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STRATEGIC PLANNING OF ECONOMIC DEVELOPMENT BASED ON AN ANALYSIS OF THE EXTENT AND PATTERN OF IMPORTATION

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Introduction

In recent years cities and states/regions have become increasingly concerned about the importation of goods and services into their local area. This concern, which is heightened in areas where unemployment is high and out-migration has occurred as a result of the recent recession, has led to legislation to increase government purchases from area businesses and by local campaigns appealing to both businesses and consumers. While the theoretical economic advantages of both international and interregional trade are well known, there is the possibility that importation may be occurring because information regarding the extent and pattern of importation in various sectors is not well known and so the local private market economy has not recognized the opportunity for providing some service or product locally. In this paper an attempt will be made to demonstrate the potential for ascertaining the extent and pattern of importation from primary data collected from local firms in an area, so as to identify such opportunities. Once known, these opportunities can be the focus for strategic planning of local economic development.

The paper will be based on a data base collected from firms in a single metropolitan area, Duluth, Minnesota. These data were gathered from a survey regarding purchases of goods and services, including a breakdown of purchases between those made locally and those imported from outside the area. While this data base is similar to an input-output purchases only survey, it included additional information which will allow examination of the pattern of importation using stochastic methods. The extent of importation occurring in the area for each sector (purchases) will be determined using traditional non-stochastic methods of analysis while the pattern of importation will be examined using stochastic (regression and covariance analysis) methodology.

To determine the extent of importation for each (product and service) sector, and, hence, the potential for local provision of products and services, the information gathered from the sample firms must be expanded to generate area (population) importation estimates. This expanding will be done on the basis of control totals for employment, a technique which is used in many non-stochastic forms of regional science modeling (e.g. input-output analysis).

After determining the extent of importation, the paper will then go on to investigate the pattern of importation in the area. This analysis will represent

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an attempt to provide a stochastic analysis of importation and may be seen as a step toward eventually doing more complicated forms of regional analysis in a stochastic framework. For example, regional scientists have proposed a stochastic form of input-output analysis but the difficulties inherent in such estimation have limited efforts to adopt the approach. Given the analysis of importation is considerably less complex than input-output analysis, stochastic methods can be used effectively.

The Extent of Importation

As mentioned, this paper reviews the results of an experiment in the analysis of import substitution possibilities for a regional economy using data which were collected under a grant provided by the Duluth Area Chamber of Commerce. The collection of the survey data was managed by the UMD Bureau of Business and Economic Research during the 1983-84 academic year.

Sixty-one industrial sectors were established for the purposes of this survey according to the Standard Industrial Classification Code and are listed in Appendix II to this paper. The surveyed firms were all members of the Duluth Chamber and its Executive Director provided the cover letter for the survey and conducted a follow-up request for responses. The survey asked respondents to identify the dollar value of their imports into Duluth, by industrial sector classification, and to identify the reasons for such imports. The possible reasons for imports were "Not Available Locally" and "Local Prices Too High."

The survey was sent to 850 owners, managers, and CEO's in the Duluth area; 115 responses provided a 13.5 percent return. The information collected was compiled in order to develop a non-stochastic method of identifying major importers and the reasons for those imports. Such a descriptive approach might provide insight into the extent of import substitution and the potential for the region. The data were also used to develop a regression (stochastic) based predictive equation to carry the analysis of Duluth's import structure a step further, again with the goal of identifying development options in mind.

Table 1 presents a summary of the results of the survey which have been adjusted (inflated) to account for the sample proportion of known (control) totals for employment. Note that the sectors in Table 1 are for purchases or purchase sectors, and so a row in Table 1 is the composite of all firms making purchases from the (row) sector. Twenty-nine of the sixty-one identified purchase sectors showed that 50 percent or more of such purchases were made outside of Duluth. The major reason for these import levels was stated as being the availability of required good and services from the local economy. Only the Publishing and Printing purchase sector was identified as being one where local prices constituted the major reason for seeking intermediate product needs from outside the region.

The major purchase sectors imported include: Construction Other than Building, Manufacturing, Lumber and Construction Materials, Machinery,

