Beyond Looking Backward:
Is Child Care a Key Economic Sector?

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Economic sectors that do not directly support exports are of little interest in traditional economic development analysis. Though input-output multipliers provide useful information about the impacts of changes in export, or exogenous, demand, they only reflect backward linkages. Many sectors, however, can be thought of as "enabling" sectors whose importance lies in their forward linkages. In an economy increasingly dominated by local service sectors, this concept is especially important for community developers. The input-output based method of hypothetical extraction offers an empirical alternative for describing the importance of economic sectors. Unlike multipliers, this method does not privilege sectors whose importance rests solely in the strength of their export-induced demand linkages. It also captures the enabling characteristics of sectors, including those sectors that sell exclusively to local households. The significance for child care, an exemplar of a non-exporting, household-serving sector is considered.

Community economic development must ultimately allocate inherently scarce community resources among competing activities in order to create value. Given the complexity of communities and the economic development problems they face, the question of where to focus resources and attention is not trivial. As documented by Warner (2001), the economic development practices of local governments have moved through successive strategies that have layered business retention and community-based development policies on top of a still dominant orientation toward firm-recruitment. Increasingly, this movement has signaled a shift of attention to the importance of fostering local, not just external, sources of growth.

The analytic tools and theoretical frameworks that guide community analysis and development strategies have also not been static. Throughout much of the latter half of the twentieth century, the power and simplicity of traditional export-base theory kept the eye of the economic development community turned to the prize of regional export-oriented

manufacturing. In recent years, this industrial recruitment framework has been increasingly supplemented by alternatives, such as Florida's (2002) creative economy and Porter's (1990) geographic clustering, which have been transforming our understanding of economic development processes. These works explicitly encompass the importance of local quality of life and the local institutional nexus of support for business. They have helped expand the horizon of economic development by shifting attention from the external towards the local. However, the extent to which these ideas will ultimately permeate the local institutions and tool-kits of routine local economic development practice remains unclear.

We believe that despite the broadening horizons, too much emphasis is still given to the traditional theory of externally-driven economic development. Associated analytic indicators such as impact multipliers accompany this external orientation and privilege sectors that have traditionally been identified as "engines of economic growth." The argument we make is not that such tools are irrelevant or that these engines are now unimportant. Instead, we are concerned that over-reliance on this analytic frame continues to create a blind spot that *a priori* marginalizes other increasingly important, and typically more locally-oriented, economic sectors. In an economy characterized for many years by growth in the face of a shrinking manufacturing base, this blind spot grows larger and increasingly hinders communities from realizing their full potential. Growth in service sector employment and the importance of locally serving sectors to economic development require a broader approach to measuring economic importance.

In this paper, we draw attention to the analytic tradition of key sector analysis (Beyers, 1976; Cai & Leuing, 2004; Schultz, 1976). Our modest goal is to highlight an approach, hypothetical extraction (HE), that is compatible with the familiar input output (I/O) representation of the interlinked sectoral structure of an economy, but that does not load the dice against consideration of locally-oriented sectors. HE adds to the toolkit of economic development analysts an objective, quantifiable measure of intersectoral connectedness, or linkage, offering additional insights into which sectors may deserve closer scrutiny by community and economic developers. We use HE in a comparative analysis of child care and other similarly sized sectors in New York State. We believe that HE holds promise for evaluating the importance of sectors that have been categorically excluded by an export-base view of development, and that have consequently failed to catch the attention of the economic development community in the past.

Export-base Theory

Export-base theory has played a pivotal role in framing the way regional scientists understand economic growth and the importance of different economic sectors in initiating and sustaining growth. The theory rests on the idea that exports, or extra-regional sales, provide the initial and only independent stimulus for economic growth in a region. As a logical consequence, export-base theory relegates economic sectors that are not export-oriented to a role that has been labeled variously "secondary," "residentiary," "residential," and "services" (Isard, 1960; Tiebout, 1962). These sectors are described in functional terms as "dependent," "subordinate," or more provocatively, "parasitic" (Peck & Tickell, 2001; Williams, 1996; 1997). Consistent with the economic base framework, the most common application of I/O models is in "impact analysis," in which the response of a regional economy to an exogenous shock is modeled. Because multipliers are predicated on exogenous or "autonomous" disturbances in an economy's output, employment, or income, the export-base model is particularly compatible with the tool of I/O analysis and its associated multipliers.

