation of the rental sector from the rental column. We discussed the real estate sector in stage 2 of our model, however, depreciation had not been considered at that stage.

On the final demand side, gross private fixed investment includes replacement investment. Therefore, in order to calculate Marxian final demand in money form FD^m, the same amount of depreciation that we deducted from the value added side must be deducted from the final demand side.

First, we will describe the calculations of the price rate of surplus value and then the value rate of surplus value. Throughout this chapter we will be using data from the 1972 I-O table to illustrate our calculations. The calculations for the other years will generate similar results.

Calculation of the Price Rate of Surplus Value

On the value added side we need to calculate variable capital, Vm and Marxian value added in price form VA^m. Then when we deduct Vm from VA^m we obtain surplus value in money form SVm. According to our notation subscript m represents categories in money form, and when discussing value added and final demand, the symbol ^ represents Marxian categories.

In this dissertation we are not addressing issues related with the social wage. There is a literature regarding the social wage and issues related with it. We are ignoring the redistribution effect of the state, and we are considering S/V, V and S after repartition of income after production. Implicitly we are assuming that taxed paid by workers are equal to the transfer payments to the workers.

Variable capital is equal to the employee compensation of the productive workers, reduced by the finance payments, WFin, by these workers to the finance sector, and by their payments WBus to the business services sector. The rational for these deductions was discussed earlier in chapter II, pp. 53.

The amounts to be deducted, WFin and WBus, represent the payments by productive workers to the finance and business services sector, respectively. These are not directly available, but they can be estimated by multiplying total consumer payments to Finance (ConFin) and to Business services

(ConBus) by the share of productive workers.

$$(WFin + WBus) = R*(ConFin + ConBus)$$

where ConFin and ConBus are the payments to the finance and business services sectors by all consumers, and R equals the ratio of total compensation of the productive workers, Comp, divided by total personal consumption expenditures, PCE. It is assumed that employee compensation, Comp, is equal to production workers' consumption.

When we deduct WFin and WBus from Comp, we obtain variable capital in money form.

$$Vm = Comp - (WFin + WBus)$$

We will use 1972 adjusted I-O table, employee compensation, and employment vectors and depreciation data to illustrate numerically our method of calculation. Table 12 is an aggregation of our 82 by 88 1972 I-O table into a 7 row and 10 column table. The adjustments and sources of our I-O tables are discussed in Appendix A.

Table 13 describes table 12 and the correspondence between its sectors and the sectors of our 82 by 88 I-O tables. The cell which corresponds to the third row and PCE column of table 12 represents (ConFin + ConBus), which is equal to $49,005.

Column total of PCE is $734,529, while according to table 57 of Appendix compensation of the productive workers Comp, for 1972 is $291,091.

Table 12
Aggregated I-O Table, 1972

	Prod	Trade	Royalties	N-C	IVA	PCE	INV++	Net Exp	Govt.	Totals
1.Production	614445	56997	20138	0	0	445699	124587	12524	98249	1372637
2.Total Trade	86029	30137	9026	0	0	216822	10964	7553	3534	364065
3.Royalties	46741	13603	26201	0	0	49004	102	904	10321	146877
4.Noncomp Imports	4703	197	203	0	0	23004	3407	-35033	3518	-0
6.IVA	0	0	0	0	0	0	-7591	0	0	-7591
7.Value Added	620719	263131	91310	0	-7591	0	0	0	0	967569
8.Totals	1372638	364064	146877	0	-7591	734529	131469	-14051	115622	2843557

R = Comp/PCE = 291,091/734,529 = .396

(WFin + WBus) = .396 * 49,005 = $19,420

Vm = Comp - (WFin + WBus) = 291,091 - 19,420 = $271,671

Table 14 presents the data required to calculate Vm for all 5 years. The sources of these numbers are identical with the sources of the numbers that we used to calculate Vm for 1972.

The Marxian value added in money form VA^m is represented by the sum of the numbers within the dotted line area of table 12, minus depreciation of production and rental sectors, tdep.

VA^m is equal to the sum of the value added of the production sectors ProdVA, which is represented by the last row and first column of table 12, $620,719, plus the column sum of the trade TotTrade and rental TotRent sectors, which are represented by the cell corresponding to the last row and 2nd column, $364,064, plus payments by the production sectors to the financial sector FinServ, and to the business sector BusServ, which are represented by the cell corresponding to the third row and first column, $46,741, plus inventory valuation adjustment IVA, seventh row and IVA column, -7,591, minus depreciation of the production and rental sectors tdep, $44,399. For the source of tdep see Appendix A.

For 1972;

VA^m=ProdVA+(TotTrade+TotRent)+(FinServ+BusServ)+IVA-tdep

VA^m=620,719 + 364,064 + 46,741 + (-7,591) - 44,399

VA^m = $979,535 million

Table 15 presents the data required to calculate VA^m for all 5 years. The sources of numbers in table 15 are identical with the sources of the numbers that we used to calculate VA^m for 1972.

Table 13

Correspondence Between Table 14 and our 82-88 I-O Table

No. and Names of Sectors of Table 14	Corresponding Numbers of Our I-O Sectors
1. Production	1 to 64, 68, 70 to 74
2. Total Trade	65, 67
3. Royalties	66, 69
4. Noncomparable Imports	75
5. Inventory Valuation Adjustment	80
6. Value Added	81
7. Totals	82

Note; Columns 6 to 9 of table 14 represent the final demand, which includes personal consumption, column 6, investment and inventory changes, column 7, net export, column 8, and government purchases, column 9. Column 10 represents row totals.

Table 14

Calculation of Variable Capital in Money Form

(Millions of Dollars)

	1958	1963	1967	1972	1977
Compensation	117,980	153.244	196,309	291,091	466,030
TotPCE	283,761	368,574	471,245	734,529	1,191,684
R = Comp/PCE	.416	.416	.417	.396	.391
ConFin	12,462	17,699	26,023	40,888	64,088
ConBus	1,275	2,889	4,596	8,117	13,595
WFin & WBus	5,711	8,560	12,755	19,420	30,380
Vm	112,269	144,684	183,554	271,671	435,651

Table 15

Calculation of Marxian Value Added in Money Form

and The Price Rate of Surplus Value

(Millions of Dollars)

	1958	1963	1967	1972	1977
ProdVA	255,723	332,745	434,291	620,719	999,305
TotTrade	104,126	130,255	175,214	265,050	423,456
TotRent	33,919	45,678	64,284	99,015	166,469
FinServ	4,901	5,426	6,443	12,289	23,384
BusServ	8,940	12,445	21,066	34,452	63,745
IVA	-311	-502	-1,843	-7,591	10,320
tdep	20,491	24,463	29,783	44,399	86,281
VA^m	386,806	501,584	669,671	979,535	1,600,398
Sm	274,537	356,900	486,117	707,864	1,164,757
Sm/Vm	2.445	2.467	2.648	2.606	2.674

On the final demand side we must calculate Vm and FD^m. And upon deducting Vm from FD^m we obtain SVm. The variable capital Vm that we calculated on the value added side is identical with the Vm on the final demand side.

Marxian final demand in money form, FD^m, is represented by the sum of the numbers within the broken line area of table 12, minus tdep, depreciation of the production and rental sectors.

FD^m is equal to the purchases by the final demand sectors from the production, trade and noncomparable imports sectors, AdjFD, which are represented by the cells corresponding to the 1st, 2nd, 4th rows and final demand columns of table 12, $907,237, plus the purchases by the non production sectors from the production, trade, rental and noncomparable imports sectors, MatUnp, which are represented by the cells corresponding to the 1st, 2nd 4th row, and 2nd and 3rd columns, $116,297, minus tdep, 44,399.

FD^m = (AdjFD - tdep) + MatUnp

For 1972, FD^m = (907,237 - 44,399) + 116297

FD^m = $979,135 million

Table 16 presents the data required to calculate FD^m for all five years. The numbers in this table are based on our adjusted I-O tables and the depreciation vectors that we are using. Their sources are mentioned in Appendix A.

When we examine the results of the calculations of the

Table 16

Calculation of Marxian Final Demand in Money Form

and The Price Rate of Surplus Value

(Millions of Dollar)

	1958	1963	1967	1972	1977
AdjFD	361,987	468,460	620,440	907,237	1,461,612
MatUnp	45,172	57,432	78,880	116,297	205,865
tdep	20,491	24,463	29,783	44,399	86,281
FD^m	386,668	501,429	669,537	979,135	1,581,197
Sm	274,399	356,744	485,983	707,464	1,145,546
Sm/Vm	2.444	2.467	2.648	2.604	2.630

price rates of surplus value we realize that the numbers from the value added side are extremely close, almost identical, with those from the final demand side (see tables 13 and 16). In 1972 VA^m was $979,535 million, while FD^m was $979,135 millions. The surplus values in money form Sm are also close to each other, because Vm is the same on both sides.

On the value added side;

Sm = VA^m - Vm = 979,535 - 271,671

Sm = $707,864 million

while on the final demand side;

Sm = FD^m - Vm = 979,135 - 271,671

Sm = $707,464 million

Based on these numbers we can draw bar diagram 1. The first two bars represent VA^m and FD^m respectively. These two are identical, because their numerical difference is insignificant. The third and fourth bars represent Sm from the value added side and Sm from the final demand side. Again the two bars are identical, because their numbers are almost the same.

When Sm from the value added side is almost the same as Sm from the final demand side and when we are using the same variable capital, Vm, then the rate of surplus value from the VA side, Sm/Vm, will be almost identical with the rate of surplus value from the FD side, Sm/Vm.

On the value added side;

FD^m, VA^m, Sm totals in price form

Comparing VA side with FD side, 1972

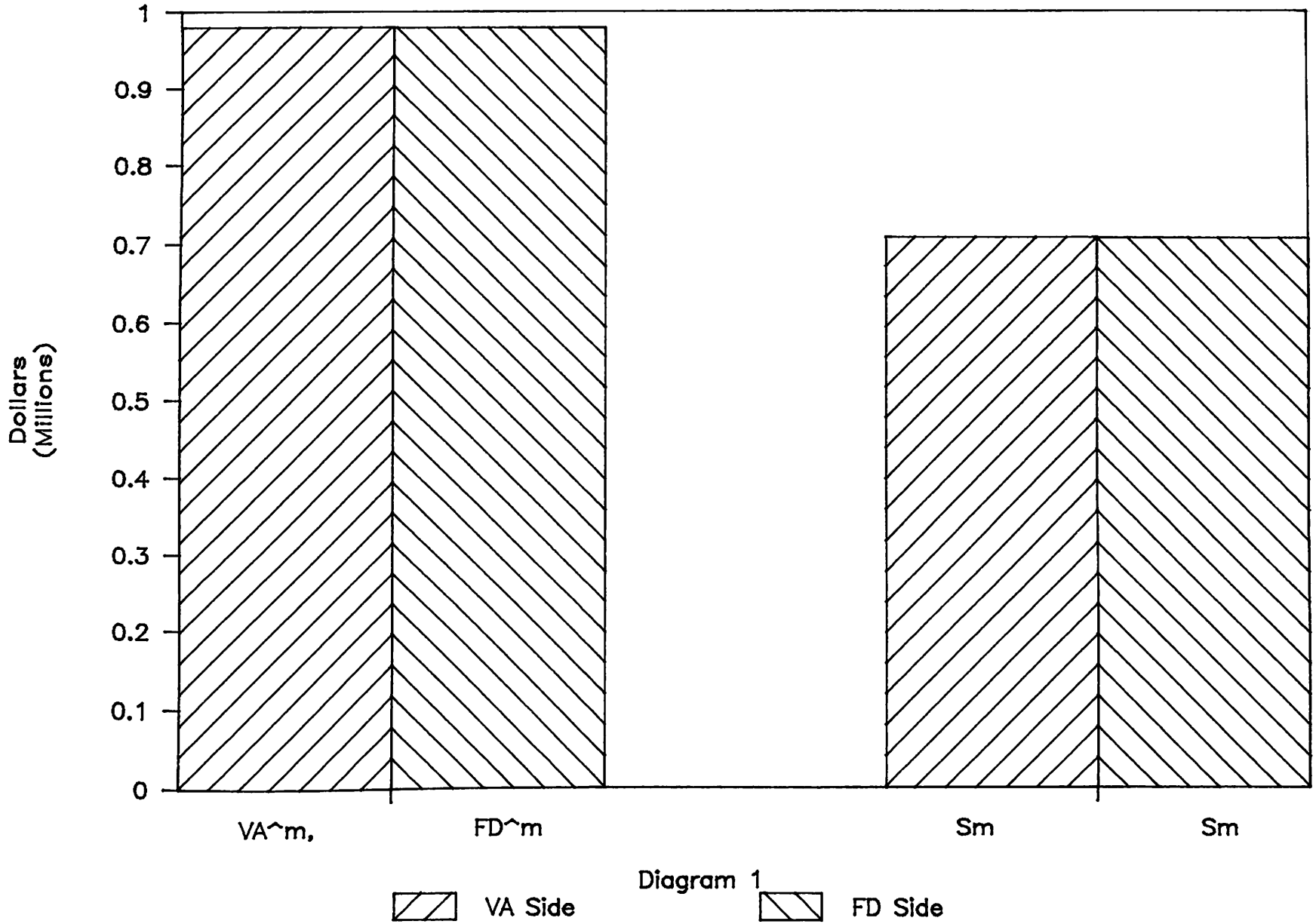

Diagram 1

Sm/Vm = 707,864 / 271,671

Sm/Vm = 2.606

On the final demand side;

Sm/Vm = 707,464 / 271,671

Sm/Vm = 2.604

The first two bars of diagram 2 represent Sm/Vm from the value added side and the final demand side respectively. These two bars are identical, demonstrating that the difference between Sm/Vm from the value added side and the final demand side is insignificant.

These results confirm that our method of calculating the price rate of surplus value from the value added side is consistent with the method of calculating the price rate of surplus value from the final demand side.

Calculation of the Value Rate of Surplus Value

On the value added side the calculation of labor value of variable capital V is similar to the method described in the theoretical model of chapter II. During the calculation of V we need data on employment, Leontief inverse matrix and consumption vector of productive workers. The employment data are provided by the tables in Appendix B, and C, while the remaining data are based on our adjusted I-O tables. For 1972 V is equal to 8,303 thousands of worker years. The employment

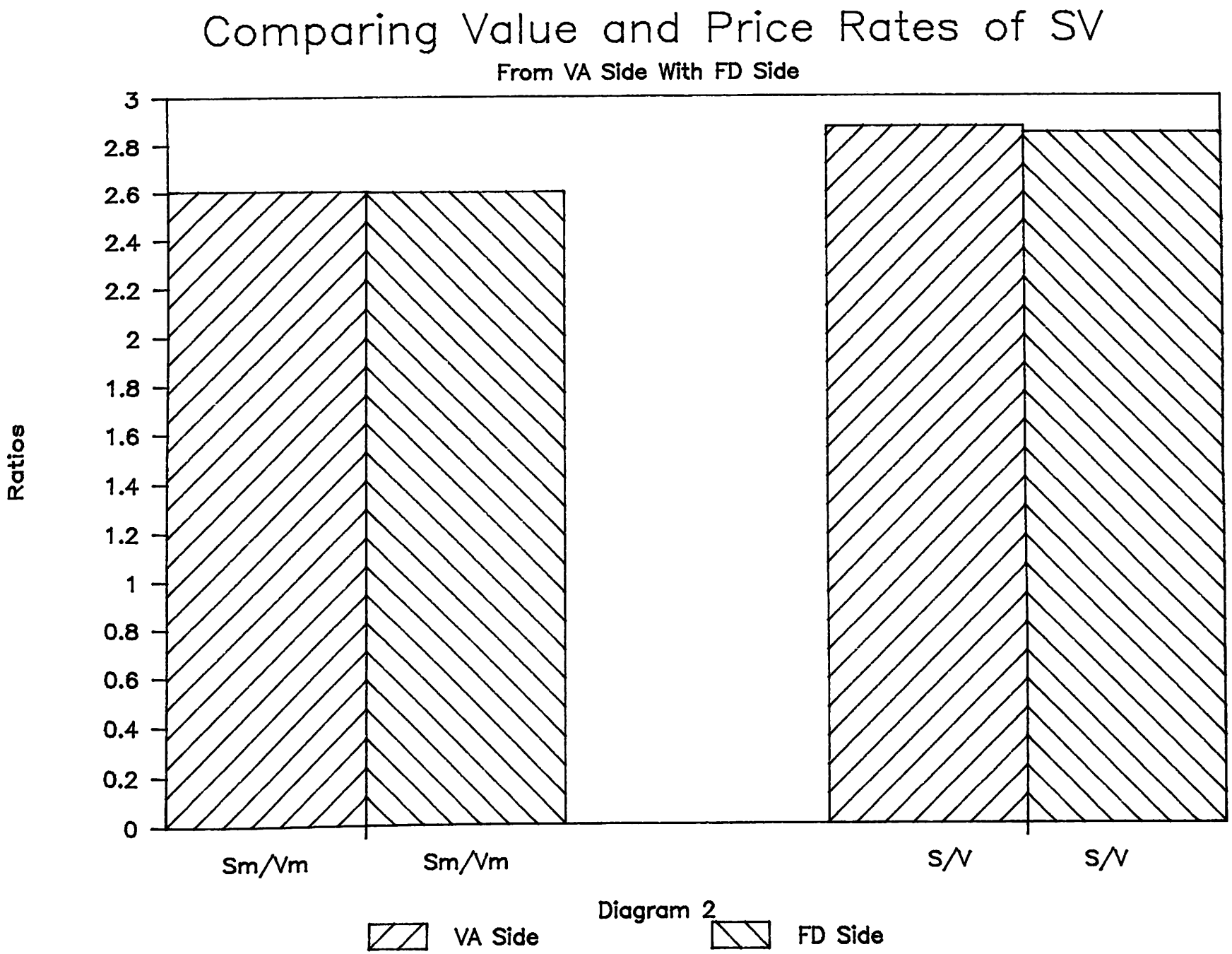
Comparing Value and Price Rates of SV
From VA Side With FD Side
Ratios
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Sm/Vm
Sm/Vm
S/V
S/V
VA Side
FD Side

Diagram 2

data for 1972 is provided by table 56 of Appendix C.

The Marxian value added VA^ is simply equal to the sum of the productive labor employed in the production sectors, Lp. For 1972 VA^ is equal to 32,169 thousands of worker years (see table 56, Appendix C).

When we deduct V from VA^ we get S. Table 17 provides the estimates of V and VA^ for all the 5 years. These numbers are based on employment estimates which are calculated in Appendices B and C.

On the final demand side the calculation of the variable capital is the same as on the value added side. However the calculation of Marxian final demand FD^ is slightly more complicated. This complication arises, because depreciation is not part of surplus value. Therefore the replacement investments of the production sectors must be removed from the gross private fixed capital formation.

We will create a replacement investment column by assuming that replacement investment of different sectors is proportional to the corresponding gross private capital formation. Therefore, we will first calculate a replacement investment coefficient column by dividing the production sectors' elements of the gross private capital formation column by the sum of the production sectors' gross private capital formation. Then we will multiply this coefficient vector by the total capital stock depreciation of the

Table 17

Calculation of The Value Rate of SV from the VA side

(Thousands of Worker years)

	1958	1963	1967	1972	1977
R	.416	.416	.417	.396	.391
V	7,253	7,684	7,948	8,303	8,962
Lp=VA^	26,384	28,000	30,871	32,169	35,069
S=Lp-V	19,131	20,316	22,924	23,866	26,107
S/V	2.638	2.644	2.884	2.874	2.913

Table 18

Calculation of The Value Rate of SV from the FD Side

(Thousands of Worker years)

	1958	1963	1967	1972	1977
ValFD	23,414	25,104	27,630	28,845	31,307
Valunp	2,735	2,687	3,035	3,112	3,550
FD^	26,149	27,791	30,665	31,957	34,858
V	7,253	7,684	7,948	8,303	8,962
S=FD^-V	18,896	20,107	22,717	23,654	25,896
S/V	2.605	2.617	2.858	2.849	2.890

production sectors. The result is a replacement investment vector of the production sectors which corresponds to the depreciation of the production sectors on the value added side. Therefore when we deduct the replacement investment vector from the gross private capital formation column, the consistence between the value added side and the final demand side of our I-O tables will not be affected, and we will have a net investment column.

We eliminate all the purchases from the non production sectors, from final demand columns and from non production sectors' columns. Then we multiply all these column vectors by the vector of labor values lv. And then add up all these numbers to arrive at the FD^, which represents the value of the production rows of the net final demand, ValFD, plus the value of the production rows of the non production sectors' columns, Valunp. After deducting V from FD^ we get SV (see table 18).

For 1972;

FD^ = ValFD + Valunp

FD^ = 28,845 + 3,112 = 31,957 Thousands of worker years

In order to obtain these numbers we need the vector of labor values, lv, and I-O tables of 1972. The employment vector which is used during the calculation of the vector of labor values, lv, corresponding to the 1972 I-O table is provided by table 56 in Appendix C. Beside the employment data

we are also using our adjusted 1972 I-O table, which is described in Appendix A.

Table 18 presents the FD^ for all 5 benchmark years of our study. The employment vectors used during their calculations are estimated in Appendices B and C.

As with the results of the price rates of surplus value, the results of our calculations of the value rates of surplus value show that the numbers from the value added side are very close with those from the final demand side (see tables 17 and 18). For the year 1972 VA^ was 32,169 thousands of worker years, while FD^ was 31,957 thousands. Variable capital V was the same on both sides 8,261 thousands.

On the value added side surplus value S is equal to:

$$S = VA^{\wedge} - V = 32,169 - 8,303$$

$$S = \$23,866 \text{ thousands}$$

while on the final demand side it is equal to:

$$S = FD^{\wedge} - V = 31,957 - 8,303$$

$$S = \$23,654 \text{ thousands}$$

The two calculations of surplus value are close to each other, because VA^ is close to FD^, while V is the same on both sides.

Based on these numbers we can draw bar diagram 3. The first bar which represents VA^ is slightly higher then the second bar, which represents FD^. The third and fourth bars

FD, VA, SV Totals in Value Form

Comparing VA Side With FD Side, 1972

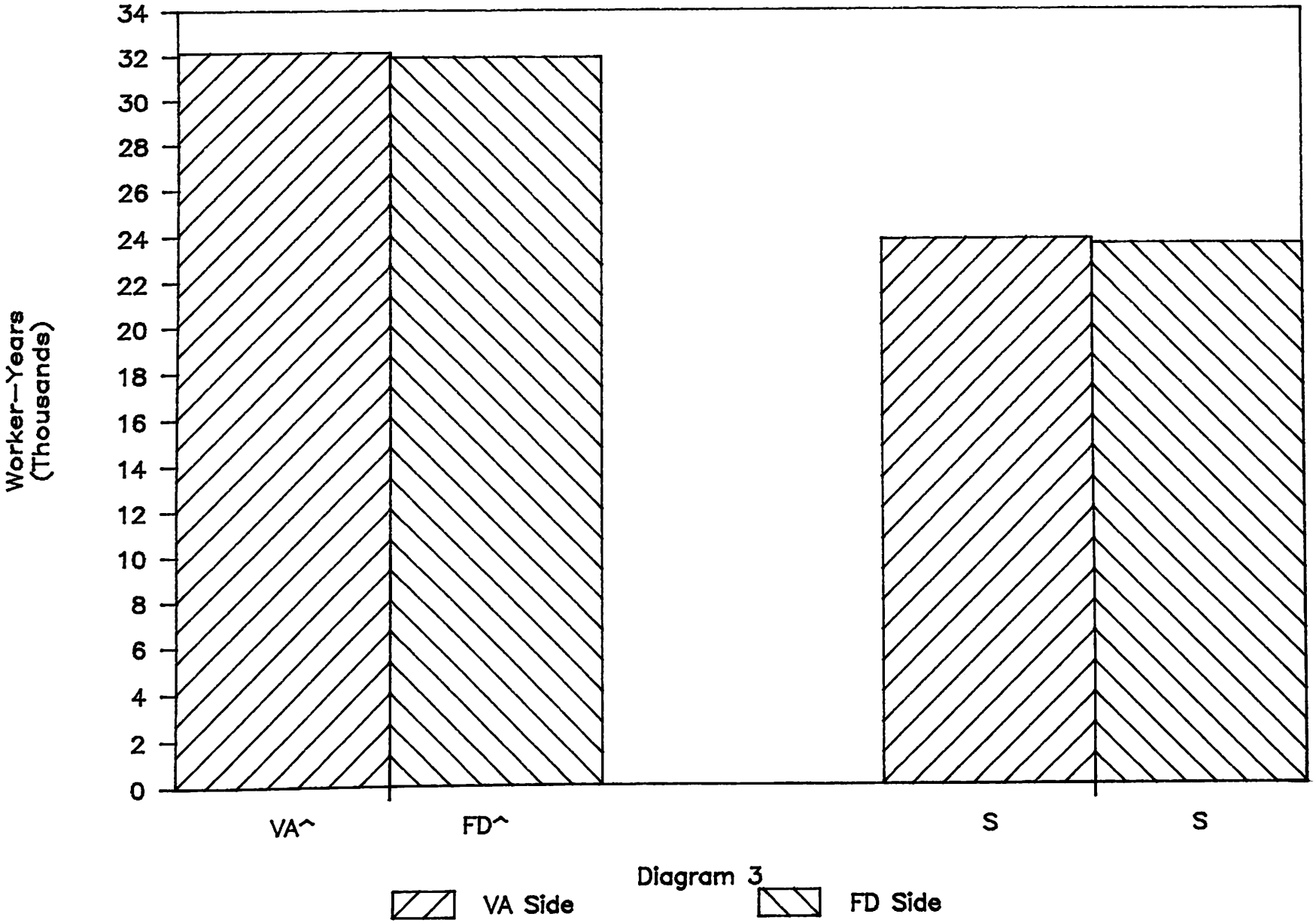

Diagram 3

represent surplus value, S, from the value added side, VA, and surplus value from the final demand side. Again the two bars are almost the same reflecting the small difference between the values of the two surplus values in value form.

The value rate of surplus value on both sides are exactly the same if we use one digit after the decimal point.

On the value added side;

S/V = 23,866 / 8,303

S/V = 2.874

On the final demand side;

S/V = 23,654 / 8,303

S/V = 2.849

The third and fourth bars of diagram 2 represent S/V from the VA side and the FD side respectively. These two bars are almost the same reflecting the small difference between the magnitudes of the value rates of surplus value, S/V.

Since the set of calculations carried out for the value added side are significantly distinct from the set of calculation for the final demand side, it is rather impressive that we produce almost identical results. However we should mention that I-O tables are build such that categories based on final demand side should equal to the corresponding categories based on the value added side. Therefore the fact that the rates of surplus value from value added side are almost identical with the rates of surplus value from final

demand side should not be surprising. Theoretically it will be more significant if the value rates of surplus value are almost equal to the price rates of surplus value.

These results, which are also based on a theoretical model show that the calculations of the value rate of surplus value from the value added side are consistent with those on the final demand side.

Comparing the Results of the Value and Price Sides

According to our theoretical model of chapter II, where there were no price value deviations, the price rate of surplus value should be identical with the value rate of surplus value. The calculations of the rate of surplus value in the U.S. indicate that for both the value added side and the final demand side, price rates of surplus value are quite close to the value rates of surplus value (see table 19). But the difference between these two measures are not random. on the contrary, the price rates of surplus value, for all 5 years are consistently lower than the value rates of surplus value (see table 19), the former averaging about 92% of the latter.

