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AUTHOR	Christiadi; Loveridge, Scott
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ABSTRACT

The Workforce Investment Act of 1998 shifts decision-making authority for funding of local job training programs from the federal government to state and local boards, which will need local decision-making tools to inform policy. One such tool is a method proposed by S. Goetz and D. Debertin to estimate demand for educational attainment at the county level utilizing nonlocal secondary data on employment patterns. The method focuses analysis on the demand of private businesses and makes possible a simple forecast of future demand. This paper estimates local demand for educational attainment in two West Virginia counties using the Goetz-Debertin (nonsurvey) method and compares results with those from a survey of local businesses. Two assumptions of the nonsurvey method are fixed proportions of occupations per sector and fixed proportions of educational attainment per occupation. Results indicate that differences in the distribution of businesses by size and by subsector across counties might affect final demand, but the nonsurvey method does not take this into account. Indications that proportions of input might change over time suggest that the nonsurvey method should use annual data sets such as the Current Population Survey. Conflicting with the nonsurvey method's second assumption is the finding that certain occupations in different sectors differ in demand for educational attainment. The study also found that the West Virginia counties' proportion of top-level occupations was substantially below national averages, suggesting underinvestment in education, and that businesses saw a real need for more computer training. (Contains 15 references, many data tables, and the business survey questionnaire.) (SV)

A Comparison of Survey and Non-Survey Methods for Estimating County-level Demand For Educational Attainment

by

Christiadi and Scott Loveridge

RESEARCH PAPER 2021

Abstract: The implementation of the Workforce Investment Act of 1998 increases the relevance of methods such as that proposed by Goetz and Debertin for estimating demand for educational attainment at county level utilizing secondary data. The method focuses the analysis on the demand of private businesses, and makes possible a simple forecast of future demand. The final estimates obtained by the method impose distributions of educational attainment demanded by private businesses in a county. This study compares the distributions with survey-based results. The paper focuses on two assumptions adopted by the non-survey method: (1) fixed proportions of occupations per sector and (2) fixed proportions of educational attainment per occupation. The study found evidence that differences in the distribution of businesses by size and by sub-sector across counties might play role in determining the final demand. The non-survey method does not yet take this matter into account. There are indications that proportions of input might change over time, so it might be necessary for the non-survey method, especially when estimating the demand of years away from the decennial census years, to use data sets that are made available annually, such as Current Population Survey, rather than Census. Another important finding is the early evidence that certain occupations in different sectors might demand for different composition of educational attainment. This suggests that it might be necessary, in the future, for the non-survey method to redefine its second assumption. The study also finds West Virginia's occupational distribution to be substantially below the national average for top-level occupations, a hint that the state may be under investing in education. Firms also indicated a real need for more computer training.

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Introduction

The process of devolution, in which centralized government power shifts to the local level, is accelerating in the U.S. and other developed countries. There are many potential explanations for this trend (Loveridge, 1999a), but whatever the underlying causes, the shift has created an increased need for local decision-making tools to help inform policy. Presently people try to make the best use of the information available, and process it to generate policies to improve the local economy. A case in point is the Workforce Investment Act of 1998, which put in place tremendous changes in the way national training programs are funded. The changes wrought by WIA became effective on July 1, 2000. The WIA shifts decision-making authority for approval of funds for local training programs from the federal government to a combination of state and sub-state boards. These boards may be ill equipped to take full advantage of the opportunities the WIA presents (Loveridge, 1999b).

This study tests a method for using general information to produce information relevant to the local economy. Particularly under the WIA, information on local employment patterns is very important for local boards as they determine the highest priorities for training programs. This study uses non-local secondary data on employment to generate an estimate of local demand for educational attainment in the workforce. The study builds on a method proposed by Goetz and Debertin[1]. The study has two main objectives. The first is to examine methods of making non-survey estimates and then make use of the results to generate information meaningful to local government. Secondly, the study evaluates whether such a method is reliable, in the sense that it does provide a reliable estimate of the demand for educational attainment at county level. For the purpose of evaluation, the study compares primary data from a survey of local businesses in two West Virginia counties with results from the non-survey estimates. In the end, based on the comparison, the study proposes ways of refining the Goetz-Debertin method; henceforth we will refer to the Goetz-Debertin method as the non-survey method.

