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Role of Services in Regional Economy Growth

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ABSTRACT Although the final demand-oriented export base paradigm dominates economic development theory and practice, its usefulness is increasingly questioned because of the changing structure of modern economies, empirical critiques of export-led growth strategies, and studies that decompose the actual sources of growth. The importance of service industries, especially local services and their role in inducing economic growth, requires a measure that includes both forward and backward linkages to empirically account for the complete role of an industry. Using data for New York State, we demonstrate how the input-output-based method of hypothetical extraction can more appropriately measure the economic linkage of a broader range of contemporary economic sectors (including services) than traditional, final demand-induced, backward-linkage multipliers. Our analysis provides empirical support for greater economic development attention to be directed toward local services.

Introduction

In this paper, a "disconnect" in the applicability of one of the most widely accepted regional science methods to a practical local economic issue is addressed: how to evaluate the economic significance of goods and services that are not produced for foreign or domestic export and are often characterized by strong forward (sales) linkages within a regional economy. Goods and services with these characteristics have been of little interest to most planners, regional economists, and economic developers despite their growing role in regional economies and leading association with job growth. This disinterest is consistent with the continuing influence of export base theory on the one hand and the related

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prevalence of multiplier and economic impact analysis on the other. Because such goods and services are of less interest than export-oriented industries, little effort has been made to apply or adapt the standard economic development toolkit to analyze them. The goal of this paper is to demonstrate an alternative analytical framework that does not, *a priori*, discourage consideration of these types of industries. To do this, hypothetical extraction (HE), which uses the standard input-output (I-O) formulation of the structure of an economy, while capturing the full range of forward and backward interindustry linkage, is employed.

A summary of changes in the overall composition of the U.S. economy and two views of the role of services in these changes is followed by a review of the literature that has focused attention on exporting industries as the drivers of economic growth. Next, an alternative "key industries" literature that utilizes both forward and backward linkage as indicators of economic significance is presented. Finally, using an I-O model of New York State, empirical comparisons of alternative indicators of economic significance, multipliers, and HE are made. As a measure of *total* linkage, HE develops an inclusive picture of the importance of sectors that may "induce" and/or "enable" economic development. We are especially interested in the implications of such indicators for industries that are not primarily oriented toward exports. Examples, based on the New York State economy, give special attention to industries that sell primarily to households.

The Roles of Manufacturing, Services, and Exports in Regional Analysis

As economic restructuring proceeds and the role of manufacturing recedes, industries generating forward-linked, domestically consumed goods and services account for a growing share of the value of total output. From 1987 to 1997, the manufacturing sector fell from a 30 percent to a 25 percent share of total U.S. output, while the service sector share (excluding transportation and trade) increased from 34 percent to 44 percent (Bureau of Economic Analysis [BEA] 2004). The BEA I-O accounts show that the declining manufacturing sector delivered a higher proportion of its output to foreign exports than did any of the growing sectors. To better capture interindustry and growth relationships in a changing economy, indicators that can account for the potential importance of sectors with strong domestic linkages are needed.

Bhatta (2002), Holland and Cooke (1992), and Martin and Holland (1992) use I-O tables for different points in time to articulate the relationship of changes in output to changes in the several components of final demand and to changes in underlying production relationships or technology. Together, these studies draw attention to the importance of domestic final demand and underscore the diversity of industries in the "economic base." They find that domestic and foreign exports have enhanced importance in smaller economies.

Because the service sector has grown to now account for nearly two-thirds or more of total U.S. consumption and output (Planting and Kuhbach 2001; Von Wachter 2001), the need to understand the relationship between the export base and the service sector has increased in importance. However, even though most analysts would take the growth in

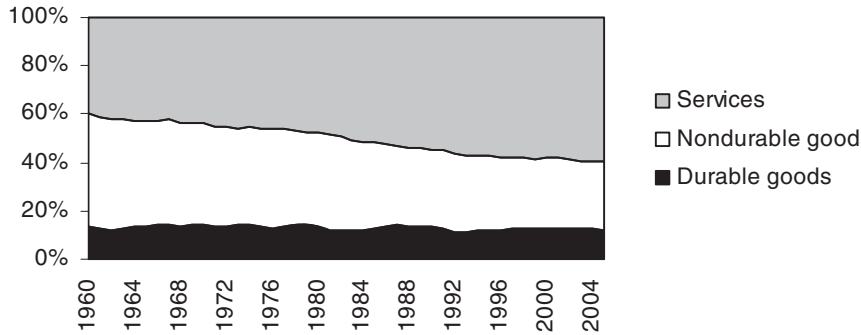

FIGURE 1. COMPOSITION OF U.S. CONSUMPTION: 1959–2004.
Source: Economic Report of the President 2006, U.S. Office of Management and Budget Table B-2: Real gross domestic product, 1959–2004 (billions of chained [2000] dollars, except as noted; quarterly data at seasonally adjusted annual rates).