Diagram 4 represents the deviation of the 1972 price and value rates of surplus value. The first two bars represent the money rate of surplus value, Sm/Vm and the value rate of

Table 19

Comparing Price and Value Rates of Surplus Value

	1958	1963	1967	1972	1977
VA Side					
Sm / Vm	2.445	2.467	2.648	2.606	2.674
S / V	2.638	2.644	2.884	2.874	2.913
(Sm/Vm)/(S/V)	.927	.933	.918	.907	.918
FD Side					
Sm / Vm	2.444	2.467	2.648	2.604	2.630
S / V	2.605	2.617	2.858	2.849	2.890
(Sm/Vm)/(S/V)	.938	.943	.927	.914	.910

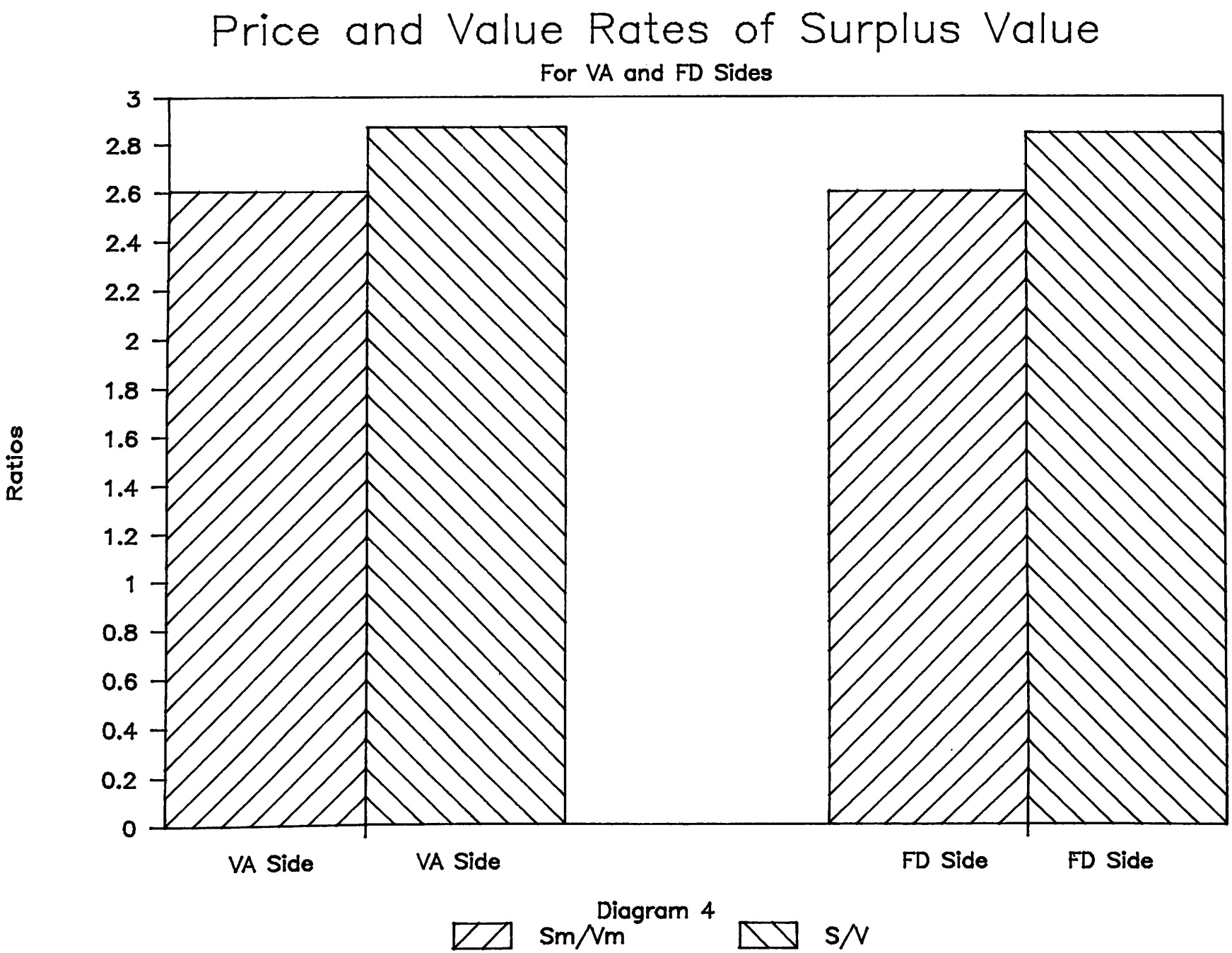
Price and Value Rates of Surplus Value
For VA and FD Sides
Ratios
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
VA Side
VA Side
FD Side
FD Side
Sm/Vm
S/V

Diagram 4

surplus value, S/V, both from the VA side. The third and fourth bars represent the FD side. For both sides the Sm/Vm are lower than S/V, though of course the differences are relatively small (roughly 8%).

Figure 1 represents all 4 different rates of surplus value during the 5 years of our study. We observe that the trends of all 4 rates are identical. From 1958 to 1963 they are rising slightly. From 1963 to 1867 they are rising more sharply, while from 1967 to 1972 they are falling slightly. From 1972 to 1977 again they are rising. Over long period of time, from 1958 to 1977 they are all rising. When we compare value rates with price rates we realize that value rates are consistently higher than price rates.

The persistent nature of the differences between price and value rates of surplus value suggests that these differences are not due to data errors. We must therefore look for some systematic cause. Shaikh has provided the following explanation, based on the uneven distribution of trading margins across commodities [4]. To get an insight into the problem, we divide the labor values of variable capital, constant capital and surplus value by the labor value of money, and then compare them with the variable capital, constant capital and surplus value in price forms.

The monetary expression of abstract labor is equal to the price form of total value TVm, divided by the total labor

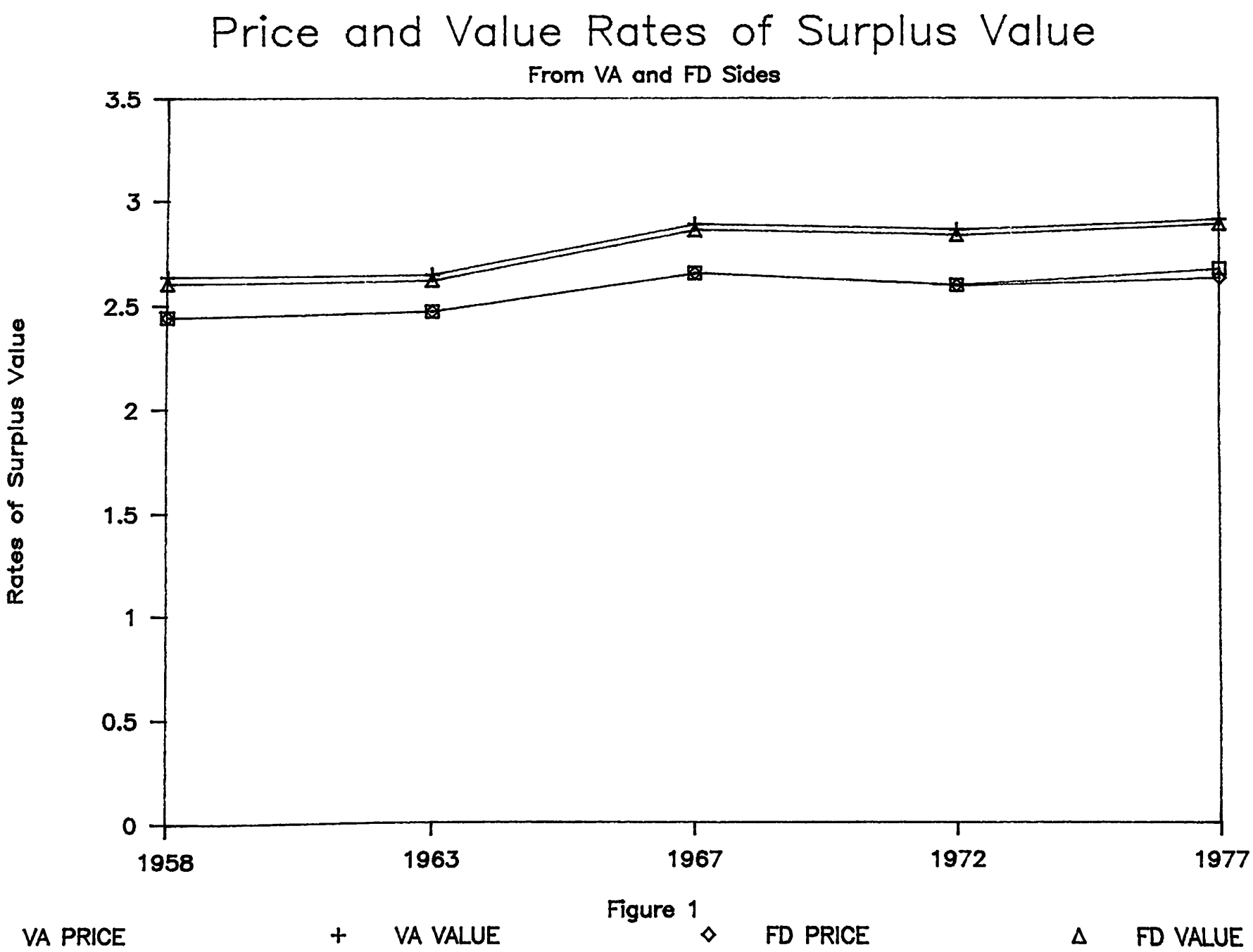
Price and Value Rates of Surplus Value
From VA and FD Sides
Rates of Surplus Value
3.5
3
2.5
2
1.5
1
0.5
0
1958
1963
1967
1972
1977
VA PRICE
+ VA VALUE
◇ FD PRICE
Δ FD VALUE

Figure 1

value TV. It represents the price of one hour of labor. It is also the inverse of the value of money, which represents the amount of labor that corresponds to one dollar. Since we have already seen that value added and final demand side estimates produce almost identical estimates for any one measure, we will illustrate the issue with estimates from the value added side.

When we add constant capital in money form Cm to the total living labor in money form, which on the value added side is represented by VA^m, we get total value in money form, TVm. Constant capital in money form, Cm is equal to the intermediate goods used by production sectors, plus the depreciation of the fixed capital in the production sectors.

$$TVm = Cm + VA^m$$

Total labor value TV is equal to constant capital C plus VA^, which represents the total living labor, S+V. Constant capital C is equal to the value of the intermediate inputs of the production sectors plus the value of the depreciation of the capital stock of the production sectors.

We calculate the value of the constant capital first by multiplying the square matrix, which represents the productive intermediate inputs of the production sectors by the vector of labor values, lv. We calculate the sum of all these numbers and we obtain the total value of intermediate inputs of the production sectors. Then we multiply the depreciation vector

of the capital stock of the production sectors by the vector of labor value. By calculating the sum of the resulting vector we can determine the value of the depreciation of the capital stock. When we add the value of the intermediate inputs and the value of the depreciation we get the value of the constant capital C.

Table 20 presents the estimates of the value of money (Mon) for each I-O year, and table 21 shows the effect of converting labor value measures C, V, S into price measures (Mon.C, Mon.V, Mon.S) via the value of money. These are then compared to the corresponding current price form estimates (Cm, Vm, and Sm).

When we look at table 21 we realize that the dollar amount of employee compensation of the productive workers Vm is consistently and significantly higher than the dollar equivalent of the labor value of variable capital Mon.V. Averaged over all five years, Vm, is about 114% of the Mon.V. On the other hand constant capital in price form Cm is consistently smaller than the money equivalent of constant capital Mon.C. Averaged over all the five years, Cm is about 90-91% of Mon.C.

These observations can be explained by noting that trading margins on goods bought for personal consumption, PCE, are much higher than trading margins on the average good, while those for constant capital are lower than average.

Table 20

Total Value, Total Product and Monetary Expression of Abstract Labor
(Thousands of Worker Years and Millions of Dollars)

	1958	1963	1967	1972	1977
C	24,073	24,565	25,006	25,602	29,144
VA	26,384	28,000	30,871	32,169	35,069
TV	50,458	52,565	55,877	57,771	64,214
Cm	290,720	365,752	462,189	657,693	1,250,932
VA^m	386,806	501,584	669,671	979,535	1,600,398
TVm	677,526	867,336	1,131,859	1,637,228	2,851,329
Mon=TVm/TV ($/hr)	13.43	16.50	20.26	28.34	44.40

Table 21
Monetary expression of Abstract Labor
and Other Ratios
(Thousands of Worker Years and Millions of Dollars)

	1958	1963	1967	1972	1977
Mon	13.43	16.50	20.26	28.34	44.40
C	24,073	24,565	25,006	25,602	29,144
Mon.C	323,248	405,330	506,527	725,562	1,294,121
Cm	290,720	365,752	462,189	657,693	1,250,932
Cm/Mon.C	.90	.90	.91	.91	.97
V	7,253	7,684	7,948	8,303	8,962
Mon.V	97,390	126,792	160,986	235,309	397,951
Vm	112,269	144,684	183,554	271,671	435,651
Vm/Mon.V	1.15	1.14	1.14	1.16	1.10
S	19,131	20,316	22,924	23,866	26,107
Mon.S	256,889	335,214	464,346	676,358	1,159,257
Sm	274,537	356,900	486,117	707,864	1,164,757
Sm/Mon.S	1.07	1.07	1.05	1.05	1.01

During 1967 the trading margin on goods bought for PCE was 60%, while the trading margins for investment was 14%, on gross export it was 9% and on federal government purchases just 4%.[5]

Since the monetary equivalent of total value, Mon.TV, is by definition equal to the total sum of prices TVm, and since the latter embodies the average mark up on commodities, it follows that the relatively higher mark up of consumer goods will be reflected in a price form Vm greater than the money equivalent of variable capital Mon.V (since this latter quantity reflects by construction the average mark up embodied in Mon).

Similarly, the price form of constant capital Cm will be lower than the money equivalent of constant capital Mon.C, since the former has a lower than average mark up and the latter reflects the average mark up embodied in Mon, by construction.

Now, we note that the surplus product is composed of a mixture of high mark up consumer goods and low mark up intermediate and investment goods. Thus the mark up on the price form of surplus product is necessarily smaller that that of consumer goods, and hence necessarily closer to the average mark up. Since Mon.S and Mon.C reflect the average mark up, by construction, our discussion amounts to saying that;

Sm/Mon.S = relative mark up on surplus product is smaller

than Vm/Mon.V = relative mark up on consumer goods consumed by productive workers. It immediately follows from this that

Sm/Vm < Mon.S/Mon.V = S/V

Thus the uneven distribution of mark ups explains our finding that the price rate of surplus value Sm/Vm is persistently lower than the value rate S/V.

In this chapter we presented the results of our calculations. We calculated the rate of surplus value in four different ways and they are all close to each other. In the next chapter we will compare our method with the method used by Edward N. Wolff.

Footnotes Chapter IV

1. U.S. Dept. of Commerce, BEA, 1980, p. 28-33.
2. See Standard Industrial Classification Codes.
3. U.S. Dept. of Commerce, BEA, 1976, p. 36.
4. Shaikh and Tonak, 1988.
5. U.S. Dept. of Commerce, BEA, 1974a, p. 28-29.

CHAPTER V

Wolff's Method of Measuring the Rate of Surplus value

Survey of Wolff's Publications

In this chapter, we are going to compare Wolff's method and our method of measuring the price and value rates of surplus value. We focus on Wolff's work because over the past 13 years he has published several articles and a book in which he presents calculations for the value and price rates of surplus value. In the first part of this chapter we will discuss his publications, and in the second part we will concentrate on the accounting framework of his book "Growth, Accumulation and Unproductive Activity: and analysis of the postwar U.S. economy."[1]

In 1975 Wolff published his first article on measuring the rate of surplus value, "The rate of surplus value in Puerto Rico".[2] In this article, he calculated the value rate of surplus value and profit-wage ratios for Puerto Rico for 1948 and 1963. For this calculation Wolff used the 1948 and 1963 I-O tables available for Puerto Rico.[3]

A major weakness of this paper is that during the calculations Wolff ignored the distinction between productive and unproductive labor and simply assumed that all labor was productive. Wolff also calculated profit-wage ratios as proxis

for the rate of surplus value. The result is shown in Table 22.

Table 22

The Rate of Surlus Value and Profit-Wage Ratios

Years	(1)rate of S/V	(2)profit/wages	(2)/(1)
1948	.9729	.5907	61%
1963	.9328	.7529	81%

According to table 22 the profit-wage ratio is just 61% of the rate of surplus value for 1948 and 81% for 1963. Clearly the profit-wage ratio and the rate of surplus value that Wolff had calculated are significantly different from one another.

Wolff concluded that "The ratio of profits to wages is thus a poor proxy for the rate of surplus value, in terms of absolute amount, magnitude of change, and even direction of change."[4]

The rate of surplus value that Wolff is calculating doesn't represent the correct rate of surplus value, because Wolff is ignoring the distinction between production, and non production sectors and the distinction between productive, and unproductive labor. And the profit-wage ratio doesn't represent the price rate of surplus value, because profit isn't identical with surplus value. Therefore it is not surprising that Wolff finds a large discrepency between his calculated rates of surplus value and profit-wage ratios.

In his second article, "Capitalist Development, Surplus Value and Reproduction" Wolff reproduces the calculation of the value rate of surplus value of Puerto Rico that he estimated in

his previous article, however, he doesn't mention the profit-wage ratios.[5] Therefore with respect to the calculation of the rate of surplus value this article doesn't introduce new ideas or results.

Wolff's third article, "Unproductive labor and the rate of surplus value in the United States, 1947-1967." was significant because it introduced many changes in the measurement of the rate of surplus value.[6]

In this article, Wolff systematically divided the economy into production and nonproduction sectors and he distinguished between productive and unproductive labor. He developed a method to calculate price and value rates of surplus value by taking into account the existence of unproductive labor. First, he calculated the value and price rates of surplus value assuming that all workers are productive and then he calculated price and value rates of surplus value distinguishing between productive and unproductive labor. The results are reproduced in table 23.[7]

After some changes, Wolff basically used the method that he developed in this article to calculate the price and value rates of surplus value in his book.[8] Therefore instead of analyzing the method developed in this article we will discuss in detail the new version of it which appeared in his book, in the second part of this chapter.

In Wolff's fourth article, "The rate of surplus value, the organic composition, and the general rate of profit in the U.S. economy, 1947-1967.", he assumes that all workers are productive

Table 23

Price and Value Rates of Surplus Value

A) Assuming that all Workers are Productive

Years	1947	1958	1963	1967
Rates of Surplus Value	1.01	1.05	1.10	1.12
Pofit-Wage ratios	.93	.93	.99	.98

B) Taking into account the existence of unproductive labor

Years	1947	1958	1963	1967
Rates of Surplus Value	2.25	2.67	2.80	3.02
Adjusted Profit-Wage Ratio	2.43	2.85	3.30	3.14

and basically repeats the calculation of the value and price rates of surplus value that he carried out in the previous artical.[9] Thus with respect to our subject this article doesn't introduce any new developments.

In 1986 Wolff published his fifth article related to this subject "The productivity slowdown and the fall in the U.S. rate of profit, 1947-1976."[10] In this article Wolff again assumes that all workers are productive. However, he changes his definition of wages and profits slightly and then calculates the value rate of surplus value and surplus income-net wages ratios. Notice that he is not using the term profit-wage ratios anymore. The results are slightly different from the previous articles and are presented below in table 24.[11]

Table 24

The Rates of Surplus Value

Years	1947	1958	1963	1967	1972	1977
Rates of Surplus Value	.96	1.012	1.092	1.081	.772	.751
Surplus Income/Net wages	.884	.897	.985	.978	.761	.700

Up until 1987 Wolff had only taken the existence of unproductive workers into account in his 1977 article. In 1987 Wolff published his book where he emphasized the growth of unproductive labor during the post WWII period, and its effect on the economy.

In the first part of his book Wolff defines nonproduction sectors and systematicaly develops methods to caclulate total necessary consumption, NC, total surplus product SP, value rate of surplus value S/V and other categories. The NC and SP correspond to the variable capital and surplus value in money form, even though Wolff doesn't explicitly present them as such. The term rate of surplus value, used by Wolff corresponds to the rate of surplus value in value form, in our terminology.

In the second half of his book, Wolff carries out a large number of empirical calculation using six input-output tables: 1947, 1958, 1963, 1967, 1972, 1976. Surprisingly in the three chapters on empirical calculations, where he presents estimates for hundreds of different kind of variables, Wolff doesn't explicitly present the estimates for necesary consumption, surplus product, and the rate of surplus value in value form.

The title of the second chapter on empirical estimates is

"Absorption of labor and capital and rate of surplus value."[12] However, Wolff does not present the estimates for the rate of surplus value even in this chapter. Instead in section C of this chapter, "Rate of surplus value and absorption of surplus labor time", Wolff calculates surplus value per worker S/N, where N represents all workers, productive and unproductive, and S represents surplus value, S=N-V. Variable capital V represents only the productive workers.[13]

	1947	1958	1963	1967	1972	1977
S/N	.802	.833	.860	.866	.857	.855

When we look at Wolff's publications we realize that in two places (Wolff 1977 and 1987) he developed methods to calculate the value and price rate of surplus value taking into account the existence of unproductive labor. And it is only in the 1977 article that Wolff calculated and presented the estimates of the rate of surplus value without assuming that all workers are productive.

The next section will compare Wolff's method of calculating the value and price rates of surplus value, presented in the third chapter of his book, with ours.

Wolff's Accounting Framework

In order to iluustrate the issues involved and to evaluate Wolff's method we will use the numerical example of chapter II to test his method and then compare the results with those we

obtained using our method.

We use this numerical example, because Wolff didn't explicitly apply the method developed in his book to calculate the rates of surplus value in the U.S.

We will use the third mapping of our model, where we have three production sectors (machinery, corn and gold) and three non production sectors (trade, rental, and royalty payments by the producers)(See table 5 and 6). In order to avoid any kind of misrepresentation of Wolff's arguments and equations, we will use his notation and reproduce his equations exactly.

In order to facilitate the comparison of our earlier results with those of Wolff's method we provide the following mapping of terms:

Wolff's Term	Our Term
Surplus Product/Consumption	Price form of surplus value final demand side
Surplus Income	Price form of surplus value value added side
Necessary Product/Consumption	Variable capital in price terms final demand side
Necessary Income	Variable capital in price terms value added side

This numerical example is sufficient to bring out the basic points of our critique, and this will demonstrate that Wolff's method is inconsistent, because even when purchaser prices are proportional to labor values, by construction, Wolff's method

does no yield the same results for the price side as it does for the value side. Thus this resulting discrepancy is in fact due to a logical inconsistency of his method.

We will first apply Wolff's method for calculating the price rate of surplus value for the final demand and value added side and then apply his method to calculate the value rate of surplus value. Finally, we will provide a critical assessment of his method.

Price Rate of Surplus Value

We will illustrate Wolff's method of calculating the price rate of surplus value by first using the final demand or use side of an IO table, and secondly, by using the value added or output side of an IO table.

In order to differentiate between the two types of calculations of the same variables by the two different methods, Wolff's and ours, we use subscript "w" for the Wolff's method and "o" for ours.

Final Demand or Use Side

The rate of surplus value is defined by Wolff as surplus product or consumption divided by necessary product or consumption. According to Wolff the necessary consumption vector, Mw, is defined as;[14]

$$Mw = Dpp + Gpp \qquad (1)$$

Where Dpp is the productive consumption vector of productive workers.

Gpp is productive government expenditures necessary for the reproduction of productive labor power. In our present illustration, there is no government sector, therefore, on the expenditure side, government expenditures will be deleted and on income side, taxes will be deleted. Therefore, the above expression for necessary consumption will simply be,

$$Mw = Dpp \qquad (2)$$

In order to calculate Dpp, we have to divide the consumption column Con, into two parts. One representing the consumption of productive workers, Conp, and the remainder will be the consumption of unproductive workers and profit earners. We will split Con up by using a ratio R, which we calculate by dividing the wages of the productive workers by the total of the consumption column, $\sum$Con. In our illustration we assume that all workers in the production sectors are productive.

Based on the numerical example of the third stage of our model in chapter II, wages of productive workers, Wp, is equal to \$70 (See table 6).

$Wp = 20 + 26 + 24 = \$70$

$\sum Con = \$162$, where $\sum Con$ is column total of Con.

$R = 70/162$

The consumption vector of productive workers, Conp is equal to $Conp = R \cdot Con$

Conp is composed of two parts Dpp which we already defined and Dup which is the unproductive consumption of productive workers. Wolff define Dup as the "unproductive output" purchased

by the productive workers.[15]

One of the major weaknesses of Wolff's accounting framework is that he defines necessary consumption NC as the expenditure of the productive workers only on productive outputs.[16]

$$NCw = \sum M = \sum (Dpp + Gpp) \qquad (3)$$

Since there isn't a government sector in this illustration the above equation reduces to,

$$NCw = \sum Dpp \qquad (4)$$

Wolff is not considering the expenditure of the productive workers on "unproductive outputs" as part of necessary consumption. According to Wolff, "By definition the labor power provided by unproductive workers is not essential for the production of any output", and " the labor time provided by unproductive workers is not part of necessary labor time since the economy could continue to operate and reproduce without it."[17]

The problem is that Wolff is associating the concept of productive labor with the concept of necessary labor. According to Wolff, unproductive labor is not necessary for the reproduction of the economy.[18] We argue that productive labor is not more necessary or less necessary than unproductive labor for the reproduction of the economy. In general, activities which are reproduced in a mode of production are necessary for the reproduction of that mode of production.

In our accounting framework all consumption by the productive workers is essential for the reproduction of the

worker and the economy. Therefore, our definition of necessary consumption (variable capital in price terms, according to our terminology) differs from Wolff's, since we add the unproductive consumption of productive workers, ∑Dup, onto the productive consumption of the productive workers, ∑Dpp,. This is formally expressed as

$$NCo = \sum Conp = \sum Dpp + \sum Dup \qquad (5)$$

Based on table 6

$$Con = \begin{vmatrix} 0 \\ 60 \\ 36 \\ 44 \\ 22 \\ 0 \end{vmatrix} \qquad Conp = 70/162 \begin{vmatrix} 0 \\ 60 \\ 36 \\ 44 \\ 22 \\ 0 \end{vmatrix} = \begin{vmatrix} 0.0 \\ 26.0 \\ 15.5 \\ 19.0 \\ 9.5 \\ 0.0 \end{vmatrix}$$

$$Dpp = \begin{vmatrix} 0.0 \\ 26.0 \\ 15.5 \end{vmatrix} \qquad Dup = \begin{vmatrix} 19.0 \\ 9.5 \\ 0.0 \end{vmatrix}$$

According to Wolff's definition, NCw = ∑M = ∑Dpp = $41.5

While for our method,

NCo = ∑M = ∑Dpp + ∑Dup =41.5 + 28.5 = $70

Next, we will discuss Wolff's calculation of surplus product, what we refer to as the price form of surplus value.

The difference between the two methods of calculating necessary consumption, as discussed above will generate a difference in the calculation of the surplus product, since necessary consumption is used during the calculation of surplus product.

In Wolff's accounting framework,[19]

$$SPw = \sum Apu + \sum (Yp - M) \qquad (6)$$

Which by rearranging and plugging in equation (2)

$SPw = \sum Apu + \sum Yp - \sum Dpp$

Where SP is surplus product and Apu is productive output purchased by non production sectors.

Yp is final output or final demand of production sectors.

Based on table 6

$$Apu = \begin{vmatrix} 18 & 9 & 9/2 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{vmatrix} \qquad Yp = \begin{vmatrix} 0 & 9/2 \\ 60 & 0 \\ 36 & 0 \end{vmatrix} \qquad M = Dpp = \begin{vmatrix} 0.0 \\ 26.0 \\ 15.5 \end{vmatrix}$$

$\sum Apu = 63/2 = \$31.5 \quad \sum Yp = 201/2 = \$100.5 \quad \sum M = \sum Dpp = \$41.5$

$SPw = 31.5 + (100.5 - 41.5) = \$90.5$

According to our model of chapter II,

$SPo = FP^m - Vm$ where FP^m is the Marxian final product and Vm is variable capital in money form.

However, in Wolff's notation this would be expressed as,

$SPo = \sum Apu + \sum Auu + \sum Yp + \sum Yu - [\sum Dpp + \sum Dup]$ (7)

where Auu is purchases of non production intermediate inputs except royalty payments, by all non production sectors. Yu represents consumption and investment of non production sectors' activities other than royalties.

Based on table 6

$$\begin{vmatrix} \\ Apu \\ \\ Auu \\ \end{vmatrix} = \begin{vmatrix} 18 & 9 & 9/2 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 4 & 2 & 1 \\ 2 & 1 & 1/2 \end{vmatrix} \qquad \begin{vmatrix} \\ Yp \\ \\ Yu \\ \end{vmatrix} = \begin{vmatrix} 0 & 9/2 \\ 60 & 0 \\ 36 & 0 \\ 44 & 1 \\ 22 & 1/2 \end{vmatrix}$$

$$\begin{vmatrix} \\ Dpp \\ \\ Dup \\ \\ \end{vmatrix} = \begin{vmatrix} 0.0 \\ 26.0 \\ 15.5 \\ 19.0 \\ 9.0 \end{vmatrix}$$

$\sum Apu = \$31.5$, $\sum Auu = \$8.8$, $\sum Yp = \$100.5$, $\sum Yu = \$72.5$,

$\sum (Dpp + Dup) = \$70$

$SPo = 31.5 + 8.5 + 100.5 + 72.5 + 70 = \$140$

Our surplus product SPo is much larger than Wolff's, SPw, because Wolff is ignoring the non production sectors of trade and rental.

Now, we can calculate the price rate of surplus value, PRSV.

According to Wolff, $PRSV = SP/NC = \$90.5/\$41.5 = 2.18$

According to us, $PRSV = 140/70 = 2$

Our surplus value and variable capital in price terms are almost double of those calculated by Wolff, but the PRSVs are relatively close. The cause of this is that, in the calculations of both SP and NC, Wolff ignores non production activities. Therefore, in absolute terms, his SP and NC are both much smaller than ours. However, the difference between his and our ratios, the price rates of SV, is relatively small, since both the numerator and denominator are increased in our case.

Value Added or Output Side

Wolff uses the concept of necessary income, NI, instead of variable capital, and surplus income, SI, instead of surplus

value. Total income, TI, is equal to SI+NI.

According to Wolff, $TI = \sum Aup + \sum Ep + \sum Rp + \sum Tp$, (8)

where Aup represents purchases made by production sectors from non production sectors.[20]

$\sum Ep$ is net wages of the production sectors.

$\sum Rp$ is the profits generated in the production sectors.

$\sum Tp$ is tax payments generated in the production sectors.

In our model, there is no government sector, therefore, we ignore taxes, while Ep will just represent gross wages of the production sectors.

Again, the main source of difference between our surplus value and Wolff's is based on the definition of variable capital or necessary income. According to Wolff, "...,it would

> be necessary to split the wages received by workers into the portions spent on productive and unproductive output. Since the latter portion is not part of the necessary costs of maintaining the labor force, it would be considered part of the surplus income of that sector."[21]

Wolff argues that a portion of productive workers' wages $\sum Ep$, which is spent to buy non production services, is part of surplus income. Then, according to Wolff, necessary income, NI, which corresponds to variable capital, is equal to Dpp which is the income of productive workers spent on production goods and services.