Theory

The non-survey method relies on two main assumptions: a fixed distribution of occupations required per sector; and a fixed distribution of education required per occupation. These two assumptions are basically rooted in the notion that business production functions exhibit Leontief technology. Under this production function, a constant return to scale applies, and a fixed proportion of inputs are required to produce one unit of output. Such an assumption is widely used and justified in regional economic input-output models. El-Hodiri and Nourzad (1988) use a mathematical proof to show that the fixed-proportion of inputs assumption may applicable even when the technology exhibits a Cobb-Douglas production function as follows.

According to the Leontief production function:

$$X_j = \min (Z_{1j}/a_{1j}, Z_{2j}/a_{2j}, Z_{3j}/a_{3j}).$$

where X_j = value of total output in sector j.

[1] Goetz, Stephan J. and David L. Debertin. 1993. "Estimating County-Level Demand for Educational Attainment." *Socio-Economic Planning Science*. Vol. 27. No.1, pp. 25-34.

Z_{1j} = value of input 1 in sector j.
a_{ij} = technical coefficient or direct input requirement.

Soliving for a_{1j} $\Rightarrow a_{1j} = Z_{1j}/X_j$.
Or a general solution $\Rightarrow a_{ij} = Z_{ij}/X_j$, which is the share of value of input to the value of total output.

Now let a Cobb-Douglass Production function be: $X_j = X_{1j}^{b1j}\ X_{2j}^{b2j}$.
In this case X is defined as input in physical terms, not the value of input.

Under this production function, b_{ij} is the proportion of input i needed to produce one unit of output in sector j, which in the Leontief production function above is a_{ij}.

The value of the marginal product (MVP) is defined as the output price (P_j) times the marginal physical product (MPP_i).

$MVP_i = P_j * MPP_i$
Where by definition:
$MPP_1 = \partial X_j/\partial X_{1j}$
$= b_{1j} X_{1j}^{b1j-1} X_{2j}^{b2j}$
$= b_{1j} X_{1j}^{b1j} X_{2j}^{b2j}/X_{1j}$
$= b_{1j} X_j/X_{1j}$
Or a general solution: $MPP_i = b_{ij}X_j/X_{ij}$
$\Rightarrow MVP_i = P_j\ b_{ij}\ X_j/X_{ij}$

Under the neoclassical assumptions of profit maximization and competitive market, wage equals value of the worker's marginal physical product, or price of input equals MVP:
$P_i = P_j\ b_{ij}\ X_j/X_{ij}$
Solving for b_{ij}:
$\Rightarrow b_{ij} = P_iX_{ij}/P_jX_j$,
which is the share of the value of input to the value of output, which is equivalent to a_{ij} in the Leontief production function.

Implied in this assumption is that technology stays the same. In other words it also says that the same proportion of inputs applies across different businesses. This study collected primary data to see whether this assumption is realistic in practice. There might be no such thing as two different businesses applying the same level of technology. What is called technology to particular kinds of businesses sometimes is not easily defined. How can one define the level of technology applied in, for instance, an insurance company with five employees? Is it the amount and the speed of the computer system or something else?

Or does the different size of business matter? Oi and Idson (1999) for instance argued that large businesses tend to pay higher wages than small businesses. They, on the other hand, did not find a clear cause why that happens. However, would that be because big businesses tend to use higher level of technology?

Technology also advances over time. The speed of technical change depends on the nature of the businesses operation. This implies that proportions of inputs might also change adjusting to the most efficient techniques of operation available. Does the method used in this study already incorporate the aspects of technical change? This is also an interesting question this study tries to answer.

Wojan (2000) examined the existence of spatial division of labor, noting that over time rural areas become more specialized in low-skills jobs and urban in high-skill jobs. He measured the degree of specialization based on the ratio of real local employment of an occupation to its predicted employment. The predicted local employment is derived under the assumption of fixed input proportions of occupation per sector, at national and local level. He found that metropolitan commuting zones are generally being more specialized in high-skill occupations (managerial and professional occupations) and non-metropolitan areas are in low-skills occupations (e.g. operators), suggesting that spatial division of labor exists. Another study by McGranahan and Ghelfi (1998) examined the trend of rural-urban shifts in jobs requiring some-college-or-higher educational attainment in two periods, 1990-to-1988, and 1989-to-1995. They found that indeed in the first period there were shifts from rural-to-urban of 7.5% of jobs requiring some-college education, and of 13.0% of jobs requiring a BA degree. However, they did not find significant shifts in the later period.