Table 1. The Extent of Importation by Purchase SIC

Purchase SIC[1] Number	Purchases			Number of firms[3]	Reasons for Importation (%)	
	Total[2] (000 $)	From Outside area (000 $)	(%)		Unavailable Locally	Local Price Higher
1500	51269	3293	6.42	20	5.00	10.00
1600	19289	15965	82.76	15	13.33	13.33
1710	3813	82	2.14	15	6.67	0
1730	12480	8509	68.18	29	10.34	6.90
1740	719	4	.50	13	7.69	0
1750	394	46	11.73	12	0	8.33
1760	2643	2070	78.33	16	6.25	12.50
1790	7085	4083	57.63	17	17.65	5.88
2700	15777	12148	77.00	*	100.00	100.00
3000	40536	29782	73.47	*	100.00	20.00
4200	13126	2244	17.10	34	20.59	2.94
4800	8296	4255	51.29	35	17.14	5.71
5000	808	808	100.00	*	100.00	0
5010	8302	2975	35.83	40	22.50	12.50
5020	3252	470	14.46	24	29.17	8.33
5030	9630	18808	95.81	30	16.67	6.67
5060	12920	7641	59.14	25	28.00	20.00
5070	3680	1330	36.14	35	22.86	17.14
5071	4451	2942	66.10	21	33.33	9.52
5072	1421	1097	77.20	21	47.62	14.29
5080	125624	91234	72.62	51	58.82	25.49
5090	16433	14840	90.31	27	55.56	14.81
5100	39139	33311	85.11	*	75.00	25.00
5110	7011	2323	33.13	69	21.74	21.74
5120	20054	8880	44.28	18	27.78	27.78
5140	1887	1741	92.30	10	40.00	30.00
5300	88	0	0	*	0	0
6001	27896	5740	20.58	48	6.25	6.25
6002	119	10	8.55	10	0	0
6003	475	0	0	11	0	0
6150	123	0	0	*	0	0
6160	22175	4312	19.45	*	25.00	0
6200	3404	113	3.31	9	0	0
6310	2704	1352	49.99	36	8.33	16.67
6320	17778	5314	29.89	67	8.96	11.94
6330	12068	5649	46.81	60	3.33	23.33
6370	46108	31067	67.38	41	12.20	9.76
6390	3643	3230	88.66	23	8.70	21.74
7200	1	0	0	*	0	0
7310	15736	1800	11.44	55	21.82	3.64
7320	1014	794	78.30	24	25.00	16.67
7330	4905	820	16.71	49	14.29	6.12
7340	984	107	10.91	16	18.75	0
7360	3198	2431	76.03	16	31.25	6.25
7370	5771	5763	99.87	8	37.50	25.00
7391	2632	2606	99.03	*	100.00	0

the volume of purchases in the area were to increase and/or the efficient scale of operation for providing such a service were to fall (e.g., as micros replace mainframe computers).

Finally, the information in Table 1 provides an estimate of the total extent of importation taking place in the area and a breakdown of this by purchase sector (row). In the next section the pattern of importation, among firms, will be analyzed using sectors which are more aggregated than in Table 1. Specifically, Appendix I gives a list of sector dummy variables which are the result of reducing the sectors from 61 in Table 1 to 8 or 9.

The Pattern of Importation

Having identified the extent of importation taking place in the Duluth area, an attempt will now be made to analyze the pattern of importation based on the same firm data used as a basis of the analysis in the last section. In this section the units of observation are the various purchases made by the sample firms (N = 115) and so a total of n = 1401 cases are available for the regression estimation which follows.

The model, which will allow analysis of the pattern of importation, may be seen as an indirect analysis of the production function of the sample firms. Though the model will not relate inputs to output, as a basic production function does, it may be seen as analyzing input substitution in a certain sense. The regression model will have as the dependent variable, PEROUT, the proportion of a firm's (i) purchases of a product or service (j) which are imported from outside the area.

By relating this variable, PEROUT, to several independent variables we will test if importation (PEROUT) is related to firm characteristics, FC, such as size, age, and type of ownership. By testing if PEROUT varies based on these characteristics we are indirectly testing the assumption inherent in input-output and economic base theory which is that there is no input substitution. That is, these theories assume a fixed proportion production function and so PEROUT, which is closely related to input-output technical coefficients, should not vary with firm characteristics, given the same firm (FS) and purchase (PS) sector.

In order to control for the type of firm and purchase in the analysis, vectors of dummy variables (covariance analysis), FS and PS, will be used to identify firms and purchases, respectively, by sector. The stochastic equation to be estimated is:

(1) $PEROUT_{ij} = f(FC_i, FS_i, PS_j, e_{ij})$

where $PEROUT_{ij}$ = proportion of firm i's purchases from sector j which are imported,

FC_i = vector of firm characteristics which will include measures of size, measures of local presence, and reasons given for importing.

FS_i = vector of 8 dummy variables to represent sector of firm i (9th sector is base),

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PS_j = vector of 8 dummy variables to represent purchase sector (9th sector is base), and
e_{ij} = random disturbance term.

While the connection between this equation and stochastic estimation of other regional models (e.g., input-output and economic base) will be discussed shortly in terms of FS and PS, the first analysis will be done using only the firm characteristics, FC. With these variables it will be possible to test if the pattern of importation is consistently determined by such characteristics for all types of firms and purchases. While other factors may also be interesting (e.g., firm location within the area or even area characteristics if similar data were collected for various metropolitan areas), we will only be testing if importation varies in terms of three general categories of firm characteristics: (1) size of firm; (2) local presence; and (3) reasons for importing.