Empirical studies using an I/O framework have partitioned the sources of observed output change over time in national, regional, and local economies between growth in local demand, export demand, or technological change, (Martin & Holland, 1992; Holland & Cooke, 1992; and Bhatta, 2002). These studies have generally concluded that, on the basis of empirical evidence, various combinations of technological change, local demand shifts, and export demand, not export demand alone, have all contributed to growth. Although some non-I/O based empirical analyses have supported the pure export-led growth hypothesis, others have challenged its validity (Abhayaratne, 1996; Burney, 1996; Panas & Vamvoukas, 2002; Blecker, 2000; Leichenko, 2000). Markusen et al. (2004) offer another analysis of the export-base framework by focusing on occupations and labor categories rather than industry classifications. They conclude that U.S. job growth in non-basic occupations has expanded faster than it has in export-base occupations, in large part because of an underlying tendency of urban Americans to spend increasing shares of their income locally.

Alternative theories of regional growth have drawn attention to demand factors other than exports *per se*, such as the mirror image growth strategy of import substitution (Williams, 1997; Bruton, 1998) and even domestic demand (Palley, 2002). There is also strong interest in supply side factors such as knowledge and productivity growth, especially in relation to endogenous growth theory and the "new economy" (Romer, 1986; Cortright, 2001; Daniels, 2004). However, the concept that, in the end, a region "cannot get richer by 'taking in its own washing'" (Hoover & Giarratani, 1984, section 11.3.1) still has pervasive influence and continues to play a major role in explaining the lack of interest in industries that primarily serve local markets (such as child care, or laundry services for that matter).

Many economists recognize the limitations of economic base theory and even caution that pure export-base theorists do not exist (Shaffer, 1999). It is our experience, however, that export-base theory remains the dominant paradigm referenced for understanding regional growth and development by many, if not most, regional economists and economic development practitioners, not to mention child care advocates and other representatives of businesses with "local" orientations. A strong bias exists against the consideration of the child care sector, or any other non-exporting sector, as a sector worthy of economic development consideration. It is our contention that non-basic sectors often "enable" the economic activity of other sectors, and they should be in the domain of economic development considerations. Such sectors enable economic activity through their forward linkages, i.e., through their forward linked sales to other sectors, increased output in those economic sectors is enabled.

Backward Linkages and Input-Output Analysis Multipliers

I/O analysis, although fully compatible with export-base theory, can be developed in ways that permit a variety of alternative interpretations and applications. I/O analysis emerges from a basic accounting framework that uses a tabular structure to capture the circular flows of funds among economic sectors as purchases from and sales to each other (Leontief, 1965; Miernyk, 1965). Figure 1 represents these flows among regional sectors that make-up the regional economy, between the regional economy and regional households, and between the external economy and both the regional economy and regional households in the form of imports and exports. Included in this basic description are flows of funds from and to household and government sectors. This basic accounting framework, or transactions table, is a cornerstone of the U.S. National Income and Product Accounts (Planting & Kuhbach; 2001), and it has been adopted by many countries as their standard national accounting system (United Nations, 2003).

Figure 1. Model of the Regional Economy
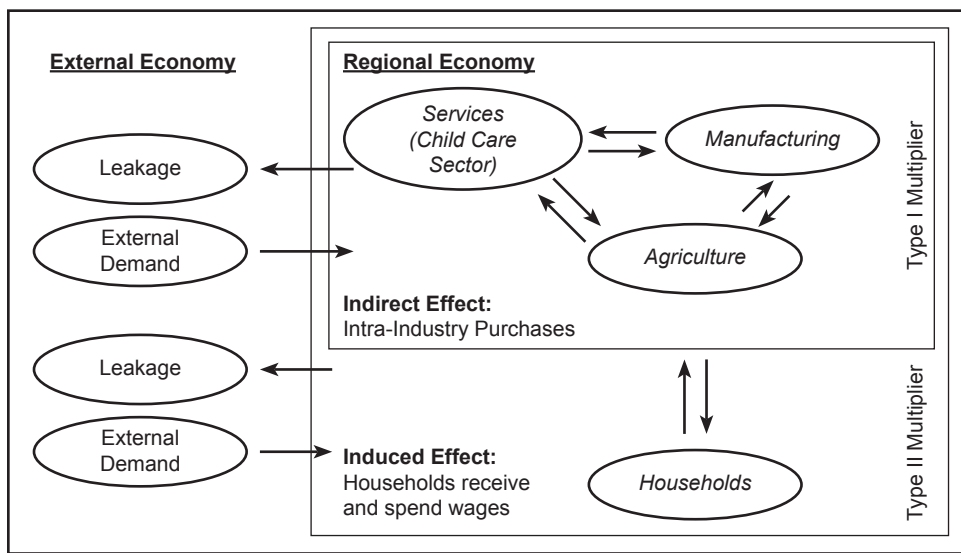
The fundamental concept at work in a backward linked I/O conceptualization of an economy is the re-spending that occurs in the course of economic activity. In order to meet increased demand, regional industries buy more inputs from regional suppliers. These suppliers, in their turn, purchase additional inputs to meet increased demand, as do successive suppliers during each round of spending in this backward chain of events. A purchase of an input by one industry engenders a secondary purchase by the input providing industry and so on. The sums of these backward linkage impacts are often summarized descriptively and numerically as "multiplier" effects. Based on the flows of funds tables within an economy, several different multipliers, which numerically capture this re-spending effect, can be computed. The most often used multipliers are for output, employment, and income. These measures describe the total amount of re-spending, employment, or income that occurs as a result of an initial one unit change in an exogenous demand (Richardson, 1972). As descriptive summations of these demand-induced successive rounds of spending, multipliers have become a standard economic measurement tool. Countless economic development studies have used multiplier analysis to look at impacts of economic activities ranging from fisheries and mining to Grateful Dead concerts (Black, McKinnish & Sanders, 2005; Gazel & Schwer, 1997; Steinback, 1999).

