

TOWARDS THE CONCEPT OF GROSS URBAN PRODUCT

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Introduction

The rapid growth of regional econometric modeling is likely to be severely constrained by the lack of regional economic accounts especially urban and state accounts. Such model builders continually bemoan the lack of both accounts and sufficient data at the regional level. The consequence of this situation has been to force model builders to build models around existing kinds of data, while they ignore many compelling issues.

With respect to the burgeoning interest in urban model building and urban economics in general, little or no attention has been paid to urban economic accounts. Some time ago Leven's pioneering study [4] outlined a procedure for the design and implementation of urban economic accounts based on survey data. A recent contribution is Armstrong et al. [1] who constructed regional economic accounts for the metropolitan area of New York City for 1972 and 1975. Nonetheless, little research on this subject has been accomplished; although the broader issues of establishing regional accounts and estimating gross state product in particular continue to interest a few regional economists, e.g. Leven et al. [5] and Weber [7]

A city, like a state or a nation, is an identifiable geographical and political entity having an economic focus all its own. The compelling reason for building urban economic accounts is to systematize, according to a well defined conceptual framework, the flow of economic information for the purpose of recording the allocation and distribution of goods and services produced by an urban economy. Subsidiary reasons for doing so are many, and are based on the uses of urban economic accounts.

The first step is to conceptualize a skeletal framework for building urban economic flow accounts. This involves a description of the sectors and industries comprising an urban economy, and a definition of the output of the urban economy and how it generates expenditure and income flows. Unlike the U.S. economy, an urban economy is extraordinarily open; consequently, the proper spatial allocation of these flows to an urban economy is a complicated issue. This is especially true for an urban area such as New York city, which is contiguous with New Jersey and other urban areas. See Armstrong et al. [1]. Other particular problems in building urban economic accounts involve multi-regional corporations; the spatial allocation of incomes earned, received and spent by commuters to and from the urban area; and special treatment of state, local and federal governments. All of these issues exist at the state level, but at the urban level they are much more complex.

The purpose of this paper is to outline the concept of urban economic accounts in the form of income, expenditure and product accounts. My effort is exploratory, and will hopefully stimulate discussion and further research about this important issue.

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Urban Income and Product Accounts

In this section we shall outline conceptual approaches to measuring the income, expenditure and product flows of an urban economy. Except for the "foreign" and government sectors, the approach is generally the same as the one used for the national economic accounts whereby separate flows of expenditures, incomes and production are set up in such a way that an aggregate or summary measure can be made of each of these flows. The approach has also been used by L'Esperance [3]. The summary measure of each of these flows is conceptually the same number, even though each flow is theoretically distinct from the other. The equality among these flows for a city can be stated as the following balancing equation:

$$(1) \quad \text{GUP} = \text{GUE} = \text{GUY}$$

where

GUP = gross urban product

GUE = gross urban expenditure

GUY = gross urban income

The concept of GUE measures at the urban level the expenditures for the goods and services produced (GUP) by an urban economy; and finally GUY is defined as the sum of the factor incomes earned by the labor and capital of a city.

All legitimate economic activities are included in GUP which means that with the advent of a city-sponsored off-track betting system, such as New York City's Off-Track Betting Corporation (OTB), a city's GUP will increase a bit if the residents who gamble place their bets with OTM instead of with illicit bookmakers.

GUP is the sum of the value added in government and private industry and is represented as:

$$(2) \quad \text{GUP} = \text{VA}_g + \text{VA}_p$$

where

VA_g = value added by government

VA_p = value added by private industry

Conceptually, value added is defined as sales plus inventory change less the costs of intermediate products. Furthermore:

$$(3) \quad \text{GA}_p = \sum_{i=1}^9 (\text{VA}_p^i)$$

where i is the i^{th} industry representing

agriculture
mining
manufacture
construction
trade

finance, insurance and real estate
transportation
communications and public utilities
services and other

Alternatively equation (2) can be rewritten as

$$(4) \quad GUP = GUP_g + GUP_p$$

where GUP_g = gross urban product in government

GUP_p = gross urban product in private industry

and $GUP_p = \sum_{i=1}^9 (GUP_p^i)$ where i is for the same industry breakdown.