service's relative share of output, employment, and consumption as *prima facie* evidence of restructuring, this conclusion has been challenged by a critical interpretation of the data that reveals a service sector "cost disease" (Baumol and Bowen 1966; Baumol in ten Raa and Schettkat 2001:chap. 1). The primary symptom of this "disease" has been the lagging productivity growth in services relative to manufacturing. Kozicki (1997) suggests that sluggish productivity growth in the service sector has been a drag on the economy and is caused by the lagging adoption of technology in that sector. This lower productivity growth then drives "exploding" service costs. Consistent with this "cost disease" view, much of the growth in services output is then seen as an illusion, when adjusted by sector-specific price indexes. Consumption decompositions showing a long-term expansion in the services component (see Figure 1) suffer from this same cost illusion. The observation that "in spite of their exploding costs, demand persists" has been called "the paradox of the services" (ten Raa and Schettkat 2001:xii). When considered in real terms, services retained a "roughly constant" share of economic output even as real income per capita increased (Baumol in ten Raa and Schettkat 2001:18). Because Baumol attributes increased relative service costs to labor that has limited ability to achieve productivity improvements, the growth in services also retains high visibility in employment data (see Figure 2). In the U.S., service employment has exceeded half of the total employment for over fifty years (Drejer 2002) and recently has reached nearly 80 percent.

However viewed, either as a structural change or as a "productivity" disease, the services industries deserve, and will undoubtedly receive, more attention *vis-à-vis* the goods-producing industries. Consequently, we need to reexamine the limitations of basic analytic approaches in order to better understand the role of services in regional economic development.

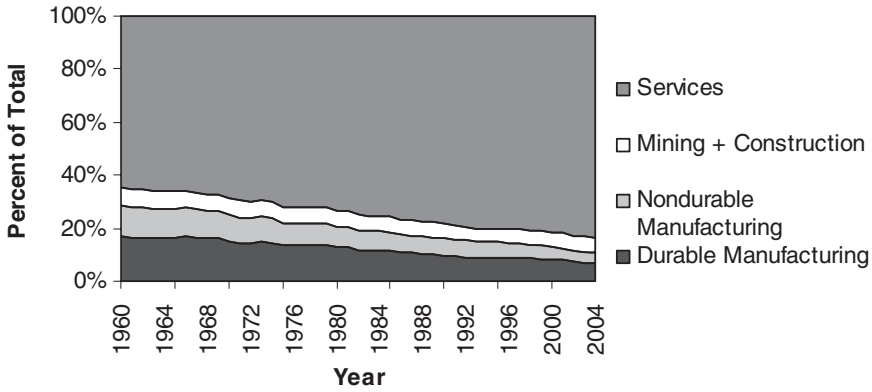

FIGURE 2. EMPLOYMENT BY INDUSTRY CLASS: 1960–2004.
Source: Economic Report of the President 2006, U.S. Office of Management and Budget, Table B-46.

Export Base

Export base theory relegates economic sectors that are not export oriented to a role that is subordinate and derivative, labeled variously as "secondary," "residentiary," "residential," and "services" (Isard 1960; Tiebout 1962) or more provocatively, "parasitic" (Williams 1996, 1997). Nonbasic industries have frequently been associated with and sometimes fully conflated with the service sector (cf. Isard 1960; Lass and Diamond 1980). While the export base theory does not entirely ignore sectors that are not export oriented, it assigns to them an entirely passive role by assuming that external markets are the only forces driving local production and income. Although the focus is often on traditional exports of goods and services, the logic of export base can also accommodate other factors as regional growth stimuli, for example, trade in services and nontrade sources of extraregional income (e.g., transfers), especially when integrated into the social accounting matrix (SAM) extension of I-O analysis (Roberts 2003; Thorbecke 1998). The SAM extension stays within the export base tradition insofar as it maintains a focus on growth that is driven by a source of demand external to a regional economy.

Despite long-standing recognition of its restrictive assumptions and related limitations, the export base theory provides the foundation for an elementary form of multiplier analysis and, more importantly, an influential theory of "long-run growth" (Richardson 1969; also Isard 1960; Glickman 1977; Schaffer 1999; Hughes 2003). Interpretations of the export base theory have for decades informed practical and theoretical debates over strategic approaches to international (Bruton 1998) as well as domestic (Jacobs 1984) regional development. In a famous exchange between North (1955, 1956) and Tiebout (1956a,b), the role of exports in determining regional income and growth was debated. North, the protagonist, argued that the importance of the export base is a result of its primary role in

determining the level of absolute and per capita income in a region (1955:257). Tiebout, the antagonist, argued that the exclusive association of income determination with exports has "led to some erroneous conclusions about regional income and regional development" (1956a:160). Along similar lines at about the same time, Blumenfeld (1955) presented a detailed critique of the use of the "basic/nonbasic" nomenclature. In arguing that the demand of local households is the foundation of any economy, he concludes, "In any common-sense use of the term, it is the 'service' industries of the metropolis that are 'basic' and 'primary', while the 'export' industries are 'secondary' and 'ancillary' " (Blumenfeld 1955:132). Recently, drawing from the supply side, alternative theories of trade and growth have extended established neoclassical foundations to highlight the role of capital stock, labor supply, and technical progress. These extensions emphasize the centrality of knowledge and information, technological innovation, regional clustering and agglomeration, and the "creative economy," all factors that support a much more inclusive notion of industry mix in the definition of a region's "economic base" (Cheshire and Malecki 2004; Florida 2002; Porter 2003). Following a review of six leading theories relating exports to growth, Leichenko's (2000) empirical tests of the direction of causality between exports and growth suggest bidirectional relationships.