Traditional I/O multipliers can be interpreted as summary measures of the extent to which the production input chain required by a given industry is purchased locally, or through "backward" linkages. They do not account for the extent to which the outputs of a given industry tend to be sold locally, i.e., its "forward" linkages. Albert O. Hirschman (1958) is generally credited with providing the impetus for linkage studies by popularizing the concepts of backward, forward, and total linkages in his prescription for economic development planning (Jones, 1976). Hirschman was interested in the relationship between the extent of linkage, or sectoral interdependence, and the probability that linkage would induce increased production. Forward linkages were seen as important enabling conduits. However, the probability that greater supply would induce new local production in forward linked industries was not easily determined. The ability of firms to sell increased output depends on many factors influencing the forward linked purchasers of their products that have little to do with enhanced supplies of inputs. The probability of forward linked growth inducement seemed particularly limited in the context of developing economies, in which

some economic sectors were likely to be absent (Drejer, 2002). Hirschman proposed that forward linkage "must always be accompanied by backward linkage, which is a result of the pressure of demand" and further, that, "While forward linkage cannot therefore act as an independent inducement mechanism, it acts as an important and powerful reinforcement to backward linkage" (Hirschman, 1958, pp. 116-117).

With his focus on underdeveloped countries, Hirschman concluded that backward linkages were more important indicators of the likelihood of increased production than were forward linkages (Hirschman, 1958). In more developed economies with well articulated interindustry relations already in existence, Hirschman's sense of limitations was less sharp and he accepted the derivation of forward and backward linkage effects from input-output tables on the grounds that economic expansion is less speculative when realized through existing industries rather than through the establishment of new industries (Drejer, 2002). Nevertheless, it seems likely that Hirschman's context of international economic development, in which entire sectors needed to be established, contributed to the strength of the "tilt" towards backward linkage that we believe persists today. Interestingly, in 2001, the Bureau of Economic Analysis actually employed the label "Total Requirement Backward Linkages" in place of the normal "Output Multipliers" (Planting & Kuhbach 2001), at least implicitly offering institutional acknowledgement of the often ignored fact that multipliers measure only backward linkages.

Service Sectors

As global and national compositions of consumption have steadily shifted from manufacturing to services (see Figure 2), there has been increased attention given to the role of services in economic development and growth (Chandrasekhar & Ghosh, 2002; Francois & Reinert, 1996; Mattoo, 2002). However, this focus is predominately on "tradable" services (Francois & Reinert, 1996) and their growing contribution to U.S. exports. Business services in particular have received attention as an important, exportable, service (Francois, 1993), and more recently, the ability of health care and even education to capture extra-regional revenues has been acknowledged. Consideration of services is commonly done only based on their ability to attract funds from outside the economy in question, i.e., through exports.

Services have received some increased economic development attention from a productivity perspective. In particular, productivity influences working through service industries associated with the "new economy" and technology have been increasingly understood to "shape" economic development (Daniels, 2004). For example, Beyers (2002) estimates that 62% of U.S. job growth between 1989 and 1997 was in service sectors that can be classified as either users (55%) or producers (7%) of information technology.

Other analysts have reconsidered the role of services more broadly. Anticipating Porter, Gillis (1987, p. 252) identifies service producing industries as important elements of the economic development infrastructure. He argues that the importance of services goes beyond their role in generating external sales or substituting for imports; services also support the "productivity and profitability" of local goods producing industries. Porter (2003, p. 562) develops this idea more fully around the central role of the local cluster, or "… a geographically proximate group of interconnected companies, suppliers, service providers and associated institutions in a particular field, linked by externalities ... ." This approach extends Hirschman's (1958) concepts of forward and backward linkages to a level inclusive of many kinds of important interactions in a modern regional economy. In view of the unpriced transactions, transformations, and externalities that are important to local clusters, many types of activities involving services are included that are not easily captured in the simple, quantified relationships found in standard input-output transactions tables.