Equating (2) and (4) we have

$$GUP_g = VA_g \text{ and } GUP_p = VA_p$$

GUY is actually the sum of factor incomes arising out of the production of goods and services of the i th industry and government. That is, GUY can be determined as follows:

$$(5) \quad GUY = L + P_r + N + P + IBT + BTP - NS + CCA$$

where GUY = gross urban income

L = Labor compensation in the form of wages, salaries and supplements

P_r = Proprietors' income

N = Net interest, rents and royalties

P = Corporate profits and inventory valuation adjustment

IBT = Indirect business taxes

BTP = Business transfer payments

NS = Net subsidies

CCA = Capital consumption allowances

The concept of GUE is as follows:

$$(6) \quad GUE = C^R + I + X + G$$

where GUE = gross urban expenditure

C^R = Intraurban personal consumption expenditures by the residents of an urban area

I = Gross private domestic urban investment

X = Net exports on current account

G = Government purchases

Let us define gross savings plus taxes net of government transfer and interest payments as

$$(7) \quad GUE - C^R = S + T_n$$

where S = gross-savings which is equal to the sum of personal and business savings

T_n = taxes net of government transfer payments to persons and interest paid by government (net) and by consumers

Gross urban income can be defined as the sum of intraurban personal consumption expenditures, gross savings and taxes net of government transfer and interest payments. That is,

$$(8) \quad GUY = C^R + S + T_n$$

The balancing identity showing the equality of identities (6) and (8), namely the equality of GUY and GUE can be written as

$$C^R + I + X + G = C^R + S + T_n$$

or more succinctly as

$$(9) \quad I + X + G = S + T_n$$

Equations (1) through (9) hold for an urban economy as well as for a state or national economy. What must be recognized is the distinct openness of an urban economy. The following discussion deals with this issue.

A. The Foreign Sector of an Urban Economy

An urban economy, unlike the national economy, has an extraordinary degree of openness with respect to its "foreign sector", which poses a number of questions: How to deal with consumer incomes in the form of "income produced" and "income received"; how to deal with the returns to capital stemming from the out-of-urban location of capital owned by the residents of an urban area; and how to deal with an urban area's output of multiplant national corporations.

In answering these questions it is worthwhile to consider the distinction between the productive resources located in an urban area and those located outside the area. The concept of gross state product (GSP) as developed by Kendrick and Jaycox [2] is based on the "gross domestic product" concept, since it covers all economic activity within a state. It is a measure of final output and the corresponding income of the factors of production employed within a state whether or not the residences or the owners of the factors are located in a state. Omitted from this concept is the income from "foreign" (other areas in

the U.S. and the rest of the world) properties owned by the residents of a state or the resident's labor income earned in "foreign" areas.

In a similar vein the residents of a city can own resources located either inside or outside a city. A distinction is made between these two kinds of resources in terms of their separate contributions to GUP and shown below. Define GUP as the sum of gross urban domestic product and net income received on foreign investments.

$$(10) \quad \text{GUP} = \text{GUP}_d + D$$

where GUP_d is the "gross urban domestic product" arising out of the contributions of the productive factors, labor and capital, located in a city. The symbol D refers to income received on foreign investments net of urban income earned by foreigners.

GUP is a global concept in the sense that it measures total production of resources owned by the residents of a city no matter where the resources are located. Therefore, GUP can be thought of as "gross urban product received" which is a more aggregate concept than GUP_d because GUP takes account of the production of goods and services emanating from the resources owned by the residents of a city no matter where these resources are located.

Subtracting D from GUY we define

$$(11) \quad \text{GUY} - D = \text{GUY}_p$$

where GUY_p is gross urban income produced, that is, the income originated by the factors employed in a city. The global concept, GUY, can be thought of as gross urban income received by the residents of a city no matter where their resources are located.

The openness of an urban economy is a major issue which cannot be neglected in the building of any urban economic accounts. The exports of an urban economy are interrelated with the economies of outside areas including the rest of the world outside the U.S. Identifying and organizing all of the components of a cities' imports and exports, which relate to the private as well as the public sector, is a vexing and troublesome problem. Another dimension of the openness of an urban economy lies in the allocation of federal tax burden and federal assistance programs by state and city. What a city receives from the federal government and the federal taxes it pays constitutes a "trading" relationship which can be accounted for in the foreign sector.