Much of the new work on the role of exports draws fresh attention to the nonexporting sectors. Porter (2003), in his analysis focused on the importance of traded sectors, found that industries serving primarily local markets account for 67 percent of total U.S. employment and showed faster employment growth (1990–2000) than "traded" industries (2.8 percent vs. 1.7 percent). Markusen (2004) and Markusen and Schrock (2006) also document faster job growth in nonbasic or "residentiary" industries and admonish that "local-serving activities" can enhance the competitiveness of exporting sectors. Empirical decompositions of growth attribute the post-1995 resurgence of the U.S. economy first and foremost to investments in information technology. According to Jorgenson, Ho, and Stiroh (2003:318), the impact of these investments was concentrated in a relatively small number of service and government industries—led by households, finance, wholesale trade, and other business services—that are not necessarily export oriented and where manufacturing is "notable by its absence."

Despite this broadening scope of attention, an underlying export base orientation continues to be very evident. Porter's (2003:571) work emphasizing the importance of regional industry clusters concludes, for example, that economic development policy should "be particularly attuned to traded clusters," because they provide higher wage rates and "appear to drive" employment and wages in industries serving primarily local markets. Even as its limitations are readily acknowledged, export base thinking continues to have a large influence.

How to Treat the Service Sector

The World Bank Group (2002:70–71) usefully draws attention to the characteristics of many services that distinguish them from tradable (and exportable) merchandise. Although services are diverse, they are often "intangible, invisible, perishable," and because they

"usually require simultaneous production and consumption," they often necessitate a physical proximity between supplier and consumer, especially for consumer as opposed to producer services. Nevertheless, (international) trade in services as a whole has been growing faster than trade in goods (World Bank Group 2002). The report on service industries voices the conclusion that "services are vital for economic development" (World Bank Group 2002:69), but notably does not extend this vitality to nonexport-oriented services.

The marginalization of service industries within the export base theory has diminished somewhat in recent years. Challenges from within the framework of the demand side growth theory itself show that many service industries, when analyzed at appropriate levels of disaggregation, do have strong backward-linkage multipliers and export markets (Richardson 1969). For example, Porter (2003) uses measures of regional employment concentration to classify industries as local or traded and then concludes that, while the majority of nearly 400 U.S. service industries primarily serve local markets, more than 150 are oriented to external markets. Producer services have been the object of particular attention because of their high growth rate within the growing service sector, their association with the "new economy" (Daniels 2004), their role in facilitating exports of goods (Daniels 2000), and their large backward linkages (Besser 2003; Coffey 1996; Francois 1993; Francois and Reinert 1996).

Williams (1997) extends the exportable services critique to less commonly acknowledged consumer services highlighting that consumer services constitute the "vast bulk" of the service industry as a whole. After focusing on the empirical analysis of industries such as tourism, sports, higher education, retailing, and culture, he concludes that many consumer services both generate substantial income from external sources via exports and strengthen backward linkages by preventing leakages. Despite Williams's vigorous defense of the role of consumer services in economic growth, he reinforces the notion that industries without strong backward linkages and export markets can be ignored.

Viewed from within the export-oriented framework, industries that deliver most of their output to the final demand of local households would thus appear to be of especially low interest, except as they plug import-induced leakages in local purchasing patterns. Consistently, "the limited economic interest in the service sector in the past may partly be explained by the fact that a major part of the employment in the service sector is in the 'soft' areas of community, social and personal services" (Drejer 2002:391). However, household purchases of local services legitimately represent more than just final consumption. Many household purchases also may be considered inputs to a more general household production function (Ironmonger 2001), for example, the role of child care in parent labor mobilization (Goetz 2006:42,46; Kimmel 2006; Warner 2006). Treating household services as inputs is a notion quite consistent with an interindustry I-O framework. Such input purchases, mainly from service industries, and their subsequent household output should not be dismissed when considering economic development opportunities. However, in official U.S. national income and product accounts, "the concept of production has been linked to the concept of a market where that output can be traded. While it is clear that

households do produce goods and services, this production is not typically traded in the market, and has therefore been excluded from the accounts" (Landefeld and McCulla 2000:292). Such an exclusion is undesirable when considering any industry's economic importance (Ironmonger 1996). The U.S. BEA has recently constructed household satellite accounts that show the importance of household production (Landefeld and McCulla 2000). Estimates of household production ranged from 12 percent to 58 percent of the gross domestic product (GDP) in 2004 (Landefeld, Fraumeni, and Vojtech 2005).

Alternative Measures of Industry Significance—"Key Sectors"

The concept of the "economic significance" of an industry is traditionally defined by the extent to which associated local industries respond directly and indirectly to changes in export sales by that particular industry. In contrast, an alternative perspective has long existed within the "key industry sector" literature (Beyers 1976; Schultz 1976; Strassert 1968). This alternative approach is based on an analysis of a more complete set of economic linkage relationships than those summarized in backward-linked multipliers. In particular, it also accounts for the production that is supported through forward linkages by local supplies of inputs (Miller and Lahr 2001). Because I-O fundamentally encompasses the interrelatedness of industries in both up- and downstream directions, it is a well-suited tool for this more complete linkage analysis.

