

Physician and Hospital Expansion of LIFT

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Summary

To improve the policy analysis capabilities of INFORUM's macro-interindustry model of the U.S. economy (LIFT), we expanded the sectoral detail in the health care area. In the previous version of the model, nursing homes were combined with hospitals; services of physicians were combined with dentists and other medical services. In addition, state and local government hospitals were combined with other S&L health activities. These combinations made it difficult to analyze government policies or insurance programs that reimbursed hospitals or physicians differently than nursing homes or other medical services.

This report describes how we derived the data to expand the model, the additional equations for the new detail in personal consumption expenditures (PCE) and labor productivity, and the changes in the model. It will also serve as a reference document for maintaining this detail; it includes some discussion about data issues and modelling considerations.

The desired expansion of detail has been accomplished in LIFT for the following series:

- output,
- personal consumption expenditures,
- price deflators,
- jobs, hours, and labor productivity,
- S&L government purchases,
- the interindustry direct requirements table.

There is a solid data foundation for some of this work, in terms of the detail available from benchmark I-O tables, the National Income and Product Accounts (NIPA), and the Bureau of Labor Statistics (BLS) Office of Employment Projections data. However, these sources were not entirely adequate. The report describes the way in available data was stretched to accomplish the desired level of detail.

Adequate data was available to separate nursing homes from hospitals. However, available data would not support separating physicians from other health professionals and S&L hospitals from other S&L health purchases. For physicians and other health professionals, our basic sources identified PCE, output, and prices; it did not separate employment or interindustry inputs. For S&L purchases, data was available to determine purchases for the separate hospital and health activities; our sources did not separate employment or for the composition of purchases. We have made assumptions, described later in the report, which enabled us to circumvent this lack of data.

We had hoped to expand the detail for income by industry (labor compensation, proprietor income, capital consumption allowances, etc.), but adequate data was not available. Therefore, LIFT retains a single health care sector for the components of income by industry.

These two qualifications, a weak data foundation for the splits (of physicians from other health

professionals and of S&L hospitals from other S&L health activities) and a single health care sector for the components of income by industry, should be kept in mind when using the model. However, the new structure is at least as reliable as the old, more aggregate structure. And it permits a flexibility in simulation. For example, LIFT can be used to study the implications of alternate assumptions about price movements in the four health sectors. When the user imposes price assumptions, LIFT will determine consistent levels of income in the health services industry.

The Data: A General Summary

LIFT is constructed with data from the NIPA and a variety of other sources. It follows conventions defined by the NIPA. In the health care area, it is important to remember that a NIPA framework implies some differences in definitions and conventions from other sources of health statistics, such as the National Health Expenditure (NHE) accounts; discussion of some of these issues appears in a later section.

In the framework of the NIPA, the providers of health care services to consumers are private hospitals, S&L government hospitals, nursing homes, physicians, dentists, and other health professionals. For this project, LIFT has been expanded to 85 producing sectors, in which

Old sector 82, Hospitals and nursing homes, has been separated into

- 82 Hospitals, private (sic 806)
- 85 Nursing homes (sic 805)

Old sector 83, Other medical services, has been separated into

- 83 Physicians (sic 801, 803)
- 84 Other medical services, including dentists (sic 802, 804, 807, 808, 809).

The old final demand category, S&L health and hospitals purchases, has been separated into:

- S&L government hospitals, net purchases of goods and services
- S&L government health, net purchases of goods and services

This detail by producing sector now exists in LIFT for output, personal consumption expenditures (PCE), price deflators, jobs, and hours. In LIFT, in addition to classifying PCE by 85 producing sectors, PCE is shown by 80 NIPA categories. In the revised model, PCE category 66, Hospitals (private and government), and PCE category 80, Nursing homes correspond to the old category 66, in which hospitals and nursing homes had been combined. LIFT classifies the components of income by industry detail (labor compensation, proprietor income, capital consumption allowances, etc.) by 51 industries. Industry 51 is Health services. No change was made to the industry detail for the components of income because adequate data was not available to do so.