Figure 2. Composition of U.S. Consumption: 1960-2004
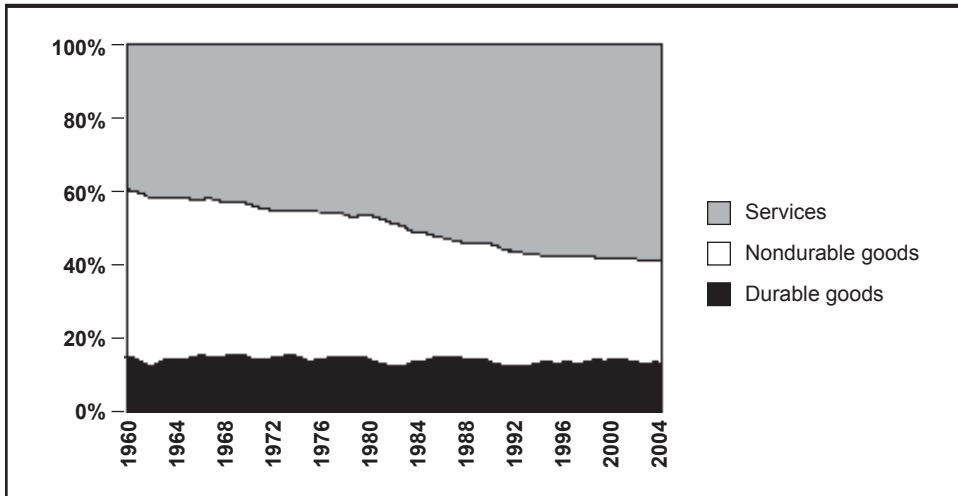
Source: Economic Report of the President: 2006.

Household Services

Whereas exportable services have earned a promotion to worthiness, household services, including sectors like child care, are left as the orphans of growth theory. Colin Williams, in *Consumer Services and Economic Development* (1997, p. i), makes an effort to "dispel the common myth that consumer services are residual activities dependent upon other economic sectors for their vitality and viability." However, his case depends entirely on the "import substitution" of local services for externally provided services, a not very well disguised inversion of export-base. His strategy is to reveal how consumer services, "as the major sector remaining entrenched in the dependent or residual category, fulfill[s] an external income-generating function" (Williams, 1997, p. 6). Williams, however, assigns no more importance to household services that do not generate external income or forestall leakages than do the mythmakers he criticizes.

Economically significant household behavior extends far beyond the simple purchases of household goods and services and sales of labor (Folbre, 2006). Households play a unique role in the economy as the ultimate beneficiaries of good economic policy decisions. In I/O analysis, however, they are "… just a large sector of the economy" (Foley, 1998). The focus in traditional I/O analysis is on inter*industry* transactions and in this framework, the aggregated "household" sector came to be described either as an aggregated "consumption" sector that buys consumer goods or as an aggregated "labor" sector, the primary output that households sell in return for employee compensation (Miernyk, 1965). Treatment of households as a single sector of the economy ignores the complexity and diversity of household and family units and their different economic roles. From a consumption perspective, household income from all sources is used to purchase goods and services. However, the same expenditures can also be thought of from a production perspective, namely as the inputs that enable households to produce their primary output, namely labor.

Through disaggregation of the spending and receipt accounts between labor income and household income (which includes transfer payments) categories, the beginnings of a more detailed treatment of the household sector can be gained. This is the first step towards the creation of a Social Accounting Matrix (SAM), which adds to the core I/O accounts a comprehensive system of transactions among disaggregated classes of households, governments, and other institutions (Thorbecke, 1998).

In I/O, households can play either an independent or dependent role. When households are considered as an exogenous source of external stimulus or demand, their spending is modeled as initially stimulating, but not responding further to changes in the level of economic activity throughout the economy. In this case, a Type I multiplier that only measures intra-industry linkage, indirect effects, is used (see Figure 1). When assumed to be endogenous, households are treated formally like an industry sector, i.e., they respond to changes in the level of external demand but do not initiate changes. In this case, a Type II multiplier that includes both indirect and induced (household spending) effects is used. For analysis of the impact of changes in demand for the products of export-oriented industries, the logic of treating households endogenously (i.e., as an integral part of the regional economy, Type II) is usually compelling: when labor incomes increase as a result of increased export sales, households dependably buy more. However, by definition household service industries sell primarily to households. Treating households endogenously therefore assumes that the demand for the output of household service sectors is fully dependent on the exogenous demand for the goods and services of other sectors. This treatment would imply that the output of the child care sector, for example, depends completely on the ability of other local sectors to sell to regional export markets.