Albert O. Hirschman (1958) popularized the concepts of backward and forward linkages in his prescription for economic development planning. Working in the context of international development of underdeveloped countries, Hirschman considered backward linkages to be more important than forward linkages. As production increases to meet new (presumably external) demand, the producer must purchase new backward-linked inputs. In contrast, while an increased supply of intermediate goods would normally follow the producer's expectations of delivery to a forward-linked market, it enables, but does not compel, in equal measure, the forward-linked industries to purchase the increased output. Nevertheless, profit-seeking producers tend to pursue and create market opportunities for their products, and Hirschman maintained that forward linkage constitutes an important inducement to growth, especially insofar as it "acts as an important and powerful reinforcement to backward linkage" (Hirschman 1958:117).

While Hirschman's prescriptions for economic development have waxed and waned in popularity since the 1950s, interest in measuring the forward and backward linkages has persisted. These concepts took on empirical content in the context of I-O analysis. This measurement is variously done under the labels of "key sector," "important industry," or "interindustrial linkage" analysis. Within this strand of literature, several attempts have been made to use a modification of I-O to mimic output multipliers with "input" multipliers, which are designed to attribute the chain of forward linkages to an industry (Beyers 1976; Ghosh 1958; Jones 1976; Khayum 1995). These have seldom been used in applied studies, especially at the local level, because of problems with economic interpretation (Dietzenbacher 1997; Miller and Lahr 2001). Miller and Lahr (2001) argue that within an economic development context, a total linkage measure that does not distinguish forward

and backward components is appropriate. Following Miller and Lahr, we propose that a simple total measure of linkage, both forward and backward, is desirable in order to present a comprehensive picture of the importance of industries that may both "induce" and "enable" economic development. Whether or not a given industry shows up as important using combined forward and backward-linkage measures is an empirical matter that we will illustrate below.

Method: From I-O Multipliers to HE

We are especially interested in exploring the relative measures of linkage for those industries, largely personal services, which primarily serve local, household demand. What do we know descriptively about their linkage effects? Can these be considered relevant to regional economic development debates? To bring empirical content to our discussion, we construct a 509-industry regional I-O model of New York State's 2001 economy and compare output, employment, and linkage effects using standard backward-linkage multipliers as well as total linkage measures provided by HE.

I-O accounts are of central importance to regional scientists in evaluating the importance of different industries. Multipliers have been (Isard 1960:310) and continue to be (Hughes 2003) routinely employed in the analysis of the economy-wide regional impacts of economic activities in sectors ranging from agriculture and manufacturing to tourism, typically with the goal of demonstrating the economic significance of a sector or project that is seeking public support. The familiar theoretically derived mathematical requirement of impact analysis is that impacts be calculated as the product of the multiplier and an exogenous shock to the economy—i.e., the product of a measure of the strength of sectoral interdependence or "backward" linkage and the strength of an initial, exogenous, growth stimulus.

Recently, the strengths and weaknesses of numerous variations of broader linkage measures have received renewed attention from I-O researchers (Cai and Leung 2004; Miller and Lahr 2001). From this work it is clear that a critical distinction needs to be made between linkage measures viewed as predictive economic impact measures and linkage measures from a more "descriptive" perspective.

Cai and Leung (2004:66) argue that a sector can exhibit a variety of linkage characteristics, depending on at least two elements: "the (hypothetical) exogenous shocks that cause the impacts and the assumptions on the underlying impact mechanisms," where each element can be defined and interpreted in alternate ways. Oosterhaven and Stelder (2002) draw attention to an important distinction, clear in abstraction if not always in practice, between linkages that have the capacity to carry growth impulses in a passive sense and those that are able to generate as well as transmit growth impulses. Hirschman (1958), too, drew attention to the multidimensional nature of impact measures, which reflect both the quantity of output produced and the likelihood that it might actually be produced as a result of any given stimulus.

Drawing on both the descriptive and impact interpretations of linkage measures, the method of HE has been recommended as a measure of total linkage, forward plus

backward, of an industry sector (Cai and Leung 2004; Leung and Pooley 2001; Miller and Lahr 2001; Oosterhaven and Stelder 2002; Schultz 1976; Strassert 1968). HE quantifies how much an economy's total output would hypothetically decrease if an industry were to be "extracted" from that economy. By extracting the industry, both the local purchases by the industry (i.e., backward linkages) and the local sales from the industry (i.e., forward linkages) are eliminated or hypothetically transformed from local purchase and sale transactions into imports and exports. The resulting change in total local economic activity would reflect the total loss, resulting from broken internal linkages, from the extraction of the chosen industry. Variations of HE have been increasingly employed to identify key or important economic industries.

Though there are some real-world analogues to HE (Miller and Lahr 2001), it is the "hypothetical" nature of the HE measure that moves it away from the impact and toward the descriptive realm. HE is used to produce a measure for ranking the relative economic importance of industries, somewhat more akin to the static measures of output or employment. HE measures "are not intended to be used as multipliers for impact evaluations, but as linkage measures to provide general and comparable information regarding sectors' linkages" (Cai and Leung 2004:72).