Generally, it is hypothesized that larger firms are more aware of purchase opportunities and are able to generate volume orders from primary suppliers (i.e., outside the area). Consequently, we expect these measures of size (TOTPUR, NUMSUPL, TOTEMP, AGEBUS — see Appendix I for detailed list of variables used in the analysis) to be positively related to PEROUT, the dependent variable. Conversely, the more local a business is the less we would anticipate them to import (i.e., a firm with a strong local presence should be less inclined to import). To test this we have several measures of local presence (PEREMPD, AGELOCAL, LOCAL) which should be inversely related to PEROUT. Finally, we have two dummy variables based on the reasons given for importing (UNAVAIL = 1 if product not available locally and LOWPRICE = 1 if lower price outside of area), which should be directly related to PEROUT, the extent of importation.

In Table 2 the regression results of equation (1) using only firm characteristics, FC is provided. These results test for a pattern of importation which is based on firm characteristics alone and ignores firm and sector differences. Later in this section such sector differences will be analyzed (i.e., covariance analysis) in order to determine if importation is a function of firm characteristics and/or sector differences. By leaving out sector differences in Table 2 we are, in effect, assuming that the importation pattern is the same for any firm or purchase whereas in later tables (4 and 5) the validity of doing this will be tested. An alternative, which would only be possible with a very extensive data base, would be to get results (equations) as in Table 2 for all firm (i)/purchase (j) sector combinations (i, j) (e.g., estimate a PEROUT equation for purchases from sector j by firms in sector i using a sample of n firms in sector i). This would be analogous to estimating technical coefficients (a_{ij}) based on a sample of firms in sector i. To date input-output analysis has not been done this way though it has been advocated (e.g., Gerking [2]) as a stochastic alternative to the traditional non-stochastic techniques.

Though some recognition of the advantages of stochastic over non-stochastic methods in regional science have been noted, empirical testing using stochastic methods has been confined to rather simple regional mo-

dels. Regression analysis has been used to estimate sectoral multipliers in cross-sectional economic base studies (e.g., Braschler [1], Mulligan and Gibson [3], and Smith, Hackbart and Van Veen [4]) but the analysis is done using aggregated cross-section data for communities, rather than firm data. Clearly, such studies are a long way from eventually estimating a complete input-output model using firm data as observations. It is believed that the approach taken in this paper, based on firm data, will advance the scope of using stochastic methods in regional sciences to some extent.

To move in this direction we have in Tables 2-3 estimated equation (1), using only FC, for each firm sector (Table 2) and purchase sector (Table 3).

Table 2. Pattern of Importation: All Purchases and for Each Purchase Sector

Dependent Variable: PEROUT = Percentage of purchases from outside area

Independent Variables	All Purchases		Purchase Sector PS1	PS3	PS4	PS5	PS7	PS8
			(t-values in parenthesis)					
Constant	7.522	29.845	19.910	84.984	-45.760	8.714	18.169	9.263
	(1.70)	(5.34)	(2.20)	(1.86)	(-1.04)	(1.29)	(1.77)	(1.27)
Measures of Size:								
TOTPUR (total purchases)	$.006^{-4}$ (.54)	$.050^{-4}$ (3.83)	$.010^{-4}$ (.35)	$-.025^{-4}$ (-.42)	$-.337^{-4}$ (-.22)	$.070^{-4}$ (2.44)	$.001^{-4}$ (.07)	$.203^{-4}$ (2.56)
TOTEMPL (total employment	$-.017^{-2}$ (-.20)	$-.032^{-2}$ (-.31)	$-.100^{-2}$ (-.88)	$-.403^{-2}$ (-1.22)	-1.714^{-2} (-.53)	$-.113^{-2}$ (-.83)	$.653^{-2}$ (1.12)	$-.036^{-2}$ (-.25)
NUMSUPL (number of suppliers)	-.045 (-1.52)	.071 (1.90)	-.047 (-.07)	-.374 (-.30)	.767 (1.61)	-.022 (-.66)	-.129 (-1.31)	-.329 (-1.70)
AGEBUS (age of business)	-.104 (-1.86)	.016 (.22)	-.571 (-5.01)	-1.626 (-3.19)	.400 (.60)	.130 (1.43)	-.021 (-.18)	-.053 (-.62)
Local Presence:								
PEREMPLD (percent employment-local)	.098 (2.04)	-.066 (-1.09)	-.108 (-1.05)	-.538 (-1.25)	.370 (.86)	-.045 (-.62)	.152 (1.43)	.082 (1.05)
AGELOCAL (years in area)	.091 (1.61)	.1180 (1.62)	.4880 (4.01)	1.2980 (2.55)	-.2790 (-.44)	-.1230 (-1.32)	.0710 (.62)	.0675 (.77)
LOCAL (=1 if local owner)	-8.083 (-3.98)	-8.219 (-3.19)	-5.528 (-1.45)	-14.839 (-1.25)	24.741 (1.40)	4.351 (1.25)	-24.591 (-5.37)	-10.936 (-3.27)
Reasons for Importing:								
UNAVAIL (=1 if unavailable)	51.073 (24.50)	- -	34.113 (4.37)	68.089 (4.29)	63.015 (2.76)	47.767 (14.81)	44.296 (7.75)	57.161 (18.14)
LOCPRIC (=1 if high local price)	41.072 (15.20)	- -	61.805 (7.84)	-2.482 (-.06)	88.079 (3.04)	18.145 (4.64)	59.653 (11.20)	46.571 (8.43)
R^2	.425	.058	.632	.608	.561	.495	.457	.502
Sample Size	1358	1358	128	32	32	361	380	493