Consider the openness of an urban economy from the expenditure side of gross state product. Earlier the symbol X was defined as net exports on current account. Subtracting D from X we have:

$$(12) \quad X - D = X_d$$

which is defined as net exports arising from urban-located resources or "net exports from domestically employed resources", a term used by Romans [6], or alternatively as net exports from produced income.

From equation (9) we can define net exports on current accounts as:

$$(13) \quad X = S + T_n - (I + G)$$

The difference between X_d and X is D , mentioned earlier as net income on foreign investments.

In his discussion of state economic accounts Romans [6] defines "private net exports" as

$$(14) \quad X_p = S + T_n - (I + G_p)$$

where G_p = state government purchases in which federal government purchases are allocated to a state on a where-produced basis. It is "private" for the reason that all flows-in-kind through the public sector are eliminated. It is assumed that these flows emanate only from the federal sector and not from other urban and state government sectors. Ohio, for example, does not derive benefits from urban and state government in Illinois; nor does the government sector in Ohio buy from urban and state governments in Illinois. Romans uses the word "private" for lack of a better adjective. What is meant by G_p is that federal government exports based on benefits exported from a state are not taken into account. What is included in G_p are purchases made by the federal government in that particular state.

However, if federal government expenditures are allocated to the states on the basis of benefits received, then Romans [6] defines "total net exports" as

$$(15) \quad X_b = S + T_n - (I + G_b)$$

when G_b is a state's allocation of federal government expenditures based on benefits received. If G_p is greater than G_b , as is obviously the case in California¹ then private net exports will exceed total net exports as defined in equation (15).

The upshot of this discussion is that the definition of a "net export" for a city will crucially depend on how G is defined. Assume that an urban government can buy goods and services from the private sector or buy them from the federal government or buy from the state government in the state where the urban economy is located. Assume, in other words, that an urban government does not purchase from other urban and other state governments.

Let G be the sum of

i) urban government purchases from the private sector (G_s). Such purchases from the private sector are made in and outside the urban area.

ii) urban area allocation of federal government expenditures consisting of goods and services produced within the urban area (G_w). This can be conceived as consumption benefits received from the federal government for the use of these goods and services which are produced locally.

iii) urban area allocation of the federal government expenditures consisting of goods and services "imported" from other states outside the urban area (G_m). This can be conceived of as consumption benefits received from the federal government on the basis of the location of production outside the urban area. An example would be the benefits received by the inhabitants of

¹California produces more defense goods and receives more R&D contracts from the federal government than any other state. Both are expenditure components of G_p . If U.S. defense expenditures, the major item in the federal budget, are allocated to California, based on the size of California's population as a measure of benefits received, then California's G_p is greater than its G_b .

Pittsburgh from the production of defense goods in California.

iv) urban area allocation of its state government expenditures consisting of goods and services produced within the state (G_t). This can be conceived of as consumption benefits received from the state government on basis of the location of production in the state. The production can take place in either the urban area or in the rest of the state, or in both places.

Hence:

$$G = G_s + G_w + G_m + G_t$$

Note that G_s is actually an urban government purchase whereas G_w , G_m , and G_t are measures of benefits received by a city. The word "purchase" is used only in reference to the private sector, whereas the word "allocation" refers to distribution of benefits received from the federal and state governments.

Rewrite (9) as

$$(16) \quad I + (X - D) + (G - G_m) = S + T_n - (D + G_m)$$

where $X - D = X_d$, defined earlier as private net exports from domestically employed resources; and where $G - G_m = G_s + G_w + G_t$ is defined as public net government purchases and allocations (or purchases of government services from the private sector, allocations from the federal government agencies located in the state and allocations from the state government of the state in which the city is located.)

Equation (16) can be regarded as a balancing equation showing the "injections" to and "withdrawals" from an urban economy. The left hand side is reduced to the amount of injections emanating within the borders of a city. The same reduction is made of the withdrawals from an urban economy to the level of withdrawals emanating within the city. However, there can be some leakage from $G - G_m$ because G_s includes purchases outside as well as inside the city. This is taken account of later on.

Also, note that net exports can be broken according to equation

$$(17) \quad X = X^F - M^F$$

where X^F is gross foreign exports and

M^F is gross foreign imports

$$X^F = X^{F,RUS} + X^{F,OUS}$$

$$M^F = M^{F,RUS} + M^{F,OUS}$$

where $X^{F,RUS}$ is foreign exports to the rest of the U.S.