Both studies suggest that spatial division of labor might exist. In line with that, one might suspect that the state of West Virginia, which is considered to be one of the most rural states in the U.S., would exhibit the smaller share of high-skill occupations and larger share of low-skill occupations, compared to the nation on average.

Detailed Description of the Non-Survey Method

The non-survey method proposed by Goetz and Debertin requires three types of data. Two of the data sources are state-level while the third is county-level. The two state level data are: (1) a table showing occupation by level of educational attainment, and (2) a table showing occupation by industry. The county level data is employment by industry. The method combines the first two state level tables to create a 3-way crosstabulation of industry, occupation, and educational attainment.[2]

Two main assumptions are imposed: first, a fixed distribution of occupations demanded by each individual sector; and second, a fixed distribution of educational attainment demanded by each individual occupation. Table 1 shows the fixed distribution imposed by assumption one, and Table 2 that by assumption 2.

[2] For more description on how the method works, see Appendix 3.

Table 1. The Distribution of Occupations Imposed on Each Individual Sector, West Virginia

Occupation	Agriculture	Mining	Construction	Manufact.	Transport	Wholesale	Retail	Finance	Services
Managers	1.9	3.8	5.4	5.2	7.1	5.5	5.2	11.0	6.2
Professionals	4.7	5.7	4.5	9.0	8.6	5.2	3.2	11.0	35.2
Sales	0.5	0.3	1.0	3.1	1.7	31.8	41.4	25.3	2.1
Clerks	4.1	5.0	4.9	9.7	24.2	18.2	7.5	43.9	15.6
Service Workers	1.6	2.1	1.0	2.3	2.8	1.8	24.9	4.7	29.6
Farm-Service Workers	79.6	0.1	0.5	1.5	0.2	0.5	0.2	1.0	0.8
Prod.-Precision Workers	1.9	52.8	49.1	19.5	17.8	9.6	5.7	2.0	4.9
Operators	2.9	21.4	14.7	40.4	30.9	18.2	3.7	0.6	4.2
Helpers/Laborers	2.9	8.7	18.9	9.1	6.8	9.2	8.3	0.6	1.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Imputed from 1990 Census of Population and Housing PUMS (5%).
Notes: Prod.-Precision Workers = Production Precision Workers; Manufact. = Manufacturing; Wholesale = Wholesale-Trade; Retail = Retail Trade.

According to the first assumption, as Table 1 shows, service sector, regardless of the county in West Virginia in which they are located, in total always requires 35.2% managerial occupations, 29.6% service worker occupations, 15.6% clerical occupations, and so on. Similarly, manufacturing sector, in total always requires only 9.0% professional occupations, but requires 40.4% operator occupations, 19.5% production-precision occupations, and so on.

According to the second assumption, as Table 2 shows, top-level occupations such as managerial occupation, regardless of the sector to which they belong, in total always requires 36.7% college-graduates-or-higher education, 25.5% some-years-of-college education, 28.4% high-school graduates, and so on. Similarly, lower level of occupations such as helper/laborer occupations, demand for only 3.2% college-graduates-or-higher education, but as many as 46.5% high-school-graduates, 36.9% less-than-high-school-graduate education, and so on.

Table 2. Percentage Distribution of the Demand for Educational Attainment Imposed on Each Individual Occupation, West Virginia

Occupations	Less than HS	Some Years of HS	HS Graduates	Some Years of College	= College Graduates	Total
Managers	1.8	7.6	28.4	25.5	36.7	100.0
Professionals	0.5	2.4	15.1	16.9	65.1	100.0
Sales	2.8	15.1	42.3	25.1	14.7	100.0
Clerks	1.7	6.9	46.4	31.8	13.2	100.0
Service Workers	9.2	26.1	41.8	17.0	5.9	100.0
Farm-Service Workers	17.6	28.7	35.1	11.6	7.0	100.0
Prod.-Precision Workers	10.2	20.6	47.6	15.0	6.6	100.0
Operators	11.1	21.5	51.7	12.2	3.5	100.0
Helpers/Laborers	10.3	26.6	46.5	13.5	3.2	100.0

Source: Imputed from 1990 U.S. Census of Population and Housing PUMS (5%).
Note: HS = High School.