This will allow some determination as to whether firm and/or purchase sectors are different from each other in terms of the model. Later we will test if PEROUT varies more by firms, by firm sector, or by purchase sector. It should be noted that input-output ignores firm differences for a given i, j firm/purchase sector but assumes sector (both firm and purchase) differences are significant. We will shortly test if this is true for the importation coefficient, PEROUT.

First, the results in the first column of Table 2 for all purchases suggest that the firm characteristics, FC, explain about 44% (R^2 = .443) of the variation in PEROUT over all (n = 1401) firm/purchase sectors. However, many of the variables do not conform to the signs hypothesized earlier (see Appendix I). The size variables show up negative for total employment, number of suppliers and age of business but none of these variables are significant at the 5% level. It was determined that these wrong signs may have related to using the reasons for importing (UNAVAIL and LOCPRIC) as independent variables. These variables provide most of the explanation as seen in the second column of Table 2 when these two variables are omitted. Furthermore, the signs and significance of the size variables are improved by leaving out the reasons for importing. The same change in sign (from incorrect to correct) occurs for the local percent employment (PEREMPD). Local ownership (LOCAL) and AGELOCAL have the same sign and significance in both columns but AGELOCAL still has the wrong sign when the reasons for importing variables are omitted. The conclusion from the first two columns is that the FC variables provide some, but by no means a complete, explanation of PEROUT and that two of the variables, UNAVAIL and LOCPRIC, provide most of the explanatory power.

The remaining columns of Table 2 give regression results for each of six purchase sectors. In these disaggregated results, and similar firm sector disaggregated results in Table 3, the two reasons for importing are consistently the most significant and have the hypothesized signs. A cursory examination of the remaining independent variables reveals several differences in signs for given independent variables but these variables are for the most part not consistently significant. While a definitive test (e.g., a Chow test) of whether the model is the same for all sectors has not been made, the results suggest that the coefficients are not substantially different across sectors.

If we assume that the model is the same for each firm/purchase sector for all the independent variables (i.e., FC) in Table 2-3, then we can proceed to test if the firm and/or purchase sectors differ in terms of the dependent variable. This will be done by introducing for firm and purchase sector differences using dummy variable vectors, FS and PS, respectively. We first consider firm sector differences (alone) in Table 4, then purchase sector differences (alone) in Table 5, and finally consider firm and purchase sector differences together in Table 6.

Tables 4 and 5 first give a regression equation with only the firm (Table 4) or purchase (Table 5) sector dummy variables which is equivalent to a one-way analysis of variance. The F value tests whether the dependent variable, PEROUT, is the same for all firm (Table 4) or purchase (Table 5) sectors. In