$NI = \sum Dpp$ (9)

Surplus income is equal to,

$$SI = \sum Rp + \sum Aup + \sum (Ep - Dpp) \qquad (10)$$

Based on IO table 6

$$NI = \sum Dpp = \$41.5$$

$$Aup = \begin{vmatrix} 10 & 2 & 0 \\ 5 & 1 & 0 \\ 2 & 9 & 3 \end{vmatrix} \qquad Rp = [8\ 13\ 9] \qquad Ep = [20\ 26\ 24]$$

$$\sum Aup = \$32 \qquad \sum Rp = \$30 \qquad \sum Ep = \$70$$

$$SI = 32 + 30 + (70 - 41.5) = \$90.5$$

Price rate of sv, $PRSVw = SI/NI = (90.5)/(41.5) = 2.18$

According to our method of calculation, variable capital is equal to the wages of the productive workers Wp. Surplus value in money form, PSV, is equal to Marxian value added VA^m minus Wp. VA^m is defined as

$$VA^m = VAp + GOt + Pr \qquad (11)$$

where VAp is the conventional value added of the production sectors.

GOt is the gross output, column total, of trade and rental sectors.

Pr is the royalty payments by the production sectors.

Based on IO table 6,

$Wp = \$70$

$GOt = [64\ 32]$ $\quad Pr = [2\ 9\ 3]$ $\quad VAp = \begin{vmatrix} 20 & 26 & 24 \\ 8 & 13 & 9 \end{vmatrix}$

$VA^m = \$210$

$$PSV = VA^m - Wp \qquad (12)$$

$PSV = 210 - 70 = \$140$

Then the price rate of surplus value is $PRSVo = 140/70 = 2$

The main source of our difference from Wolff's is the measurement of variable capital and the treatment of the trade and rental sectors. We include the total of trade and rental sectors in the surplus value, while Wolff only includes only a portion of the trade and rental sectors, the amount of trade and rental services bought by the production sector.

II Value rate of Surplus Value

Unlike the case of the price rate of surplus value, when we are calculating the value rate of surplus value, Wolff calculates variable capital in exactly the same way as we do and so we get the same numerical results. However, the measurement of surplus value will be significantly different.

Variable capital v is equal to;

$$v = lv.Conp \qquad (13)$$

$$lv = l[1-Ap]^{-1} \qquad (14)$$

Based on the IO table lv =[4/3, 3/2, 2, 0, 0] hrs/$

We have already calculated the consumption vector of the productive workers, Conp.

$$Conp = \begin{vmatrix} 0.0 \\ 26.0 \\ 15.5 \\ 19.5 \\ 9.5 \\ 0.0 \end{vmatrix}$$

$$v = (4/3 * 0)+(3/2 * 26)+(2 * 15.5)+(0*19)+(0*9.5)+(0*0)$$

$$v = 70 \text{ hrs}$$

Surplus value according to Wolff is equal to;[22]

$Sw = N - v$ (15)

Where N is the total productive and unproductive labor time.

Based on our model, total productive labor is 210 hrs and total unproductive labor is 135 hrs.

Therefore, $N = 210 + 135 = 345$ hrs

$Sw = 345 - 70 = 275$ hrs

Thus the rate of surplus value according to Wolff is

$RSVw = Sw/V = 275/70 = 3.93$

Here, Wolff is making a mistake, because once we agree that in our economy or in our model there are productive and unproductive labor then in order to calculate surplus value we should deduct variable capital from total labor time of just the productive workers. Only productive workers produce value and surplus value.

According to our method of calculating, surplus value is equal to;

$So = Np - v$

Where Np is the labor time of productive workers.

Based on our model $Np = 210$ hrs

Thus, rate of surplus value, $RSVo = 210/70 = 2$

Conclusion

Chapter II of this dissertation provides a test to determine the accuracy of the method of calculating the rate of surplus value. According to this test, variable capital, surplus

value and the rate of surplus value in money terms should be equal to the variable capital, surplus value and rate of surplus value in value terms, respectively, whenever there are no purchaser price - value deviations across sectors.

When testing the accuracy of our model by using the numerical illustration of chapter II we show that surplus value in price terms $140, variable capital in price terms $70, and the price rate of surplus value 2 are consistent with the surplus value 140hrs, variable capital 70hrs and the value rate of surplus value 2. They should be identical because, in our model, we are assuming that the value of one dollar is one hour.

However, in the case of Wolff, his money surplus value $90.5, variable capital in price form $41.5, and price rate of surplus value 2.18, are significantly different from surplus value 275hrs, variable capital 70hrs and value rate of surplus value 3.93.

The inconsistencies between price and value variables in Wolff's calculations are based on three major problems of his accounting framework.

There are three major differences between Wolff's accounting framework and ours. First, for the calculation of necessary income, Wolff doesn't consider the expenditure of the productive workers on " unproductive outputs" as part of necessary consumption. Therefore Wolff's calculation of necessary income or variable capital in price terms will generate smaller numbers than ours.

Second, during the calculation of surplus income, Wolff includes in the surplus income the amount of trade and rental sectors bought only by the production sector, while we include the total trade and rental sectors. Therefore Wolff's calculation of surplus income or surplus value in price form will generate smaller numbers than ours. The result is that although surplus value and variable capital in money forms based on Wolff's accounting framework generate significantly smaller numbers than ours, the rate of surplus value in money form according to Wolff's method will be relatively close to ours.

Third, during the calculation of the value rate of surplus value, Wolff calculated surplus value by deducting variable capital from total employment, instead of just the productive workers. The result is that surplus value and the rate of surplus value based on Wolff's method will be overestimated.

We could conclude that Wolff's method of measuring rate of surplus value has theoretical problems, such as defining necessary consumption and surplus value and that his calculation method fails the test of chapter II and generates inconsistent results.

Footnotes of Chapter V

1.Wolff, 1987.

2. Wolff, 1975.

3. The first three columns of this table are based on Wolff's table 3 of, Wolff, 1975, p. 940.

4. Ibid., p. 940.

5. Wolff, 1977a.

6. Wolff, 1977b.

7. This table combines sections of tables 2 and 3 of Wolff, 1977b.

8. Wolff, 1987.

9. Wolff, 1979.

10. Wolff, 1986.

11. This table is based on table 2 of Wolff, 1986, p. 94.

12. Wolff, 1987, p. 121.

13. Ibid., p. 133.

14. Ibid., p. 79.

15. Ibid., p. 74.

16. Ibid., p. 79.

17. Ibid., p. 78.

18. Ibid., p. 78.

19. Ibid., p. 79.

20. Ibid., p. 76.

21. Ibid., p. 75.

22. Ibid., p. 83.

Conclusion

In the first part of this dissertation we constructed a method to calculate the price and value rates of surplus value. Then we tested this method by using a numerical example. The result is that the measurement method that we are using to calculate price and value rates of surplus value is accurate and consistent.

In the second part of the dissertation we described how we improved the existing data base by compiling employment and employee compensation vectors, which are consistent with the I-O tables that we are using.

We were able to make use of the work done by Coughlin, Crane and Yuskavage in developing employment and employee compensation estimates for 1967, 1972, 1977.

For 1958, and 1963 we generated new employment and employee compensation vectors, based on the method employed by Coughlin, which were then consistent with the 1958 and 1963 I-O tables.

Then we carried out four different types of calculations of the rates of surplus value and compared results.

First, we calculated and compared the price rate of surplus value from the value added side with the price rate of surplus value from the final demand side. These two rates of surplus value were almost identical.

Second, we calculated and compared the value rate of surplus value from the value added side with the value rate of surplus value from the final demand side. They were almost

identical.

Third, we calculated and compared the price rate of surplus value from the value added side with the value rate of surplus value from the value added side. The price rate of surplus value on average is 92 percent of the value rate of surplus value.

Fourth, we calculated and compared the price rate of surplus value from the final demand side with the value rate of surplus value from the final demand side. The price rate of surplus value on average is 93% percent of the value rate of surplus value.

We can conclude from these results that in order to calculate the rate of surplus value one can either use the price rate of surplus value or the value rate surplus value. Both are accurate and appropriate ways of estimating the rate of surplus value. If we are interested in analyzing Marxian categories over a long period of time, then we could use the price forms and calculate the price rate of surplus value instead of the value rate, because it is very difficult to do time series analysis with labor values, due to the scarcity of data.

In order to calculate the value rate of surplus value we need I-O tables to generate labor values. Therefore we only can calculate the value rate of surplus value for those years for which an I-O table exists. For the U.S. there have only been 7 benchmark year I-O tables produced since WWII. Clearly

we can't do time series analysis with just 7 observations.

On the other hand for the calculation of the price rate of surplus value we don't need disaggregated interindustry data. National income and product accounts are sufficient. Therefore based on NIPA data we can calculate the price rate of surplus value for every year, analyze its trend and do time series analysis.

We could suggest the following directions, for future research. First, we could use the same accounting framework developed in this dissertation to calculate other Marxian categories, such as, the organic composition of capital, the rate of profit and others.

Second we could extend our discussion of the U.S. to other industrialized countries such as members of the European Community and Japan. And then we could compare and analyze the results. It would also be desirable to investigate the possibilities of extending our discussion to third world countries which provides a serious challenge not only due to serious shortages of data but also for theoretical developments in Marxian analysis.

Third, we could move from static analysis to dynamic analysis. Recent developments in dynamic input-output models, and schemes of expanded reproduction, provide us models which could be developed and used to investigate different macro and micro growth rates.[1]

Footnote

1. Such as Juillard, 1985.

Appendix A

General Discussion of I-O Tables

We are using 82 by 88 sectors, similar input-output tables for 5 benchmark years 1958, 1963, 1967, 1972, and 1977. There are a total of 80 economic sectors, represented by the first 80 rows and 80 columns. Table 10 lists the names and numbers of the economic sectors and the corresponding sector numbers of the BEA 85 sector I-O table.

The final demand is represented by the 81-87th columns. the last column represents the row totals. The numbers and the names of the final demand sector are:

81. Personal consumption expenditures
82. Gross private fixed capital formation
83. Net inventory change
84. Exports
85. Imports
86. Federal government purchases
87. State and local government purchases
88. Row totals

The 81st row of our I-O tables represents value added, while the last row represents column totals. The 1967, 1972, and 1977 BEA I-O tables disaggregate the value added into three components: employee compensation, indirect business

taxes and property type income. While the 1958 and 1963 BEA I-O tables don't disaggregate the value added.

In order to be consistent the 3 components of the value added for the 1967, 1972, and 1977 tables were aggregated into one row so that all 5 tables have just one row for the value added.

In BEA I-O tables the first four sectors are agricultural sectors, but for our I-O tables we aggregate these four sectors into one sector. We aggregate the two BEA I-O construction sectors 11, 12, into one sector, which becomes the 8th sector of our tables. The reason for these aggregations is that the depreciation matrices that we are using for the measurement of the rate of surplus value have one aggregate agriculture sector and one construction sector.

The depreciation matrices are generated from investment matrices. The investment matrices developed by the BEA contain 1 aggregated agriculture sector and one construction sector. Therefore in order to make the I-O tables compatible with the investment matrices, one should adjust the I-O tables and aggregate the agriculture and construction sectors.

In the BEA 1972 and 1977 I-O tables, sector 74 represents "eating and drinking places". Before 1972 there was no separate sector of "eating and drinking places". It was treated as part of the retail trade sector. Therefore in order

to have homogeneous I-O tables for all the years the adjusted I-O tables that we are using eliminate the separate "eating and drinking places" sector from the 1972 and 1977 I-O tables.

The trade sector, sector 69 of the 1958, 1963, and 1967 BEA I-O tables become sector 65 in our corresponding tables. For the years 1972 and 1977 the trade sector of our I-O tables, correspond to the combination of the trade sector, 69, and " eating and drinking places", sector 74, of the original BEA I-O tables. For a description of the method used to merge " eating and drinking places" with the trade sector see Michel Juillard(1988). The I-O tables were aggregated by Paul Cooney.

Imports

Sector 75, of our I-O tables represents noncomparable imports, which corresponds to sector 80 of the 1972 and 1977 BEA I-O tables. There are two types of imports: (1) competitive, comparable or directly allocated imports and (2) complementary, non-comparable or transferred imports. The first type of imports, comparable imports, are related with goods which are also produced in the U.S. While the second type of imports, noncomparable imports, are related with goods which are not produced in the U.S., such as spices and bananas.(U.S. dept. of Commerce, 1980, p44). The treatment of imports in the 1958, 1963 and 1967 BEA I-O tables is

significantly different from the treatment in the 1972 and 1977 BEA I-O tables.

In the 1958, 1963 and 1967 BEA I-O tables there is a separate row for the comparable imports. In these I-O tables this type of imports is called "Directly allocated imports", which are represented by the corresponding I-O sector 80A. All the entries of this row are positive numbers except the number in the cell which corresponds to the intersection of the "Directly allocated imports" row and the net exports column of the final demand. The absolute value of this negative number is equal to the total of all the positive entries of the "Directly allocated imports". The result is that the sum of all the entries of this row is equal to zero.

Similarly, in these early BEA I-O tables there is a separate row, 80B for the comparable imports, which are called "Transferred imports". Again, all the entries of this row are positive, except for the cell, which corresponds to the net exports column, which is negative and has an absolute value equal to the sum of all the positive entries of the row. As in the last case the sum of all the entries of this row is equal to 0.

All the entries of the net exports column in the final demand section represent gross exports except for the two cells, which correspond to the comparable and noncomparable imports and contain negative numbers. The label net exports

for this column could be misleading, because individual entries of this column don't represent net exports, which implies gross exports minus imports. Each entry of this column represents either gross export or gross import. The column is called "net", because the sum of all entries of this column represents net exports. With respect to the imports, these I-O tables are balanced, because the sum of all the entries of comparable and noncomparable rows are 0 and the column corresponding to the import, 80A and 80B are either empty or do not exist.

In the 1972 and 1977 BEA I-O tables there is no comparable imports row. There is just a noncomparable imports row. The treatment of noncomparable imports is similar to its treatment in the early BEA I-O tables. However, the treatment of the comparable imports and the treatment of imports in the final demand in the 1972 and 1977 tables are different from the earlier BEA I-O tables.

In the 1972 and 1977 tables there is neither a comparable import row, nor a column. Comparable imports used by the economic sectors are spread around the intermediate inputs and final demand of the I-O tables, such that each cell, each number, of the intermediate inputs and final demand represents purchases of domestically produced commodity i and imports of the same commodity by an economic sector.

The final demand of the I-O tables represents the gross

national product, GNP. Therefore the amount of comparable imports of product i used by all economic sectors should be deducted from the row total of sector i. In the 1972 and 1977 BEA I-O tables in the final demand there is a separate column for exports and a separate column for imports, whereby all the elements of the import column are negative numbers.

Our I-O tables treat imports based on the method used for the 1972 and 1977 BEA I-O tables. Therefore the 1958, 1963 and 1967 I-O tables that we are using are adjusted with respect to imports, such that all five tables are treating imports in the same way. The adjustments of these earlier BEA tables involve the elimination of the comparable imports row and the creation of separate export and import columns in the final demand section. These adjustments were done and explained by Michel Juillard(1988).

Rental sector

BEA I-O tables, similar to the NIPAs include in the rental sector, a large amount of fictitious rent, which is called imputed rent. NIPAs and I-O tables treat homeowners as if they were firms and were renting their homes from themselves. Therefore in the case of homeowners a fictitious amount of rent is calculated that homeowners allegedly pay to themselves and this fictitious rent is registered as

fictitious profit in the value added section of the rental sector's column.

At the same time when homeowners buy goods and services to maintain and repair their houses these purchases are registered as intermediate inputs bought by the rental sector. These purchases are not fictitious because homeowners actually buy these commodities, however they are imputations related to the rental sector. Therefore the rental sector's column is inflated artificially by the two types of imputed rent: one fictitious related with the value added and one real related with the intermediate goods.

The real estate row is also artificially inflated exactly by the same amount that the rental column is inflated. The cell which represents the intersection of the rental row and the consumption column is increased by the amount of total imputed rent.

The fictitious rental has been eliminated from the I-O tables that we are using . The result is that the column and row totals of the rental sector of our I-O tables are much smaller than the totals of the BEA I-O tables. These adjustments were done by Michel Juillard.

There is one more adjustment involving the final demand sectors. It is the treatment of new home construction. Input-output tables and NIPAs treat new home construction as investment, because they can generate income over many years.

We don't consider new home construction as investment, because it doesn't increase the productive capital stock. In the BEA I-O tables the cell which corresponds to the intersection of sector 11, new construction with the personal consumption expenditures' column is empty. The cell which corresponds to the intersection of sector 11 with the gross private fixed capital formation is significantly large, because new home construction is represented by this cell. In our I-O tables the amount of new home construction is moved from the investment column to the personal consumption column. The result is that in our I-O tables the cell which corresponds to the intersection of the construction sector with the personal consumption column is not empty and it represents the new home construction, while the amount in the cell which corresponds to the intersection of the construction sector with the investment column is much smaller than the corresponding cell in the BEA I-O tables. This implies that in our I-O tables, the total of the investment column is smaller than the corresponding column total of the BEA I-O table.

Industry by Industry I-O Tables

The 1958, 1963 and 1967 BEA commodity by industry I-O tables are called interindustry transactions table, while the 1972 and 1977 BEA commodity by industry I-O tables are referred to as use matrices.

Our I-O tables for all five years are homogeneous industry by industry tables. The key intuitive difference between a commodity by industry I-O table and an industry by industry I-O table is that in the commodity by industry table the rows represent a homogeneous product, such as the row which represents the agricultural sector includes only agricultural goods, while in an industry by industry I-O table the row which represents the agricultural industry includes everything that the agricultural industry is producing. If the agricultural sector is producing goods other than agricultural products then the row which represents the agricultural sector will include goods other than the agricultural goods.

We are using industry by industry tables instead of commodity by industry tables because for the calculation of the rate of surplus value we examine primary inputs, specifically employment. The examination of employment and labor values can be done more accurately and conveniently if industry by industry tables are being used, instead of commodity by industry tables, because employment data is compiled based on industries(UN, 1973, p350).

Industry by industry tables are calculated by using both the use and make matrices. The (i,j) element of an use matrix represents the amount of commodity i, used by industry j. The (i,j) element of a make matrix represents the amount of commodity j produced by industry i.

In order to create an industry by industry table, T, we must first divide every entry of a make matrix by the corresponding column total. The result is a coefficient make matrix W. Then we multiply the coefficient make matrix W, with the use matrix U and we get the industry by industry matrix T.

$$T = W * U$$

The result is that in an industry by industry table a fraction of a commodity produced is allocated to every industry which produces that commodity(Leotief & Duchin 1986 P146-148). These adjustments were made and discussed by Michel Juillard(1988).

Force Account Construction

BEA I-O tables are adjusted for force account construction, FAC. When economic sectors other than the construction sector are engaged in construction activities, then the I-O tables transfer the values of these construction activities done by other economic sectors to the construction sector. The result is that for a specific year the total output of the construction sector in an BEA I-O table is significantly larger than the output of the construction sector in a NIPA table, because NIPA's don't adjust their tables for force account construction while BEA I-O tables do.

During the calculation of the rate of surplus value beside using the I-O tables we also have to use employment

vectors, employee compensation vectors and depreciation matrices. The depreciation matrices are based on the investment matrices, and depreciation vector. The depreciation vectors and the related capital stock data provided by the Bureau of Industrial Economics, U.S. department of Commerce, are not adjusted for force account construction, FAC.

The employment and employee compensation data for the years 1967, 1972 and 1977 are adjusted for force account construction, while for the years 1958 and 1963 they are not.

In order to have valid and accurate calculations of the rates of surplus value, the data base that we are using should be homogeneous. However, as just mentioned, one part of the data base is adjusted for FAC, while the other part is not. Therefore we should adjust our data base, such that either all components of the data base are adjusted for FAC or not adjusted for FAC. We have chosen the second option and our data base is not adjusted for FAC. Therefore those components of our data base which were already adjusted for FAC, such as the I-O tables had to be readjusted so that the adjustment for FAC was reversed and those components of the data base which had not been adjusted for FAC, such as depreciation should stay the way they were.

We decided not to adjust our data base for FAC, because it was possible to generate a relatively accurate data base which wasn't adjusted for FAC, while it was not possible to

generate as accurate a data base which was adjusted for FAC. The original I-O tables, the employment and employee compensation vectors for the 1967, 1972, and 1977 years are adjusted for FAC and we had enough information with respect to FAC, to reverse the FAC adjustments accurately (See chapter III). However we didn't have enough information with respect to FAC to adjust the depreciation matrices, the employment vectors and the employee compensation vectors for the 1958 and 1963 years for FAC.

There was a small adjustment made to the depreciation vector that we are using and to the related capital stock data. The Bureau of Industrial Economics, BIE, considers capitalized expenses of exploration as investment and includes them in the "Oil and gas extraction" sector. Ken Rogers of the BIE adjusted these vectors and excluded capitalized exploration expenses from the capital stock and related data.

The FAC adjustments of the I-O tables were reversed by Paul Cooney.

Appendix B

Employment and Employee Compensation of 1958,63 IO Tables

Adjustments of 1958 NIPA Employment Estimates

In this section we will describe the estimation of 1958 employment vector in detail. For 1963 the procedures will be exactly the same. Only the numbers will change. We will use six tables to make all the adjustments and generate the final IO employment vector.

In chapter III we already discussed that the first and second type of adjustments are related only with the mining and manufacturing sectors. Therefore, the first three tables deal only with mining and manufacturing sectors.

The First Type of Adjustment

The tables that we will present here are mentioned in chapter III. The first two tables are related with the first type of adjustment. The Census of Manufactures divides the data into two parts. The first set is related with the manufacturing plants, which are called "Operating Manufacturing Establishments" and the second data set is related with administrative activities outside manufacturing plants, such as accounting, warehousing, repair services, and are called "Central Administrative Office or CAO".

All the detail data provided by the Census of manufactures deal with the Operating Manufacturing Establishments. The data on CAO's is provided only at 2 digit

SIC level. When we make the first type of adjustment we will use Census of Manufacture's total employment estimates, which are the sums of operating establishments and CAOs. However, when we do the second type of adjustments we will use only operating establishments' estimates, because CAO's are available only at 2 digit SIC and we need 3 and 4 digit SIC estimates to disaggregate NIPA's. Therefore in Table 25 we show the breakdown of the total estimates of Census of manufactures between "Operating establishments" and CAO's. The last column represents the sum of the two.

When we compare the total of CAO with the total of manufactures employment we see that CAO employment is just 3.76 percent of total manufacturing employment. However the share of CAO employment went up to 4.3 percent in 1963. While Census of Manufactures at two digits SIC level provides data on CAOs, Census of Mineral industries does not provide separately data on CAOs at any level of aggregation. Therefore in table 25 we just have total employment of each mining sector.

Table 26 completes the first type of adjustment. The total of NIPA estimates for mining and manufacturing is .59 percent (see column 5) less than Census estimates. One of the largest discrepancy occurs in Petroleum refining(SIC 29). However, the difference will diminish when we combine Petroleum refining sector with Oil and Gas extraction(SIC 13). The estimates of Census of minerals and manufactures(column 4)

Table 25
Employment(1000 of employees)
Censuses of Mineral Industries and Manufactures,1958

1 SIC No.	2	3	4	5 Operating Establish	6 CAO	7 Census Totals
	Mining					
10	Metal Mining					91.40
11,12	Coal Mining					210.80
13	Oil & Gas Extrac.					312.90
14	Non Metalic Min.					118.70
	Total Mining					733.80
	MANUFACTURING					
20	Food & Kindred Prod.			1718.10	63.30	1781.40
21	Tobacco Manufactures			84.50	7.50	92.00
22	Textile Mill Products			903.20	15.40	918.60
23	Apparel & Other Textile			1182.00	7.50	1189.50
24	Lumber & Wood			585.40	5.70	591.10
25	Furniture & Fixtures			354.20	3.00	357.20
26	Paper & Allied Prod.			551.30	22.30	573.60
27	Printing & Publishing			864.60	7.10	871.70
28	Chemicals & Allied Prod.			698.30	85.60	783.90
29	Petroleum & Coal Prod.			179.10	68.30	247.40
30	Rubber & Plastic			347.80	8.30	356.10
31	Leather & Leather Prod.			349.20	9.30	358.50
32	Stone, Clay & glass			552.50	22.30	574.80
33	Primary Metal Prod.			1091.90	37.60	1129.50
34	Fabricated Metal			1060.50	29.80	1090.30
35	Machinery, Except Electrica			1350.30	35.50	1385.80
36	Electrical Equipment			1140.80	77.80	1218.60
371	Motor Vehicales			579.70	29.50	609.20
19+37-371	Transpor. & Ordo.			1190.50	52.15	1242.65
38	Instruments			286.40	7.40	293.80
39	Misc. Manufacturing			352.70	6.75	359.45
	Total Manufacture			15423.00	602.10	16025.10
	Total Min & Manu					16758.90

Table 26

Adjusting NIPA Mining and Manufactures Estimates,1958

(1,000 of employees)

1 SIC No.	2	3 NIPA	4 Census Total	5 Percent discrepan (3-4)/3*100	6 Adjusted Census	7 NIPA-Cen Adjustmen 6-3	8 Adjusted NIPA
	Mining						
10	Metal Min	93.00	91.40	1.72	90.85	-2.15	90.85
11,12	Coal Mini	217.00	210.80	2.86	209.51	-7.49	209.51
13	Oil & Gas	324.00	312.90	3.43	310.98	-13.02	310.98
14	Non Metal	118.00	118.70	-0.59	118.00	-0.00	118.00
Total Mining		752.00	733.80	2.42	729.34	-22.66	729.34
	MANUFACTURING						
20	Food & Ki	1749.00	1781.40	-1.85	1771.02	22.02	1771.02
21	Tobacco M	93.00	92.00	1.08	91.45	-1.55	91.45
22	Textile M	922.00	918.60	0.37	913.13	-8.87	913.13
23	Apparel &	1158.00	1189.50	-2.72	1182.63	24.63	1182.63
24	Lumber &	613.00	591.10	3.57	587.46	-25.54	587.46
25	Furniture	364.00	357.20	1.87	355.04	-8.96	355.04
26	Paper & A	558.00	573.60	-2.80	570.29	12.29	570.29
27	Printing	871.00	871.70	-0.08	866.53	-4.47	866.53
28	Chemicals	795.00	783.90	1.40	779.18	-15.82	779.18
29	Petroleum	227.00	247.40	-8.99	246.05	19.05	246.05
30	Rubber &	345.00	356.10	-3.22	354.05	9.05	354.05
31	Leather &	356.00	358.50	-0.70	356.39	0.39	356.39
32	Stone, Cl	563.00	574.80	-2.10	571.46	8.46	571.46
33	Primary M	1159.00	1129.50	2.55	1122.62	-36.38	1122.62
34	Fabricate	1078.00	1090.30	-1.14	1083.90	5.90	1083.90
35	Machinery	1359.00	1385.80	-1.97	1377.73	18.73	1377.73
36	Electrica	1232.00	1218.60	1.09	1211.29	-20.71	1211.29
371	Motor Veh	615.00	609.20	0.94	605.55	-9.45	605.55
19+37-371	Transpor.	1148.00	1242.65	-8.24	1235.84	87.84	1235.84
38	Instrumen	327.00	293.80	10.15	291.86	-35.14	291.86
39	Misc. Man	376.00	359.45	4.40	357.22	-18.78	357.22
Total Manufac.		15908.00	16025.10	-0.74	15930.66	22.66	15930.66
							0.00
Total Min & Manu		16660.00	16758.90	-0.59	16660.00	-0.00	16660.00

are multiplied by .59, and the result is deducted from the estimates of Census. The outcome of this computations is the adjusted Census employment estimates. Even though, for each industry, the estimates of the adjusted Census is different from NIPA's, the column sum of adjusted Census is equal to the total of NIPA, 16,660 thousand employees.

The next step is to find the difference between NIPA estimates and adjusted Census estimates(column 7). We will have the first adjustment of NIPA estimates by deducting NIPA-Census adjustments from NIPA (column 8). At the end of this first type of adjustment, adjusted Census (column 6) is identical with adjusted NIPA (column 8).

The Second Type of Adjustment

NIPA divides mining and manufacturing sectors into 25 two digit SIC industries. In 85 sectors IO table there are 58 mining and manufacturing sectors. Therefore, we should disaggregate the 25 mining and manufacturing adjusted NIPA estimates into 58 sectors.