Miller and Lahr (2001:425) demonstrate that from a practical perspective, many of the HE variants are either identical or are likely to produce similar empirical rankings of industry importance. They endorse the HE measure originally proposed by Paelinck, de Caevel, and Degueldre (1965) and then employed by Strassert (1968), which is based on the Leontief model and does not attempt to decompose the total into forward and backward components. Based on Miller and Lahr's discussion, we adopt a version of their "complete extraction," whereby all forward and backward linkages between the industry of interest and all other industries are removed. More explicitly, to calculate our HE measures, the row and column vectors in the direct requirements (a_{ij}) matrix, representing the unitized inputs and outputs of the sector to be extracted, are set to zero before the Leontief inverse is calculated. The multipliers derived from this altered Leontief inverse are multiplied by the unchanged final-demand vector to calculate the reduced value of economy-wide output under the hypothetical scenario where all local purchases and sales of the extracted industry are assumed to be replaced by imports and exports, respectively.

Extraction measures can be calculated whether or not households are endogenized, i.e., included in the Leontief inverse. We calculate both Type I (households exogenous) and Type SAM (households endogenous) in our models. We are especially interested in industries that sell primarily or exclusively to local households. If households are treated exogenously, i.e., as part of final demand, these sectors will have zero or near-zero forward linkages. If, as is more typical, households are treated endogenously, HE involves the elimination of an industry's forward linkage to households as well as its backward linkage to suppliers. Household-serving industries induce economic activity not only through their backward purchase linkages, but also enable economic activity through forward linkage by supporting households either as consumers or suppliers of labor. HE captures the total value of these broken linkages. Both I-O and HE models have been used to assess the linkage effects

of household-serving sectors such as child care (Pratt and Kay 2006; Warner and Liu 2005, 2006).

Empirical Comparisons of Sectoral Importance

Using a 509-industry regional I-O model of New York State's 2001 economy, we first compare industry rankings on the familiar bases of total output and total employment. Then we compare four types of linkage measures: output multipliers with households treated both exogenously (Type I) and endogenously (Type SAM), and HE measures with households treated exogenously (Type I) and endogenously (Type SAM).[1] The data and multipliers are derived from the MIG's IMPLAN® Pro software.[2] The HE measures are calculated for each industry using a program written in SAS to manipulate the IMPLAN industry-by-industry transactions matrix.

Table 1, displaying aggregated totals and multipliers for eight major sectors, shows that services dominate the New York State economy in terms of the traditional indicators of output and jobs, with government, trade, and manufacturing also constituting major fractions of the economy. The Type I (no household-spending effects) and Type SAM (household-spending effects included) multipliers, averaged across industries within each major sector, are highest for the utility, mining, and trade and transportation sectors, and lowest for services, when no household-spending effects are considered. When including the effects of income changes on household spending by using the Type SAM multipliers, the service sector still ranks last, but manufacturing moves to the third position ahead of utilities. Manufacturing industries are among those industries typically privileged by economic development policy in part because of these large backward-linkage multipliers, the potential to serve the export markets suggested by the export base theory, and because some of these industries have historically offered better-paying jobs.

Consistent with the production relationships captured in I-O, industries that produce large quantities of output tend to be backward-linked to local industries providing large quantities of inputs and to be forward-linked to local industries producing a large output value. Thus, the hypothetically extracted values of linkages for industries with large outputs have a logical tendency to be large themselves. For the New York model, the correlation between an industry's Type I HE measure (linkages to households not included) and the value of output is not absolute; but at 0.88, the correlation coefficient is very high. The correlation of the Type SAM HE measure (linkages to households are included) to output is even higher at 0.94.

As is true with multiplier measures that are scaled independently of industry size, more insights are provided by normalized HE measures that contrast the value of direct industry output with the value of linked output throughout the rest of the economy. Our normalized HE measure is the ratio between the total value of extracted output, including forward and backward linkages, and the output value of the industry in question. This normalized extraction measure shows the relative value of an industry's forward and backward linkages and is less than one if the value of an industry's output is greater than the value of output to which it is linked, directly and indirectly, in the economy. Table 2 shows normalized

TABLE 1. MAJOR SECTORS' OUTPUT AND EMPLOYMENT, NEW YORK STATE (2001).

Major sector	Output (million $)	Number of jobs	Type I multiplier	Type SAM multiplier
Services	758,248 **(1)**	5,863,825 **(1)**	1.25 **(8)**	1.50 **(8)**
Manufacturing	160,064 **(2)**	714,057 **(4)**	1.29 **(5)**	1.72 **(3)**
Trade and transportation	157,084 **(3)**	1,837,268 **(2)**	1.35 **(3)**	1.78 **(2)**
Government and other	132,000 **(4)**	1,413,174 **(3)**	1.29 **(5)**	1.55 **(6)**
Construction	48,946 **(5)**	495,874 **(5)**	1.32 **(4)**	1.62 **(5)**
Utilities	21,301 **(6)**	42,221 **(7)**	1.37 **(1)**	1.67 **(4)**
Agriculture, forestry, fishing	5,263 **(7)**	70,853 **(6)**	1.29 **(5)**	1.55 **(6)**
Mining	1,935 **(8)**	8,493 **(8)**	1.36 **(2)**	1.83 **(1)**

Note: Numbers in bold inside parentheses indicate rank. SAM, social accounting matrix.
Source: IMPLAN analysis.