Table 3. Pattern of Importation: Each Firm Sector

Dependent Variable: PEROUT = Percentage of purchases from outside area

Independent Variables	Firm Sector FS1	FS2	FS3	FS4	FS5	FS6	FS7	FS8	FS9
				(t-values in parenthesis)					
Constant	.595	-10.93	-86.17	23.81	53.2	17.66	83.70	20.78	49.88
	(.11)	(-.59)	(-1.84)	(1.64)	(1.88)	(.49)	(1.95)	(2.31)	(.89)
Measures of Size:									
TOTPUR (total purchases)	$.140^{-5}$	$.092^{-5}$	$.270^{-5}$	$-.195^{-5}$	$.158^{-5}$	1.13^{-5}	4.41^{-5}	$.643^{-5}$	-5.41^{-5}
	(.18)	(.41)	(2.02)	(-.37)	(.32)	(.12)	(2.34)	(0.93)	(-.74)
TOTEMP (total employment)	.0576	.0139	.0056	.0091	-.3810	-.2800	-.1840	-.0008	.0592
	(.096)	(2.16)	(2.38)	(0.92)	(-1.58)	(-1.19)	(-1.18)	(-.21)	(.42)
NUMSUPL (number of suppliers)	-2.03	-.864	-1.33	-.0135	.480	-1.30	-1.14	-.337	2.00
	(-1.95)	(-2.13)	(-1.33)	(-.29)	(.66)	(-1.61)	(-2.28)	(-2.08)	(.36)
AGEBUS (age of business)		-.0731	.1721	-.0327	-1.009	-.068	-.077	.210	
		(-.40)	(.36)	(-.08)	(-3.10)	(-.40)	(-.27)	(1.57)	
Local Presence:									
PEREMPD (percent employment-local)		.314	.897		-.717	.045	.160	-.067	
		(1.72)	(3.66)		(-1.64)	(.13)	(.05)	(-.90)	
AGELOCAL (years in area)	.0903	-.1016			1.631	.0991	.0063	-.2141	
	(.15)	(-.58)			(2.20)	(.75)	(.03)	(-1.53)	
LOCAL (=1 if local owner)		-12.76	1.61	7.77	13.12	-11.59	-76.83	-8.30	-37.60
		(-1.97)	(.04)	(.51)	(1.47)	(-1.47)	(-2.69)	(-.82)	(-.60)
Reasons for Importing:									
UNAVAIL =1 if unavailable)	55.58	49.07	57.86	30.31	55.55	67.89	55.24	63.86	27.15
	(5.00)	(10.79)	(6.18)	(3.26)	(4.98)	(7.79)	(5.91)	(20.50)	(.67)
LOCPRIC (=1 if high local price)	38.75	47.06	49.96	42.75	61.02	60.82	28.82	55.29	48.08
	(5.27)	(9.28)	(4.28)	(4.04)	(3.27)	(6.08)	(1.91)	(12.50)	(.78)
R^2	.810	.548	.519	.340	.352	.451	.459	.555	.319
Sample Size	41	236	81	94	115	141	135	487	28

the second part of these tables the firm (Table 4) and purchase (Table 5) sector variables and FC variables are both used to provide some indication of the relative explanatory power of (between) firm/purchase sector differences (FS/PS) and firm characteristics (FC) (i.e., within firm sector differences). The latter, FC, is clearly larger indicating that contrary to the assumption of input-output, within sector differences are greater than between sector differences. However, the conclusion is not as strong if the reasons for importing are omitted from the analysis as seen in Tables 4A, 5A and 6A.

It should be kept in mind that the assumption of input-output, and other related regional models, is that all firms within a sector are the same (i.e., they all have some technical coefficients, a_{ij}) but that there are differences be-

tween sectors (i.e., firms in different sectors have different technical coefficients or a_{ij} does not equal a_{ik}). The evidence in Tables 4 and 5 contradicts this assumption as well as related results provided in Table 6. While this evidence does not in itself disprove the use of input-output or related non-stochastic regional models, it does raise an interesting question as to what the results would be if a stochastic testing of an input model were made with a_{ij}, which is analogous to PEROUT, as the dependent variable and using firms as the units of observation. Current practice is not to conduct any such testing but to assume a priori that between sector differences are significant while within sector differences are not. Sometimes rows and columns (i.e., sectors) may be combined on the basis of a_{ij} similarities but this does not get at testing stochastically for within sector variation using firms as the unit of observation.

Table 4: Firm Sector Differences in Importation

Dependent Variable: PEROUT = percentage of purchases from outside area

	Independent Variables			
Sector	**Firm Sector (FS)**	**Firm Sector (FS)**	**Firm Characteristics (FC)**	
Constant	32.750	22.975	**Measures of Size:**	
	(4.519)	(3.13)	TOTPUR (total	.7721E-06
1	-19.433	-23.03	purchases)	(.76)
	(-2.07)	(-3.20)	TOTEMP (total	.2562E-03
2	-3.305	-23.887	employment)	(.30)
	(-.43)	(-3.92)	NUMSUPL (number	-.0679
3	-4.873	-24.671	of suppliers)	(-2.30)
	(-.58)	(-3.72)	AGEBUS (age of	-.0529
4	13.803	-7.653	business)	(-.91)
	(1.67)	(-1.17)	**Local Presence:**	
5	-12.298	-10.920	PEREMPD (percent	.1087
	(-1.52)	(-1.74)	employment-local)	(2.25)
6	-17.133	-14.942	AGELOCAL (years	.0464
	(-2.16)	(-2.44)	in area)	(.78)
7	-12.387	-10.797	LOCAL (=1 if	-10.87
	(-1.55)	(-1.76)	local owner)	(-4.01)
8	-8.175	-13.370	**Reasons for Importing:**	
	(-1.10)	(-2.32)	UNAVAIL (=1 if	52.10
R^2	.035	.445	unavailable)	(24.82)
F-value	6.276	63.084	LOCPRIC (=1 if	42.78
			high local price)	(15.86)
			Sample Size	1358

Aside from raising some interesting questions about the potential for stochastic methods in regional science, the results in Tables 4 and 5 also have a practical use. The coefficients for each sector indicate something about the pattern of importation. That is, the more negative the coefficient indicates which sectors do the least amount of importing (i.e., relative to the base sector). Such information can, and would, be quite useful for strategic planning purposes in economic development. For example, the purchase sector with the largest positive coefficient in Table 5 is the one which tends to