The first adjusted Census industry that we should disaggregate is Metal Mining(SIC 10). In 85 sectors IO tables SIC 10 is broken down into two sectors; Iron mining IO sector 5 and Nonferrous mining IO sector 6. In order to disaggregate SIC 10 we need a proportion or a ratio. We will get this ratio from employment estimates of Census of Mineral industries. IO sector 5 corresponds to SIC 101 and SIC 106(second column of

TABLE 27

Disaggregating Adjusted NIPA Mining & Manufac. Estimates,1958

1 I-O No.	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggregate Census	6 ratio	7 Adjusted NIPA	8 Adjusted NIPA by I-O Indus
	MINING						
	1011	30.10					
	106	5.40					
5			35.50		0.39		35.29
	1021	27.60					
	1031	11.20					
	104	4.40					
	1051	0.70					
	1081	2.20					
	109	9.80					
6			55.90		0.61		55.56
	10			91.40		90.85	
7	11 & 12			210.80		209.51	209.51
8	13			312.90		310.98	310.98
	1411	2.30					
	142	41.70					
	144	37.20					
	145	8.80					
	1481	1.10					
	149	5.70					
9			96.80		0.82		96.23
10	147	21.90	21.90		0.18		21.77
	14			118.70		118.00	
Total Mining						729.34	729.34
	MANUFACTURING						
13	19	207.80	207.80		0.17		216.10
14	20					1771.02	1771.02
15	21					91.45	91.45
	2211	243.40					
	2221	81.70					
	2231	56.00					
	2241	24.60					
	2261	49.20					
	2262	16.20					
	2269	7.80					
	228	106.90					
16			585.80		0.28		589.59
	227	33.70					
	229	68.90					
17			102.60		0.05		103.26
	225	213.40					

TABLE 27, continue

Disaggregating Adjusted NIPA Mining & Manufac. Estimates,1958

1 I-O No.	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggregate Census	6 ratio	7 Adjusted NIPA	8 Adjusted NIPA by I-O Indus
	2311	122.20					
	232	272.50					
	233	360.00					
	234	111.30					
	235	35.50					
	236	80.80					
	2371	9.40					
	238	60.00					
18			1265.10		0.61		1273.28
19	239	128.80	128.80		0.06		129.63
	22 & 23			2082.30		2095.76	
20	24-244	541.70	541.70		0.93		547.44
21	244	39.60	39.60		0.07		40.02
	24			581.30		587.46	
22	251	251.40	251.40		0.72		256.78
23	25-251	96.20	96.20		0.28		98.26
	25			347.60		355.04	
24	26-265	374.20	374.20		0.67		384.23
25	265	181.20	181.20		0.33		186.06
	26			555.40		570.29	
26	27					866.53	866.53
	281	238.10					
	287	38.70					
	2861	7.30					
	289	60.30					
27			344.40		0.49		383.80
28	282		121.50		0.17		135.40
	283	95.90					
	284	78.60					
29			174.50		0.25		194.46
30	285	58.80	58.80		0.08		65.53
	28			699.20		779.18	
31	29					246.05	246.05
32	30					354.05	354.05
	311	37.10					
	312	4.00					
33			41.10		0.12		41.96
34	32-311-312	308.00	308.00		0.88		314.43
	31			349.10		356.39	

TABLE 27, continue

Disaggregating Adjusted NIPA Mining & Manufac. Estimates,1958

1 I-O No.	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggregate Census	6 ratio	7 Adjusted NIPA	8 Adjusted NIPA by I-O Indus
	321	21.20					
	322	92.10					
	323	24.00					
35			137.30		0.25		141.63
36	32-321-322-323		416.70		0.75		429.83
	32			554.00		571.46	
	331	578.20					
	332	182.00					
	3391	36.50					
	3399	9.80					
37			806.50		0.74		830.25
	333	47.10					
	3341	14.40					
	335	160.30					
	336	62.20					
38			284.00		0.26		292.37
	33			1090.50		1122.62	
	3411	54.30					
	3491	9.60					
39			63.90		0.06		65.46
	343	71.80					
	344	340.60					
40			412.40		0.39		422.46
	345	85.10					
	3461	125.60					
41			210.70		0.20		215.84
	342	135.70					
	347	52.20					
	3481	55.50					
	349-3491	127.70					
42			371.10		0.35		380.15
	34			1058.10		1083.90	
	351	95.60					
43			95.60		0.07		97.69
	3522	108.60					
44			108.60		0.08		110.97
	3531	95.30					
	3532	17.80					
	3533	31.90					
45			145.00		0.11		148.16
46	353-3531-2-3		54.70		0.04		55.89
47	354	233.50	233.50		0.17		238.60
48	355	162.30	162.30		0.12		165.84
49	356	211.40	211.40		0.16		216.01

TABLE 27, continue

Disaggregating Adjusted NIPA Mining & Manufac. Estimates,1958

1 I-O No.	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggregate Census	6 ratio	7 Adjusted NIPA	8 Adjusted NIPA by I-O Indus
50	359	115.50	115.50		0.09		118.02
51	357	121.60	121.60		0.09		124.25
52	358	100.10	100.10		0.07		102.28
	35			1348.30		1377.73	
	361	134.40					
	362	156.30					
53			290.70		0.26		313.75
54	363	143.00	143.00		0.13		154.34
55	364	123.30	123.30		0.11		133.08
	365	73.90					
	366	215.10					
56			289.00		0.26		311.92
57	367	197.90	197.90		0.18		213.59
58	369	78.40	78.40		0.07		84.62
	36			1122.30		1211.29	
59	371					605.55	605.55
60	372	765.50	765.50		0.64		796.06
61	37-371-372		215.10		0.18		223.69
	19+37-371			1188.40		1235.84	
	3811	67.50					
	382	75.60					
	384	41.70					
	387	26.20					
62			211.00		0.71		207.56
	3831	7.20					
	3851	18.20					
	3861	60.30					
63			85.70		0.29		84.30
	38			296.70		291.86	
64	39					357.22	357.22
Total Manufac						15930.69	15930.69
Total Min. & Manu						16660.03	16660.03

table 27). Employment of SIC 101 is 30.10 thousand while for SIC 106 it is 5.4 thousand(column 3). When we add them we get the Census estimate for IO sector 5(column 4).

We follow the same procedure for IO sector 6. The Census estimate of IO sector 6 is 55.9(column 4). When we add the Census estimates of IO sectors 5 and 6 we get the Census estimate of the metal mining industry, SIC 10, which is 91.4(column 5). Then we divide the Census estimates of IO sectors 5 and 6 with their total, 91.4,the aggregated Census estimate of SIC 10. The ratios for IO sectors 5 and 6 are .39 and .61(column 6). These numbers imply that I-O sector 5, Iron mining, represents 39% of metal mining, while non-ferrous mining represents the remaining 61%. We will multiply the adjusted NIPA estimate of Metal mining SIC 10 (column 7) 90.85 thousand by these ratios and we get the disaggregated adjusted NIPA estimates for the IO sector 5, 35.29 thousand and I-O sector 6, 55.56 thousand. Column 7 of table 27 is identical with column 8 of table 26.

For the other aggregate economic sectors, agriculture, trade, services, etc., we can directly use NIPA estimates. There is no need to adjust NIPA estimates with Census estimates the way we did for mining and manufacturing and there is no need for disaggregation. On the contrary in 85 sectors IO tables, transportation, trade, finance, services, and government sectors are much more aggregated than NIPA's. Therefore, in these sectors we will either aggregate NIPA

estimates, such as services, or we will use NIPA's aggregate estimates such as transportation, trade, and government.

Table 28 aggregates NIPA services estimates into the corresponding IO sectors. For example IO sector 72, Hotels, personal services, and repair, with 1538 thousand employees, corresponds to 3 NIPA sectors, Hotels (SIC 70) 524 thousand, Personal services(SIC 72) 890 thousand, and Miscellaneous repair services (SIC 76) 124 thousand employees.

The third Type of Adjustment

Table 29 represents the final employment estimates for 1967 by Coughlin. After adjusting NIPA data to make it compatible with the Census of mining and manufactures numbers, and after using census of mining and manufactures numbers to disaggregate NIPA adjusted numbers, Coughlin gets the adjusted NIPA employment estimates by I-O industries, which is column 4 of table 29. This adjusted NIPA employment vector is the result of the first two types of adjustments.

After making the third type of adjustments, Coughlin gets the final I-O employment vector (column 5 of table 29). However, when he makes the third type of adjustments, beside making changes related with Manufactures sales offices, MSO's, and redefinitions, he also makes adjustments for Force account construction, FAC. We should reverse Coughlin's FAC adjustments because we are reversing Force account construction adjustment of our I-O tables. Therefore we don't

Table 28
Aggregating NIPA Services Estimates,1958

SIC No.	I-O No.		NIPA	I-O
70		NIPA Hotels	524	
72		NIPA Personal Services	890	
76		NIPA Misce. Repair Ser.	124	
	72	IO Hotels, Personal Services & Repair		1538
73		NIPA Business Services	637	
81		NIPA Legal Services	141	
89		NIPA Misce. Prof. Services	353	
	73	IO Business Services		1131
75	75	IO Auto Repair	234	234
78		NIPA Motion Pictures	199	
79		NIPA Amusement & Recrea. Services	306	
	76	IO Amusements		505
80		NIPA Health Ser.	1455	
82		NIPA Educational Ser.	663	
83,86		NIPA Social Services	1017	
	77	NIPA IO 77 Medical, Educa.		3135

Table 29

Coughlin's Employment Estimates & Ratios,1967

1 IO No. & Name	2 3	4 Adjusted NIPA by IO Indus	5 Final IO Estimates	6 FAC 1967	7 Final IO Estimates Minus FAC	8 Ratios (7)/(4)
IO 1,2,3,4 Agriculture		1547	1552	0	1552	1.003232
IO 5 iron mining		26.9	24.1	-2.8	26.9	1
IO 6 nonferrous mining		44.8	40.9	-3.9	44.8	1
IO 7 Coal mining		133.1	130.3	-2.8	133.1	1
IO 8 Crude petroleum		247.7	202.7	-45	247.7	1
IO 9 Stone & clay mining		97.2	95.4	-1.8	97.2	1
IO 10 Chemicals & Fert. min		24.1	22.6	-1.4	24	0.995850
IO 11,12 Construction		3344	4336.6	1101.4	3235.2	0.967464
IO 13 Ordonance		407	406.3	-0.7	407	1
IO 14 Food & Kindred Prod.		1745.7	1845.2	-7.3	1852.5	1.061178
IO 15 Tobacco Manu.		84.1	95.2	-0.2	95.4	1.134363
IO 16 Broad & narrow fabric		599	621.8	-1.5	623.3	1.040567
IO 17 Miscellaneous Textile		121	123.8	-0.3	124.1	1.025619
IO 18 Apparel		1458.2	1477.6	-0.8	1478.4	1.013852
IO 19 Misc. fabricated text		175.6	176	-0.1	176.1	1.002847
IO 20 Lumber & wood		536.3	535.8	-2.7	538.5	1.004102
IO 21 Wooden containers		31.9	31.8	0	31.8	0.996865
IO 22 Household Furniture		304.6	304.4	-0.5	304.9	1.000984
IO 23 Other Furniture		130.4	130.5	-0.4	130.9	1.003834
IO 24 Paper & allied Prod.		454.7	456	-3.9	459.9	1.011436
IO 25 Paperboard Containers		223.8	225.8	-0.8	226.6	1.012511
IO 26 Printing & pub.		1064.2	1069.7	-2.5	1072.2	1.007517
IO 27 Chemicals & chem Prod		451.3	452.4	-4.5	456.9	1.012408
IO 28 Plastics & synthetic		214.9	217	-2.3	219.3	1.020474
IO 29 Drugs, Cleaning prod.		257	265.1	-1.5	266.6	1.037354
IO 30 Paints & allied Prod.		70.8	72.8	-0.4	73.2	1.033898
IO 31 Petroleum Refining		213.2	208.3	-6	214.3	1.005159
IO 32 Rubber & Misce.		537.1	538.9	-1.5	540.4	1.006144
IO 33 Leather tanning		33.9	34	-0.1	34.1	1.005899
IO 34 Footwear & leather Pr		306.6	306.6	-0.2	306.8	1.000652
IO 35 Glass & glass Prod.		178.3	180.5	-0.8	181.3	1.016825
IO 36 Stone & Clay Prod.		449.4	452.2	-2.5	454.7	1.011793
IO 37 Primary Iron & steel		958.2	969.1	-5.5	974.6	1.017115
IO 38 Primary Nonfer. metal		386.1	399	-2.8	401.8	1.040663
IO 39 Metal containers		82.1	81.9	-0.2	82.1	1
IO 40 Heating, Plumbing pro		471.2	444.9	-1.4	446.3	0.947156
IO 41 Screw Machine Prod.		349.1	348.4	-1	349.4	1.000859
IO 42 Other Fabri. metal pr		488.4	488.2	-1.2	489.4	1.002047
IO 43 Engines& Turbines		103.8	105.6	-0.4	106	1.021194
IO 44 Farm Machinery		151.7	152	-0.4	152.4	1.004614
IO 45 Const. mining Machine		197.4	197	-0.7	197.7	1.001519
IO 46 Materials Handling Ma		89	88.8	-0.2	89	1
IO 47 Metalworking machiner		343.6	345.1	-0.9	346	1.006984
IO 48 Special Ind. Machiner		215.1	217.9	-0.6	218.5	1.015806
IO 49 General Ind. Machin.		289.4	288.9	-0.8	289.7	1.001036
IO 50 Machine shop Prod.		205.3	206.3	-0.3	206.6	1.006332
IO 51 Office, computing Mac		211.1	215.7	-0.5	216.2	1.024159
IO 52 Service Ind. Machines		145.1	146	-0.4	146.4	1.008959

IO 53 Electric transmission	420.9	425.7	-1.1	426.8	1.014017
IO 54 Household Appliances	178.4	177.9	-0.5	178.4	1
IO 55 Electric Lighting equ	166.1	167.5	-0.3	167.8	1.010234
IO 56 Radio, TV, commu. equ	687.3	690	-1.4	691.4	1.005965
IO 57 Electronic components	437.1	439.2	-0.9	440.1	1.006863
IO 58 Misc. Electrical Mach	113.6	114	-0.3	114.3	1.006161
IO 59, Motor Vehicles	826.7	849	-1.9	850.9	1.029273
Io 60 Aircraft & Parts	830.1	828.4	-2.3	830.7	1.000722
IO 61 Other transportation	300.9	310.6	-0.9	311.5	1.035227
IO 62 Prof., Scient. Instru	262	259.1	-0.5	259.6	0.990839
IO 63 Optical, Photo equipm	152.3	152.6	-0.7	153.3	1.006565
IO 64 Misc. Manufac.	434.1	442.9	-0.7	443.6	1.021884
IO 65 Transportaion	2661	2566	-91.8	2657.8	0.998797
IO 66 Communications	848	825.8	-48.6	874.4	1.031132
IO 67 Radio & TV Broad.	119	118.9	-0.1	119	1
IO 68 Elec. Gas & Water	646	540.5	-105.5	646	1
IO 69,74 Trade	13862	13268	-6.5	13274.5	0.957617
IO 70 Finance & Ins.	2617	2614.2	-2.8	2617	1
IO 71 Real estate	665	443.3	-210.2	653.5	0.982706
IO 72 Hotels Personal Ser.	1966	1656.7	-4.6	1661.3	0.845015
IO 73 Business Services	2090	2385.1	-1.7	2386.8	1.142009
IO 75 Auto Repair	347	722.4	-1.5	723.9	2.086167
IO 76 Amusements	621	562.7	-3.9	566.6	0.912399
IO 77 Medical, Educa.	4972	5025.1	-7.3	5032.4	1.012148
IO 78 Fed. Enterprises	887.2	875.7	-11.5	887.2	1
IO 79 State Enterprises	454	327.1	-126.9	454	1
IO 82 Govern. Industry	15044	14693.9	-350.1	15044	1
IO 83 Rest Of World	-5	-5	0	-5	1
IO 84 Household Endustry	2527	2527	0	2527	1
TOTALS	75331.1	75331.4	0.4	75331	78.62703

need to adjust employment vectors of 1958 and 1963 for FAC.

Coughlin provides FAC adjustments for each sector (column 6 of table 29). Therefore when we subtract FAC adjustments from Coughlin's final I-O employment estimates, we get final I-O employment estimates without FAC (column 7).

When we divide final I-O estimates without FAC (column 7) by the adjusted NIPA (column 4) we get a vector of ratios which reflect the third type of adjustment without FAC. The ratio for I-O sector 5, iron mining is 1, which means that this sector is not affected from the third type of adjustment. The adjusted NIPA for sector 5 is 26.9 thousand and the final employment is 26.9 thousand. However there are sectors where the third type of adjustment is significant and their ratios are significantly different from 1.

The sector with the highest ratio is I-O sector 75 Auto repair. The ratio is 2.086, which implies that the third type of adjustment is very large, and that the final employment number is more than the double of NIPA employment. NIPA employment number for Auto repair is 347 thousand, while the final I-O employment is 724 thousand. The cause of this large change is that auto repair workers working for auto dealers are considered trade workers in NIPA, and auto repair workers in I-O tables. Obviously if we just use NIPA or BLS employment data without adjusting them for I-O redefinitions, the result will be erroneous.

When we multiply the ratios (column 8) with the adjusted

NIPA by I-O industries (column 4) we will get the final I-O estimates without FAC. We will multiply these ratios with the adjusted NIPA by I-O industries of 1958 and we will get the final I-O employment estimates for 1958 (see table 30).

In table 30, column 6 represents NIPA numbers for 1958 after the first and second type of adjustments. Column 7 is the ratios from table 29. And when we multiply these ratios with the adjusted NIPA we get the final I-O employment estimates (column 8). One final adjustment involves I-O sectors 8 and 11, where the amount of reclassification is large enough that we are directly transferring the industry group of oil and gas field services (SIC 138) 116.3 thousand employees from crude petroleum and natural gas, I-O sector 8, to new construction I-O sector 11.

Employment Vector of Productive Workers

The last column of table 30 provides us with the employment vector of all employees of all economic sectors. Therefore the column sum of final I-O employment data for all employees is equal to the total employment in the economy of that specific year. According to the NIPA in 1958 there were 58,708 thousands part time and full time employees. Column sum of final I-O data calculated in table 30 is equal to 58,616 thousands. The .16% difference was caused by calculation errors. In 1963 the difference was just .03%.

Table 30
IO EMPLOYMENT DATA 1958

1 SIC No	2 I-O	3	4 NIPA	5 NIPA-Cens Adjust	6 Adjust NIPA by I-O Indus	7 Coughlin Ratios	8 Final IO Data
1 TO 9	1,2,3,4		1989.00	0.00	1989.00	1.003232	1995.43
10			93.00	-2.15			
	5				35.29	1.000000	35.29
	6				55.56	1.000000	55.56
11,12	7		217.00	-7.49	209.51	1.000000	209.51
13	8		324.00	-13.02	310.98	1.000000	194.68
14			118.00	0.00			
	9				96.23	1.000000	96.23
	10				21.77	0.995850	21.68
15 TO 17	11,12		2794.00	0.00	2794.00	0.967464	2819.39
19	13				216.00	1.000000	216.00
20	14		1749.00	22.02	1771.02	1.061178	1879.37
21	15		93.00	-1.55	91.45	1.134363	103.74
22,23			2080.00	15.76			
	16				589.59	1.040567	613.51
	17				103.26	1.025619	105.91
	18				1273.28	1.013852	1290.92
	19				129.63	1.002847	130.00
24			613.00	-25.54			
	20				547.44	1.004102	549.69
	21				40.02	0.996865	39.89
25			364.00	-8.96			
	22				256.78	1.000984	257.03
	23				98.26	1.003834	98.64
26			558.00	12.29			
	24				384.23	1.011436	388.62
	25				186.06	1.012511	188.39
27	26		871.00	-4.47	866.53	1.007517	873.04
28			795.00	-15.82			
	27				383.80	1.012409	388.56
	28				135.40	1.020474	138.17
	29				194.46	1.037354	201.72
	30				65.53	1.033898	67.75
29	31		227.00	19.05	246.05	1.005159	247.32
30	32		345.00	9.05	354.05	1.006144	356.23
31			356.00	0.39			
	33				41.96	1.005899	42.21
	34				314.43	1.000652	314.64
32			563.00	8.46			
	35				141.63	1.016825	144.01
	36				429.83	1.011793	434.90
33			1159.00	-36.38			
	37				830.25	1.017115	844.46
	38				292.37	1.040663	304.26
34			1078.00	5.90			
	39				65.46	1.000000	65.46
	40				422.46	0.947156	400.14
	41				215.84	1.000859	216.03
	42				380.15	1.002047	380.93

35		1359.00	18.73			
	43			97.69	1.021194	99.76
	44			110.97	1.004614	111.48
	45			148.16	1.001519	148.39
	46			55.89	1.000000	55.89
	47			238.60	1.006984	240.27
	48			165.84	1.015806	168.46
	49			216.01	1.001036	216.23
	50			118.02	1.006332	118.77
	51			124.25	1.024159	127.25
	52			102.28	1.008959	103.20
36		1232.00	-20.71			
	53			313.75	1.014017	318.15
	54			154.34	1.000000	154.34
	55			133.08	1.010234	134.44
	56			311.92	1.005965	313.78
	57			213.59	1.006863	215.06
	58			84.62	1.006161	85.14
371	59	615.00	-9.45	605.55	1.029273	623.28
19+37-371		1148.00	87.84			
	60			796.06	1.000722	796.63
	61			223.69	1.035227	231.57
38		327.00	-35.14			
	62			207.56	0.990839	205.66
	63			84.30	1.006565	84.85
39	64	376.00	-18.78	357.22	1.021884	365.04
40 TO 47	65	2532.00	0.00	2532.00	0.998797	2528.95
481,7,9	66	772.00	0.00	772.00	1.031132	796.03
483	67	86.00	0.00	86.00	1.000000	86.00
49	68	615.00	0.00	615.00	1.000000	615.00
50 TO 59	69	10783.00	0.00	10783.00	0.957617	10325.98
60 TO 64, 67	70	1980.00	0.00	1980.00	1.000000	1980.00
65,66	71	572.00	0.00	572.00	0.982706	562.11
70,72,76	72	1538.00	0.00	1538.00	0.845015	1299.63
73,81,89	73	1131.00	0.00	1131.00	1.142009	1291.61
75	75	234.00	0.00	234.00	2.086167	488.16
78,79	76	505.00	0.00	505.00	0.912399	460.76
80,82,86	77	3135.00	0.00	3135.00	1.012148	3173.08
Fed Enter	78	659.00	0.00	659.00	1.000000	659.00
Sta Enter	79	337.00	0.00	337.00	1.000000	337.00
Gov Indus	82	9832.00	0.00	9832.00	1.00	9832.00
R O World	83	4.00	0.00	4.00	1.00	4.00
House Ind	84	2550.00	0.00	2550.00	1.00	2550.00
TOTAL		58708.00	0.03	58707.95	78.63	58616.25

Census of Mining and Census of Manufactures provide employment and wage data for all employees and for productive workers at two, three, and four digit SIC. We will aggregate three and four digit SIC employment data such that we will have employment vectors of all employees and productive workers which correspond to the I-O sectors (see table 31).

The first four columns of table Proe 58 is almost identical to the first four columns of table 27. In table 31 we are dealing only with Census and I-O sectors. In table 27 we were dealing also with NIPA sectors.

The second column of table 31 represents 2,3, and 4 digit SIC numbers. Column three represents the census employment data for all employees of the corresponding SIC. Then in column 4 we aggregate census numbers to get aggregated census employment data which corresponds to the I-O sectors. The first number of column 4 is 35.5 which corresponds to I-O sector 5. Input- output sector 5 is composed of SIC 1011 and 106. When we added census employment numbers of SIC 1011, 30.1 thousand and SIC 106, 5.4 thousand (column 3) we got 35.5 thousand.

Column 5 represents census productive workers data for the corresponding SIC and column 6 is the aggregated census data which corresponds to the I-O sectors. When we divide productive workers numbers, column 6 by the all employees numbers, column 4, we get the productive workers ratio for mining and manufacturing, column 7.

Table 31

Ratio of Productive Workers to all Employees, 1958
Employment (1,000)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratio (6)/(4)
	MINING					
	1011	30.10		22.50		
	106	5.40		4.40		
5			35.50		26.90	0.76
	1021	27.60		20.90		
	1031	11.20		8.70		
	104	4.40		3.80		
	1051	0.70		0.50		
	1081	2.20		2.00		
	109	9.80		7.90		
6			55.90		43.80	0.78
7	11 & 12		210.80		183.70	0.87
8	13		312.90		214.00	0.68
	1411	2.30		2.10		
	142	41.70		35.10		
	144	37.20		30.70		
	145	8.80		7.30		
	1481	1.10		1.00		
	149	5.70		4.70		
9			96.80		80.90	0.84
10	147		21.90		15.90	0.73
Total Mining			733.80		565.20	0.77
	MANUFACTURING					
13	19		207.80		118.10	0.57
14	20		1698.80		1137.60	0.67
15	21		84.50		76.30	0.90
	2211	243.40		228.60		
	2221	81.70		74.50		
	2231	56.00		49.10		
	2241	24.60		21.50		
	2261	49.20		42.10		
	2262	16.20		13.60		
	2269	7.80		6.80		
	228	106.90		98.50		
16			585.80		534.70	0.91
	227	33.70		28.40		
	229	68.90		57.10		
17			102.60		85.50	0.83
	225	213.40		190.20		

Table 31b

Ratio of Productive Workers to all Employees, 1958
Employment (1,000)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratio (6)/(4)
	2311	122.20		107.20		
	232	272.50		247.10		
	233	360.00		310.80		
	234	111.30		96.60		
	235	35.50		30.80		
	236	80.80		71.00		
	2371	9.40		7.90		
	238	60.00		51.90		
18			1265.10		1113.50	0.88
19	239		128.80		108.50	0.84
20	24-244		541.70		470.10	0.87
21	244		39.60		35.40	0.89
22	251		251.40		212.20	0.84
23	25-251		96.20		75.30	0.78
24	26-265		374.20		305.00	0.82
25	265		181.20		143.50	0.79
26	27		864.10		529.50	0.61
	281	238.10		157.60		
	287	38.70		27.30		
	2861	7.30		5.90		
	289	60.30		40.30		
27			344.40		231.10	0.67
28	282		121.50		86.20	0.71
	283	95.90		54.90		
	284	78.60		47.90		
29			174.50		102.80	0.59
30	285		58.80		33.20	0.56
31	29		179.20		130.50	0.73
32	30		347.80		270.50	0.78
	311	37.10		32.50		
	312	4.00		2.80		
33			41.10		35.30	0.86
34	32-311-312		308.00		274.80	0.89
	321	21.20		17.60		
	322	92.10		79.10		
	323	24.00		19.70		
35			137.30		116.40	0.85
36	32-321-322-323		416.70		329.50	0.79
	331	578.20		469.60		
	332	182.00		153.20		
	3391	36.50		29.10		
	3399	9.80		7.40		
37			806.50		659.30	0.82

Table 31c

Ratio of Productive Workers to all Employees, 1958
Employment (1,000)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratio (6)/(4)
	333	47.10		37.50		
	3341	14.40		10.80		
	335	160.30		123.20		
	336	62.20		51.30		
38			284.00		222.80	0.78
	3411	54.30		46.90		
	3491	9.60		7.70		
39			63.90		54.60	0.85
	343	71.80		54.60		
	344	340.60		250.50		
40			412.40		305.10	0.74
	345	85.10		66.10		
	3461	125.60		100.00		
41			210.70		166.10	0.79
	342	135.70		104.90		
	347	52.20		43.40		
	3481	55.50		44.10		
	349-3491	127.70		94.30		
42			371.10		286.70	0.77
43	351		95.60		65.10	0.68
44	3522		108.60		79.90	0.74
	3531	95.30		66.50		
	3532	17.80		11.70		
	3533	31.90		20.70		
45			145.00		98.90	0.68
46	353-3531-2-3		54.70		34.70	0.63
47	354		233.50		174.30	0.75
48	355		162.30		112.50	0.69
49	356		211.40		143.40	0.68
50	359		115.50		91.50	0.79
51	357		121.60		81.00	0.67
52	358		100.10		67.80	0.68
	361	134.40		90.50		
	362	156.30		107.00		
53			290.70		197.50	0.68
54	363		143.00		108.60	0.76
55	364		123.30		95.20	0.77
	365	73.90		57.90		
	366	215.10		133.70		
56			289.00		191.60	0.66
57	367		197.90		155.20	0.78
58	369		78.40		60.40	0.77
59	371		577.20		458.20	0.79
60	372		765.50		499.50	0.65

Table 31d

Ratio of Productive Workers to all Employees, 1958
Employment (1,000)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratio (6)/(4)
61	37-371-372		215.10		176.90	0.82
	3811	67.50		43.20		
	382	75.60		50.20		
	384	41.70		29.60		
	387	26.20		20.50		
62			211.00		143.50	0.68
	3831	7.20		5.10		
	3851	18.20		15.30		
	3861	60.30		38.50		
63			85.70		58.90	0.69
64	39		363.60		294.60	0.81
Total Manufac			15388.40		11639.30	0.76
Total Min. & Manu			16122.20		12204.50	0.76

Adjustments of 1958 NIPA Employee Compensation Estimates

The calculation method of employee compensation for I-O sectors is identical with the calculation method of employment estimates. We will focus on the employee compensation estimates provided by NIPA and will make three types of adjustments.

We will discuss only calculations which are different from the calculation of employment estimates. The major difference is related with the first type of adjustment. At this point we should restate that I-O mining and manufacturing numbers are based on Census data, while the total I-O employee compensation figures are equal to NIPA's because the value added of an I-O table is equal to the value added of NIPA. Therefore we should adjust Census data such that the total of adjusted Census data is equal to the total of NIPA data (see chapter III.

The first type of adjustment, during the calculation of employee compensation is slightly more complicated than during the calculation of employment because employee compensation has two parts, wages, salaries, and wage supplements, while employment has just one component, number of workers employed. The value added of an I-O table includes employee compensation. However, Census of Mining and Manufactures provide only data on wages and salaries, while NIPA provides

data on wages and salaries and also on employee compensation. Therefore, we will use NIPA to generate wage supplements for the Census data.

First, we will adjust wages and salaries of Census of mining and manufactures such that the total of Census wages and salaries is equal to the total of NIPA (see table 32). Column 5 of table 1 is the sum of column 3, wages and salaries of operating establishments, and column 4, wages and salaries of Central administrative offices, CAO.