TABLE 2. MAJOR SECTORS' AVERAGE EXTRACTION/OUTPUT, NEW YORK STATE (2001).

Major sector	Type I extraction/output	Type SAM extraction/output
Construction	0.65 **(1)**	0.95 **(6)**
Trade and transportation	0.64 **(2)**	1.57 **(1)**
Utilities	0.57 **(3)**	0.99 **(4)**
Manufacturing	0.55 **(4)**	1.28 **(3)**
Services	0.55 **(4)**	1.31 **(2)**
Mining	0.51 **(6)**	0.98 **(5)**
Agriculture, forestry, fishing, hunting	0.45 **(7)**	0.91 **(7)**
Government and other	0.45 **(7)**	0.91 **(7)**

Note: Numbers in bold inside parentheses indicate rank. SAM, social accounting matrix.
Source: IMPLAN, calculations by authors.

extraction measures averaged across all industries in each of the eight major sectors. Construction, trade and transportation, and utilities have, on average, the largest normalized extraction measures when household linkages are considered exogenous (Type I). Services jump to second when household linkages are included. This stands in stark contrast to services' last-place ranking with the standard backward linkage multipliers shown in Table 1. Overall, HE points to the importance of an industry's forward and backward linkages to the broader New York State economy and shows the importance of services relative to the other major sectors.

Table 3 shows the ten individual industries with the highest ratios of extracted linkage to output, with households excluded and included in the extraction, respectively, and compares their ranks to other measures of importance. As was also true for the Type I multipliers, nearly all the individual industries with the strongest combined forward and backward linkages to New York's other industries, when households are exogenous (Type I), are manufacturers. This result shows the diversity of individual manufacturers even though the average for the manufacturing sector as a whole is only fourth in Table 2. Notably, the top-ten-ranked extraction industries in Table 3 (mostly construction and packaging inputs) all have significant forward linkages to other sectors.

The bottom of Table 3 shows the individual industries with the strongest combined forward and backward linkages to all other industries, when households are endogenous (Type SAM). This list includes a nearly equal number of service and manufacturing industries. The top-ranked industry is passenger transit, a critical input to the regional economy, especially for households. Two of the four service industries appearing on the list, "veterinary services" and "civic, social, professional and similar organizations," do not

TABLE 3. RANKS AMONG 509 NEW YORK STATE INDUSTRIES COMPARED BY INDICATORS OF IMPORTANCE (2001).

	Major sector	Hypothetical extraction		Multipliers		Industry	
		Type I	Type SAM	Type I	Type SAM	Output	Jobs
Top ten industries ranked by Type I extraction							
Wood preservation	Manufacturing	**1**	7	5	25	441	450
Veneer and plywood manufacturing	Manufacturing	**2**	28	22	67	463	449
Wood windows and door manufacturing	Manufacturing	**3**	29	56	100	274	258
Sawmills	Manufacturing	**4**	54	21	82	221	207
Engineered wood member and truss manufacturing	Manufacturing	**5**	34	72	112	396	350
Pipeline transportation	Trade	**6**	19	83	88	294	377
Cut stock, resawing lumber, and planing	Manufacturing	**7**	76	10	38	314	342
Reconstituted wood product manufacturing	Manufacturing	**8**	84	89	264	401	405
Plastics bottle manufacturing	Manufacturing	**9**	86	217	383	319	330
Flexible packaging foil manufacturing	Manufacturing	**10**	95	26	121	440	465

TABLE 3. (CONTINUED)

	Major sector	Hypothetical extraction		Multipliers		Industry	
		Type I	Type SAM	Type I	Type SAM	Output	Jobs
Top ten industries ranked by Type SAM extraction							
State and local government passenger transit	Services	106	**1**	20	2	98	54
Animal, except poultry, slaughtering	Manufacturing	32	**2**	3	7	273	352
Civic, social, professional and similar organizations	Services	91	**3**	117	22	106	42
Fluid milk manufacturing	Manufacturing	50	**4**	2	5	122	163
Veterinary services	Services	200	**5**	110	34	169	115
Funds, trusts, and other financial vehicles	Services	108	**6**	6	6	47	92
Wood preservation	Manufacturing	1	**7**	5	25	441	450
Miscellaneous store retailers	Trade	150	**8**	78	32	68	36
Cellulosic organic fiber manufacturing	Manufacturing	163	**9**	19	1	467	406
Cheese manufacturing	Manufacturing	40	**10**	1	4	129	195

Note: Numbers are ranks in the 509 sector model. SAM, social accounting matrix.
Source: IMPLAN, calculations by authors.

appear on the list of the largest backward-linked SAM multipliers, pointing to the importance of large forward sales to households for these industries. Only one industry, wood preservation, appears in both parts of Table 3.