Table 4A: Firm Sector Differences in Importation Without UNAVAIL, LOCPRIC

Dependent Variable: PEROUT = percentage of purchases from outside area

	Independent Variables		
Sector	**Firm Sector (FS)**	**Firm Sector (FS)**	**Firm Characteristics (FC)**
Constant	32.750 (4.519)	42.892 (4.56)	**Measures of Size:**
1	-19.433 (-2.07)	-20.513 (-2.22)	TOTPUR (total purchases) .4893^{-5} (3.76)
2	-3.305 (-.43)	-13.914 (-1.78)	TOTEMP (total employment) -.6442^{-3} (-.59)
3	-4.873 (-.58)	-17.416 (-2.04)	NUMSUPL (number of suppliers) .0438 (1.16)
4	13.803 (1.67)	2.077 (.25)	AGEBUS (age of business) -.0251 (-.33)
5	-12.298 (-1.52)	-20.400 (-2.53)	**Local Presence:** PEREMPD (percent employment-local) -.0850 (-1.38)
6	-17.133 (-2.16)	-20.069 (-2.55)	AGELOCAL (years in area) .1825 (2.40)
7	-12.387 (-1.55)	-18.669 (-2.37)	LOCAL (=1 if local owner) -5.750 (-1.67)
8	-8.175 (-1.10)	-11.965 (-1.62)	Sample Size 1358
R^2	.035	.080	
F-value	6.276	7.729	

Table 5: Purchase Sector Differences in Importation

Dependent Variable: PEROUT = percentage of purchases from outside area

	Independent Variables		
Sector	**Purchase Sector (PS)**	**Purchase Sector (PS)**	**Firm Characteristics (FC)**
Constant	31.555 (6.01)	22.665 (3.82)	**Measures of Size:**
1	-19.914 (-3.18)	-20.984 (-4.41)	TOTPUR (total purchases) -.4286^{-6} (-.38)
2	54.612 (3.29)	1.505 (.11)	TOTEMP (total employment) -.1762^{-3} (-.22)
3	-6.961 (-.81)	-12.356 (-1.90)	NUMSUPL (number of suppliers) -.0359 (-1.24)
4	-7.774 (-.90)	-11.416 (-1.76)	AGEBUS (age of business) -.0914 (-1.67)
5	-4.439 (-.79)	-20.248 (-4.73)	**Local Presence:** PEREMPD (percent employment-local) .0818 (1.74)
6	-31.555 (-.81)	-18.465 (-.63)	AGELOCAL (years in area) .0889 (1.59)
7	-3.843 (-.80)	-3.272 (-.91)	LOCAL (=1 if local owner) -10.24 (-5.08)
8	-5.573 (-1.13)	-11.473 (-3.08)	**Reasons for Importing:** UNAVAIL (=1 if unavailable) 53.10 (25.29)
R^2	.0246	.4517	LOCPRIC (=1 if high local price) 41.13 (15.36)
F-value	4.260	64.940	Sample Size 1358

Table 5A: Purchase Sector Differences in Importation Without UNAVAIL, LOCPRIC

Dependent Variable: PEROUT = percentage of purchases from outside area

	Independent Variables			
Sector	**Purchase Sector (PS)**	**Purchase Sector (PS)**	**Firm Characteristics (FC)**	
Constant	31.555 (6.01)	40.438 (5.30)	**Measures of Size:**	
1	-19.914 (-3.18)	-25.859 (-4.21)	TOTPUR (total purchases)	$.3930^{-5}$ (2.73)
2	54.612 (3.29)	21.434 (1.19)	TOTEMP (total employment)	-1.360^{-3} (-.13)
3	-6.961 (-.81)	-11.774 (-1.40)	NUMSUPL (number of suppliers)	.0666 (1.79)
4	-7.774 (-.90)	-9.923 (-1.18)	AGEBUS (age of business)	.0134 (.19)
5	-4.439 (-.79)	-8.715 (-1.58)	**Local Presence:** PEREMPD (percent employment-local)	-.0685 (-1.14)
6	-31.555 (-.81)	-25.548 (-.67)	AGELOCAL (years in area)	.1264 (1.75)
7	-3.843 (-.80)	-3.976 (-.85)	LOCAL (=1 if local owner)	-10.40 (-4.03)
8	-5.573 (-1.13)	-7.475 (-1.56)	Sample Size	1358
R^2	.0246	.0823		
F-value	4.260	8.020		

be the most imported by firms in the area and may provide the greatest potential for local provision of a product or service. Of course, the results here, which indicate which type of product is being imported by the greatest number of firms, would have to be examined in conjunction with the results in Table 1, which indicates the extent (in dollar volume) of product importation.