$X^{F,OUS}$ is foreign exports to outside the U.S.

$M^{F,RUS}$ is foreign imports from the rest of the U.S.

$M^{F,OUS}$ is foreign imports from outside the U.S.

Next, consider the spatial disposition of consumer expenditures:

Let C_p = Consumption expenditures of consumer goods and services produced by a city regardless of the residence of the people making the purchases. This consists of three parts.

$$(18) \quad C_p = C^R + C^{RUS} + C^{OUS}$$

where C^R , as defined earlier, consists of intraurban personal consumption expenditures by the residents of a city. C^{RUS} equals consumption expenditures in a given city by the residents of the rest of the U.S. C^{OUS} equals consumption expenditures in a given city by the residents of other countries.

In other words, total urban consumption expenditures for the production of a city's goods and services can be broken down into three components: expenditures by the residents of the city, expenditures by residents of the other areas of the U.S., and expenditures by residents of other countries. Such a breakdown is especially meaningful to cities dependent on tourism from other areas of the U.S. and abroad.

A more general formulation of the balance between the "injections" to and the "withdrawals" from an urban economy than the one shown in equation (16) begins with a breakdown of D into:

$$(19) \quad D = D_K + D_L$$

where D_K is the income received on foreign investments in the form of interest, dividends, and branch profits net of foreign earned urban area income of the same type.

D_L is the net exchanges of the labor with the rest-of-world. These are laborers who are residents of a city but work elsewhere. For example, persons who commute across urban boundaries to work will find their wages and salaries included in D_L .

Therefore equations (10) and (12) can be rewritten respectively as

$$(10^1) \quad GUP = GUP_p + D_K + D_L$$

$$(12^1) \quad X = X_d + D_K + D_L$$

Also MF , defined as imports from the rest-of-the-world including the rest-of-the-states in the U.S. consists of

- i) consumer expenditures on imports (C^F)
- ii) urban government purchases and allocations from the rest-of-the world (G^F); here G^F is equal to the sum of $G_m + G_f$. The symbol G_m , defined earlier, is the allocation of federal government expenditures consisting of goods and services produced in other areas in the U.S., and G_f is urban government purchases of foreign (rest-of-the U.S. and outside the U.S.) private goods and services. It is assumed that urban governments do not exchange goods and services among themselves.
- iii) business expenditures on imports (B^F).

Gross exports (X^F) consist of:

- a) business sales to rest-of-world (B^E)
- b) D as defined above.

Net exports (X) can now be written as

$$X = X^F - M^F = B^E + D - C^F - G^F - B^F$$

and net exports from domestically employed resources are

$$X - D = X_d = (B^E - B^F) - C^F - G^F$$

Rewriting (16) as a more general balancing equation we have:

$$(20) \quad I + (X - D) + (G - G^F) = S + T_n - (D + G^F)$$

Equation (20) shows that the amount of injections (left side of the equality sign) and the amount of leakages (right side of the equality sign) is reduced by $D + G^F$, the sum of net income received of foreign investments and government expenditures from the rest-of-the-world.

The reduction of $D + G^F$ can be broken down into

$$(D_L + D_K) + (G_m + G_f)$$

The full breakdown of urban government expenditures is

$$G = G_m + G_f + G_w + G_d + G_t$$

where $G_m + G_f = G^F$ is urban government allocations and purchases of foreign goods and services from the federal government and the private sector respectively. Earlier we had defined G_s as urban government purchases from the private sector regardless of the location of the productive resources. Subtracting G_f , the foreign sector, from G_s leaves urban government purchases of domestically produced goods and services, symbolized as G_d . In other words, urban government allocations of federal government expenditures in the form of consumption benefits are:

$$G_m + G_w$$

and urban government purchases from the private sector are:

$$G_d + G_f$$

In summary the extraordinary openness of an urban economy calls for extended ways of conceiving of how the foreign and government sectors ought to be treated. For example, extending the concept of D , urban income received on foreign investments net of urban income earned by foreigners so that it becomes the sum of D_K , net investment income from outside the city, and D_L net labor income from outside the city, helps determine urban "income received" and "income produced." Also urban government expenditures and allocations refer to direct purchases plus benefits received. Treating the urban foreign and government sectors in this manner allows for more realistic balancing equation showing the "injections" to and "withdrawals" from an urban economy.

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