Column 6 is NIPA wages and salaries. Column 7 represents the percentage of discrepancy between NIPA and Census wage data, which is calculated by first deducting Census data, column 5, from NIPA, column 6, then dividing the result by NIPA, and finally by multiplying this fraction by 100. When we compare the totals of Census and NIPA data we see that NIPA numbers on average are .63%, which is the last number of column 7, larger than Census data.

Then we multiply Census wages and salaries of every sector by .0063, the average difference between Census and NIPA data, and we get the adjusted Census wages and salaries, column 8. The total of adjusted Census wages, $82,595, is exactly identical with the total of NIPA numbers.

Next we will use the adjusted Census wages and NIPA data to calculate adjusted Census employee compensation estimates (see table 33). The third column of table 33 is NIPA employee compensation. The forth column is NIPA wages and salaries.

Table 32

Wages and Salaries, 1958(million dollars)

1 SIC No.	2	3 Census Operating Establish	4 Census CAO	5 Census Totals	6 NIPA	7 Percent Discrepan (6-5)/6*100	8 Adjusted Census
	Mining						
10	Metal Mining			485.60	507.00	4.22	488.82
11,12	Coal Mining			1008.50	1034.00	2.47	1015.06
13	Oil & Gas Extrac.			1700.70	1789.00	4.94	1712.06
14	Non Metalic Min.			553.50	583.00	5.06	557.20
	Total Mining			3748.30	3913.00	4.21	3773.14
	MANUFACTURING						
20	Food & Ki	7622.30	442.10	8064.40	7981.00	-1.04	8115.07
21	Tobacco M	294.60	47.10	341.70	342.00	0.09	343.87
22	Textile M	2942.90	100.20	3043.10	3116.00	2.34	3062.88
23	Apparel &	3586.60	51.20	3637.80	3659.00	0.58	3661.03
24	Lumber &	2007.50	34.80	2042.30	2178.00	6.23	2056.13
25	Furniture	1413.70	22.30	1436.00	1502.00	4.39	1445.54
26	Paper & A	2759.40	161.50	2920.90	2869.00	-1.81	2939.12
27	Printing	4489.20	44.60	4533.80	4550.00	0.36	4562.69
28	Chemicals	3940.50	664.00	4604.50	4707.00	2.18	4634.38
29	Petroleum	1116.70	539.20	1655.90	1481.00	-11.81	1665.30
30	Rubber &	1723.30	62.20	1785.50	1740.00	-2.61	1796.55
31	Leather &	1146.00	46.20	1192.20	1213.00	1.71	1199.90
32	Stone, Cl	2586.40	167.60	2754.00	2759.00	0.18	2771.52
33	Primary M	6280.50	319.80	6600.30	6785.00	2.72	6643.38
34	Fabricate	5425.30	208.90	5634.20	5700.00	1.15	5670.39
35	Machinery	7314.30	263.40	7577.70	7579.00	0.02	7625.82
36	Electrica	5755.20	568.20	6323.40	6456.00	2.05	6364.39
371	Motor Veh	3318.10	220.00	3538.10	3780.00	6.40	3562.10
19+37-371	Transpor.	7237.50	408.02	7645.52	6930.00	-10.32	7689.52
38	Instrumen	1509.50	54.50	1564.00	1778.00	12.04	1575.29
39	Misc. Man	1379.10	47.88	1426.98	1577.00	9.51	1436.99
	Total Man	73848.60	4473.70	78322.30	78682.00	0.46	78821.86
	Total Min & Manu			82070.60	82595.00	0.63	82595.00

NIPA don't provide detailed data on wages and supplements. Therefore we get NIPA wage supplements, column 5, when we deduct wages and salaries, column 4, from employee compensation, column 3. NIPA provides wage supplements data for the total mining and total manufacturing sectors. These numbers are identical with the total wage supplements of mining, $384 million, and manufacturing, $7560 million, that we calculated in table 33.

Column 6 is the adjusted wages and salaries of Census. This column is identical with column 8 of table 32. Column 7 calculates wage supplements for Census wages and salaries. First we calculate the ratios of wage supplements with respect to the wages by dividing NIPA wage supplements, column 5, with NIPA wages and salaries, column 4. Then we multiply Census wages with these ratios and we get the corresponding wage supplements of Census, column 7. Column 8, which is the sum of wages and salaries, column 6, and wage supplements, column 7, is the adjusted employee compensation of Census of mining and manufactures.

The last step for the first type of adjustment is to calculate the adjusted NIPA estimates (see table 34). Column 5 of table 34 is NIPA employee compensation. Column 6 is the adjusted Census employee compensation, which is calculated in table 33, column 8. The totals of NIPA and adjusted Census compensation are supposed to be equal and are almost equal, $90,539 million for NIPA and $90,545.06 million for Census.

Table 33
Adjusted Census Of Mining and Manufactures,1958
Employee Compensation (million dollars)

1 SIC No.	2	3 NIPA Compen	4 NIPA Wage & Sa	5 NIPA Supp	6 Adjusted Census Wage & Sa	7 Adjusted Census Supp 5/4*(6)	8 Adjusted Census Compen 6 + 7
	Mining						
10	Metal Min	558.00	507.00	51.00	488.82	49.17	537.99
11,12	Coal Mini	1222.00	1034.00	188.00	1015.06	184.56	1199.62
13	Oil & Gas	1895.00	1789.00	106.00	1712.06	101.44	1813.50
14	Non Metal	622.00	583.00	39.00	557.20	37.27	594.47
	Total Min	4297.00	3913.00	384.00	3773.14	372.44	4145.58
	MANUFACTURING						
20	Food & Ki	8701.00	7981.00	720.00	8115.07	732.10	8847.17
21	Tobacco M	385.00	342.00	43.00	343.87	43.24	387.11
22	Textile M	3318.00	3116.00	202.00	3062.88	198.56	3261.44
23	Apparel &	3918.00	3659.00	259.00	3661.03	259.14	3920.17
24	Lumber &	2297.00	2178.00	119.00	2056.13	112.34	2168.47
25	Furniture	1597.00	1502.00	95.00	1445.54	91.43	1536.97
26	Paper & A	3094.00	2869.00	225.00	2939.12	230.50	3169.62
27	Printing	4819.00	4550.00	269.00	4562.69	269.75	4832.44
28	Chemicals	5238.00	4707.00	531.00	4634.38	522.81	5157.19
29	Petroleum	1968.00	1481.00	487.00	1665.30	547.60	2212.90
30	Rubber &	1930.00	1740.00	190.00	1796.55	196.17	1992.73
31	Leather &	1294.00	1213.00	81.00	1199.90	80.13	1280.03
32	Stone, Cl	3010.00	2759.00	251.00	2771.52	252.14	3023.66
33	Primary M	7542.00	6785.00	757.00	6643.38	741.20	7384.58
34	Fabricate	6146.00	5700.00	446.00	5670.39	443.68	6114.07
35	Machinery	8246.00	7579.00	667.00	7625.82	671.12	8296.94
36	Electrica	7063.00	6456.00	607.00	6364.39	598.39	6962.78
371	Motor Veh	4535.00	3780.00	755.00	3562.10	711.48	4273.58
19+37-371	Transpor.	7440.00	6930.00	510.00	7689.52	565.90	8255.42
38	Instrumen	1990.00	1778.00	212.00	1575.29	187.83	1763.12
39	Misc. Man	1711.00	1577.00	134.00	1436.99	122.10	1559.09
	Total Man	86242.00	78682.00	7560.00	78821.86	7577.60	86399.46
Total Min & Manu		90539.00	82595.00	7944.00	82595.00	7950.04	90545.04

Table 34
Adjusted NIPA, Mining and Manufactures,1958
Employee Compensation (million dollars)

1 SIC No.	2	3	4	5 NIPA	6 Adjusted Census	7 NIPA-Cen Adjustmen 6 - 5	8 Adjusted NIPA 5 + 7
	Mining						
10	Metal Mining			558.00	537.99	-20.01	537.99
11,12	Coal Mining			1222.00	1199.62	-22.38	1199.62
13	Oil & Gas Extrac.			1895.00	1813.50	-81.50	1813.50
14	Non Metalic Min.			622.00	594.47	-27.53	594.47
	Total Mining			4297.00	4145.58	-151.42	4145.58
	MANUFACTURING						
20	Food & Kindred Prod.			8701.00	8847.17	146.17	8847.17
21	Tobacco Manufactures			385.00	387.11	2.11	387.11
22	Textile Mill Products			3318.00	3261.44	-56.56	3261.44
23	Apparel & Other Textile			3918.00	3920.17	2.17	3920.17
24	Lumber & Wood			2297.00	2168.47	-128.53	2168.47
25	Furniture & Fixtures			1597.00	1536.97	-60.03	1536.97
26	Paper & Allied Prod.			3094.00	3169.62	75.62	3169.62
27	Printing & Publishing			4819.00	4832.44	13.44	4832.44
28	Chemicals & Allied Prod.			5238.00	5157.19	-80.81	5157.19
29	Petroleum & Coal Prod.			1968.00	2212.90	244.90	2212.90
30	Rubber & Plastic			1930.00	1992.73	62.73	1992.73
31	Leather & Leather Prod.			1294.00	1280.03	-13.97	1280.03
32	Stone, Clay & glass			3010.00	3023.66	13.66	3023.66
33	Primary Metal Prod.			7542.00	7384.58	-157.42	7384.58
34	Fabricated Metal			6146.00	6114.07	-31.93	6114.07
35	Machinery, Except Electrica			8246.00	8296.94	50.94	8296.94
36	Electrical Equipment			7063.00	6962.78	-100.22	6962.78
371	Motor Vehicales			4535.00	4273.58	-261.42	4273.58
19+37-371	Transpor. & Ordo.			7440.00	8255.42	815.42	8255.42
38	Instruments			1990.00	1763.12	-226.88	1763.12
39	Misc. Manufacturing			1711.00	1559.09	-151.91	1559.09
	Total Manufacture			86242.00	86399.48	157.48	86399.48
	Total Min & Manu			90539.00	90545.06	6.06	90545.06

When we deduct NIPA employee compensation vector, column 5, from employee compensation vector of adjusted Census, column 6, we get the discrepancies between NIPA and adjusted Census of individual sectors, column 7. These discrepancies represents the NIPA adjustments of each sector. The total of these adjustments should be 0, and are almost 0, $6.06 million out of 90,545.06 million. When we add these adjustments to the NIPA employee compensation estimates we will get the adjusted NIPA vector, column 8.

Through table 32 and 33 we adjusted Census data such that its total is equal to the NIPA's total. In table 34 we are adjusting NIPA numbers such that each number of the adjusted NIPA vector, column 8, is identical to the numbers of the adjusted Census, column 6.

The I-O mining and manufacturing sectors are based on Census data. However, the total value added of the I-O is equal to the value added of NIPA. Therefore through the first type of adjustment, we adjust Census of mining and manufactures data of each sector such that their total is equal to the NIPA's (column 6 of table 34). Then we adjust NIPA numbers such that the adjusted NIPA data of each sector will be equal to the numbers of the adjusted Census, column 8 of table 34 while the total of the adjusted NIPA estimates remain equal to the unadjusted NIPA estimates.

The second and third types of adjustments of NIPA employee compensations are identical with the method of

TABLE 35

Disaggregating Adjusted NIPA Mining & Manufacturing, 1958
Payroll and Employee Compensation, (million dollars)

1 I-O No.	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggregate Census Payrol	6 ratio	7 Adjusted NIPA Compen	8 Adjusted NIPA by I-O Indus
	MINING						
	1011	169.00					
	106	26.70					
5			195.70		0.40		216.81
	1021	143.50					
	1031	54.40					
	104	23.20					
	1051	3.60					
	1081	12.10					
	109	53.10					
6			289.90		0.60		321.18
	10			485.60		537.99	
7	11 & 12			1008.50		1199.62	1199.62
8	13			1700.70		1813.50	1813.50
	1411	7.10					
	142	189.80					
	144	172.80					
	145	36.20					
	1481	3.50					
	149	23.50					
9			432.90		0.78		464.94
10	147	120.60	120.60		0.22		129.53
	14			553.50		594.47	
Total Mining						4145.58	4145.58
	MANUFACTURING						
13	19	1391.00	1391.00		0.19		1586.64
14	20					8847.74	8847.74
15	21					387.11	387.11
	2211	724.50					
	2221	276.70					
	2231	206.10					
	2241	85.90					
	2261	189.90					
	2262	74.30					
	2269	28.80					
	228	307.00					
16			1893.20		0.29		2084.06
	227	123.30					
	229	271.90					
17			395.20		0.06		435.04
	225	649.80					

TABLE 35, continue

Disaggregating Adjusted NIPA Mining & Manufacturing, 1958
Payroll and Employee Compensation, (million dollars)

1 I-O No.	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggregate Census Payrol	6 ratio	7 Adjusted NIPA Compen	8 Adjusted NIPA by I-O Indus
	2311	408.00					
	232	693.20					
	233	1154.00					
	234	321.60					
	235	123.40					
	236	231.20					
	2371	50.50					
	238	177.50					
18			3809.20		0.58		4193.23
19	239	426.30	426.30		0.07		469.28
	22 & 23			6523.90		7181.61	
20	24-244	1864.30	1864.30		0.94		2035.49
21	244	121.80	121.80		0.06		132.98
	24			1986.10		2168.47	
22	251	942.10	942.10		0.68		1042.69
23	25-251	446.60	446.60		0.32		494.28
	25			1388.70		1536.97	
24	26-265	1944.90	1944.90		0.70		2217.56
25	265	835.00	835.00		0.30		952.06
	26			2779.90		3169.62	
26	27					4832.44	4832.44
	281	1459.70					
	287	160.40					
	2861	30.10					
	289	327.00					
27			1977.20		0.50		2583.30
28	282		683.40		0.17		892.89
	283	545.70					
	284	417.50					
29			963.20		0.24		1258.46
30	285	323.40	323.40		0.08		422.54
	28			3947.20		5157.19	
31	29					2212.90	2212.90
32	30					1992.73	1992.73
	311	165.60					
	312	18.70					
33			184.30		0.16		205.91
34	32-311-312	961.40	961.40		0.84		1074.12

TABLE 35, continue

Disaggregating Adjusted NIPA Mining & Manufacturing, 1958
Payroll and Employee Compensation, (million dollars)

1 I-O No.	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggregate Census Payrol	6 ratio	7 Adjusted NIPA Compen	8 Adjusted NIPA by I-O Indus
	31			1145.70		1280.03	
	321	133.60					
	322	431.30					
	323	109.60					
35			674.50		0.26		785.92
36	32-321-322-323		1920.50		0.74		2237.74
	32			2595.00		3023.66	
	331	3570.80					
	332	886.10					
	3391	213.70					
	3399	52.70					
37			4723.30		0.75		5563.91
	333	265.90					
	3341	75.70					
	335	885.30					
	336	318.70					
38			1545.60		0.25		1820.67
	33			6268.90		7384.58	
	3411	303.90					
	3491	53.00					
39			356.90		0.07		403.17
	343	357.50					
	344	1806.90					
40			2164.40		0.40		2445.00
	345	441.00					
	3461	645.70					
41			1086.70		0.20		1227.58
	342	656.90					
	347	224.30					
	3481	261.00					
	349-3491	662.20					
42			1804.40		0.33		2038.32
	34			5412.40		6114.07	
43	351	551.80	551.80		0.08		626.83
44	3522	551.00	551.00		0.08		625.92
	3531	496.80					
	3532	97.00					
	3533	174.70					
45			768.50		0.11		873.00
46	353-3531-2-3		304.80		0.04		346.25
47	354	1379.60	1379.60		0.19		1567.19
48	355	853.60	853.60		0.12		969.67
49	356	1143.30	1143.30		0.16		1298.76

TABLE 35, continue

Disaggregating Adjusted NIPA Mining & Manufacturing, 1958 Payroll and Employee Compensation, (million dollars)

1 I-O No.	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggregate Census Payrol	6 ratio	7 Adjusted NIPA Compen	8 Adjusted NIPA by I-O Indus
50	359	574.90	574.90		0.08		653.07
51	357	667.50	667.50		0.09		758.26
52	358	508.80	508.80		0.07		577.98
	35			7303.80		8296.94	
	361	724.40					
	362	819.10					
53			1543.50		0.28		1917.03
54	363	731.60	731.60		0.13		908.65
55	364	564.20	564.20		0.10		700.74
	365	326.10					
	366	1203.90					
56			1530.00		0.27		1900.26
57	367	853.80	853.80		0.15		1060.42
58	369	383.00	383.00		0.07		475.69
	36			5606.10		6962.78	
59	371					4273.58	4273.58
60	372	4720.10	4720.10		0.65		5383.96
61	37-371-372		1126.40		0.16		1284.82
	19+37-371			7237.50		8255.42	
	3811	399.20					
	382	387.50					
	384	194.50					
	387	119.30					
62			1100.50		0.70		1229.14
	3831	37.60					
	3851	71.50					
	3861	369.00					
63			478.10		0.30		533.98
	38			1578.60		1763.12	
64	39					1559.09	1559.09
Total Manufac						86400.05	86400.05
Total Min. & Manu						90545.63	90545.63

Table 36

Aggregating NIPA Services' Employee Compensation Estimates, 1958

SIC No.	I-O No.		NIPA	I-O
70		NIPA Hotels	1479	
72		NIPA Personal Services	2700	
76		NIPA Misce. Repair Ser.	525	
	72	IO Hotels, Personal Services & Repair		4704
73		NIPA Business Services	3047	
81		NIPA Legal Services	546	
89		NIPA Misce. Prof. Services	2027	
	73	IO Business Services		5620
75	75	IO Auto Repair	855	855
78		NIPA Motion Pictures	774	
79		NIPA Amusement & Recrea. Services	1053	
	76	IO Amusements		1827
80		NIPA Health Ser.	4152	
82		NIPA Educational Ser.	1854	
83,86		NIPA Social Services	3330	
	77	NIPA IO 77 Medical, Educa.		9336

Table 37

Coughlin's Employee Compensation Estimates & Ratios,1967

1 IO No. & Name	2	3	4 Adjusted NIPA by IO Indus	5 Final IO Estimates	6 FAC 1967	7 Final IO Estimates Minus FAC	8 Ratios (7)/(4)
IO 1,2,3,4 Agriculture			4694	4710.4	0	4710.4	1.003493
IO 5 iron mining			253	228.1	-24.9	253	1
IO 6 nonferrous mining			388.6	352.2	-36.4	388.6	1
IO 7 Coal mining			1242.5	1214.7	-27.8	1242.5	1
IO 8 Crude petroleum			2086	1676.4	-409.6	2086	1
IO 9 Stone & clay mining			701.3	686.4	-14.9	701.3	1
IO 10 Chemicals & Fert. min			211.6	199.1	-12.5	211.6	1
IO 11,12 Construction			27106	36113.2	9662.8	26450.4	0.975813
IO 13 Ordonance			4084.8	4079.4	-5.4	4084.8	1
IO 14 Food & Kindred Prod.			12339.3	13132.8	-53.5	13186.3	1.068642
IO 15 Tobacco Manu.			577.9	641.7	-1.7	643.4	1.113341
IO 16 Broad & narrow fabric			3233.6	3398.4	-11.1	3409.5	1.054397
IO 17 Miscellaneous Textile			748.8	777.3	-2.5	779.8	1.041399
IO 18 Apparel			6660.8	6782	-5.6	6787.6	1.019036
IO 19 Misc. fabricated text			894.7	899	-1	900	1.005923
IO 20 Lumber & wood			3075.8	3074.1	-21.9	3096	1.006567
IO 21 Wooden containers			152.7	152.4	-0.3	152.7	1
IO 22 Household Furniture			1667.9	1667.7	-3.8	1671.5	1.002158
IO 23 Other Furniture			919.7	922.3	-2.8	925.1	1.005871
IO 24 Paper & allied Prod.			3835.1	3862.8	-30.2	3893	1.015097
IO 25 Paperboard Containers			1601.6	1625.9	-5.7	1631.6	1.018731
IO 26 Printing & pub.			8135.1	8202.3	-17.7	8220	1.010436
IO 27 Chemicals & chem Prod			4168.3	4197	-35.2	4232.2	1.015329
IO 28 Plastics & synthetic			2036.5	2063.1	-19	2082.1	1.022391
IO 29 Drugs, Cleaning prod.			2322.5	2420.1	-11.2	2431.3	1.046846
IO 30 Paints & allied Prod.			600.4	622.4	-2.6	625	1.040972
IO 31 Petroleum Refining			2624.3	2591.4	-52.7	2644.1	1.007544
IO 32 Rubber & Misce.			3967.1	3990.9	-11.4	4002.3	1.008872
IO 33 Leather tanning			231.5	232.6	-0.5	233.1	1.006911
IO 34 Footwear & leather Pr			1473.5	1474.7	-1.3	1476	1.001696
IO 35 Glass & glass Prod.			1382	1409.5	-5.7	1415.2	1.024023
IO 36 Stone & Clay Prod.			3325	3366.8	-18.3	3385.1	1.018075
IO 37 Primary Iron & steel			8978.1	9120	-43.9	9163.9	1.020694
IO 38 Primary Nonfer. metal			3301.2	3437.8	-22	3459.8	1.048043
IO 39 Metal containers			774	772.2	-1.8	774	1
IO 40 Heating, Plumbing pro			3701.6	3468.5	-10.5	3479	0.939863
IO 41 Screw Machine Prod.			2974.3	2969.5	-7.5	2977	1.000907
IO 42 Other Fabri. metal pr			3633.1	3635.1	-8.5	3643.6	1.002890
IO 43 Engines& Turbines			984.2	1004.1	-3	1007.1	1.023267
IO 44 Farm Machinery			1270.5	1276.3	-3	1279.3	1.006926
IO 45 Const. mining Machine			1703.8	1701.4	-5	1706.4	1.001526
IO 46 Materials Handling Ma			779.4	779.6	-1.5	781.1	1.002181
IO 47 Metalworking machiner			3254	3273.4	-6.2	3279.6	1.007867
IO 48 Special Ind. Machiner			1847.6	1878.8	-4.4	1883.2	1.019268
IO 49 General Ind. Machin.			2529.6	2530.6	-6.4	2537	1.002925
IO 50 Machine shop Prod.			1615.2	1623.5	-2.5	1626	1.006686
IO 51 Office, computing Mac			1899.9	1951.8	-3.5	1955.3	1.029159
IO 52 Service Ind. Machines			1126.9	1138.8	-3.2	1142	1.013399

IO 53 Electric transmission	3426.8	3483.7	-8.1	3491.8	1.018968
IO 54 Household Appliances	1355.3	1351.7	-3.6	1355.3	1
IO 55 Electric Lighting equ	1164.9	1182.6	-2.6	1185.2	1.017426
IO 56 Radio, TV, commu. equ	6153.4	6186.7	-10.5	6197.2	1.007118
IO 57 Electronic components	3104.6	3131.1	-6.8	3137.9	1.010726
IO 58 Misc. Electrical Mach	878.2	883.9	-2.2	886.1	1.008995
IO 59, Motor Vehicles	8220.6	8463.9	-15.7	8479.6	1.031506
IO 60 Aircraft & Parts	8501	8489.9	-17.3	8507.2	1.000729
IO 61 Other transportation	2382.1	2469.2	-7.2	2476.4	1.039586
IO 62 Prof., Scient. Instru	1976.4	1953.2	-4	1957.2	0.990285
IO 63 Optical, Photo equipm	1404.4	1411.8	-5.6	1417.4	1.009256
IO 64 Misc. Manufac.	2632.3	2711.4	-5	2716.4	1.031949
IO 65 Transportaion	21847	20961	-860.2	21821.2	0.998819
IO 66 Communications	6966	6820.3	-488.4	7308.7	1.049196
IO 67 Radio & TV Broad.	1061	1060.2	-0.8	1061	1
IO 68 Elec. Gas & Water	5908	4900.4	-1007.6	5908	1
IO 69,74 Trade	75216	70286.1	-49.6	70335.7	0.935116
IO 70 Finance & Ins.	19399	19379.3	-19.7	19399	1
IO 71 Real estate	3400	1715.2	-1584	3299.2	0.970352
IO 72 Hotels Personal Ser.	8557	6926.9	-34.6	6961.5	0.813544
IO 73 Business Services	14390	16098.3	-15.3	16113.6	1.119777
IO 75 Auto Repair	1821	3804.4	-11.8	3816.2	2.095661
IO 76 Amusements	3318	3053.4	-30.7	3084.1	0.929505
IO 77 Medical, Educa.	22709	23292.6	-53.1	23345.7	1.028037
IO 78 Fed. Enterprises	5881	5779.1	-101.9	5881	1
IO 79 State Enterprises	3227	2048.8	-1178.2	3227	1
IO 82 Govern. Industry	85142	81983.8	-3158.2	85142	1
IO 83 Rest Of World	57	57	0	57	1
IO 84 Household Endustry	4701	4701	0	4701	1
TOTALS	471915.3	471915.4	0.00	471915.4	78.76574

Table 38

IO EMPLOYEE COMPENSATION ESTIMATES, 1958

1 SIC No	2 I-O	3	4 NIPA	5 NIPA-Cens Adjust	6 Adjust NIPA by I-O Indus	7 Coughlin Ratios	8 Final IO Data
1 TO 9	1,2,3,4		3134.00	0.00	3134.00	1.003493	3144.95
10			558.00	-20.01			
	5				216.81	1.000000	216.81
	6				321.18	1.000000	321.18
11,12	7		1222.00	-22.38	1199.62	1.000000	1199.62
13	8		1895.00	-81.50	1813.50	1.000000	1217.22
14			622.00	-27.53			
	9				464.94	1.000000	464.94
	10				129.53	1.000000	129.53
15 TO 17	11,12		14916.00	0.00	14916.00	0.975813	15151.51
19	13				1586.64	1.000000	1586.64
20	14		8701.00	146.17	8847.74	1.068642	9455.07
21	15		385.00	2.11	387.11	1.113341	430.99
22,23			7236.00	-54.39			
	16				2084.06	1.054397	2197.43
	17				435.04	1.041399	453.05
	18				4193.23	1.019036	4273.05
	19				469.28	1.005923	472.06
24			2297.00	-128.53			
	20				2035.49	1.006567	2048.86
	21				132.98	1.000000	132.98
25			1597.00	-60.03			
	22				1042.69	1.002158	1044.94
	23				494.28	1.005871	497.18
26			3094.00	75.62			
	24				2217.56	1.015097	2251.04
	25				952.06	1.018731	969.89
27	26		4819.00	13.44	4832.44	1.010436	4882.87
28			5238.00	-80.81			
	27				2583.30	1.015329	2622.90
	28				892.89	1.022391	912.88
	29				1258.46	1.046846	1317.41
	30				422.54	1.040972	439.85
29	31		1968.00	244.90	2212.90	1.007544	2229.59
30	32		1930.00	62.73	1992.73	1.008872	2010.41
31			1294.00	-13.97			
	33				205.91	1.006911	207.33
	34				1074.12	1.001696	1075.94
32			3010.00	13.66			
	35				785.92	1.024023	804.80
	36				2237.74	1.018075	2278.19
33			7542.00	-157.42			
	37				5563.91	1.020694	5679.05
	38				1820.67	1.048043	1908.14
34			6146.00	-31.93			
	39				403.17	1.000000	403.17
	40				2445.00	0.939863	2297.97
	41				1227.58	1.000907	1228.69
	42				2038.32	1.002890	2044.21

35		8246.00	50.94			
	43			626.83	1.023267	641.41
	44			625.92	1.006926	630.26
	45			873.00	1.001526	874.33
	46			346.25	1.002181	347.01
	47			1567.19	1.007867	1579.52
	48			969.67	1.019268	988.35
	49			1298.76	1.002925	1302.56
	50			653.07	1.006686	657.44
	51			758.26	1.029159	780.37
	52			577.98	1.013399	585.72
36		7063.00	-100.22			
	53			1917.03	1.018968	1953.39
	54			908.65	1.000000	908.65
	55			700.74	1.017426	712.95
	56			1900.26	1.007118	1913.79
	57			1060.42	1.010726	1071.79
	58			475.69	1.008995	479.97
371	59	4535.00	-261.42	4273.58	1.031506	4408.22
19+37-371		7440.00	815.42			
	60			5383.96	1.000729	5387.88
	61			1284.82	1.039586	1335.68
38		1990.00	-226.88			
	62			1229.14	0.990285	1217.20
	63			533.98	1.009256	538.92
39	64	1711.00	-151.91	1559.09	1.031949	1608.90
40 TO 47	65	14469.00	0.00	14469.00	0.998819	14451.91
481,7,9	66	3867.00	0.00	3867.00	1.049196	4057.24
483	67	586.00	0.00	586.00	1.000000	586.00
49	68	3745.00	0.00	3745.00	1.000000	3745.00
50 TO 59	69	41955.00	0.00	41955.00	0.935116	39232.79
60 TO 64, 67	70	9801.00	0.00	9801.00	1.000000	9801.00
65,66	71	2052.00	0.00	2052.00	0.970352	1991.16
70,72,76	72	4704.00	0.00	4704.00	0.813544	3826.91
73,81,89	73	5620.00	0.00	5620.00	1.119777	6293.15
75	75	855.00	0.00	855.00	2.095661	1791.79
78,79	76	1827.00	0.00	1827.00	0.929505	1698.21
80,82,86	77	9336.00	0.00	9336.00	1.028037	9597.75
Fed Enter	78	3250.00	0.00	3250.00	1.000000	3250.00
Sta Enter	79	1520.00	0.00	1520.00	1.000000	1520.00
Gov Indus	82	42115.00	0.00	42115.00	1.00	42115.00
R O World	83	22.00	0.00	22.00	1.00	22.00
House Ind	84	3503.00	0.00	3503.00	1.00	3503.00
TOTAL		257816.00	6.06	257822.63	78.77	257409.58