Extraction

Because I/O fundamentally incorporates the interrelatedness of sectors, it is a well-suited and extensively utilized tool in an alternative application that focuses on the analysis of purchase and sales linkages. Sometimes this measurement is done under the labels of "key," or "important," sector analysis or "inter-industrial linkage" analysis. The essential idea is that industries with many linkages (whether backward or forward) to other sectors, and those with linkages to quantitatively large portions of the economy, occupy important nodes in the intersecting networks of economic exchange. We propose that a total measure of linkage, both forward and backward, is needed in order to offer a comprehensive indicator of the importance of sectors that may both "induce" and "enable" economic development. Whether or not a given sector, be it in manufacturing or services, shows up as important using this measure is an empirical matter.

Recently, the strengths and weaknesses of numerous linkage measures have received renewed attention by I/O researchers. Cai and Leung (2004) point out that although measures of direct purchase and sales linkage are well accepted, a number of issues arise with measures that capture indirect and induced linkages. Not far from Hirschman's concerns, they underscore the critical distinction that needs to be made between linkage measures viewed as measuring transmitted growth impulses and linkage measures viewed from a more "descriptive" perspective. Miller and Lahr (2001, p. 2) also highlight the descriptive value, as opposed to the analytic or modeling value, of information that can be recovered from an interindustry transactions matrix. Situated somewhere between the descriptive and impact traditions, but much closer to the former in most respects, the method of HE has been suggested as a preferred way of measuring the total linkage, forward plus backward, of an industry sector (Strassert, 1968; Schultz, 1976; Miller & Lahr, 2001; Leung & Pooley, 2001; Oosterhaven & Stelder, 2002; Cai & Leung, 2004). Variations of HE have been increasingly employed to identify key or important economic sectors.

As its name suggests, hypothetical extraction quantifies how much an economy's total output would decrease if a sector(s) were to be "extracted" from that economy. For extraction of the sector under consideration, all of the domestic sales and purchases for that sector are set to zero, but the sector's final demand[1] is left unchanged. This implies that the sector in question, while maintaining its sales to external demanders, now purchases all of its inputs outside the

regional economy and sells none of its outputs to sectors within the regional economy. To satisfy unchanged final demand for their products, the sectors that use the extracted sector's output as an input would have to import the goods and services that were previously purchased locally from the extracted sector. In other words, the sector in question continues to produce locally, but its linkages, both purchases and sales, within the regional economy are broken, so it is actually the sector's local connections that are "hypothetically extracted."

Extraction and Child Care in the New York Economy

Child care has a uniquely complex importance for an economy. It can influence the productivity and participation of both the future and the current workforce, affecting both parents and children. Fortunately, these influences are receiving increased attention (Meyers & Jordan, 2006; Kimmel, 2006; Barnett & Ackerman, 2006). Child care as an economic sector also makes contributions in its own right, just like all other goods and services producing sectors. This contribution is rarely measured or weighed in importance because of the contested applicability of routine measurement tools, such as multipliers, to locally serving and especially household service sectors. Accounting for linkages by using the key industry technique of hypothetical extraction offers an alternative that is more comprehensive and appropriate than are total output or multiplier measures alone. The child care sector's backward linkages to suppliers and forward linkages to households can be appropriately quantified through hypothetical extraction, whereas the use of multipliers for sectors with no potential to export is questionable. When interpreted as a linkage rather than impact measure, the fact that services like childcare are purchased almost exclusively by households ceases to be a problem.

Based on a 509 sector New York State I/O model for 2001 (Minnesota Implan Group), we illustrate in Table 1 the different perspective that extractions can provide by contrasting five output based measures. The first column (A) of Table 1 is simply total sector output for 41 of the 509 New York State sectors arranged in descending order. The second and third columns are the Type I (column B) and Type II (column C) multipliers, measuring backward linkages. Type I treats households exogenously and Type II treats them endogenously.[2]

The final two columns show the reduced value of economy-wide output associated with extraction of a sector, i.e., breaking all of the sector's local input and output linkages. Type I extraction treats households exogenously (column D), and Type II extraction treats them endogenously (column E)[3]. For each multiplier or extraction, the value for each sector is shown accompanied by that sector's rank among the 41 sectors included in Table 1.