PCE in current and constant prices was available from the NIPA for the 4 sectors. Note that PCE for hospitals in the NIPA is given for three types of hospitals: private for-profit, private non-profit, and government hospitals. The PCE data was used to move the I-O output, in current and constant prices, for these 4 health care sectors. (See Medpce.dat.)

For S&L government purchases, NIPA table 3.17 distinguished total purchases for hospitals and for health. Note that NIPA purchases are net purchases, which is an important consideration for hospitals. That is, gross purchases by hospitals are reduced by their receipts for services. In the I-O table, personal consumption expenditures at all hospitals (public as well as private) appear in the PCE column of the private hospital row. S&L hospital receipts (of payment for services) appear as a negative entry in the private hospital row of the S&L hospital column of the I-O table. This accounting convention insures that the row sum is the output for private hospitals. In the government columns, purchases are shown as positive entries; sales appear as negative entries. Thus, the NIPA accounting conventions yield a somewhat strange sum for the government column until we remember that the sum of purchases of government hospitals is net of receipts for services. In 1992, PCE at government hospitals was \$53.2 billion. Net purchases (purchases less receipts) of S&L hospitals was \$7.6 billion. Therefore, the implied S&L hospital gross purchases are \$60.8 billion.

In addition to production, consumption, and prices, other data is required for the model. We revised the input-output table, to specify material, service, and value-added inputs into these four health sectors. Jobs and hours worked were also derived for the model at this level of detail. The separation of hospitals and nursing homes was straight-forward because:

- (1) the benchmark I-O tables included separate sectors
- (2) jobs and hours were available from our usual source, the BLS Office of Employment Projections (OEP).

The other splits were difficult because the underlying I-O and jobs detail was not adequate. These data difficulties were described in two memos to HCFA (July 28 and August 12).

The I-O table and the OEP jobs data from BLS include data for the sectors:

Doctors, dentists, other health practitioners
Other medical services.

For our sector 83, Physicians, we exclude dentists and chiropractors from the Doctors sector and include them with Other medical services. The I-O table also includes only a single sector for S&L health and hospitals, which we need to separate. The NIPA is our source for government employment; it distinguishes education from other S&L employment, but has no detail for health or hospitals. HCFA was not able to provide any additional data. Therefore, we put considerable effort into seeking other sources and stretching the available data. This report describes how the data was derived and refers to various programs and G runstreams which can be used to update this work.

The Data: Jobs and Hours

The BLS Office of Employment Projections is our source for data on jobs and hours in the private sector. It includes three categories of jobs and hours data: wage and salary employees, the self-employed, and unpaid family workers. Its detail is adequate for Hospitals (private) and Nursing homes. However, its Health practitioner category includes dentists and chiropractors as well as Physicians. From other BLS data (Employment, Hours, and Earnings), we can determine wage and salary employees in Physicians' offices (see eheann.run). However, we have been

unable to find any data to separate self-employed physicians from self-employed dentists and chiropractors. Consequently, we used the ratio of self-employed health practitioners to wage and salary workers in the offices of health practitioners to infer the number of self-employed physicians. The non-physician health practitioners were then a residual. Hours were split with the ratio of physicians' jobs to practitioner jobs. (See Getemp.add for this work.)

Our source for employment and labor compensation for government is the NIPA, tables 6.2 and 6.4. The NIPA did not provide the detail desired for S&L government. For S&L government Health and Hospitals, employment data was available from the Census publication GE/91-1, Government Employment, Public Employment, 1991 (and earlier issues). This publication also provides payroll, which was used to derive labor compensation. This data was used to split the combined data (derived in the macrovariable work, Mks&l.add). Data from this source (Public Employment) differs from the NIPA data, so it was used to provide the proportions by which the NIPA total was split in components. The major differences are that:

- Public Employment payroll include excludes benefits,
- Public Employment data are only for the month of October.

The NIPA data is annual labor compensation, that is wages and salaries plus benefits. (See Mkhlmhbb.add for this work.)