Table 39

Ratios of Productive Workers to All Employees' Wages, 1958
Payroll and Wages (million dollars)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratio (6)/(4)
	MINING					
	1011	169.00		116.30		
	106	26.70		19.50		
5			195.70		135.80	0.69
	1021	143.50		106.40		
	1031	54.40		39.00		
	104	23.20		19.80		
	1051	3.60		2.30		
	1081	12.10		10.60		
	109	53.10		40.80		
6			289.90		218.90	0.76
	10					
7	11 & 12		1008.50		841.50	0.83
8	13		1700.70		1011.20	0.59
	1411	7.10		6.10		
	142	189.80		148.40		
	144	172.80		134.80		
	145	36.20		26.90		
	1481	3.50		3.00		
	149	23.50		17.50		
9			432.90		336.70	0.78
10	147		120.60		78.30	0.65
	14					
Total Mining			3748.30		2622.40	0.70
	MANUFACTURING					
13	19		1391.00		672.70	0.48
14	20		7553.30		4502.10	0.60
15	21		294.70		247.80	0.84
	2211	724.50		646.70		
	2221	276.70		234.00		
	2231	206.10		166.20		
	2241	85.90		65.20		
	2261	189.90		149.20		
	2262	74.30		57.60		
	2269	28.80		22.50		
	228	307.00		258.40		
16			1893.20		1599.80	0.85
	227	123.30		92.10		
	229	271.90		196.40		
17			395.20		288.50	0.73
	225	649.80		520.10		

Table 39, continue

Ratios of Productive Workers to All Employees' Wages, 1958

1	2	3	4	5	6	7
		Payroll and Wages (million dollars)				
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratio (6)/(4)
	2311	408.00		321.50		
	232	693.20		568.90		
	233	1154.00		875.40		
	234	321.60		237.40		
	235	123.40		96.40		
	236	231.20		178.60		
	2371	50.50		41.70		
	238	177.50		133.20		
18			3809.20		2973.20	0.78
19	239		426.30		317.50	0.74
20	24-244		1864.30		1525.90	0.82
21	244		121.80		99.10	0.81
22	251		942.10		706.90	0.75
23	25-251		446.60		314.90	0.71
24	26-265		1944.90		1446.10	0.74
25	265		835.00		592.90	0.71
26	27		4479.70		2590.90	0.58
	281	1459.70		892.40		
	287	160.40		99.50		
	2861	30.10		21.80		
	289	327.00		188.50		
27			1977.20		1202.20	0.61
28	282		683.40		429.80	0.63
	283	545.70		250.70		
	284	417.50		208.50		
29			963.20		459.20	0.48
30	285		323.00		153.10	0.47
	28			3946.80		
31	29		1116.70		758.40	0.68
32	30		1723.30		1211.40	0.70
	311	165.60		133.20		
	312	18.70		11.50		
33			184.30		144.70	0.79
34	32-311-312		961.40		767.30	0.80
	31			1145.70		
	321	133.60		110.70		
	322	431.30		350.20		
	323	109.60		83.10		
35			674.50		544.00	0.81
36	32-321-322-323		1920.50		1390.00	0.72
	331	3570.80		2694.50		
	332	886.10		682.90		
	3391	213.70		158.30		
	3399	52.70		35.10		
37			4723.30		3570.80	0.76
	333	265.90		200.60		

Table 39, continue

Ratios of Productive Workers to All Employees' Wages, 1958

Payroll and Wages (million dollars)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratio (6)/(4)
	3341	75.70		46.90		
	335	885.30		632.40		
	336	318.70		238.30		
38			1545.60		1118.20	0.72
	3411	303.90		249.50		
	3491	53.00		38.10		
39			356.90		287.60	0.81
	343	357.50		243.50		
	344	1806.90		1181.90		
40			2164.40		1425.40	0.66
	345	441.00		305.90		
	3461	645.70		458.60		
41			1086.70		764.50	0.70
	342	656.90		454.50		
	347	224.30		167.70		
	3481	261.00		184.40		
	349-3491	662.20		440.00		
42			1804.40		1246.60	0.69
43	351		551.80		356.30	0.65
44	3522		551.00		373.20	0.68
	3531	496.80		310.30		
	3532	97.00		56.40		
	3533	174.70		101.90		
45			768.50		468.60	0.61
46	353-3531-2-3		304.80		169.60	0.56
47	354		1379.60		943.70	0.68
48	355		853.60		525.30	0.62
49	356		1143.30		691.30	0.60
50	359		574.90		420.40	0.73
51	357		667.50		398.70	0.60
52	358		508.80		299.60	0.59
	361	724.40		426.20		
	362	819.10		496.20		
53			1543.50		922.40	0.60
54	363		731.60		499.90	0.68
55	364		564.20		382.90	0.68
	365	326.10		220.30		
	366	1203.90		652.30		
56			1530.00		872.60	0.57
57	367		853.80		570.70	0.67
58	369		383.00		261.20	0.68
59	371		3318.10		2478.30	0.75
60	372		4720.10		2675.80	0.57
61	37-371-372		1126.40		865.90	0.77
	3811	399.20		222.50		
	382	387.50		226.00		
	384	194.50		114.20		

Table 39, continue

Ratios of Productive Workers to All Employees' Wages, 1958

Payroll and Wages (million dollars)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratio (6)/(4)
	387	119.30		80.20		
62			1100.50		642.90	0.58
	3831	37.60		23.50		
	3851	71.50		53.50		
	3861	369.00		201.60		
63			478.10		278.60	0.58
	38			1578.60		
64	39		1456.30		1029.70	0.71
Total Manufac			73715.50		49479.10	0.67
Total Min. & Manu			77463.80		52101.50	0.67

adjustments of NIPA employment and the methods of tables 35, 36, 37, and 38 are identical with those of tables 27, 28, 29, and 30 of employment.

Column 8 of table 38 provides the final I-O employee compensation data of all employees for 1958. In order to calculate the employee compensation of productive workers (See table 39), we will use the same method that we used during the calculation of employment of productive workers (See table 39).

First, using Census of Mining and Manufactures data we should calculate the ratios of production workers' wages over all employees' wages of each mining and manufactures sectors. (see table 39). Column 7 of table 39 provides these ratios.

For the calculation of productive worker's complete wage vector, we need ratios for agriculture, construction, services, and other sectors. However, we don't have data on productive worker's earnings in those sectors. Therefore in order to calculate the wages of productive workers in agriculture, construction, and services we are using the ratios of the number of productive workers over all employees provided by the "Employment and Training Report of the President," 1981, table C.

The calculations of the employment and employee compensation vectors of 1963 I-O table are exactly similar to the method that we discribed above. Tables 40 to 45 present the estimation of 1963 employment vector. The description of

these tables are identical to the description of tables 25, 26, 27, 28, 30, and 31 respectively. Therefore we will present them without any description. Tables 46 to 52 present the estimation of 1963 employee compensation vector. The descriptions of these tables are identical to the description of tables 32, 33, 34, 35, 36, 38, and 39 respectively.

Table 40

Employment(1000 of employees)
Censuses of Mineral Industries and Manufactures,1963

1 SIC No.	2 Sectors' Names	3 4 5 Operating Establish	6 CAO	7 Census Totals 5 + 6
	Mining			
10	Metal Mining			77.80
11,12	Coal Mining			145.70
13	Oil & Gas Extrac.			271.50
14	Non Metalic Min.			121.50
	Total Mining			616.50
	MANUFACTURING			
20	Food & Kindered Prod.	1643.10	71.50	1714.60
21	Tobacco Manufactures	77.30	6.50	83.80
22	Textile Mill Products	863.20	19.90	883.10
23	Apparel & Other Textil	1279.50	11.00	1290.50
24	Lumber & Wood	563.10	5.60	568.70
25	Furniture & Fixtures	376.50	4.70	381.20
26	Paper & Allied Prod.	588.00	25.80	613.80
27	Printing & Publishing	913.20	11.80	925.00
28	Chemicals & Allied Pro	737.40	115.70	853.10
29	Petroleum & Coal Prod.	153.50	66.40	219.90
30	Rubber & Plastic	415.00	11.80	426.80
31	Leather & Leather Prod	327.50	7.60	335.10
32	Stone, Clay & glass	573.90	28.90	602.80
33	Primary Metal Prod.	1126.50	40.40	1166.90
34	Fabricated Metal	1082.10	28.50	1110.60
35	Machinery, Except Elec	1459.40	61.20	1520.60
36	Electrical Equipment	1511.80	100.40	1612.20
371	Motor Vehicales	693.80	38.40	732.20
19+37-371	Transpor. & Ordo.	1153.30	52.47	1205.77
38	Instruments	305.50	11.00	316.50
39	Misc. Manufacturing	393.40	6.93	400.33
	Total Manufacture	16237.00	726.50	16963.50
	Total Min & Manu			17580.00

Table 41

Adjusting NIPA Mining and Manufactures Estimates, 1963
(1,000 of Employees)

1 SIC No.	2 NIPA	3 Census Total	4 Percent Discre (2-3)/2	5 Adjust Census	6 NIPA-Cen Adjust 5-2	7 Adjusted NIPA 2+6
Mining						
10	81.00	77.90	3.83	78.12	-2.88	78.12
11,12	148.00	145.70	1.55	146.11	-1.89	146.11
13	289.00	271.50	6.06	272.30	-16.70	272.30
14	116.00	121.50	-4.74	121.82	5.82	121.82
Total M	634.00	616.60	2.74	618.36	-15.64	618.36
MANUFACTURING						
20	1744.00	1714.60	1.69	1719.44	-24.56	1719.44
21	89.00	83.80	5.84	84.05	-4.95	84.05
22	895.00	883.10	1.33	885.58	-9.42	885.58
23	1274.00	1290.50	-1.30	1294.03	20.03	1294.03
24	588.00	568.70	3.28	570.33	-17.67	570.33
25	389.00	381.20	2.01	382.28	-6.72	382.28
26	622.00	613.80	1.32	615.53	-6.47	615.53
27	930.00	925.00	0.54	927.58	-2.42	927.58
28	865.00	853.10	1.38	855.50	-9.50	855.50
29	192.00	219.90	-14.53	220.43	28.43	220.43
30	417.00	426.80	-2.35	427.96	10.96	427.96
31	347.00	335.10	3.43	336.06	-10.94	336.06
32	600.00	602.80	-0.47	604.46	4.46	604.46
33	1176.00	1166.90	0.77	1170.16	-5.84	1170.16
34	1146.00	1110.60	3.09	1113.78	-32.22	1113.78
35	1533.00	1520.60	0.81	1524.85	-8.15	1524.85
36	1558.00	1612.20	-3.48	1616.52	58.52	1616.52
371	744.00	732.20	1.59	734.26	-9.74	734.26
19+37-371	1133.00	1205.77	-6.42	1208.91	75.91	1208.91
38	362.00	316.50	12.57	317.50	-44.50	317.50
39	391.00	400.33	-2.39	401.41	10.41	401.41
Tot Man	16995.00	16963.50	0.19	17010.64	15.64	17010.64
Min, Man	17629.00	17580.10	0.28	17629.00	0.00	17629.00

TABLE 42

Disaggregating Adjusted NIPA Mining & Manufactures Employment Estimates, 1963

1 I-O No	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggre Census	6 ratio	7 Adjust NIPA	8 Adjusted NIPA by I-O Indus
	MINING						
	1011	23.10					
	106	3.10					
5			26.20		0.34		26.3
	1021	26.50					
	1031	9.40					
	104	4.20					
	1051	0.60					
	1081	2.20					
	109	8.70					
6			51.60		0.66		51.8
	10			77.80		78.1	
7	11 & 12			145.70		146.1	146.1
8	13			271.50		272.3	272.3
	1411	2.20					
	142	43.20					
	144	40.10					
	145	8.30					
	1481	0.90					
	149	5.50					
9			100.20		0.83		100.7
10	147	21.00	21.00		0.17		21.1
	14			121.20		121.8	
Total Mining						618.4	618.4
	MANUFACTURING						
13	19	248.20	248.20		0.21		259.6
14	20					1719.4	1719.4
15	21					84.1	84.1
	2211	209.00					
	2221	88.20					
	2231	47.40					
	2241	23.20					
	2261	42.10					
	2262	19.50					
	2269	9.20					
	228	102.70					
16			541.30		0.25		550.5
	227	35.70					
	229	65.90					
17			101.60		0.05		103.3

TABLE 42, continue

Disaggregating Adjusted NIPA Mining & Manufactures Employment Estimates, 1963

1 I-O No	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggre Census	6 ratio	7 Adjust NIPA	8 Adjusted NIPA by I-O Indus
	225	220.50					
	2311	122.70					
	232	305.60					
	233	405.50					
	234	113.90					
	235	30.80					
	236	81.90					
	2371	9.30					
	238	61.50					
18			1351.70		0.63		1374.8
19	239	148.40	148.40		0.07		150.9
	22 & 23			2143.00		2179.6	
20	24-244	532.10	532.10		0.94		538.9
21	244	31.00	31.00		0.06		31.4
	24			563.10		570.3	
22	251	270.30	270.30		0.72		274.4
23	25-251	106.30	106.30		0.28		107.9
	25			376.60		382.3	
24	26-265	386.90	386.90		0.66		405.0
25	265	201.10	201.10		0.34		210.5
	26			588.00		615.5	
26	27					927.6	927.6
	281	236.70					
	287	42.80					
	2861	6.80					
	289	60.60					
27			346.90		0.47		402.4
28	282		144.70		0.20		167.9
	283	99.00					
	284	85.60					
29			184.60		0.25		214.1
30	285	61.30	61.30		0.08		71.1
	28			737.50		855.5	
31	29					220.4	220.4
32	30					428.0	428.0
	311	31.40					
	312	2.90					

TABLE 42, continue

Disaggregating Adjusted NIPA Mining & Manufactures Employment Estimates, 1963

1 I-O No	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggre Census	6 ratio	7 Adjust NIPA	8 Adjusted NIPA by I-O Indus
33			34.30		0.10		35.2
34	32-311-312	293.20	293.20		0.90		300.9
	31			327.50		336.1	
	321	22.80					
	322	98.00					
	323	26.20					
35			147.00		0.26		154.8
36	32-321-322-323		426.90		0.74		449.6
	32			573.90		604.5	
	331	568.90					
	332	199.60					
	3391	36.30					
	3399	15.00					
37			819.80		0.73		856.3
	333	48.80					
	3341	15.50					
	335	167.00					
	336	69.20					
38			300.50		0.27		313.9
	33			1120.30		1170.2	
	3411	53.30					
	3491	10.50					
39			63.80		0.06		65.7
	343	68.20					
	344	325.50					
40			393.70		0.36		405.2
	345	94.50					
	3461	132.20					
41			226.70		0.21		233.3
	342	136.60					
	347	65.60					
	3481	55.50					
	349-3491	140.30					
42			398.00		0.37		409.6
	34			1082.20		1113.8	
43	351	86.60	86.60		0.06		90.5
44	3522	112.60	112.60		0.08		117.7
	3531	104.50					
	3532	16.90					
	3533	29.20					
45			150.60		0.10		157.4
46	353-3531-2-3		60.40		0.04		63.1

TABLE 42, continue

Disaggregating Adjusted NIPA Mining & Manufactures Employment Estimates, 1963

1 I-O No	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggre Census	6 ratio	7 Adjust NIPA	8 Adjusted NIPA by I-O Indus
47	354	259.00	259.00		0.18		270.6
48	355	171.50	171.50		0.12		179.2
49	356	233.10	233.10		0.16		243.6
50	359	135.80	135.80		0.09		141.9
51	357	137.10	137.10		0.09		143.3
52	358	112.60	112.60		0.08		117.7
	35			1459.30		1524.9	
	361	132.10					
	362	161.00					
53			293.10		0.19		313.4
54	363	145.90	145.90		0.10		156.0
55	364	133.00	133.00		0.09		142.2
	365	90.80					
	366	476.90					
56			567.70		0.38		607.0
57	367	288.50	288.50		0.19		308.5
58	369	83.70	83.70		0.06		89.5
	36			1511.90		1616.5	
59	371					734.3	734.3
60	372	679.40	679.40		0.59		710.7
61	37-371-372		228.00		0.20		238.5
	19+37-371			1155.60		1208.9	
	3811	33.10					
	382	94.00					
	384	51.40					
	387	29.80					
62			208.30		0.68		216.6
	3831	11.90					
	3851	20.30					
	3861	64.90					
63			97.10		0.32		100.9
	38			305.40		317.5	
64	39					401.4	401.4
Total Manufac						17010.6	17010.6
Total Min. & Manu						17629.0	17629.0

Table 43

Aggregating NIPA Services Estimates,1963

SIC No.	I-O No.		NIPA	I-O
70		NIPA Hotels	594	
72		NIPA Personal Services	930	
76		NIPA Misce. Repair Ser.	147	
	72	IO Hotels, Personal Services		1671
73		NIPA Business Services	943	
81		NIPA Legal Services	169	
89		NIPA Misce. Prof. Services	432	
	73	IO Business Services		1544
75	75	IO Auto Repair	299	299
78		NIPA Motion Pictures	175	
79		NIPA Amusement & Recrea. Se	380	
	76	IO Amusements		555
80		NIPA Health Ser.	1863	
82		NIPA Educational Ser.	848	
83,86		NIPA Social Services	1173	
	77	NIPA IO 77 Medical, Educa.		3884

Table 44

IO EMPLOYMENT DATA 1963

1 SIC No	2 I-O	3 NIPA	4 NIPA-Ce Adjust	5 Adjust NIPA by	6 Coughlin Ratios	7 Final IO Data
1 TO 9	1,2,3,4	1925.00	0.00	1925.00	1.003232	1931.22
10		81.00	-2.88			
	5			26.31	1.000000	26.31
	6			51.81	1.000000	51.81
11,12	7	148.00	-1.89	146.11	1.000000	146.11
13	8	289.00	-16.70	272.30	1.000000	159.90
14		116.00	5.82			
	9			100.71	1.000000	100.71
	10			21.11	0.995850	21.02
15 TO 17	11,12	2958.00	0.00	2958.00	0.967464	2974.16
19	13			259.65	1.000000	259.65
20	14	1744.00	-24.56	1719.44	1.061178	1824.63
21	15	89.00	-4.95	84.05	1.134363	95.34
22,23		2169.00	10.61			
	16			550.55	1.040567	572.88
	17			103.34	1.025619	105.99
	18			1374.79	1.013852	1393.83
	19			150.94	1.002847	151.37
24		588.00	-17.67			
	20			538.93	1.004102	541.14
	21			31.40	0.996865	31.30
25		389.00	-6.72			
	22			274.38	1.000984	274.65
	23			107.90	1.003834	108.31
26		622.00	-6.47			
	24			405.01	1.011436	409.64
	25			210.52	1.012511	213.15
27	26	930.00	-2.42	927.58	1.007517	934.55
28		865.00	-9.50			
	27			402.40	1.012409	407.39
	28			167.85	1.020474	171.29
	29			214.14	1.037354	222.14
	30			71.11	1.033898	73.52
29	31	192.00	28.43	220.43	1.005159	221.57
30	32	417.00	10.96	427.96	1.006144	430.59
31		347.00	-10.94			
	33			35.20	1.005899	35.41
	34			300.86	1.000652	301.06
32		600.00	4.46			
	35			154.83	1.016825	157.44
	36			449.64	1.011793	454.94
33		1176.00	-5.84			
	37			856.29	1.017115	870.95
	38			313.87	1.040663	326.63
34		1146.00	-32.22			
	39			65.66	1.000000	65.66

Table 44, continue

IO EMPLOYMENT DATA 1963

1 SIC No	2 I-O	3 NIPA	4 NIPA-Ce Adjust	5 Adjust NIPA by	6 Coughlin Ratios	7 Final IO Data
	40			405.19	0.947156	383.78
	41			233.32	1.000859	233.52
	42			409.61	1.002047	410.45
35		1533.00	-8.15			
	43			90.49	1.021194	92.41
	44			117.66	1.004614	118.20
	45			157.36	1.001519	157.60
	46			63.11	1.000000	63.11
	47			270.63	1.006984	272.52
	48			179.20	1.015806	182.03
	49			243.57	1.001036	243.82
	50			141.90	1.006332	142.80
	51			143.26	1.024159	146.72
	52			117.66	1.008959	118.71
36		1558.00	58.52			
	53			313.38	1.014017	317.77
	54			156.00	1.000000	156.00
	55			142.20	1.010234	143.66
	56			606.98	1.005965	610.60
	57			308.46	1.006863	310.58
	58			89.49	1.006161	90.04
371	59	744.00	-9.74	734.26	1.029273	755.75
19+37-371		1133.00	75.91			
	60			710.74	1.000722	711.25
	61			238.52	1.035227	246.92
38		362.00	-44.50			
	62			216.55	0.990839	214.57
	63			100.95	1.006565	101.61
39	64	391.00	10.41	401.41	1.021884	410.19
40 TO 47	65	2470.00	0.00	2470.00	0.998797	2467.03
481,7,9	66	730.00	0.00	730.00	1.031132	752.73
483	67	97.00	0.00	97.00	1.000000	97.00
49	68	614.00	0.00	614.00	1.000000	614.00
50 TO 59	69	11853.00	0.00	11853.00	0.957617	11350.63
60 TO 64, 67	70	2274.00	0.00	2274.00	1.000000	2274.00
65,66	71	606.00	0.00	606.00	0.982706	595.52
70,72,76	72	1671.00	0.00	1671.00	0.845015	1412.02
73,81,89	73	1544.00	0.00	1544.00	1.142009	1763.26
75	75	299.00	0.00	299.00	2.086167	623.76
78,79	76	555.00	0.00	555.00	0.912399	506.38
80,82,86	77	3884.00	0.00	3884.00	1.012148	3931.18
Fed Enter	78	736.00	0.00	736.00	1.000000	736.00
Sta Enter	79	398.00	0.00	398.00	1.000000	398.00
Gov Indus	82	11273.00	0.00	11273.00	1.00	11273.00
R O World	83	4.00	0.00	4.00	1.00	4.00
House Ind	84	2656.00	0.00	2656.00	1.00	2656.00
TOTAL		64176.00	-0.03	64175.97	78.63	64155.42

TABLE 45

Ratios of Productive Workers to All Employees, 1963
Employment (1,000)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratios (6)/(4)
	MINING					
	1011	23.1		18.1		
	106	3.1		2.6		
5			26.2		20.7	0.79
	1021	26.5		21.4		
	1031	9.4		7.8		
	104	4.2		3.6		
	1051	0.6		0.4		
	1081	2.2		1.9		
	109	8.7		6.4		
6			51.6		41.5	0.80
7	11 & 12		145.7		128.9	0.88
8	13		271.5		191.9	0.71
	1411	2.2		2.0		
	142	43.2		36.2		
	144	40.1		33.0		
	145	8.3		7.1		
	1481	0.9		0.8		
	149	5.5		4.6		
9			100.2		83.7	0.84
10	147		21.0		14.6	0.70
Total Mining			616.2		481.3	0.78
	MANUFACTURING					
13	19		248.2		122.9	0.50
14	20		1643.1		1098.1	0.67
15	21		77.3		68.6	0.89
	2211	209.0		195.5		
	2221	88.2		79.7		
	2231	47.4		41.6		
	2241	23.2		20.6		
	2261	42.1		35.5		
	2262	19.5		16.2		
	2269	9.2		7.9		
	228	102.7		94.8		
16			541.3		491.8	0.91
	227	35.7		30.4		
	229	65.9		54.9		
17			101.6		85.3	0.84
	225	220.5		198.0		
	2311	122.7		109.1		

TABLE 45, continue

Ratios of Productive Workers to All Employees, 1963

Employment (1,000)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratios (6)/(4)
	232	305.6		280.0		
	233	405.5		356.1		
	234	113.9		99.8		
	235	30.8		26.8		
	236	81.9		72.7		
	2371	9.3		7.7		
	238	61.5		54.0		
18			1351.7		1204.2	0.89
19	239		148.4		126.7	0.85
20	24-244		532.1		469.4	0.88
21	244		31.0		28.0	0.90
22	251		270.3		231.6	0.86
23	25-251		106.3		83.2	0.78
24	26-265		386.9		308.7	0.80
25	265		201.1		159.1	0.79
26	27		913.2		559.8	0.61
	281	236.7		155.7		
	287	42.8		29.5		
	2861	6.8		5.4		
	289	60.6		29.9		
27			346.9		220.5	0.64
28	282		144.7		101.7	0.70
	283	99.0		54.9		
	284	85.6		53.3		
29			184.6		108.2	0.59
30	285		61.3		33.8	0.55
31	29		153.5		109.5	0.71
32	30		415.0		328.8	0.79
	311	31.4		27.3		
	312	2.9		2.1		
33			34.3		29.4	0.86
34	32-311-312		293.2		263.0	0.90
	321	22.8		19.4		
	322	98.0		86.5		
	323	26.2		21.7		
35			147.0		127.6	0.87
36	32-321-322-323		426.9		328.2	0.77
	331	568.9		466.3		
	332	199.6		170.7		
	3391	36.3		29.2		
	3399	15.0		11.5		

TABLE 45, continue

Ratios of Producive Workers to All Employees, 1963

Employment (1,000)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratios (6)/(4)
37			819.8		677.7	0.83
	333	48.8		39.7		
	3341	15.5		11.3		
	335	167.0		130.4		
	336	69.2		58.4		
38			300.5		239.8	0.80
	3411	53.3		46.1		
	3491	10.5		8.5		
39			63.8		54.6	0.86
	343	68.2		51.4		
	344	325.5		242.4		
40			393.7		293.8	0.75
	345	94.5		74.8		
	3461	132.2		108.3		
41			226.7		183.1	0.81
	342	136.6		108.0		
	347	65.6		54.8		
	3481	55.5		45.1		
	349-3491	140.3		104.4		
42			398.0		312.3	0.78
43	351		86.6		61.7	0.71
44	3522		112.6		84.7	0.75
	3531	104.5		76.5		
	3532	16.9		11.8		
	3533	29.2		20.1		
45			150.6		108.4	0.72
46	353-3531-2-3		60.4		38.4	0.64
47	354		259.0		195.6	0.76
48	355		171.5		120.0	0.70
49	356		233.1		161.9	0.69
50	359		135.8		108.5	0.80
51	357		137.1		88.3	0.64
52	358		112.6		77.8	0.69
	361	132.1		91.8		
	362	161.0		116.9		
53			293.1		208.7	0.71
54	363		145.9		116.2	0.80
55	364		133.0		104.5	0.79
	365	90.8		74.1		
	366	476.9		269.7		
56			567.7		343.8	0.61
57	367		288.5		210.9	0.73
58	369		83.7		65.3	0.78
59	371		693.8		571.0	0.82

TABLE 45, continue

Ratios of Producive Workers to All Employees, 1963
Employment (1,000)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratios (6)/(4)
60	372		679.4		390.3	0.57
61	37-371-372		228.0		188.8	0.83
	3811	33.1		22.2		
	382	94.0		62.7		
	384	51.4		38.3		
	387	29.8		23.3		
62			208.3		146.5	0.70
	3831	11.9		8.3		
	3851	20.3		16.5		
	3861	64.9		39.3		
63			97.1		64.1	0.66
64	39		390.8		315.0	0.81
Total Manufac			16231.0		12219.8	0.75
Total Min. & Manu			16847.2		12701.1	0.75

Table 46

Wages and Salaries, 1963(million dollars)

1 SIC No.	2 Census Operating Establish	3 Census CAO	4 Census Totals 2 + 3	5 NIPA	6 Percent Discrep (5-4)/5	7 Adjusted Census
Mining						
10			521.6	540	3.41	526.16
11,12			821.1	839	2.13	828.19
13			1744.7	1894	7.88	1760.70
14			661.5	683	3.15	667.27
Total Mining			3748.9	3956	5.24	3782.32
Manufacturing						
20	8637.2	596.8	9234.0	9444	2.22	9313.79
21	330.5	50.8	381.3	397	3.95	384.65
22	3385.0	152.9	3537.9	3635	2.67	3568.61
23	4423.0	85.8	4508.8	4604	2.07	4547.70
24	2338.7	46.7	2385.4	2517	5.23	2406.67
25	1726.7	40.4	1767.1	1859	4.94	1782.81
26	3508.2	238.2	3746.4	3830	2.18	3778.76
27	5514.8	96.7	5611.5	5651	0.70	5659.24
28	4969.8	1043.8	6013.6	6111	1.59	6065.23
29	1133.8	629.1	1762.9	1500	-17.53	1775.57
30	2364.0	106.7	2470.7	2446	-1.01	2491.37
31	1227.8	50.2	1278.0	1354	5.61	1289.44
32	3212.5	250.0	3462.5	3504	1.18	3492.10
33	7734.1	414.8	8148.9	8241	1.12	8218.52
34	6387.5	256.5	6644.0	7094	6.34	6703.93
35	9571.0	575.6	10146.6	10275	1.25	10233.41
36	9284.3	922.9	10207.2	9749	-4.70	10289.57
371	5193.5	384.3	5577.8	5601	0.41	5625.09
19+37-371	8621.7	513.4	9135.1	8521	-7.21	9207.14
38	1912.5	98.0	2010.5	2367	15.06	2030.50
39	1837.5	62.0	1899.5	1906	0.34	1915.58
Tot Man	93314.1	6615.6	99929.7	100606	0.67	100779.68
Total Min & Manu			103678.6	104562	0.84	104562.00