The remaining columns of Table 3 summarize the rankings across a number of different indicators for the industries that rank at the top for the two extraction measures. Looking first at the top half of the table for the leading industries for the Type I extraction measures, it becomes clear from the output and jobs columns that none would attract attention on these bases alone. Additionally, only five are among the fifty highest-ranked industries ranked by the Type I multiplier, while only two are among the top fifty ranked by the Type SAM multiplier. Multipliers do not capture the important forward linkages that these industries provide.

The leading sectors ranked by the Type SAM normalized extraction measures (the bottom half of the table) exhibit a different pattern. In terms of output and jobs, these industries cover a wider range across the spectrum, from relatively large to relatively small. Although the rankings are quite different individually, the top ten industries listed by Type SAM extraction also include seven industries which are among the top fifty when ranked by Type I multiplier, and all ten are among the top fifty when ranked by the Type SAM multiplier (including six in the top ten). The importance of household linkages in the regional economy helps to explain this greater consistency in rankings across measures of importance when households are considered endogenously.

Linkage Effects of Industries Primarily Serving Household Demand

For this analysis, individual industries delivering 95 percent or more of the value of their output to households were identified. For New York State, twenty-five of the 509 industries delivered at least 95 percent of their final demand delivered to households. Table 4 gives rankings across all 509 industries of output and linkage measures for these twenty-five industries. Based on IMPLAN data, these industries account for nearly one-quarter of output in the U.S. economy and 12 percent of output in the New York State economy. Twenty of these industries are ranked in the top half of all New York State industries by output, and eleven are in the top one hundred. Twenty of these twenty-five industries are in services or retail trade. The (imputed), value of the services provided to homeowners by their dwellings eating and drinking establishments, health care providers, and car repair and maintenance services make the largest contributions to state output, followed by several retail industries, recreation, and child care services. The proportion of jobs in these labor-intensive industries is higher than their output contributions, at 32 percent for the nation and 16 percent for New York State. Their output and employment rankings attest to the importance of local household purchases in the regional economy.

Table 4 also includes HE Type I and HE Type SAM output ratios for these industries. Among the industries serving household demand, only “civic, social, professional and similar organizations” ranks in the top one hundred New York State industries using the Type I extraction/output measure. This is not surprising, considering that the extraction Type I measure does not count any of the forward linkages to households. In contrast, while

TABLE 4. RANKS (OUT OF 509) FOR TWENTY-FIVE OF NEW YORK STATE'S INDUSTRIES WITH 95% OR MORE HOUSEHOLD FINAL DEMAND (2001).

Major sector	Individual industry name	Industry		Hypothetical extraction		Multipliers	
		Output	Employment	Type I	Type SAM	Type I	Type SAM
Services	Owner-occupied dwellings (imputed value)	5	479	468	167	438	481
Services	Food services and drinking places	11	1	199	21	161	66
Services	Offices of physicians, dentists, and other health	13	6	465	38	424	127
Services	Auto repair and maintenance, except car wash	22	21	105	41	76	149
Trade	Motor vehicle and parts dealers	39	28	323	22	277	92
Trade	General merchandise stores	53	16	336	44	334	159
Trade	Nonstore retailers	59	30	274	23	205	91
Trade	Building material and garden supply stores	67	44	207	48	340	180
Trade	Miscellaneous store retailers	68	33	150	8	78	32

TABLE 4. (CONTINUED)

Major sector	Individual industry name	Industry		Hypothetical extraction		Multipliers	
		Output	Employment	Type I	Type SAM	Type I	Type SAM
Services	Other amusement, gambling, and recreation	81	64	371	39	263	179
Services	Child day care services	93	46	364	35	225	141
Trade	Furniture and home furnishings stores	104	67	343	33	273	130
Trade	Sporting goods, hobby, book and music stores	105	51	156	14	133	64
Services	Civic, social, professional and similar organizations	106	38	91	3	117	22
Services	Personal care services	112	53	404	51	247	164
Trade	Electronics and appliance stores	118	69	226	16	441	68

TABLE 4. (CONTINUED)

Major sector	Individual industry name	Industry		Hypothetical extraction		Multipliers	
		Output	Employment	Type I	Type SAM	Type I	Type SAM
Trade	Gasoline stations	127	72	204	11	107	50
Services	Veterinary services	169	110	200	5	110	34
Services	Videotape and disc rental	191	121	426	78	338	407
Services	Car washes	226	120	153	58	377	341
Manufacturing	Other snack food manufacturing	260	323	231	57	124	299
Manufacturing	Frozen cakes and other pastries manufacturing	364	392	126	12	14	47
Manufacturing	Upholstered household furniture manufacturing	390	319	320	36	148	123
Agriculture	Hunting and trapping	415	352	477	193	464	483
Manufacturing	Tortilla manufacturing	470	455	240	53	173	237

Note: Numbers are ranks in the 509 sector model. SAM, social accounting matrix.
Source: IMPLAN, calculations by authors.

the extraction Type SAM rankings again place "civic, social, professional and similar organizations" near the top of this list, all but two of the other household serving industries are also ranked among the top one hundred, with only seven being left out of the top fifty. As we recognize the importance of both household demand and forward linkages in the regional economy, we see a different array of key industries.