The Data: The I-O Table

S&L Government, Health and Hospitals

In the 1982 Benchmark I-O Table, S&L Health and Hospitals are a single activity. The NIPA provided total net purchases. Labor compensation was derived from NIPA controls and the Census publication mentioned above. We have assumed that all consumer spending at government hospitals was done at S&L hospitals. Therefore, this PCE appears as a negative entry (or sale) in the cell for the private hospital row and the S&L hospital column. The remainder of the column was split in proportion to the following two components:

- S&L health purchases, less labor compensation
- S&L hospital net purchases, less labor compensation, plus sales to consumers.

Using this method, S&L purchases by product were estimated for the period 1977-1992. (See the program Getslg.for this work.)

Hospitals and Nursing Homes

In the benchmark I-O table, separate columns were available for these activities. Therefore, no special attention was needed to obtain the desired detail.

Physicians and Other Medical Services

The I-O table includes two sectors, Doctors and dentists, and Other medical services. To construct a sector for Physicians, we need to remove dentists and chiropractors from the Doctors sector. The I-O workfile provides separate allocations for the services rendered by these health professionals, so the adjustment to the rows of the I-O table was simple. Of course, most are sold to PCE and the NIPA already make this distinction. However, the workfile provides no information by which the purchases of physicians can be separated from purchases of dentists. Therefore, purchases by dentists and chiropractors were removed from the Doctors column by the ratio of services provided by dentists and chiropractors to services provided by all doctors. These purchases were included with the purchases of Other medical services. We assumed that physicians and dentists used the same goods and services in the same proportions of total output. This assumption is probably a poor one, but no data was found with which an alternate assumption could be made. (See the I-O table aggregation programs, where these splits were made: the split subroutine of Aggmat.for 1982 and Getnew.for 1977.)

The Model: An Overview

With the underlying data derived in the manner described above, we rebuilt LIFT with 85 producing sectors and related changes in detail. The new detail includes

Production, Prices, and Jobs by producing sector

- 82 Private hospitals
- 83 Physicians
- 84 Other medical services, including dentists
- 85 Nursing homes

Personal consumption expenditures, by category

- 64 Physicians
- 65 Dentists and other professional health services
- 66 Hospitals, private and government
- 80 Nursing homes
- 78 Foreign travel by US residents \ unrelated to health,
- 79 Travel in US by foreigners / but new detail in the model.

Macro variables

- Labor compensation, current dollars
 - WSLHP S&L government hospitals
 - WSLHO S&L government other health activities
- Labor compensation, constant 1977 dollars
 - WSLHPC S&L government hospitals
 - WSLHOC S&L government other health activities
- New purchases, current dollars
 - GSLHPZ S&L government hospitals
 - GSLHOZ S&L government other health activities
- Net purchases, constant 1977 dollars
 - GSLHP S&L government hospitals
 - GSLHO S&L government other health activities
- Employment
 - EMP94HP S&L government hospitals
 - EMP94HO S&L government other health activities

Other variables

- HOS mnemonic for S&L hospital purchases by sector
- HLH mnemonic for S&L health purchases by sector

Aside from the changes in detail described above, the structure and operation of LIFT does not differ.

The Model: New Equations

The equations in LIFT for the non-health sectors are unchanged. Equations have been added in consumer spending to reflect the new detail. Please see the companion paper, PCE Equations: Revision and Review (Janoska, January 1994) for a discussion of the consumer expenditure equations for the health care sectors in LIFT.

In LIFT, labor productivity is forecast by industry; it depends upon trends and changes in output. Hours are determined from labor productivity and output. Jobs are derived from hours and the length of the work year. The equations for annual hours worked per job are a function of trends and some macro factors, such as the unemployment rate. For the four health sectors, we have not included equations. Instead, we have included exogenous assumptions about the trends in productivity and the length of the work year; these assumptions can be modified by the user. Hours and jobs are then derived from output and these assumptions.