Table 47

Adjusted Census Of Mining and Manufactures, 1963
Employee Compensation (million dollars)

1 SIC No.	2 NIPA Compen	3 NIPA Wage & S	4 NIPA Supp	5 Adjusted Census Wage & Sa	6 Adjusted Census Supp 4/3*(5)	7 Adjusted Census Compen 5 + 6
Mining						
10	605	540	65	526.2	63.3	589.5
11,12	1041	839	202	828.2	199.4	1027.6
13	2032	1894	138	1760.7	128.3	1889.0
14	746	683	63	667.3	61.5	728.8
Tot Min	4424	3956	468	3782.3	452.6	4234.9
MANUFACTURING						
20	10484	9444	1040	9313.8	1025.7	10339.5
21	476	397	79	384.7	76.5	461.2
22	3950	3635	315	3568.6	309.2	3877.9
23	5030	4604	426	4547.7	420.8	4968.5
24	2723	2517	206	2406.7	197.0	2603.6
25	2030	1859	171	1782.8	164.0	1946.8
26	4197	3830	367	3778.8	362.1	4140.9
27	6138	5651	487	5659.2	487.7	6147.0
28	6939	6111	828	6065.2	821.8	6887.0
29	2068	1500	568	1775.6	672.3	2447.9
30	2736	2446	290	2491.4	295.4	2786.7
31	1489	1354	135	1289.4	128.6	1418.0
32	3904	3504	400	3492.1	398.6	3890.7
33	9492	8241	1251	8218.5	1247.6	9466.1
34	7814	7094	720	6703.9	680.4	7384.3
35	11383	10275	1108	10233.4	1103.5	11336.9
36	10717	9749	968	10289.6	1021.7	11311.2
371	7095	5601	1494	5625.1	1500.4	7125.5
19+37-371	9445	8521	924	9207.1	998.4	10205.5
38	2677	2367	310	2030.5	265.9	2296.4
39	2101	1906	195	1915.6	196.0	2111.6
Tot Man	112888	100606	12282	100779.7	12373.7	113153.3
Min, Ma	117312	104562	12750	104562.0	12826.2	117388.2

Table 48

Adjusted NIPA, Mining and Manufactures, 1963
Employee Compensation (million dollars)

1 SIC No.	2 Sectors' Names	3	4 NIPA	5 Adjusted Census	6 NIPA-Cen Adjust 5 - 4	7 Adjust NIPA 4 + 6
	Mining					
10	Metal Mining		605	589.5	-15.5	589.5
11,12	Coal Mining		1041	1027.6	-13.4	1027.6
13	Oil & Gas Extrac.		2032	1889.0	-143.0	1889.0
14	Non Metalic Min.		746	728.8	-17.2	728.8
	Total Mining		4424	4234.9	-189.1	4234.9
	MANUFACTURING					
20	Food & Kindered Pr		10484	10339.5	-144.5	10339.5
21	Tobacco Manufactur		476	461.2	-14.8	461.2
22	Textile Mill Produ		3950	3877.9	-72.1	3877.9
23	Apparel & Other Te		5030	4968.5	-61.5	4968.5
24	Lumber & Wood		2723	2603.6	-119.4	2603.6
25	Furniture & Fixtur		2030	1946.8	-83.2	1946.8
26	Paper & Allied Pro		4197	4140.9	-56.1	4140.9
27	Printing & Publish		6138	6147.0	8.9	6147.0
28	Chemicals & Allied		6939	6887.0	-52.0	6887.0
29	Petroleum & Coal P		2068	2447.9	379.9	2447.9
30	Rubber & Plastic		2736	2786.8	50.8	2786.8
31	Leather & Leather		1489	1418.0	-71.0	1418.0
32	Stone, Clay & glas		3904	3890.7	-13.3	3890.7
33	Primary Metal Prod		9492	9466.1	-25.9	9466.1
34	Fabricated Metal		7814	7384.3	-429.7	7384.3
35	Machinery, Except		11383	11336.9	-46.1	11336.9
36	Electrical Equipme		10717	11311.2	594.2	11311.2
371	Motor Vehicales		7095	7125.5	30.5	7125.5
19+37-371	Transpor. & Ordo.		9445	10205.5	760.5	10205.5
38	Instruments		2677	2296.4	-380.6	2296.4
39	Misc. Manufacturin		2101	2111.6	10.6	2111.6
	Total Manufacture		112888	113153.3	265.3	113153.3
	Total Min & Manu		117312	117388.2	76.2	117388.2

TABLE 49

Disaggregating Adjusted NIPA Mining & Manufacturing,1963 Payroll and Employee Compensation, (million dollars)

1 I-O No	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggre Census	6 ratio	7 Adjust NIPA	8 Adjusted NIPA by I-O Indus
	MINING						
	1011	161.6					
	106	20.4					
5			182.0		0.35		205.7
	1021	187.3					
	1031	49.3					
	104	24.8					
	1051	3.4					
	1081	13.9					
	109	60.9					
6			339.6		0.65		383.8
	10			521.6		589.5	
7	11 & 12			821.1		1027.6	1027.6
8	13			1744.7		1889.0	1889.0
	1411	7.8					
	142	229.1					
	144	212.2					
	145	42.2					
	1481	4.6					
	149	28.5					
9			524.4		0.79		577.8
10	147	137.1	137.1		0.21		151.1
	14			661.5		728.8	
Total Mining						4234.9	4234.9
	MANUFACTURING						
13	19	1981.7	1981.7		0.23		2339.0
14	20					10339.5	10339.5
15	21					461.2	461.2
	2211	771.6					
	2221	366.0					
	2231	202.9					
	2241	91.9					
	2261	190.5					
	2262	106.0					
	2269	40.4					
	228	359.1					
16			2128.4		0.27		2411.4
	227	152.4					
	229	316.8					
17			469.2		0.06		531.6
	225	787.5					

TABLE 49, continue

Disaggregating Adjusted NIPA Mining & Manufacturing,1963 Payroll and Employee Compensation, (million dollars)

1 I-O No	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggre Census	6 ratio	7 Adjust NIPA	8 Adjusted NIPA by I-O Indus
	2311	494.2					
	232	899.5					
	233	1426.0					
	234	378.8					
	235	116.0					
	236	265.1					
	2371	56.0					
	238	208.8					
18			4631.9		0.59		5247.7
19	239	578.7	578.7		0.07		655.6
	22 & 23			7808.2		8846.4	
20	24-244	2226.9	2226.9		0.95		2479.2
21	244	111.8	111.8		0.05		124.5
	24			2338.7		2603.6	
22	251	1149.7	1149.7		0.67		1296.3
23	25-251	577.0	577.0		0.33		650.5
	25			1726.7		1946.8	
24	26-265	2401.3	2401.3		0.68		2834.3
25	265	1106.9	1106.9		0.32		1306.5
	26			3508.2		4140.9	
26	27					6147.0	6147.0
	281	1763.2					
	287	213.2					
	2861	32.7					
	289	386.0					
27			2395.1		0.48		3319.1
28	282		973.9		0.20		1349.6
	283	673.8					
	284	525.8					
29			1199.6		0.24		1662.4
30	285	401.2	401.2		0.08		556.0
	28			4969.8		6887.0	
31	29					2447.9	2447.9
32	30					2786.8	2786.8
	311	163.3					
	312	15.9					
33			179.2		0.15		207.0
34	32-311-312	1048.6	1048.6		0.85		1211.0

TABLE 49, continue

Disaggregating Adjusted NIPA Mining & Manufacturing,1963
Payroll and Employee Compensation, (million dollars)

1 I-O No	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggre Census	6 ratio	7 Adjust NIPA	8 Adjusted NIPA by I-O Indus
	31			1227.8		1418.0	
	321	172.2					
	322	535.3					
	323	138.3					
35			845.8		0.26		1024.4
36	32-321-322-323		2366.7		0.74		2866.4
	32			3212.5		3890.7	
	331	4167.9					
	332	1233.6					
	3391	259.8					
	3399	94.7					
37			5756.0		0.75		7088.6
	333	327.8					
	3341	96.3					
	335	1094.4					
	336	412.1					
38			1930.6		0.25		2377.5
	33			7686.6		9466.1	
	3411	377.0					
	3491	66.6					
39			443.6		0.07		512.8
	343	391.4					
	344	1922.7					
40			2314.1		0.36		2675.2
	345	584.2					
	3461	772.6					
41			1356.8		0.21		1568.5
	342	799.5					
	347	330.6					
	3481	297.6					
	349-3491	845.4					
42			2273.1		0.36		2627.8
	34			6387.6		7384.3	
43	351	609.3	609.3		0.06		721.7
44	3522	689.1	689.1		0.07		816.3
	3531	683.7					
	3532	109.5					
	3533	184.3					
45			977.5		0.10		1157.9
46	353-3531-2-3		403.8		0.04		478.3
47	354	1841.7	1841.7		0.19		2181.5
48	355	1094.8	1094.8		0.11		1296.8
49	356	1542.0	1542.0		0.16		1826.5

TABLE 49, continue

Disaggregating Adjusted NIPA Mining & Manufacturing,1963
Payroll and Employee Compensation, (million dollars)

1 I-O No	2 SIC No.	3 Census	4 Census I-O Agg	5 Aggre Census	6 ratio	7 Adjust NIPA	8 Adjusted NIPA by I-O Indus
50	359	793.6	793.6		0.08		940.0
51	357	945.2	945.2		0.10		1119.6
52	358	673.9	673.9		0.07		798.2
	35			9570.9		11336.9	
	361	822.0					
	362	1004.9					
53			1826.9		0.20		2225.7
54	363	864.0	864.0		0.09		1052.6
55	364	709.6	709.6		0.08		864.5
	365	458.9					
	366	3394.6					
56			3853.5		0.42		4694.8
57	367	1535.8	1535.8		0.17		1871.1
58	369	494.5	494.5		0.05		602.5
	36			9284.3		11311.2	
59	371					7125.5	7125.5
60	372	5253.7	5253.7		0.61		6201.1
61	37-371-372		1411.0		0.16		1665.4
	19+37-371			8646.4		10205.5	
	3811	208.2					
	382	581.2					
	384	291.2					
	387	157.6					
62			1238.2		0.65		1486.8
	3831	79.1					
	3851	96.4					
	3861	498.8					
63			674.3		0.35		809.7
	38			1912.5		2296.4	
64	39					2111.6	2111.6
Total Manufac						113153.3	113153.3
Total Min. & Manu						117388.2	117388.2

Table 50

Aggregating NIPA Employee Compensation Estimates, 1963
Services Sectors

SIC No.	I-O No.		NIPA	I-O
70		NIPA Hotels	1952	
72		NIPA Personal Services	3416	
76		NIPA Misce. Repair Ser.	768	
	72	IO Hotels, Personal Services		6136
73		NIPA Business Services	5187	
81		NIPA Legal Services	813	
89		NIPA Misce. Prof. Services	3049	
	73	IO Business Services		9049
75	75	IO Auto Repair	1313	1313
78		NIPA Motion Pictures	859	
79		NIPA Amusement & Recrea. Se	1563	
	76	IO Amusements		2422
80		NIPA Health Ser.	6688	
82		NIPA Educational Ser.	3143	
83,86		NIPA Social Services	4478	
	77	NIPA IO 77 Medical, Educa.		14309

Table 51

IO EMPLOYEE COMPENSATION ESTIMATES, 1963

1 SIC No	2 I-O	4 NIPA	5 NIPA-Cen Adjust	6 Adjust NIPA by I-O Indus	7 Coughlin Ratios	8 Final IO Data 6 * 7
1 TO 9	1,2,3,4	3534	0.0	3534.0	1.003493	3546.3
10		605	-15.5			
	5			205.7	1.000000	205.7
	6			383.8	1.000000	383.8
11,12	7	1041	-13.4	1027.6	1.000000	1027.6
13	8	2032	-143.0	1889.0	1.000000	1207.3
14		746	-17.2			
	9			577.8	1.000000	577.8
	10			151.1	1.000000	151.1
15 TO 17	11,12	19466	0.0	19466.0	0.975813	19676.8
19	13			2339.0	1.000000	2339.0
20	14	10484	-144.6	10339.5	1.068642	11049.2
21	15	476	-14.8	461.2	1.113341	513.5
22,23		8980	-133.7			
	16			2411.4	1.054397	2542.6
	17			531.6	1.041399	553.6
	18			5247.7	1.019036	5347.6
	19			655.6	1.005923	659.5
24		2723	-119.4			
	20			2479.2	1.006567	2495.5
	21			124.5	1.000000	124.5
25		2030	-83.2			
	22			1296.3	1.002158	1299.0
	23			650.6	1.005871	654.4
26		4197	-56.2			
	24			2834.3	1.015097	2877.1
	25			1306.5	1.018731	1331.0
27	26	6138	9.0	6147.0	1.010436	6211.1
28		6939	-52.0			
	27			3319.1	1.015329	3369.9
	28			1349.6	1.022391	1379.8
	29			1662.4	1.046846	1740.3
	30			556.0	1.040972	578.7
29	31	2068	379.9	2447.9	1.007544	2466.4
30	32	2736	50.8	2786.8	1.008872	2811.5
31		1489	-71.0			
	33			207.0	1.006911	208.4
	34			1211.0	1.001696	1213.1
32		3904	-13.3			
	35			1024.4	1.024023	1049.0
	36			2866.4	1.018075	2918.2
33		9492	-25.9			
	37			7088.6	1.020694	7235.3
	38			2377.6	1.048043	2491.8
34		7814	-429.7			
	39			512.8	1.000000	512.8
	40			2675.2	0.939863	2514.3

Table 51, continue

IO EMPLOYEE COMPENSATION ESTIMATES, 1963

1 SIC No	2 I-O	4 NIPA	5 NIPA-Cen Adjust	6 Adjust NIPA by I-O Indus	7 Coughlin Ratios	8 Final IO Data 6 * 7
	41			1568.5	1.000907	1569.9
	42			2627.8	1.002890	2635.4
35		11383	-46.1			
	43			721.7	1.023267	738.5
	44			816.3	1.006926	821.9
	45			1157.9	1.001526	1159.6
	46			478.3	1.002181	479.4
	47			2181.5	1.007867	2198.7
	48			1296.8	1.019268	1321.8
	49			1826.5	1.002925	1831.9
	50			940.0	1.006686	946.3
	51			1119.6	1.029159	1152.3
	52			798.3	1.013399	808.9
36		10717	594.2			
	53			2225.8	1.018968	2268.0
	54			1052.6	1.000000	1052.6
	55			864.5	1.017426	879.6
	56			4694.0	1.007118	4727.4
	57			1871.1	1.010726	1891.2
	58			602.5	1.008995	607.9
371	59	7095	30.5	7125.5	1.031506	7350.0
19+37-371		9445	760.5			
	60			6201.1	1.000729	6205.6
	61			1665.4	1.039586	1731.4
38		2677	-380.6			
	62			1486.8	0.990285	1472.3
	63			809.7	1.009256	817.2
39	64	2101	10.6	2111.6	1.031949	2179.0
40 TO 47	65	17050	0.0	17050.0	0.998819	17029.9
481,7,9	66	4820	0.0	4820.0	1.049196	5057.1
483	67	767	0.0	767.0	1.000000	767.0
49	68	4719	0.0	4719.0	1.000000	4719.0
50 TO 59	69	54960	0.0	54960.0	0.935116	51394.0
60 TO 64,67	70	13912	0.0	13912.0	1.000000	13912.0
65,66	71	2698	0.0	2698.0	0.970352	2618.0
70,72,76	72	6136	0.0	6136.0	0.813544	4991.9
73,81,89	73	9049	0.0	9049.0	1.119777	10132.9
75	75	1313	0.0	1313.0	2.095661	2751.6
78,79	76	2422	0.0	2422.0	0.929505	2251.3
80,82,86	77	14309	0.0	14309.0	1.028037	14710.2
Fed Enter	78	4415	0.0	4415.0	1.000000	4415.0
Sta Enter	79	2146	0.0	2146.0	1.000000	2146.0
Gov Indus	82	58120	0.0	58120.0	1.00	58120.0
R O World	83	32	0.0	32.0	1.00	32.0
House Ind	84	3824	0.0	3824.0	1.00	3824.0
TOTAL		341004	76.2	341079.4	78.77	340981.9

Table 52

Ratios of Production workers to All Employees' wages
Payroll and Wages, 1963,(million dollars)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratios (6)/(4)
	MINING					
	1011	161.6		112.8		
	106	20.4		15.2		
5			182.0		128.0	0.70
	1021	187.3		142.4		
	1031	49.3		37.9		
	104	24.8		20.0		
	1051	3.4		2.3		
	1081	13.9		11.5		
	109	60.9		41.5		
6			339.6		255.6	0.75
	10					
7	11 & 12		821.1		700.9	0.85
8	13		1744.7		1093.0	0.63
	1411	7.8		7.0		
	142	229.1		177.8		
	144	212.2		170.3		
	145	42.2		34.1		
	1481	4.6		4.2		
	149	28.5		22.8		
9			524.4		416.2	0.79
10	147		137.1		85.7	0.63
	14					
Total Mining			3748.9		2679.4	0.71
	MANUFACTURING					
13	19		1981.7		789.0	0.40
14	20		8637.2		6159.4	0.71
15	21		330.5		271.5	0.82
	2211	771.6		688.4		
	2221	366.0		306.5		
	2231	202.9		160.2		
	2241	91.9		73.0		
	2261	190.5		146.8		
	2262	106.0		81.4		
	2269	40.4		30.0		
	228	359.1		306.0		
16			2128.4		1792.3	0.84
	227	152.4		115.2		
	229	316.8		232.3		
17			469.2		347.5	0.74

Table 52, continue

Ratios of Production workers to All Employees' wages
Payroll and Wages, 1963,(million dollars)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratios (6)/(4)
	225	787.5		628.8		
	2311	494.2		398.1		
	232	899.5		751.6		
	233	1426.0		1112.1		
	234	378.8		282.0		
	235	116.0		91.7		
	236	265.1		207.3		
	2371	56.0		45.6		
	238	208.8		160.2		
18			4631.9		3677.4	0.79
19	239		578.7		433.8	0.75
20	24-244		2226.9		1851.2	0.83
21	244		111.8		92.1	0.82
22	251		1149.7		880.7	0.77
23	25-251		577.0		409.3	0.71
24	26-265		2401.3		1779.7	0.74
25	265		1106.9		771.5	0.70
26	27		5514.8		3191.0	0.58
	281	1763.2		1052.9		
	287	213.2		128.9		
	2861	32.7		22.9		
	289	386.0		217.2		
27			2395.1		1421.9	0.59
28	282		973.9		602.7	0.62
	283	673.8		296.6		
	284	525.8		275.2		
29			1199.6		571.8	0.48
30	285		401.2		183.5	0.46
31	29		1133.8		745.1	0.66
32	30		2364.0		1672.4	0.71
	311	163.3		129.8		
	312	15.9		9.7		
33			179.2		139.5	0.78
34	32-311-312		1048.6		842.6	0.80
	321	172.2		143.8		
	322	535.3		446.6		
	323	138.3		103.9		
35			845.8		694.3	0.82
36	32-321-322-323		2366.7		1655.9	0.70
	331	4167.9		3225.0		
	332	1233.6		989.0		
	3391	259.8		198.3		

Table 52, continue

Ratios of Production workers to All Employees' wages
Payroll and Wages, 1963,(million dollars)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratios (6)/(4)
	3399	94.7		65.4		
37			5756.0		4477.7	0.78
	333	327.8		251.4		
	3341	96.3		60.5		
	335	1094.4		793.6		
	336	412.1		317.7		
38			1930.6		1423.2	0.74
	3411	377.0		311.1		
	3491	66.6		49.1		
39			443.6		360.2	0.81
	343	391.4		263.1		
	344	1922.7		1281.1		
40			2314.1		1544.2	0.67
	345	584.2		417.5		
	3461	772.6		567.3		
41			1356.8		984.8	0.73
	342	799.5		572.6		
	347	330.6		248.7		
	3481	297.6		213.3		
	349-3491	845.4		560.0		
42			2273.1		1594.6	0.70
43	351		609.3		401.7	0.66
44	3522		689.1		476.8	0.69
	3531	683.7		462.4		
	3532	109.5		67.7		
	3533	184.3		113.5		
45			977.5		643.6	0.66
46	353-3531-2-3		403.8		229.6	0.57
47	354		1841.7		1292.6	0.70
48	355		1094.8		679.1	0.62
49	356		1542.0		962.4	0.62
50	359		793.6		593.2	0.75
51	357		945.2		523.7	0.55
52	358		673.9		406.6	0.60
	361	822.0		484.2		
	362	1004.9		640.6		
53			1826.9		1124.8	0.62
54	363		864.0		613.8	0.71
55	364		709.6		487.6	0.69
	365	458.9		322.3		
	366	3394.6		1589.4		
56			3853.5		1911.7	0.50
57	367		1535.8		920.7	0.60
58	369		494.5		347.2	0.70

Table 52, continue

Ratios of Production workers to All Employees' wages
Payroll and Wages, 1963,(million dollars)

1	2	3	4	5	6	7
		All Employees		Production Workers		
I-O No.	SIC No.	Census	Census I-O Agg	Census	Census I-O Agg	Ratios (6)/(4)
59	371		5193.5		4069.7	0.78
60	372		5253.7		2586.0	0.49
61	37-371-372		1411.0		1055.5	0.75
	3811	208.2		119.8		
	382	581.2		345.0		
	384	291.2		165.5		
	387	157.6		102.8		
62			1238.2		733.1	0.59
	3831	79.1		47.2		
	3851	96.4		69.0		
	3861	498.8		251.6		
63			674.3		367.8	0.55
	38					
64	39		1812.1		1253.5	0.69
Total Manufac			93266.1		63041.5	0.68
Total Min. & Manu			97015.0		65720.9	0.68

Appendix C

In this Appendix we will discuss the derivation of employment and employee compensation vectors of the productive workers corresponding to our 1967, 1972 and 1977 I-O tables. Tables 53, 56, and 58 present the derivation of the employment vectors, while tables 55, 57 and 59 present the calculation of employee compensation vectors. First we will describe table 53.

The first column of table 53 presents the sector numbers of our I-O tables (see table 54). In this table there are 77 sectors, because 3 sectors of our 80 sectors I-O tables, noncomparable imports, scrap and inventory evaluation adjustments, do not gave corresponding employment components.

The second column of table 53 presents final employment with FAC adjustment. This vector corresponds to the BEL I-O tables. Our I-O tables are reversing FAC adjustment, therefore we should deduct FAC employment figures, third column, from column two. The result is the final employment vector without FAC, column 4, which corresponds to our I-O tables.

The numbers of production workers with FAC adjustments of mining and manufacturing are presented by column 5. When we divide the number of production workers, column 5, with the corresponding number of all employees, column 2, we get ratios, column 6. When we multiply these ratios with the

Table 53

Employment Estimates of All Employees and Production Workers, 1967 (1,000 workers)

1 I-O No.	2 Final IO Emp	3 FAC	4 Final IO Emp Minus FAC	5 Prod Workers	6 Ratios 5/2	7 Final Prod Work 6*4
1	1552	0	1552		0.83	1290.32
2	24.1	-2.8	26.9	21.1	0.88	23.55
3	40.9	-3.9	44.8	34.3	0.84	37.57
4	130.3	-2.8	133.1	115.2	0.88	117.68
5	95.4	-45	140.4	76.7	0.80	112.88
6	95.4	-1.8	97.2	78.9	0.83	80.39
7	22.6	-1.4	24	15.9	0.70	16.88
8	4444	1101.4	3342.6		0.84	2820.83
9	406.3	-0.7	407	214.8	0.53	215.17
10	1845.2	-7.3	1852.5	1166.5	0.63	1171.11
11	95.2	-0.2	95.4	74.7	0.78	74.86
12	621.8	-1.5	623.3	535.1	0.86	536.39
13	123.8	-0.3	124.1	96.7	0.78	96.93
14	1477.6	-0.8	1478.4	1277	0.86	1277.69
15	176	-0.1	176.1	149.7	0.85	149.79
16	535.8	-2.7	538.5	467.4	0.87	469.76
17	31.8	0	31.8	28.3	0.89	28.30
18	304.4	-0.5	304.9	257.3	0.85	257.72
19	130.5	-0.4	130.9	100.2	0.77	100.51
20	456	-3.9	459.9	335.1	0.73	337.97
21	225.8	-0.8	226.6	172.6	0.76	173.21
22	1069.7	-2.5	1072.2	631.6	0.59	633.08
23	452.4	-4.5	456.9	249.6	0.55	252.08
24	217	-2.3	219.3	121.3	0.56	122.59
25	265.1	-1.5	266.6	126.9	0.48	127.62
26	72.8	-0.4	73.2	36.3	0.50	36.50
27	208.3	-6	214.3	99.3	0.48	102.16
28	538.9	-1.5	540.4	410.1	0.76	411.24
29	34	-0.1	34.1	28.4	0.84	28.48
30	306.6	-0.2	306.8	264.9	0.86	265.07
31	180.5	-0.8	181.3	139.6	0.77	140.22
32	452.2	-2.5	454.7	329.7	0.73	331.52
33	969.1	-5.5	974.6	752.2	0.78	756.47
34	399	-2.8	401.8	296.6	0.74	298.68
35	81.9	-0.2	82.1	61.4	0.75	61.55
36	444.9	-1.4	446.3	341.1	0.77	342.17
37	348.4	-1	349.4	280.7	0.81	281.51
38	488.2	-1.2	489.4	373.7	0.77	374.62
39	105.6	-0.4	106	72.1	0.68	72.37
40	152	-0.4	152.4	104	0.68	104.27
41	197	-0.7	197.7	135.2	0.69	135.68
42	88.8	-0.2	89	54.9	0.62	55.02
43	345.1	-0.9	346	256.1	0.74	256.77

Table 53, continue

Employment Estimates of All Employees and Production Workers, 1967 (1,000 workers)

1 I-O No.	2 Final IO Emp	3 FAC	4 Final IO Emp Minus FAC	5 Prod Workers	6 Ratios 5/2	7 Final Prod Work 6*4
44	217.9	-0.6	218.5	141	0.65	141.39
45	288.9	-0.8	289.7	196.6	0.68	197.14
46	206.3	-0.3	206.6	169.9	0.82	170.15
47	215.7	-0.5	216.2	119.7	0.55	119.98
48	146	-0.4	146.4	100.6	0.69	100.88
49	425.7	-1.1	426.8	276.7	0.65	277.41
50	177.9	-0.5	178.4	135.2	0.76	135.58
51	167.5	-0.3	167.8	123.1	0.73	123.32
52	690	-1.4	691.4	411.7	0.60	412.54
53	439.2	-0.9	440.1	293.4	0.67	294.00
54	114	-0.3	114.3	83.7	0.73	83.92
55	849	-1.9	850.9	615.4	0.72	616.78
56	828.4	-2.3	830.7	489.3	0.59	490.66
57	310.6	-0.9	311.5	249	0.80	249.72
58	259.1	-0.5	259.6	175.8	0.68	176.14
59	152.6	-0.7	153.3	90.1	0.59	90.51
60	442.9	-0.7	443.6	350.9	0.79	351.45
61	2566	-91.8	2657.8		0.87	2315.30
62	825.8	-48.6	874.4		0.87	761.72
63	118.9	-0.1	119		0.87	103.66
64	540.5	-105.5	646		0.87	562.75
65	13268	-6.5	13274.5		1.00	13274.50
66	2614.2	-2.8	2617		1.00	2617.00
67	443.3	-210.2	653.5		1.00	653.50
68	1656.7	-4.6	1661.3		0.92	1529.03
69	2385.1	-1.7	2386.8		1.00	2386.80
70	722.4	-1.5	723.9		0.92	666.27
71	562.7	-3.9	566.6		0.92	521.49
72	5025.1	-7.3	5032.4		0.92	4631.74
73	875.7	-11.5	887.2		0.87	772.87
74	327.1	-126.9	454		0.87	395.49
75	14693.9	-350.1	15044		1.00	15044.00
76	-5	0	-5		1.00	-5.00
77	2527	0	2527		1.00	2527.00
Totals	75331.5	0.4	75331.1			67368.88

Table 54
I-O Sector Numbers & Names

1 Agriculture
2 Iron mining
3 Nonferrous mining
4 Coal mining
5 Crude petroleum
6 Stone & clay mining
7 Chemicals & Fert. min.
8 Construction
9 Ordonance
10 Food & Kindred Prod.
11 Tobacco Manu.
12 Broad & narrow fabrics
13 Miscellaneous Textiles
14 Apparel
15 Misc. fabricated textile
16 Lumber & wood
17 Wooden containers
18 Household Furniture
19 Other Furniture
20 Paper & allied Prod.
21 Paperboard Containers
22 Printing & pub.
23 Chemicals & chem Prod
24 Plastics & synthetic
25 Drugs, Cleaning prod.
26 Paints & allied Prod.
27 Petroleum Refining
28 Rubber & Misce.
29 Leather tanning
30 Footwear & leather Prod.
31 Glass & glass Prod.
32 Stone & Clay Prod.
33 Primary Iron & steel
34 Primary Nonfer. metals
35 Metal containers
36 Heating, Plumbing prod.
37 Screw Machine Prod.
38 Other Fabri. metal prod.
39 Engines& Turbines
40 Farm Machinery
41 Const. mining Machinery
42 Materials Handling Mach.
43 Metalworking machinery
44 Special Ind. Machinery
45 General Ind. Machin.
46 Machine shop Prod.
47 Office, computing Mach.
48 Service Ind. Machines
49 Electric transmission

Table 54
I-O Sector Numbers & Names

50 Household Appliances
51 Electric Lighting equip.
52 Radio, TV, commu. equip
53 Electronic components
54 Misc. Electrical Machinery
55, Motor Vehicles
56 Aircraft & Parts
57 Other transportation
58 Prof., Scient. Instruments
59 Optical, Photo equipment
60 Misc. Manufac.
61 Transportaion
62 Communications
63 Radio & TV Broad.
64 Elec. Gas & Water
65 Trade
66 Finance & Ins.
67 Real estate
68 Hotels Personal Ser.
69 Business Services
70 Auto Repair
71 Amusements
72 Medical, Educa.
73 Fed. Enterprises
74 State Enterprises
75 Govern. Industry
76 Rest Of World
77 Household Industry

of these tables is similar to the description of table 55.