To highlight the importance different indicators make for the formal child care industry in the New York economy (which, it should be noted, is significantly undercounted in the I/O representation; see Warner 2006), we show results only for the 41 sectors that are most similar to child care in terms of the level of output contributed to the state economy (column A). This group includes a few agricultural, transportation, and utility sectors, as well as a diverse group of service and manufacturing sectors. Focusing on sectors with similar output levels serves as a control for the overall scale of each sector when making descriptive comparisons of the dollar denominated extraction values. These 41 sectors, with output levels closest to Child Day Care Services (#19), have output levels that range from $2 to $3.6 billion. The child care sector contributes $2.7 billion in output (column A), ranking as 19th among the 41 sectors in Table 1 and 93rd out of 509 sectors in New York State.

Table 1. Alternative Indicators of Industry Significance

		Backward Linkages			Total Linkages	
		A	B	C	D	E
	Sector	Industry Output	Type I Multiplier	Type II Multiplier	Type I Extraction	Type II Extraction
		Mil. $	Value (Rank)	Value (Rank)	Mil. $ (Rank)	Mil. $ (Rank)
1	Perf. Arts and Sports Promo.	3,624	1.35 (22)	1.79 (12)	1,527 (18)	3,402 (22)
2	Toilet Preparation Manuf.	3,543	1.40 (13)	1.59 (34)	1,379 (25)	3,607 (18)
3	Specialized Design Services	3,457	1.32 (27)	1.70 (23)	2,310 (8)	3,755 (16)
4	Scenic and Sightseeing Services	3,419	1.38 (16)	1.85 (7)	2,656 (6)	4,594 **(5)**
5	Electronic Computer Manuf.	3,397	1.41 (11)	1.78 (13)	1,392 (23)	3,034 (25)
6	Elem. & Secondary Schools	3,215	1.35 (19)	1.93 **(3)**	1,140 (29)	4,918 **(3)**
7	Amusement & Recreation	3,177	1.33 (26)	1.71 (22)	1,104 (32)	5,404 **(2)**
8	Plastics Plumbing Fixtures	3,139	1.41 (12)	1.66 (28)	3,485 **(2)**	4,587 (6)
9	Information Services	2,948	1.22 (37)	1.71 (21)	1,105 (31)	2,685 (30)
10	Machinery & Equip. Rental	2,935	1.30 (31)	1.50 (36)	3,489 **(1)**	4,081 (10)
11	Paper & Paperboard Mills	2,891	1.46 (7)	1.69 (26)	1,352 (26)	2,001 (36)
12	Other Educational Services	2,885	1.29 (33)	1.70 (24)	2,908 **(5)**	4,022 (12)
13	Waste Manag. & Services	2,836	1.39 (14)	1.75 (16)	2,365 (7)	4,032 (11)
14	Other Support Services	2,807	1.29 (32)	1.59 (33)	3,029 **(3)**	3,893 (14)
15	Elect. Component Manuf.	2,777	1.52 (6)	1.84 (8)	2,952 **(4)**	3,774 (15)
16	Highway/Street/ Bridge Const.	2,751	1.35 (21)	1.81 (10)	973 (33)	2,233 (33)
17	Jewelry & Silverware Manuf.	2,729	1.35 (23)	1.64 (30)	929 (35)	1,876 (37)
18	Automotive Equip. Rental	2,723	1.25 (36)	1.49 (37)	1,451 (22)	3,005 (26)
19	*Child Day Care Services*	*2,705*	*1.35 (20)*	*1.74 (18)*	*957 (34)*	*4,613 (4)*
20	Computer Related Services	2,700	1.11 (40)	1.62 (31)	1,281 (27)	2,657 (31)
21	Bread & Bakery Product	2,685	1.38 (18)	1.65 (29)	1,726 (17)	3,980 (13)
22	Maintenance & Repair	2,668	1.38 (17)	1.77 (15)	1,913 (14)	2,962 (27)

Table 1. (Cont'd)