After creating the 3-way crosstabulations, and then standardizing total employment in each sector to one (100%), the method creates a matrix showing the percentage distribution of demand for educational attainment by occupations and industry. The study calls this the requirements matrix referring to the exact proportions of workers having education A required by occupation B employed in businesses in sector C. An example of the requirements matrix is shown in Table 3. Notice that by the above two assumptions, it is implied that this matrix applies to each individual county in West Virginia. In other words the methods assumes each sector in the local (county-level) industry exhibits the same distribution of demand for educational attainment as described in the requirements matrix. So service sector in any county within West Virginia, for instance, always requires: 2.270% of its all workers to have college-graduates-or-higher education and to hold managerial occupations; 22.92% to have some-years-of-college education and to hold professional occupations; 0.26% to have less-than-HS education and to hold clerical occupations; and so on. Each sector has its own distribution of occupations, as well as educational attainment. The matrix shows that in total, service is the sector that demands the highest proportion of top-level occupations (managerial and professional occupations), 41.41%, compared to 14.29% by manufacturing, and 9.45% by mining. The service sector demands the most highly educated workers[3], 49.48%, compared to 29.17% by manufacturing, and 26.21% by mining.

[3] Some years of college or higher

Table 3. The Requirements Matrix: Demand for Educational Attainment in Service, Manufacturing, and Mining Sectors, West Virginia

INDUSTRY/ OCCUPATION	Educational Attainment					
	Less than HS	Some Years of HS	HS Graduate	Some Years of College	= College Graduate	Total
SERVICE						
Managers	0.11	0.47	1.76	1.58	2.27	6.21
Professionals	0.19	0.84	5.31	5.95	22.92	35.20
Sales	0.06	0.32	0.89	0.53	0.31	2.10
Clerks	0.26	1.08	7.23	4.96	2.07	15.61
Service Workers	2.71	7.74	12.39	5.05	1.75	29.65
Farm-Service Workers	0.15	0.24	0.29	0.10	0.06	0.83
Prod.-Precision Workers	0.50	1.00	2.31	0.73	0.32	4.86
Operators	0.47	0.90	2.18	0.51	0.15	4.21
Helpers/Laborers	0.14	0.36	0.62	0.18	0.04	1.34
Total	4.58	12.95	32.99	19.59	29.89	100.00
MANUFACTURING						
Managers	0.10	0.40	1.49	1.34	1.92	5.25
Professionals	0.05	0.21	1.36	1.53	5.88	9.04
Sales	0.09	0.47	1.33	0.79	0.46	3.13
Clerks	0.16	0.68	4.51	3.09	1.29	9.73
Service Workers	0.21	0.59	0.95	0.39	0.13	2.27
Farm-Service Workers	0.27	0.44	0.54	0.18	0.11	1.54
Prod.-Precision Workers	2.00	4.02	9.29	2.93	1.28	19.53
Operators	4.47	8.68	20.89	4.91	1.42	40.37
Helpers/Laborers	0.94	2.43	4.25	1.23	0.29	9.14
Total	8.29	17.93	44.61	16.38	12.79	100.00
MINING						
Managers	0.07	0.29	1.07	0.96	1.38	3.76
Professionals	0.03	0.14	0.86	0.96	3.70	5.69
Sales	0.01	0.05	0.15	0.09	0.05	0.34
Clerks	0.08	0.35	2.32	1.59	0.66	5.01
Service Workers	0.20	0.56	0.89	0.36	0.13	2.13
Farm-Service Workers	0.01	0.02	0.03	0.01	0.01	0.07
Prod.-Precision Workers	5.40	10.88	25.14	7.94	3.47	52.83
Operators	2.37	4.61	11.08	2.60	0.76	21.42
Helpers/Laborers	0.90	2.32	4.06	1.18	0.28	8.73
Total	9.08	19.21	45.60	15.69	10.43	100.00

Source: Imputed from 1990 U.S. Census of Population and Housing PUMS (5%).

The final step of the method is to relate the requirements matrix to the county employment data to estimate the countywide employment demand. This is done by multiplying each cell of the requirements matrix within a sector by the total employment of the relevant sector. This yields an estimate of the countywide employment demand by sector. Notice that the estimate obtained is in absolute terms. There is no need to change the estimate into relative terms per sector, because by default each county has exactly the same percentage distribution of demand per sector (i.e. the requirements matrix).