The Model: Prices and the Components of Income by Industry

LIFT determines unit prices for the 85 sectors as the sum of unit costs. Unit costs include unit costs for materials, services, and value-added. Value-added is the sum of the components of factor income which LIFT estimates by 51 industries. LIFT industry 51 is Health services. The behavioral equations in LIFT for value-added are estimated for the different components of income by industry (labor compensation, proprietor income, net interest payments, capital consumption allowances, profits, etc.). To derive value-added for the 85 products, value-added by the 51 industries is "bridged" to the 85 producing sectors. For Health services, the bridging serves to disaggregate industry 51, Health services, into the four detailed sectors (Hospitals, Nursing homes, Physicians, Other health services). We had hoped to reduce the bridging necessary for the health sectors by expanding the industry detail for the components of income by industry. As mentioned above, the industry detail in LIFT for the components of income by industry was not changed in this revision of LIFT because no data was available to disaggregate Health services.

The allocation by bridging is done on the basis of the base-year shares of industry value-added by producing sector, moved by the growth in real output. This method, of course, is a weak way to model the major component of prices in the 4 health sectors. To improve price determination, we need data that is specific to each of the 4 health sectors. For example, to understand price change in physicians services, we need data on proprietor income and labor compensation in that industry; for hospital services, we need data on labor compensation, capital consumption allowances, etc.

Although we have some reservations about the process by which health prices are forecast, the added detail in the model does open some new possibilities for simulations. For policy simulations, an assumption about prices can be imposed on one or more of the health sectors; LIFT can then trace the implications of these assumptions. When an exogenous price is imposed, LIFT will recalculate value-added so that it is consistent with the imposed price.

Some Data Notes

NIPA accounting for government hospitals

The NIPA accounting for government hospitals warrants a bit more attention. Prior to the December 1991 benchmark revision of the NIPA, PCE for hospitals did not include spending at government hospitals. Government receipts for hospital charges were shown as nontaxes and S&L purchases for hospitals were gross purchases. The treatment was changed with the benchmark revisions. PCE now includes spending at government hospitals. Government receipts for hospital services no longer appear as nontaxes. Instead S&L hospital purchases are now net purchases, with gross purchases reduced by the amount of receipts. From the NIPA, we cannot ascertain how much of the spending by consumers at government hospitals is done at S&L hospitals as opposed to federal hospitals. We have assumed that all PCE at government hospitals is spent at state and local government hospitals. This assumption seems to be appropriate because in the pre-benchmark NIPA, for 1989, S&L nontaxes for S&L hospital and health charges were 41.3 billion dollars, while all of federal nontaxes were only 1.8 billion. In addition, the benchmark revision made little change to federal purchases for health and hospitals (for 1989, purchases were changed 9.842 to 9.798 billion). However, 1989 S&L purchases for health and hospitals changed from 48.7 to 11.5 billion in the benchmark revision. Of course, the pre- and post-benchmark NIPA are not strictly comparable, because revisions may have occurred for reasons other than the change in this accounting convention. The comparison does, however, strongly suggest, that PCE at government hospitals is largely at S&L government hospitals.

Hospital expenditures: the NIPA and the NHE

NHE estimates of hospital expenditures exceed the NIPA estimates of personal consumer expenditures for hospital care. After a bit of thought, we are guessing that this difference exists because some levels of government are providing care which the NHE counts but that the NIPA does not, because it is not consumer spending. The NIPA counts as hospital PCE spending which is funded by private insurance, by government transfer payments, or by consumers themselves. Much of the care at federal hospitals, such as military or veterans hospitals, is part of federal purchases, not part of PCE. (Are we correct in our assumption that such care is counted as hospital expenditures in the NHE? If so, it seems valid to assume that PCE for care at government hospitals is spending done at S&L hospitals. Is this the way both accounts work?)

Data Documentation: Runstreams and Programs

1. Medpce.dat, Output.dat, Getpce.sav

G runstreams and "save" files that derive output and prices from NIPA data on personal consumption expenditures.