Similar conclusions regarding the types of firms doing importing can be found in Table 4 though these would be less valuable as a strategic planning tool since they do not identify what new businesses might be viable in the area. On a more positive note, for any of the regression results a strategic planner might try to ascertain which firm purchases involve overimporting. This could be done by examining residuals from the regression results and, specifically, looking for large positive residuals. These would represent cases where the actual amount of importation, PEROUT, is greater than would be expected (i.e., the predicted value of PEROUT) given the firm characteristics (FC), firm sector (FS), and purchase sector (PS) of the case. However, to use the regression results in this way would lead to disclosure of the individual firm purchasing information collected in the survey whereas the estimated regression equations (as given in Tables 2-6) can be presented by a public agency and still not lead to any disclosure of the underlying firm survey data.

Table 6: Firm/Purchase Sector Differences in Importation

Dependent Variable: PEROUT = percentage of purchases from outside area

	Independent Variables				
Sector	Firm (FS)	Purchase (PS)	Firm (FS)	Purchase (PS)	Firm Characteristics (FC)
Constant	41.346 (4.75)		39.058 (4.76)		**Measures of Size:**
1	-21.238 (-2.29)	-21.825 (-3.53)	-23.534 (-3.33)	-20.999 (-4.47)	TOTPUR (total purchases) -.2478E-6 (-.22)
2	-4.610 (-.61)	50.661 (3.09)	-25.054 (-4.18)	3.570 (.26)	TOTEMP (total employment) .2262E-3 (.27)
3	-7.556 (-.91)	-6.359 (-.75)	-25.904 (-3.97)	-9.188 (-1.42)	NUMSUPL (number of suppliers) -.0580 (-2.00)
4	12.229 (1.49)	-8.269 (-.97)	-9.835 (-1.52)	-10.729 (-1.67)	AGEBUS (age of business) -.05233 (-.92)
5	-13.755 (-1.71)	-5.607 (-1.01)	-12.159 (-1.97)	-19.290 (-4.56)	**Local Presence:** PEREMPD (percent employment-local) .09442 (1.99)
6	-19.836 (-2.51)	-27.078 (-.70)	-17.813 (-2.95)	-19.723 (-.68)	AGELOCAL (years in area) .05566 (.10)
7	-14.269 (-1.80)	-2.732 (-.58)	-13.338 (-2.20)	-2.987 (-.84)	LOCAL (=1 if local owner) -12.970 (-4.85)
8	-10.661 (-1.44)	-5.807 (-1.20)	-14.890 (-2.63)	-10.986 (-2.99)	**Reasons for Importing:**
R^2	.0625		.4700		UNAVAIL (=1 if unavailable) 53.841 (25.51)
F-value		5.587		47.254	LOCPRIC (=1 if high local price 42.731 (15.98)
					Sample Size 1358

Conclusion

This paper has attempted to analyze local importation using both non-stochastic and stochastic methods. It hopefully has been successful in suggesting how such methods might be used in a local area for strategic planning of economic development. By determining the extent and pattern of importation both the public and private sectors in a local area will be better informed as they plan for the future. It may well be that lack of such information, rather than economic disadvantage, is the reason for low local provision of some product or service. The analysis suggested in this paper can be the basis for identifying such opportunities.

While having definite policy applications, the paper has also attempted to provide some stochastic basis for testing the assumptions of many regional forms of analysis. Specifically, regression analysis is used to make more use of the type of firm specific data which is usually collected in an input-output purchases only survey. A model is provided for examining both within sector and between sector differences and testing if such differences are statistically significant. While the results in this paper do not disprove, in themselves, the assumptions usually made in regional science (e.g. within sector differences are negligible or no input substitution), they do raise questions about such assumptions and suggest a direction for further refinement of testing such assumptions using stochastic methods.

Table 6A: Firm/Purchase Sector Differences in Importation Without UNAVAIL, LOCPRIC

Dependent Variable: PEROUT = percentage of purchases from outside area

	Independent Variables					
Sector	**Firm (FS)**	**Purchase (PS)**	**Firm (FS)**	**Purchase (PS)**	**Firm Characteristics (FC)**	
Constant	41.346 (4.75)		55.310 (5.20)		**Measures of Size:**	
1	-21.238 (-2.29)	-21.825 (-3.53)	-22.351 (-2.44)	-25.471 (-4.18)	TOTPUR (total purchases)	$.3789^{-5}$ (2.63)
2	-4.610 (-.61)	50.661 (3.09)	-16.587 (-2.14)	23.796 (1.34)	TOTEMP (total employment)	$-.4131^{-3}$ (-.38)
3	-7.556 (-.90)	-6.359 (-.75)	-20.955 (-2.47)	-8.187 (-.98)	NUMSUPL (number of suppliers)	.0392 (1.05)
4	12.229 (1.49)	-8.269 (-.97)	-.788 (-.09)	-9.239 (-1.11)	AGEBUS (age of business)	-.0292 (-.39)
5	-13.755 (-1.71)	-5.607 (-1.01)	-22.800 (-2.84)	-7.903 (-1.45)	**Local Presence:** PEREMPD (percent employment-local)	-.0889 (-1.45)
6	-19.836 (-2.51)	-27.078 (-.70)	-23.264 (-2.97)	-19.651 (-.52)	AGELOCAL (years in area)	.1952 (2.59)
7	-14.269 (-1.80)	-2.732 (-.58)	-21.697 (-2.76)	-2.815 (-.61)	LOCAL (=1 if local owner)	-7.960 (-2.31)
8	-10.661 (-1.44)	-5.807 (-1.20)	-14.735 (-2.00)	-6.759 (-1.42)	Sample Size	1358
R^2	.0625		.1044			
F-value		5.587		6.762		