The only reason to convert the results to relative terms is when one needs to see the percentage distribution of the total countywide demand instead of demand per sector. In this case each county will have different distributions of demand for occupations as well as for educational attainment. The industrial structure determines the pattern of demand for occupations, which further determines the pattern of demand for educational attainment.

Modifying the Non-Survey Method

Some modifications of the original Goetz-Debertin method were necessary. The secondary data proposed by the method is no longer published in the same way it was from the 1980 Census. In short, except for the county level data, what was regarded by Goetz and Debertin as "readily available secondary data" now are no longer easily obtained. This called for a different way of obtaining the required secondary data.

Census sample data are publicly available, so one can generate Table 1 and Table 2 through manipulation of available data sets. This study generates the tables from the 1990 Census of Population and Housing PUMS (5% sample) CD-Rom. However, there are now data sources other than the 1990 Census that might be applied in this method: Current Population Survey (CPS) 1997, and Occupational Employment Statistics (OES) Survey 1997.[4] Thus there are three different requirements matrices available depending on the source of data chosen. This paper first, focuses the analysis on the estimates made using the 1990 Census data sets, which is the standard data sets suggested by Goetz and Debertin. Afterwards, a specific section of the paper discusses differences of the estimates due to the use of alternative data sets.

Non-Survey Method: Results for Brooke County and Mingo County

For the purpose of this study, two local West Virginia economies were chosen: Brooke County and Mingo County. Brooke County is in the State's northern panhandle wedged between Ohio and Pennsylvania, and is about 30 miles from Pittsburgh. Mingo County is one of West Virginia's southern counties and borders both Kentucky and Virginia. The county seats of the two counties lie 289 miles apart. The two counties are quite dissimilar in terms of their industrial history and prospects. As explained above, differences in the structure of the local industry translate into differences in estimated demand across counties. The following passages describe the non-survey method results for the two counties.

The county level data required by the non-survey method describes the structure of the local economy. Table 4 shows the distribution of employment by industry in both counties, compared

[4] Data from OES survey 1997 is publicly available by request to the State Employment Security Agencies.

to the statewide average distribution. In aggregate, in terms of the pattern of employment distribution between exporting and non-exporting industry, Brooke County has a distribution similar to the statewide average. They both have about 70% employment share in non-exporting industry, or only 30% share in exporting industry. This means about 70% of the economic activity in Brooke County is determined by interactions among local economic agents. In other words only about 30% of its economy is affected by economic situations outside the state.[5] In Mingo County, on the other hand, only about 63% of economic activity is determined by interactions among local economic agents. This says that Mingo County's economy, compared to Brooke County's, depends a little more on its exporting industry, or on economic conditions outside the state.

Although in aggregate the distribution pattern is similar, at finer levels of disaggregation, some differences emerge. Brooke County's exporting industry is highly dominated by manufacturing sector (29.2% employment share, compared to only 15.0% share of the statewide average), whereas Mingo County's is highly dominated by mining sector (29.0% employment share). This describes a specific feature of the local economy in both counties.

Table 4. Employment in West Virginia, and Brooke and Mingo Counties, by Industry

Industry	West Virginia 1990	Brooke County Employment 1997	Brooke County %	Mingo County Employment 1997	Mingo County %
Exporting Industry	30.8	2,436	29.8	3,474	37.1
Agriculture	2.3	48	0.6	39	0.4
Mining	5.5	0.0	0.0	2,713	29.0
Construction	8.0	0.0	0.0	403	4.3
Manufacturing	15.0	2,388	29.2	319	3.4
Non-Exporting Industry	69.2	5,750	70.2	5,879	62.9
Transportation	7.8	546	6.7	1,405	15.0
Wholesale-Trade	3.2	210	2.6	250	2.7
Retail-Trade	21.3	1,942	23.7	1,429	15.3
Finance	4.3	372	4.5	451	4.8
Services	32.6	2,680	32.7	2,344	25.1
Total	100.0	8,186	100.0	9,353	100.0

Sources: West Virginia data is imputed from 1990 Census of Population and Housing PUMS (5%), and the county data is from Regional Economic Information System (REIS).