2. Getemp.add, Employ.dat

G runstreams and save files that derive jobs, hours worked, length of the work year, and labor productivity.

3. Mkhlmhbb.add, Hlhmbb.sav

G runstreams and save files that derive the macrovariables for S&L health and hospitals. Be careful, because the general LIFT macrovariable work is a starting point (see mks&l.add and s&l.sav); that work contained an error in the update for the December 1993 meeting. Remember (and make sure) that S&L hospital, health, and other sum to the NIPA category S&L other (that is, S&L other than education.)

4. Getslg.for

Fortran program to derive "vectors" for LIFT for S&L health and for S&L hospitals, for 1997 - 1991. It uses the distribution of purchases by sector from the 1982 I-O table, as well as aggregates from the NIPA.

5. Getfdv.for

Fortran program to put output, prices, hours, etc., derived above in steps 1 and 2, in an "fdv" format for LIFT.

6. Split, from Aggmat.for, and Aggmat.dat

Aggmat is the Fortran program which aggregated the 1982 I-O table to the LIFT and DOM sectors. Split is the subroutine which moves dentists and chiropractors from Doctors to Other medical services. This work is in the McCarthy directory "\io\1982\aggre85".

7. Memo, July 28, 1993, Data Needs

8. Memo, August 12, 1993, Follow-up on Data Needs

Look at the forecast. But first, make sure we have what we want in the model.

1. LIFT data

Including data for the new sectors is a bit tricky because we want to keep any Dec93 meeting work for the non-health sectors. The initial McCarthy work from October had the new health detail, but these vectors were done before the December meeting updates with current data revisions for output, price, NIPA, etc. The Meade work for the 85 sector split tried to keep the meeting updates for the non-health sectors, while adding the new health detail.

At this point, most of the data has been reviewed. Some corrections have been made piecemeal. Others need to be done. The health data, where needed, has been revised to reflect the Dec93 update work. Here are my suggestions for finishing LIFT85. We should start with the files as they are found on Ralph's pc. And we should run all of the "loader" programs.

a. fdv.dat

Update (1990-1992) with McCarthy data for sectors 82-85:

Out, Prd, Hrs, Yhr.

Pce should be ok.

Verify data for other years.

b. price.dat

Update with McCarthy data (1990-92) for sectors 82-85:

Pdm

Cp should be ok.

Verify data for other years.

c. macroact.dat

Update with McCarthy notes (given to Ralph).

- data for current years (1990-92) has been revised.

- data and series names were mismatched.

Verify all new data.

d. fixes, pfixes, macrofix

See what we have. Is it what we want?

e. eqs.dat

Jeff should review this file and make sure that the desired pce equations are there. (At one point, we had the wrong ones.)

2. Matlis: See h:\lift85\mbb for the corrected files.
 - a. dirfor.dat
In block 1, the location in dirfor of the discrepancy and s&l health was changed to avoid messy code for matlis. So check the following:
 - "tabs" that need to be changed,
 - namitem.s.dat - it may need some changes
 - wrtfor.dat - "
 - b. matlis.for and matlis.exe - are now working
 - c. matlis.mak
Has hopefully fixed a trap which we built for ourselves. The "matin.mak" and the "matlis.mak" (and probably the "summary.mak") each would, if not "util.obj" existed would compile one. But matlis used f77i3, while the others used f77i. When linked, the wrong util causes problems. Matlis does not need to use f77i3, so the "mak" has been changed. (For all of these short programs, all of the code, except util, is contained in a single file, so it can be compiled and linked directly which avoids the "mak" pitfall altogether.)
3. Dirhis
Has it been re-made? With history for the new industry and macro detail?
4. The forecast
 - a. Productivity
Until all is working properly, we should continue using fixes which mimic the Dec93 forecast. But productivity needs a careful review. Try plotting indexes of both hours and output. (It would be nice to have an "igr" command.) We should probably review all the sectors this way.
 - b. PCE
 - c. Prices
5. Suggested fixes in health area