Appendix I: List of Variables

Dependent Variable:

PEROUT = percentage of firm i purchases of good j made outside the area

Independent Variables:

Firm characteristics (FC) — hypothesized signs in parentheses

Measures of Size:

TOTPUR = total dollar purchases made by firm (+)
NUMSUPL = number of suppliers purchased from (+)
TOTEMP = total employment of firm (+)
AGEBUS = age of business (±)

Local Presence:

PEREMPD = percentage of employment in Duluth (−)
AGEDLTH = years located in Duluth (−)
LOCAL = 1 if local owner; 0 if not (−)

Reasons to Import:

UNAVAIL = 1 if unavailable locally; 0 otherwise (+)
LOCPRIC = 1 if local price higher; 0 otherwise (+)

Firm/Purchase Sector Vectors (FS/PS):

FS1/PS1 = 1 if firm/purchase SIC is 1500-1790; 0 otherwise
FS2/PS2 = 1 if firm/purchase SIC is 2700-3000; 0 otherwise
FS3/PS3 = 1 if firm/purchase SIC is 4200-4700; 0 otherwise
FS4/PS4 = 1 if firm/purchase SIC is 4800-4911; 0 otherwise
FS5/PS5 = 1 if firm/purchase SIC is 5000-5140; 0 otherwise
FS6/PS6 = 1 if firm/purchase SIC is 5200-5900; 0 otherwise
FS7/PS7 = 1 if firm/purchase SIC is 6000-7320; 0 otherwise
FS8/PS8 = 1 if firm/purchase SIC is 7310-8930; 0 otherwise
(base group is SIC numbers above 8930)

Appendix II: SIC Index

1500 Building Construction — General, Contractors and Operative Builders
1600 Construction other than Building Construction — General Contractors
1710 Plumbing, Heating (Except Electric), and Air Conditioning
1730 Electrical Work
1740 Masonry, Stonework, Tile Setting, and Plastering
1750 Carpentering and Flooring
1760 Roofing and Sheet Metal Work
1790 Miscellaneous Special Trade Contractors
2700 Publishing and Printing
3000 Manufacturing
4200 Motor Freight Transportation and Warehousing
4800 Communication
4911 Utilities
5000 Wholesale — Durable

5010 Motor Vehicles and Automotive Parts and Supplies
5020 Furniture and Home Furnishings
5030 Lumber and Other Construction Materials
5060 Electrical Goods
5070 Hardware, and Plumbing and Heating Equipment and Supplies
5071 Computer Hardware
5072 Computer Software
5080 Machinery, Equipment, and Supplies
5090 Miscellaneous Durable Goods
5100 Wholesale — Nondurable
5110 Paper and Paper Products
5120 Drugs, Drug Proprietaries and Druggists' Sundries
5140 Apparel, Piece Goods, and Notions
5300 Retail Trade
6001 Banking — Interest Paid
6002 Banking — Trust Services
6003 Banking — Other expenses
6150 Business Credit Institutions
6160 Mortgage Bankers and Brokers
6200 Security and Commodity Brokers, Dealers, Exchanges, and Services
6310 Life Insurance
6320 Accident and Health Insurance and Medical Service Plans
6330 Fire, Marine, and Casualty Insurance
6370 Pension, Health, and Welfare Funds
6390 Insurance Carriers, Not Elsewhere Classified
7200 Laundry
7310 Advertising
7320 Consumer Credit Reporting Agencies, Mercantile Reporting Agencies, and Adjustment and Collection Agencies
7330 Mailing, Reproduction, Commercial Art and Photography, and Stenographic Services
7340 Services to Dwellings and Other Buildings
7360 Personnel Supply Services
7370 Computer and Data Processing Services
7391 Research and Development Laboratories
7392 Consulting Services, Management, Public Relations, Economics/Forecasting
7394 Equipment Rental and Leasing Services
7395 Photofinishing Laboratories
7397 Commercial Testing Laboratories
7399 Business Services, Not Elsewhere
7510 Automotive Truck Rental and Leasing
7600 Miscellaneous Repair Services
7900 Theater — Symphony
8000 Health Services
8070 Medical and Dental Laboratories
8090 Health and Allied Services, Not Elsewhere Classified

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