Data of tables 56 and 57 are based on Jane R. Cranes's work, while data of tables 58 and 59 are based on Robert Yuskavage's work.

employment of all employees with reversed FAC, column 4, we obtain the final employment vector of the production workers, which correspond to our I-O tables. Data presented by columns 2, 3, and 5 are provided by Coughlin.

Tables 56 and 58 present the derivation of the production workers' employment vectors corresponding to our 1972 and 1977 I-O tables respectively. The description of table 53 applies to the tables 56 and 58.

Table 55 presents the derivation of employee compensation vector of productive workers corresponding to our 1967 I-O table. Column 2 presents final employee compensation vector with FAC adjustment. When we deduct FAC employee compensation vector from column 2 we obtain employee compensation vector of all employees, which corresponds to our 1967 I-O table.

Column 5 presents wage vector (without wage supplements), with FAC adjustment, of all employees. While column 6 presents wage vector of just the production workers. When we divide column 6 with column 5 we obtain a vector of ratios. We will multiply these ratios with employee compensation vector of all employees with reversed FAC adjustment, column 4, and we obtain the final employee compensation vector, which corresponds to our 1967 I-O table. Data presented by columns 2, 3, 5, and 6 are provided by Coughlin.

Tables 57 and 59 present the derivation of the employee compensation vectors of the productive workers corresponding to our 1972 and 1977 I-O tables respectively. The description

Table 55

Employee Compensation Estimates of All Employees and Poduction Workers, 1967 (Million Dollars)

1 I-O No.	2 Final IO Comp	3 FAC	4 Final IO Comp Minus FAC	5 All Emp Wages	6 Prod Workers Wages	7 Ratios 6/5	8 pcom67 7*4
1	4710	0	4710			0.83	3916.2
2	228	-24.9	253	200	156	0.78	198.1
3	352	-36.4	389	309	240	0.78	301.9
4	1215	-27.8	1243	962	812	0.84	1048.7
5	882	-409.6	1292	798	522	0.65	845.8
6	686	-14.9	701	621	475	0.77	536.9
7	199	-12.5	212	180	114	0.63	133.4
8	36908	9662.8	27245			0.84	22992.1
9	4079	-5.4	4085	3610	1502	0.42	1699.9
10	13133	-53.5	13186	11736	6333	0.54	7114.9
11	642	-1.7	643	511	332	0.65	418.4
12	3398	-11.1	3410	3101	2363	0.76	2598.6
13	777	-2.5	780	701	460	0.66	512.4
14	6782	-5.6	6788	6186	4603	0.74	5050.8
15	899	-1	900	814	594	0.73	657.5
16	3074	-21.9	3096	2782	2181	0.78	2427.3
17	152	-0.3	153	138	110	0.79	121.2
18	1668	-3.8	1672	1517	1101	0.73	1213.5
19	922	-2.8	925	830	553	0.67	616.0
20	3863	-30.2	3893	3454	2238	0.65	2522.2
21	1626	-5.7	1632	1462	968	0.66	1080.6
22	8202	-17.7	8220	7510	4011	0.53	4390.6
23	4197	-35.2	4232	3716	1726	0.46	1966.1
24	2063	-19	2082	1803	798	0.44	921.8
25	2420	-11.2	2431	2148	753	0.35	851.8
26	622	-2.6	625	558	223	0.40	250.4
27	2591	-52.7	2644	1969	786	0.40	1055.9
28	3991	-11.4	4002	3501	2313	0.66	2643.7
29	233	-0.5	233	208	153	0.73	171.2
30	1475	-1.3	1476	1338	994	0.74	1096.6
31	1410	-5.7	1415	1252	866	0.69	978.8
32	3367	-18.3	3385	3013	1918	0.64	2154.5
33	9120	-43.9	9164	7798	5526	0.71	6493.9
34	3438	-22	3460	3017	1986	0.66	2277.9
35	772	-1.8	774	665	453	0.68	527.6
36	3469	-10.5	3479	3092	2056	0.67	2314.2
37	2970	-7.5	2977	2610	1878	0.72	2142.1
38	3635	-8.5	3644	3251	2154	0.66	2414.2
39	1004	-3	1007	882	540	0.61	616.8
40	1276	-3	1279	1106	662	0.60	765.9
41	1701	-5	1706	1487	913	0.61	1047.1
42	780	-1.5	781	698	379	0.54	424.4
43	3273	-6.2	3280	2955	1985	0.67	2202.8

Table 55, continue

Employee Compensation Estimates of All Employees and Poduction Workers, 1967 (Millions of Dollars)

1 I-O No.	2 Final IO Comp	3 FAC	4 Final IO Comp Minus FAC	5 All Emp Wages	6 Prod Workers Wages	7 Ratios 6/5	8 pcom67 7*4
44	1879	-4.4	1883	1686	951	0.56	1061.4
45	2531	-6.4	2537	2247	1354	0.60	1528.2
46	1624	-2.5	1626	1479	1100	0.74	1209.3
47	1952	-3.5	1955	1763	757	0.43	839.4
48	1139	-3.2	1142	1013	604	0.60	680.4
49	3484	-8.1	3492	3109	1662	0.53	1867.0
50	1352	-3.6	1355	1195	788	0.66	893.7
51	1183	-2.6	1185	1052	642	0.61	723.2
52	6187	-10.5	6197	5538	2567	0.46	2872.1
53	3131	-6.8	3138	2801	1449	0.52	1622.9
54	884	-2.2	886	775	499	0.64	571.1
55	8464	-15.7	8480	7149	4663	0.65	5530.1
56	8490	-17.3	8507	7546	3793	0.50	4276.1
57	2469	-7.2	2476	2199	1589	0.72	1789.5
58	1953	-4	1957	1765	978	0.55	1084.6
59	1412	-5.6	1417	1252	591	0.47	669.0
60	2711	-5	2716	2463	1587	0.64	1749.9
61	20961	-860.2	21821			0.87	19009.2
62	6820	-488.4	7309			0.87	6366.9
63	1060	-0.8	1061			0.87	924.3
64	4900	-1007.6	5908			0.87	5146.7
65	70286	-49.6	70336			1.00	70335.7
66	19379	-19.7	19399			1.00	19399.0
67	1715	-1584	3299			1.00	3299.2
68	6927	-34.6	6962			0.92	6407.3
69	16098	-15.3	16114			1.00	16113.6
70	3804	-11.8	3816			0.92	3512.4
71	3053	-30.7	3084			0.92	2838.6
72	23293	-53.1	23346			0.92	21487.0
73	5779	-101.9	5881			0.87	5123.1
74	2049	-1178.2	3227			0.87	2811.1
75	81984	-3158.2	85142			1.00	85142.0
76	57	0	57			1.00	57.0
77	4701	0	4701			1.00	4701.0
Totals	471915	0.00	471915				395356

of these tables is similar to the description of table 55.

Data of tables 56 and 57 are based on Jane R. Cranes's work, while data of tables 58 and 59 are based on Robert Yuskavage's work.

Table 56

Employment Estimates of All Employees and Production Workers, 1972, (1,000 workers)

1 I-O No.	2 All Empl	3 FAC Empl	4 Emp+FAC 2 + 3	5 Prodac Workers	6 Ratio 5/4	7 Prod Workers 6*4
1	1504.8	-8.42	1496.38		0.831391	1244.08
2	17.6	3.01	20.61	16.1	0.914772	18.85
3	47.9	3.63	51.53	42.9	0.895615	46.15
4	152.5	2.95	155.45	135.4	0.887868	138.02
5	171.4	24.76	196.16	133.4	0.778296	152.67
6	88.8	2.42	91.22	75.3	0.847972	77.35
7	18.6	0.66	19.26	13.9	0.747311	14.39
8	4738.95	-592.65	4146.30		0.843903	3499.08
9	242	1.74	243.74	125.4	0.518181	126.3
10	1754.1	5.17	1759.27	1147.3	0.654067	1150.68
11	74.8	0.28	75.08	59.6	0.796791	59.82
12	596.7	1.98	598.68	504.3	0.845148	505.97
13	137.8	0.46	138.26	107.4	0.779390	107.76
14	1504	0.75	1504.75	1288.6	0.856781	1289.24
15	188.6	0.29	188.89	158.6	0.840933	158.84
16	600.7	2.65	603.35	520.4	0.866322	522.7
17	23.1	0.05	23.15	20	0.865800	20.04
18	320.2	1.05	321.25	272.4	0.850718	273.29
19	144.6	0.48	145.08	111.4	0.770401	111.77
20	434.4	2.39	436.79	324	0.745856	325.78
21	235.9	0.62	236.52	174.9	0.741415	175.36
22	1090.3	1.03	1091.33	637.4	0.584609	638
23	430	4.61	434.61	230.5	0.536046	232.97
24	197	0.12	197.12	116.8	0.592893	116.87
25	281.1	1.06	282.16	137.6	0.489505	138.12
26	73.3	0.51	73.81	36.2	0.493860	36.45
27	198.8	2.39	201.19	99	0.497987	100.19
28	627	1.70	628.70	486.8	0.776395	488.12
29	26.9	0.04	26.94	22.1	0.821561	22.13
30	257.7	0.15	257.85	218.5	0.847885	218.63
31	184.6	1.30	185.90	147.8	0.800650	148.84
32	466.3	4.17	470.47	344.7	0.739223	347.78
33	839.9	18.25	858.15	676.7	0.805691	691.4
34	368.3	4.03	372.33	283.1	0.768666	286.2
35	81.1	0.57	81.67	66.8	0.823674	67.27
36	444.8	1.07	445.87	322.9	0.725944	323.68
37	310.5	1.36	311.86	263.1	0.847342	264.25
38	490	3.09	493.09	376.3	0.767959	378.67
39	124.4	0.26	124.66	81	0.651125	81.17
40	132.9	0.63	133.53	95	0.714823	95.45
41	200.9	0.81	201.71	136.8	0.680935	137.35
42	83.4	0.37	83.77	49.6	0.594724	49.82

Table 56, continue

Employment Estimates of All Employees and Production Workers, 1972, (1,000 workers)

1 I-O No.	2 All Empl	3 FAC Empl	4 Emp+FAC 2 + 3	5 Prodac Workers	6 Ratio 5/4	7 Prod Workers 6*4
43	273.5	0.89	274.39	197.4	0.721755	198.04
44	196.3	0.85	197.15	122.7	0.625063	123.23
45	274.4	1.16	275.56	181.6	0.661807	182.37
46	189.6	1.02	190.62	150.4	0.793248	151.21
47	213.1	0.32	213.42	107.9	0.506335	108.06
48	208.1	0.76	208.86	143.1	0.687650	143.62
49	386.4	1.34	387.74	254.3	0.658126	255.18
50	175.7	1.02	176.72	130.9	0.745019	131.66
51	190.9	0.61	191.51	140.3	0.734939	140.75
52	599.1	2.00	601.10	342.2	0.571190	343.34
53	358.8	1.17	359.97	233.6	0.651059	234.36
54	129.7	0.41	130.11	94.2	0.726291	94.5
55	804.7	3.23	807.93	643.3	0.799428	645.88
56	502.5	1.81	504.31	275.5	0.548258	276.49
57	409.6	0.78	410.38	321.8	0.785644	322.41
58	267.6	0.85	268.45	167.7	0.626681	168.23
59	160.7	0.85	161.55	86.9	0.540759	87.36
60	456.7	0.93	457.63	354	0.775125	354.72
61	2514.3	44.30	2558.60		0.871134	2228.88
62	935.3	73.92	1009.22		0.871134	879.17
63	139	-0.43	138.57		0.871134	120.71
64	512.3	112.39	624.69		0.871134	544.19
65	15355.2	3.33	15358.53		1	15358.53
66	3058.8	1.81	3060.61		1	3060.61
67	1050.7	32.24	1082.94		1	1082.94
68	1849.6	-27.39	1822.21		0.920384	1677.13
69	3196.5	6.26	3202.76		1	3202.76
70	846.5	-18.17	828.33		0.920384	762.38
71	664.7	-12.45	652.25		0.920384	600.32
72	6021.6	-110.68	5910.92		0.920384	5440.32
73	853.6	9.05	862.65		0.871134	751.48
74	282.8	86.41	369.21		0.871134	321.63
75	15396.7	472.35	15869.05		1	15869.05
76	-11	0.00	-11.00		1	-11
77	2202	0.00	2202.00		1	2202
Tot	24199.25	-469.872	23729.37	14007.8		17598.83

Table 57

Employee Compensation Estimates of All Employees and Production Workers, 1972 (Million Dollars)

1 I-O No.	2 Final IO Comp	3 FAC Comp	4 Final Comp Minus FAC	5 All Emp Wages	6 Prod Workers Wages	7 Ratios 6/5	8 Pcom72 7*4
1	6153	-11.0	6164			0.83	5093.1
2	246	-34.0	280	199	184	0.93	259.0
3	613	-41.1	654	501	421	0.84	549.2
4	2149	-33.4	2182	1713	1457	0.85	1855.1
5	2126	-280.3	2406	1831	1205	0.66	1584.2
6	825	-27.4	853	818	640	0.78	667.1
7	216	-7.3	223	191	127	0.67	148.3
8	60155	11802.6	48352			0.84	40494.6
9	3605	-19.6	3625	3026	1214	0.40	1454.0
10	17146	-58.4	17204	14952	8480	0.57	9757.2
11	734	-3.2	737	597	411	0.69	508.2
12	4319	-22.4	4341	3897	2960	0.76	3297.3
13	1155	-5.3	1160	1027	684	0.67	772.6
14	9001	-8.5	9009	8143	5935	0.73	6566.6
15	1339	-3.2	1342	1181	826	0.70	937.9
16	4999	-30.0	5029	4396	3424	0.78	3917.8
17	146	-0.5	146	130	101	0.77	113.4
18	2305	-11.9	2316	2067	1525	0.74	1708.4
19	1358	-5.4	1363	1199	797	0.66	905.6
20	5142	-27.0	5169	4460	3001	0.67	3479.0
21	2360	-7.1	2367	2063	1319	0.64	1513.3
22	11429	-11.7	11440	10261	5460	0.53	6087.3
23	5695	-52.1	5747	4895	2202	0.45	2585.5
24	2522	-16.8	2539	2147	1063	0.50	1257.1
25	3510	-12.1	3522	3040	1141	0.38	1322.4
26	859	-5.7	864	756	295	0.39	337.4
27	3222	-27.1	3249	2523	1064	0.42	1370.3
28	6241	-19.2	6260	5334	3605	0.68	4231.0
29	248	-0.4	249	215	151	0.70	174.9
30	1663	-1.8	1665	1494	1080	0.72	1203.5
31	2084	-14.7	2098	1758	1279	0.73	1525.9
32	4836	-47.2	4883	4210	2759	0.66	3199.6
33	11543	-206.6	11749	9467	7034	0.74	8729.3
34	4406	-45.7	4452	3690	2565	0.70	3094.7
35	1069	-6.5	1075	882	683	0.77	831.7
36	4590	-12.1	4603	3989	2530	0.63	2919.6
37	4071	-16.3	4087	3413	2450	0.72	2933.9
38	4909	-35.0	4944	4262	2839	0.67	3293.4
39	1738	-3.0	1741	1466	834	0.57	989.7
40	1599	-7.2	1606	1330	841	0.63	1015.2
41	2593	-9.2	2602	2195	1333	0.61	1580.9
42	994	-4.1	998	857	433	0.51	504.2

Table 57, continue

Employee Compensation Estimates of All Employees and Production Workers, 1972 (Million Dollars)

1 I-O No.	2 Final IO Comp	3 FAC Comp	4 Final Comp Minus FAC	5 All Emp Wages	6 Prod Workers Wages	7 Ratios 6/5	8 Pcom72 7*4
43	3482	-10.1	3492	3051	1898	0.62	2172.6
44	2248	-9.7	2258	1968	1034	0.53	1186.3
45	3258	-13.1	3271	2790	1617	0.58	1895.1
46	1987	-11.5	1998	1766	1243	0.70	1406.6
47	2736	-3.6	2739	2407	901	0.37	1025.0
48	2375	-8.5	2383	2027	1209	0.60	1421.4
49	4182	-15.2	4197	3634	1969	0.54	2274.5
50	1802	-10.1	1812	1550	980	0.63	1145.1
51	1850	-6.9	1857	1592	956	0.60	1115.1
52	7474	-22.5	7497	6437	2823	0.44	3288.2
53	3659	-13.2	3672	3209	1559	0.49	1783.4
54	1521	-4.7	1526	1270	794	0.63	954.0
55	12454	-36.6	12491	9825	7221	0.74	9180.8
56	7574	-20.5	7595	6311	2785	0.44	3350.7
57	4176	-8.9	4185	3652	2512	0.69	2878.4
58	2777	-9.6	2787	2451	1196	0.49	1359.6
59	2073	-9.7	2083	1779	761	0.43	890.8
60	3752	-10.5	3763	3342	2110	0.63	2375.4
61	30395	-639.7	31034			0.87	26937.9
62	12341	-891.5	13233			0.87	11486.1
63	1596	-2.6	1599			0.87	1387.9
64	7011	-1306.1	8317			0.87	7218.9
65	107596	-37.7	107634			1.00	107633.6
66	31076	-20.5	31097			1.00	31096.7
67	8461	-365.0	8826			1.00	8826.0
68	10842	-157.1	10999			0.90	9899.3
69	28972	-70.9	29043			1.00	29042.9
70	6320	-6.7	6327			0.90	5694.1
71	4449	-26.3	4475			0.90	4027.8
72	43714	-262.7	43976			0.90	39578.8
73	9278	-148.9	9427			0.87	8185.8
74	2982	-998.2	3980			0.87	3456.1
75	131948	-5452.4	137400			1.00	137400.0
76	48	0.0	48			1.00	48.0
77	5349	0.0	5349			1.00	5349.0
Totals	717668	-0.2	717668				611741.5

Table 58

Employment Estimates of All Employees and Production Workers, 1977 (1,000 workers)

1 I-O No.	2 All Empl	3 FAC Empl	4 Emp+Fac 2 + 3	5 prodac Workers	6 ratio 5/4	7 Prod Workers 6*4
1	1790.6	4.3	1794.9		0.78	1400.4
2	24	1.7	25.7	18.9	0.79	20.2
3	55.8	2.8	58.6	45.8	0.82	48.1
4	240.7	3.7	244.4	206.7	0.86	209.9
5	144.3	12.9	157.2	70.5	0.49	76.8
6	91.8	1.1	92.9	73	0.80	73.9
7	23.9	0.6	24.5	17.5	0.73	17.9
8	5754.9	-1210.3	4544.6		0.78	3565.1
9	187.3	0.4	187.7	92.1	0.49	92.3
10	1605.8	0.8	1606.6	1071.8	0.67	1072.3
11	67	0	67	50.4	0.75	50.4
12	559.6	0.4	560	459.6	0.82	459.9
13	124.3	0	124.3	99.1	0.80	99.1
14	1410.3	0.1	1410.4	1207.2	0.86	1207.3
15	185.9	0	185.9	155.6	0.84	155.6
16	641.8	0.7	642.5	537.4	0.84	538.0
17	17.8	0.1	17.9	15.5	0.87	15.6
18	313.5	0.6	314.1	265.3	0.85	265.8
19	152	0.8	152.8	118.4	0.78	119.0
20	450.2	4.5	454.7	329.8	0.73	333.1
21	203.3	0.2	203.5	156.6	0.77	156.8
22	1114.5	0.3	1114.8	625.6	0.56	625.8
23	463.8	8.3	472.1	248.3	0.54	252.7
24	203.4	1.1	204.5	111.2	0.55	111.8
25	283.6	1.1	284.7	151.4	0.53	152.0
26	61.5	0.9	62.4	33	0.54	33.5
27	201.2	7.4	208.6	101.2	0.50	104.9
28	730.4	0.9	731.3	563.9	0.77	564.6
29	23.7	0	23.7	19.6	0.83	19.6
30	233	0	233	192	0.82	192.0
31	198.9	0.3	199.2	148.4	0.75	148.6
32	448.1	0.5	448.6	335.9	0.75	336.3
33	830.3	9.6	839.9	652.8	0.79	660.3
34	358.3	0.8	359.1	267.9	0.75	268.5
35	78.4	0.3	78.7	60	0.77	60.2
36	476.8	3.7	480.5	349.2	0.73	351.9
37	347.3	0.5	347.8	282.6	0.81	283.0
38	542.7	1.1	543.8	417.9	0.77	418.7
39	131.1	0.4	131.5	90.1	0.69	90.4
40	162.6	0.3	162.9	110.9	0.68	111.1
41	257.5	0.4	257.9	171.3	0.67	171.6
42	84.1	0.2	84.3	55.1	0.66	55.2

Table 58, continue

Employment Estimates of All Employees and Production Workers, 1977 (1,000 workers)

1 I-O No.	2 All Empl	3 FAC Empl	4 Emp+Fac 2 + 3	5 prodac Workers	6 ratio 5/4	7 Prod Workers 6*4
43	297.1	0.3	297.4	217.8	0.73	218.0
44	184.7	0.3	185	117.5	0.64	117.7
45	314.1	0.4	314.5	212.4	0.68	212.7
46	226.1	0.5	226.6	184	0.81	184.4
47	284.9	0.1	285	123.5	0.43	123.5
48	192.6	0.5	193.1	138.4	0.72	138.8
49	406.1	0.5	406.6	267.3	0.66	267.6
50	165.5	0.5	166	128.6	0.78	129.0
51	164.4	0.2	164.6	127.1	0.77	127.3
52	628.6	0.7	629.3	334.9	0.53	335.3
53	378	0.6	378.6	257.9	0.68	258.3
54	165.8	0.1	165.9	115.7	0.70	115.8
55	924.6	1.3	925.9	712.3	0.77	713.3
56	460.7	0.5	461.2	251.1	0.55	251.4
57	420.5	0.9	421.4	317.8	0.76	318.5
58	320.8	0.3	321.1	206.4	0.64	206.6
59	182.4	0.1	182.5	100.3	0.55	100.4
60	455.2	0.9	456.1	338.8	0.74	339.5
61	2681.3	92.6	2773.9		0.85	2359.0
62	896.9	131.7	1028.6		0.85	874.7
63	168.8	0.2	169		0.85	143.7
64	591.3	158.9	750.2		0.85	638.0
65	19013.8	21.6	19035.4		1.00	19035.4
66	3643.2	2.3	3645.5		1.00	3645.5
67	761.2	140.8	902		1.00	902.0
68	2234.2	6.8	2241		0.89	2003.6
69	4060.7	1.8	4062.5		1.00	4062.5
70	680.2	8.4	688.6		0.89	615.7
71	674.7	11.2	685.9		0.89	613.3
72	8236.8	25.1	8261.9		0.89	7386.8
73	804.6	26.7	831.3		0.85	706.9
74	566.5	114.7	681.2		0.85	579.3
75	16576.7	385	16961.7		1.00	16961.7
76	-20	0	-20		1.00	-20.0
77	1936	0	1936		1.00	1936.0
Totals	90955	0.00	90955	14131.3		81592.4

Table 59

Employee Compensation Estimates of All Employees and Production Workers, 1977 (Millions of Dollars)

1 I-O No.	2 compen	3 FAC Comp	4 comp+fac 2 + 3	5 All Emp Wages	6 Prod Wages	7 Ratio 6/5	8 Pcom77 7*4
1	11619	65.5	11684			0.78	9116.4
2	603	25.9	628	466	332	0.71	448.2
3	1172	42.6	1214	926	700	0.76	917.3
4	5584	56.3	5641	4110	3344	0.81	4589.1
5	3570	196.4	3766	2905	1203	0.41	1559.9
6	1430	16.8	1446	1236	898	0.73	1051.0
7	433	9.1	442	361	249	0.69	304.2
8	90372	-18430.3	71941			0.78	56436.0
9	4162	6.1	4168	3372	1319	0.39	1630.5
10	25372	12.2	25384	21310	11731	0.55	13973.7
11	1118	0.0	1118	865	571	0.66	737.5
12	6122	6.1	6128	5356	3856	0.72	4411.5
13	1500	0.0	1500	1288	877	0.68	1021.8
14	11971	1.5	11972	10509	7484	0.71	8526.6
15	2086	0.0	2086	1764	1238	0.70	1464.3
16	8643	10.7	8654	7284	5316	0.73	6315.3
17	157	1.5	158	137	107	0.78	123.9
18	3197	9.1	3206	2763	1999	0.72	2319.5
19	2073	12.2	2086	1761	1193	0.68	1412.8
20	8674	68.5	8743	7268	4590	0.63	5521.2
21	3107	3.0	3110	2595	1733	0.67	2077.0
22	16884	4.6	16889	14623	7322	0.50	8456.8
23	10056	126.4	10182	8266	3674	0.44	4526.1
24	4506	16.8	4523	3740	1558	0.42	1884.2
25	5629	16.8	5645	4721	1820	0.39	2176.1
26	1101	13.7	1115	927	394	0.42	473.9
27	5205	112.7	5317	4179	1766	0.42	2246.4
28	10728	13.7	10742	8875	5842	0.66	7070.7
29	347	0.0	347	294	192	0.65	226.7
30	2008	0.0	2008	1741	1216	0.70	1402.4
31	3519	4.6	3523	2847	1903	0.67	2355.1
32	6987	7.6	6994	5851	3863	0.66	4618.1
33	19099	146.2	19246	15020	10918	0.73	13989.1
34	6853	12.2	6865	5492	3687	0.67	4608.7
35	1790	4.6	1795	1438	1000	0.69	1247.3
36	7445	56.3	7501	6273	3890	0.62	4651.3
37	6485	7.6	6492	5271	3862	0.73	4757.2
38	8219	16.8	8236	6876	4578	0.67	5482.9
39	2825	6.1	2831	2289	1405	0.61	1737.5
40	3064	4.6	3069	2461	1456	0.59	1815.9
41	5116	6.1	5122	4178	2514	0.60	3082.8
42	1449	3.0	1452	1222	670	0.55	796.1
43	5380	4.6	5385	4575	2963	0.65	3487.7

Table 59, continue

Employee Compensation Estimates of All Employees and Production Workers, 1977 (Million Dollars)

1 I-O No.	2 compen	3 FAC Comp	4 comp+fac 2 + 3	5 All Emp Wages	6 Prod Wages	7 Ratio 6/5	8 Pcom77 7*4
44	3144	4.6	3149	2643	1450	0.55	1727.1
45	5444	6.1	5450	4509	2712	0.60	3278.6
46	3856	7.6	3864	3358	2106	0.63	2422.3
47	4940	1.5	4941	4171	1384	0.33	1639.8
48	3132	7.6	3139	2581	1637	0.63	1991.4
49	6507	7.6	6515	5456	2897	0.53	3458.3
50	2440	7.6	2447	1986	1352	0.68	1666.8
51	2311	3.0	2314	1933	1292	0.67	1546.4
52	11688	10.7	11698	9657	3966	0.41	4804.8
53	5584	9.1	5593	4728	2457	0.52	2906.8
54	2993	1.5	2994	2446	1402	0.57	1715.8
55	23069	19.8	23089	17863	12547	0.70	16218.3
56	10580	7.6	10588	8363	3730	0.45	4722.4
57	7411	13.7	7424	6174	3649	0.59	4387.2
58	4905	4.6	4909	4177	2066	0.49	2428.0
59	3472	1.5	3473	2914	1263	0.43	1505.4
60	5417	13.7	5430	4681	2746	0.59	3185.3
61	49595	1410.1	51005			0.85	43375.4
62	18364	2005.5	20369			0.85	17322.4
63	2745	3.0	2748			0.85	2337.3
64	11999	2419.7	14418			0.85	12261.5
65	187189	328.9	187518			1.00	187518.1
66	52675	35.0	52710			1.00	52710.4
67	6677	2144.1	8821			1.00	8821.4
68	16709	103.5	16813			0.89	15032.0
69	52700	27.4	52727			1.00	52727.3
70	10818	127.9	10945			0.89	9786.1
71	7157	170.6	7328			0.89	6551.6
72	82877	382.2	83259			0.89	74440.9
73	14129	406.6	14535			0.85	12361.2
74	7550	1746.6	9297			0.85	7906.3
75	203934	5862.7	209797			1.00	209796.6
76	-40	0.0	-40			1.00	-40.2
77	5930	0.0	5930			1.00	5930.0
Totals	1165555	0.0	1165555	275076	163889		983494

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