Recent data indicate employment in West Virginia's mining sector in decline. "West Virginia Economic Outlook 1999" indicates that job growth for the mining sector fell at the rate of 5% annually from 1990 to 1998. Apparently, although West Virginia export of coal to outside the U.S. grew at 24.1% annually, its export to other states within the U.S. fell.[6] Mingo County

[5] The term 'export' here includes both out-of-state and out-of-country (the U.S.) exports.

[6] See: West Virginia Economic Outlook 1999, page 5; and West Virginia International Trade and Investment (1999), page 22. Both are publications of the Bureau of Business and Economic Research, West Virginia University.

mining sector is not an exception. This sector contributes over 50% of local private personal income, but starting from 1995 the income from this sector began to decline, causing overall local personal income to decline as well. From 1995 to 1997 personal income from this sector fell at an annual rate of 2.3%.

In the case of the manufacturing sector, the same sources indicate that the annual job growth in this sector in West Virginia after 1994 is stable at zero. In other words, since 1994 this sector, in aggregate, has no longer experienced the job losses it did from 1990 to 1994. Looking at more detailed information, data in fact show that within the manufacturing sector the non-durable sub-sector is still experiencing job-losses, but the loss is offset by the positive job-growth in the durable manufacturing sub-sector. Brooke County manufacturing sector mostly consists of durable industries. This sub-sector contributes almost 90% of income from the manufacturing sector, or about 40% of total private local personal income. The stable growth of durable sub-sector outweighs the continuous fall in the non-durable sub-sector.

As mentioned above, the fixed distributions imposed in Table 1 and 2, translate differences in the local economy into differences in the total demand for occupations and educational attainment. Table 5 shows how the distribution of the total estimated demand for occupations differs across various regions.[7]

Table 5. The Percentage Distribution of Occupations Demanded in the U.S., West Virginia, and Brooke and Mingo County.

Occupation	US	WV	Brooke	Mingo
Top-Level Occupations	30.1	21.4	22.1	18.8
Managers	12.3	5.8	5.9	5.6
Professionals	17.8	15.6	16.2	13.4
Middle Level Occupations	56.0	71.2	71.1	74.5
Sales	11.8	12.3	13.5	9.4
Clerks	16.3	13.3	13.8	13.3
Service Workers	13.2	16.0	16.7	12.7
Farm Service Workers	2.5	2.5	1.3	0.8
Prod.-Precision Workers	11.3	14.4	10.2	23.2
Operators	10.9	13.7	16.6	15.0
Low-Level Occupations	3.9	6.5	5.8	6.6
Helper/Laborers	3.9	6.5	5.8	6.6
Total	100.0	100.0	100.0	100.0

Sources: US data is from 1990 Census of Population, Social and Economic Characteristics (U.S.), West Virginia data is imputed from 1990 U.S. Census of Population and Housing PUMS (5%), and the county data is from both the 1990 PUMS (5%) and Regional Economic Information System (REIS).

[7] To get estimates in Table 5, one needs to sum up, by occupations, all demands across sectors obtained from the requirement matrix.

According to the 1990 Population Census, the share of population living in West Virginia's urban areas is around 20%, indicating that the state is really a rural state. As expected, West Virginia employment, compare to national employment, is less concentrated in top-level occupations (21.4%, compared to 30.1%), and more concentrated in low-level occupations (78.6%, compared to 69.9%). This agrees with Wojan, 2000 and McGranahan and Ghelfi, 1998. What about the comparison with the two counties? The same data source indicates that the share of urban population in Brooke County is over 50%, whereas in Mingo County is about 12%. Table 5 shows that Brooke County has a larger share of top-level occupations (22.1%) than Mingo County (18.8%), and the state on average (21.4%). This fact also supports the existence of spatial division of labor.

Recall that Brooke County, compared to the state average, has a much higher share of employment in the manufacturing sector, and a little higher share in the services and retail-trade sectors. Table 1 imposes a high proportion of operators needed in manufacturing sector (40.4%), and a great proportion of professionals and sales workers needed in the services and retail-trade sectors. Consequently, one should expect that Brooke County, compared to the state, would exhibit a higher estimated demand for operators, and a slightly higher demand for professionals and sales workers. As expected, in Brooke County, the estimated demand for operators is 16.6%, about three percent higher than the average demand in the state. The estimated demand for professionals and service workers is slightly higher, 16.2% and 13.5% respectively, compared to state averages of 15.6% and 12.3% respectively.