23	Rail Transportation	2,639	1.38 (15)	1.69 (25)	2,110 (10)	3,444 (21)
24	St. & Local Gov. Pass. Transit	2,633	1.59 **(4)**	2.80 **(1)**	1,922 (13)	5,420 **(1)**
25	Investigation & Security Services	2,553	1.13 (38)	1.67 (27)	1,513 (20)	3,134 (23)
26	Natural Gas Distribution	2,498	1.32 (29)	1.47 (38)	1,737 (16)	3,459 (20)
27	Navigation Instruments	2,496	1.41 (9)	1.78 (14)	1,127 (30)	2,063 (35)
28	Water Transportation	2,491	1.62 **(3)**	1.90 **(5)**	2,101 (11)	3,742 (17)
29	Turbine Generator Manuf.	2,485	1.28 (34)	1.46 (39)	692 (39)	1,138 (41)
30	Furniture Store	2,443	1.32 (28)	1.74 (17)	916 (37)	4,177 (9)
31	Sport/Hobby/Book/ Music Stores	2,431	1.41 (10)	1.82 (9)	1,503 (21)	4,349 (8)
32	Civic/Social/Prof. Organizations	2,346	1.42 (8)	1.91 **(4)**	1,841 (15)	4,443 (7)
33	Broadcast/Wireless Comm. Equip.	2,329	1.67 **(2)**	1.89 (6)	1,520 (19)	2,215 (34)
34	Federal Military	2,254	1.00 (41)	1.61 (32)	0 (41)	1,375 (40)
35	Semiconductors Manuf.	2,232	1.12 (39)	1.46 (40)	807 (38)	1,578 (38)
36	Database & Directory Publishers	2,170	1.26 (35)	1.46 (41)	925 (36)	1,455 (39)
37	Other Accommodations	2,143	1.55 **(5)**	1.81 (11)	1,198 (28)	2,773 (29)
38	Personal Care Services	2,111	1.34 (25)	1.72 (19)	666 (40)	3,472 (19)
39	Electronic Equip. Repair & Maint.	2,084	1.34 (24)	1.72 (20)	2,012 (12)	3,132 (24)
40	Household Goods Repair & Maint.	2,018	1.30 (30)	1.53 (35)	1,391 (24)	2,590 (32)
41	Cattle Ranching	1,992	1.67 **(1)**	1.94 **(2)**	2,296 (9)	2,781 (28)

New York State Sectors Most Similar in Total Output to Child Day Care Services. Source: Analysis based on 2001 data from IMPLAN.

Child Day Care Services has a Type I multiplier (column B) of 1.35 that ranks 20th among the 41 chosen sectors. This ranking indicates that a $1 change in exogenous final demand for Child Day Care Services would be accompanied by a $1.35 change in total New York State economic activity. This Type I multiplier assumes no changes in household spending, including spending on child care, will result from changes in New York State output, even though output changes would be accompanied by changes in labor income and employment.

Moving to column C, we see that Child Day Care Services' Type II multiplier is 1.78, with a rank of 18th. This ranking indicates that each dollar change in exogenous demand would be accompanied by a $1.78 change in total New York State economic activity. Such a change in demand must come about from a source of demand outside of the New York State economy. For example, federal child care subsidies could be considered as exogenous or autonomous. This larger Type II impact occurs by assuming that household spending will change as economy-wide output changes. This spending includes a change in spending

on child care that accompanies any change in employment and labor income. Child Day Care Services, which is ranked in the middle of the 41 sectors with respect to output, stays in the middle when Type I and Type II multipliers are considered.

In columns D and E, we present extraction measures of total linkage. Using a Type I extraction measure (i.e., household spending is treated exogenously), the Child Day Care Services sector rank drops from the middle of the group of 41 when considering its output (A) or multipliers (B and C), to nearer the bottom of the group (column D, rank 34). This lowered ranking is a reflection of the fact that although Type I extraction measures both backward and forward linkages for all of the sectors, it fails to measure the forward linkages that are most significant for child care, namely sales to households. For sectors, such as Machinery & Equipment Rental (#10), Other Educational Services (#12), and Other Support Services (#14), the Type I extraction measure moves them strongly up in the rankings compared to their multiplier values; from backward Type I linkage ranks of 31, 33, and 32 to total Type I linkage ranks of 1, 5, and 3 respectively. Each of these sectors is likely to be very locally serving with strong forward linkages to businesses, but with weak linkages to households.

The Type II extraction measure in which household spending is treated endogenously tells a different story altogether. Here the ranking of Child Day Care Services advances strongly, to near the top (rank 4). Bringing the linkages between industry and households into consideration acknowledges the dual role that households play, both as consumers of goods and services and as suppliers of labor. This sector is linked to $4.6 billion of economic output in New York State, or 1.71 times the value of its direct output, placing it fourth among the 41 similarly sized sectors in our analysis.

Empirically, Type II extraction draws attention to a somewhat different subset of industries than are highlighted by Type II multipliers. For example, Amusement and Recreation (#7) moves from the middle ranking to near the top of the total linkage rankings. Several sectors with relatively low ranks for Type II multipliers also had low ranks for Type II extractions: Jewelry & Silverware Manufacturing (#17), Computer Related Services (#20), Turbine Engine Manufacturing (#29), Semiconductor Manufacturing (#35), and Household Goods Repair & Maintenance (#40). Other sectors, such as Scenic & Sightseeing Transportation (#4), Elementary & Secondary Education (#6), State & Local Government Passenger Transit (#24), and Civic, Social, and Professional Organizations (#32) all ranked high for both Type II multipliers and Type II extraction. Because it is a total linkage measure, HE does not preclude sectors with very strong backward linkages from bubbling-up in the extraction measure the way that multipliers preclude strongly forward linked sectors.