Table 4 also provides ranks for backward-linkage multipliers. These should be interpreted with caution. These are industries for which little or no final demand other than household demand exists. With households assumed to be endogenous, there are limited sources of exogenous demand for these sectors and the SAM multipliers, predicated on changes in exogenous final demand, have limited practical meaning.

Discussion

The economy continues to shift its center of gravity from manufacturing to service industries involving food, health, recreation, child care, and similar fundamental household services, along with retail and business services. These service industries exhibit a strong combination of forward and backward linkages and play a strong role in supporting economic activity within the economy, precisely because of their importance to households. These industries provide critical local services that form part of the social infrastructure for economic development, beyond any impact on export promotion.

As economic developers give increasing attention to the importance of quality of life, locally serving industries (e.g., culture, arts, recreation, child care) are beginning to receive more economic development attention. Richard Florida (2002) argues these services are critical to supporting a creative economy. Ann Markusen (2004) points to their importance for metropolitan employment growth and argues that it is time to give more attention to occupations than industries in economic development strategies because labor is more permanent and a better investment in a region's economic future over the long term. Increasingly, economic developers are looking at the role of local services and linking economic development incentives to strategies that improve the wages and working conditions for the increasingly large portions of the labor force in such industries (Adams and Neumark 2005; Doussard 2006).

Local services are critical to regional economic vitality. Passenger transit ranks first among all sectors in the New York State economy when a Type SAM extraction method is used (Table 3). Our more focused analysis on household-serving sectors (Table 4) has identified other services such as civic and social organizations, retail trade, and child care as also important.

Across the country, economic developers and business leaders have been giving increasing attention to the role of child care in the regional economy (Warner 2006). We see from Table 4 that child care ranks thirty-fifth in Type SAM extraction, forty-sixth in employment, and ninety-third in output for New York State. Although at present, economic development policy in New York is *not* focused on child care, a 2006 survey of economic developers found more than 80 percent believed that child care should be part of economic development policy (Cornell University 2006).

Economic development policy should be focused on critical industries that face hindrances, constraints, or underutilized capacities relative to their regional economic importance. Increased attention to the cost–benefit analysis of economic development incentives provided by state and local government (Bartik 2005) should place a high value on the appropriate measurement of the total connectivity for all types of industries. Our HE analysis provides a descriptive measure that can be of clear use to state and local economic developers. For example, traditional economic development tools can be applied to the child care sector (Warner et al. 2004). These include strategies to improve employee retention, and efforts to enhance intermediary functions for labor management and consumer information. In addition, policies that stimulate effective demand through parental child care subsidies would also help address labor shortages in other sectors by freeing more parents to work (Kimmel 2006).

The significance of these local service industry linkages is enhanced as increased recognition is given to the heretofore undercounted role of households as producers in national accounts. In particular, the purchases made by households are being more formally recognized for their roles as consumption, and as both capital and current inputs to the household sector's economic production activities. As economic development practitioners recognize the importance of household services, they challenge us to develop theories and methods that more appropriately measure the role of services and household demand.

Conclusion

This paper was stimulated by the question of how to most appropriately measure the economic development significance of nonexporting, mainly forward-linked, sectors and individual industries. These industries tend to be taken for granted or considered insignificant by analysis that is guided by the logic of the export base theory, where the stimulus for all economic activity is sales to exogenous final demand components.

Whether the increased cognizance of service industries in economic development is evidence of a "new economy" or of a "diseased" sector will continue to be debated by economists. "While the concept of a 'new economy' is contested, there is perhaps more widespread support for the view that economic change is increasingly shaped by the behavior of service firms" (Daniels 2004:129). This reshaping has engendered calls for a new research agenda. "I argue that existing theory and approaches to measurement need to be modified, need to be refined, need to be redefined in order to respond meaningfully to the new twists and turns taking place in the industrial economies around the globe" (Beyers 2002:5).

As a start, economic development practitioners need analytic methods that are not preconditioned on an export base view of development. We present HE as an analytical alternative to I-O multipliers. HE is a method that makes use of the well-developed interindustry framework, while not privileging export-oriented industries over local, especially household-serving, industries. HE's applicability is independent of a sector's or an individual industry's final demand composition, making it as applicable to nonexporting,

forward-linked sectors as to their basic, mainly backward-linked, counterparts. As such, it provides a more complete descriptive measure of the regional economic importance of economic sectors.

NOTES

1. IMPLAN Pro multipliers come in multiple varieties and with inconsistent naming conventions. Ours are adapted from those employed by the Minnesota IMPLAN Group (MIG, Inc.). Type I multipliers are calculated using the standard Leontief inverse matrix $(I–A)^{-1}$, where the household rows and columns are excluded from the inverse. Type SAM multipliers involve a similar inverse matrix, with the household rows and columns included in the inverse. Thus, Type I measures do not account for changes in worker/household income and expenditures, whereas Type SAM measures do. Similarly, HE Type I measures exclude the household rows and columns from the Leontief inverse, whereas Type SAM HE measures include them.
2. MIG, Inc. manages the IMPLAN® economic impact modeling system originally developed by the U.S. Forest Service. Based on a complete and internally consistent set of regional social accounts, IMPLAN® is widely used for in-depth I-O analysis of state, county, or user-defined multicounty regions. See http://www.implan.com for details.

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