For the three sectors that moved up significantly in rankings between Type I multipliers and Type I extraction, Machinery & Equipment Rental (#10), Other Educational Services (#12), and Other Support Services (#14), rankings fall back when Type II extraction is used. The titles of these sectors could easily lead one to believe that they serve households, but, as their fall in rankings for Type II extraction indicate, they do not. The Machinery & Equipment Rental sector rents and leases commercial-type and industrial-type machinery and equipment, typically caters to a business clientele, and does not generally operate retail-like or store-front facilities. The Other Educational Services sector includes business and secretarial schools, computer and management training, and vocational training, but it does not include colleges or universities. The Other Support Services sector mainly includes packaging, folding, and labeling services.

Members of the Chamber of Commerce in a city dominated by a single industry or the mayor of a college town instinctively senses, based on its size, the importance of the dominant sector in their localities. They are likely to keep clear lines of communications with the plant manager and college president and devote time to the industry's outlook

or the university's affairs. Multipliers, which capture backward linkages, help to put in perspective for Chamber members and the mayor the actual or potential contributions of other local sectors that export, regardless of their size. Hypothetical extraction, which captures backward and forward linkages, expands this perspective to include local sectors that may not export, or may even serve households more than business interests. Based on extraction results, Chamber members or the mayor might establish closer ties with the local day care council or take a second look at targeting some of their scarce resources to the child care sector.

The numerical results of this particular analysis demonstrate that the use of hypothetical extraction may paint a different picture of sectoral importance relative to the use of multipliers for the same economy. It has been our purpose to highlight the appropriateness of the method of hypothetical extraction when a sector has either little, or no, external final demand and/or when a sector's economic role is better described as enabling and forward linked, versus demanding and backward linked. For any specific economy, the final key industry indicator values will ultimately be an empirical issue.

CONCLUSIONS

I/O has a long history of being used to describe and analyze inter-industry linkages. An export-base orientation has limited usefulness in analyses of sectors that do not export, i.e., local serving and typically service industries. Although not denying the importance of exports, we suggest that analytic methods are needed that do not literally take non-exporting sectors for granted.

Multipliers, as a standard tool for assessing the relative importance of a sector, are predicated on changes in final demand. If final demand changes are anticipated from policies, as in the case of federal child care subsidies for a state economy (Warner, et al., 2003, Warner & Liu 2006), then multipliers are appropriate tools. For circumstances in which final demand changes are not anticipated from policies or for consideration of sectors for which final demand is not important or is even absent, then total linkage measures of importance resulting from hypothetically extracting a sector may provide a more appropriate alternative. The lack of a fully articulated causal relationship between linkage and economic development calls for close interpretation of the importance and nature of linkage measures. However, HE makes it possible for sectors that have been relegated to the economic development shadows, by the nature of their non-export function and/or household service orientation, to be considered worthy of a closer look for development consideration on the basis of their economic integration and enabling characteristics.

Our empirical analysis illustrates that the choice of linkage measure used makes an empirical difference to rankings of sectors with similar output levels. Using a measure that includes the strength of forward linkages to households, the ranking of Child Day Care Services, among a cohort of sectors with similar output levels, advances strongly to near the top of those considered.

NOTES

1 Final demand is sometime referred to as 'exogenous' demand or even the 'autonomous' sector, because in the export base framework, it is "the one in which changes occur which are transmitted throughout the rest of the table" (Miernyk, 1965). Final demand is closely related to GDP and is often defined in text books as the market value of final goods and services produced by labor and property in the U.S. (See the BEA's Web glossary http://www.bea.gov/bea/glossary/GlossaryIndex.htm).

2 The Type II multiplier used here is what IMPLAN labels a Type SAM multiplier with households endogenous. It is called a SAM multiplier because the I/O table from which it is derived contains detailed SAM information about household expenditures and labor income and information on transfer payments and expenditures such as taxes and unemployment compensation.

3 IMPLAN does not compute hypothetical extraction measures. To extract each sector reported in Table 1, the IMPLAN SAM direct requirements matrix for New York State was exported to SAS, where the appropriate industry's purchase and sales coefficients were zeroed-out. The Leontief inverse was then recomputed with these new coefficients and multiplied by the original SAM final demands to calculate economic output in this hypothetical smaller economy.

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