Similarly, since Mingo County exhibits a much higher employment share in mining and transportation sectors, Mingo County's demand for production-precision workers and operators, which takes up 23.2% and 15.0% of the total local demand respectively, are higher than that of the state on average, which takes up only 14.4% and 13.7% respectively. In addition to that, a lower employment share in Retail-Trade and Services sectors causes Mingo County to have a relatively lower demand for sales and service workers (9.4% and 12.7% respectively, compared to 13.5% and 16.7% respectively in Brooke County).

In general Brooke County's demand for types of occupations is quite similar to the statewide average. Brooke County's demand for top-level occupations takes up about 22%, which is about the same as the state average of 21.4%, and higher than that of Mingo County's of about 19%. On the other hand Brooke County's demand for low-level occupations takes up only 5.8%, which is less than the state average of 6.5% and that of Mingo County's of 6.6%. This suggests that the labor market in Brooke County might have a relatively higher capacity to absorb more skillful workers than that in Mingo County.

Overall, however, the labor market situation in both counties, as well as in the state on average, is much less promising than the national average. Only about 20% of jobs in West Virginia require top-level occupations. This is about 10 percent lower than the U.S. businesses on average require. On the other hand about 6% of the jobs in West Virginia are low-level type of occupations. This is about 2.5% higher than the national average. Other data sources describe the labor market situation in West Virginia, indicating that from 1980 to 1998 the unemployment

rate in West Virginia was always higher than that in the U.S. on average.[8] Some of the state's unemployment woes may be related to under investment in education.

Estimated Demand for Educational Attainment – As mentioned, differences in the estimated demand for occupations imply further differences in the estimated demand for educational attainment. Table 6 shows how estimated demand for educational attainment differs between Brooke and Mingo County, and how the two counties compare to the statewide average.

Table 6. The Percentage Distribution of the Demand for Educational Attainment in West Virginia, Brooke and Mingo County, Non-Survey Method

Educational Attainment	WV	Brooke	Mingo
= High School Graduates	63.4	61.6	64.3
Less than High School	6.3	6.0	6.7
Some Years of High School	16.1	15.8	16.4
High School Graduates	39.8	39.8	41.2
= High School Graduates	36.7	38.4	35.7
Some Years of College	19.1	19.4	18.7
College Graduates or Higher	18.6	19.0	17.0
Total	100.0	100.0	100.0

Sources: Imputed from 1990 U.S. Census of Population and Housing PUMS (5%) and Regional Economic Information System (REIS).

Because Brooke County has a higher demand for top-level occupations than Mingo County and the state on average, using the assumption imposed in Table 2, Brooke County should have a higher demand for highly educated workers. Table 6 shows that Brooke County's estimated demand for highly educated workers takes up 38.4% of all workers in the county. This is higher than the proportion demanded in the state on average, which is 37.5%. By the same reason Mingo County's demand for highly educated workers, which is 35.7%, is lower than that demanded in the state on average.

Notice also that the mode level of educational attainment of all the workers is high-school-graduates, 40%. So it would be of no surprise that most of the jobs, regardless of which sector dominates, will mostly be middle-level type occupations, which require medium skills possessed by workers with this category of educational attainment. In fact, as indicated by Table 2 above, one can see each of all middle level type of occupations, ranging from sales to operators workers, require more than 40% of all workers to have high-school-graduate educational attainment (with the exception of farm-service workers, which requires a somewhat smaller proportion, 35.1%).

Survey Implementation

A phone survey was conducted of businesses in Brooke County and Mingo County. The survey targeted businesses operating in two largest sectors in each county. The survey interviewed

[8] Data is from "West Virginia Economic Outlook 1999," page 7, Bureau of Business and Economic Research, West Virginia University.

businesses operating in services and manufacturing sectors in Brooke County, and those operating in services and mining sectors in Mingo County. The list of respondents (businesses) was obtained from American Business Disc 1999. The interviewers called all businesses on the list, without any exceptions. Interviewers asked for the person in charge of hiring employees. Two types of questionnaires were used according to the type of businesses: the first type of questionnaire applies to big businesses (those with 10 or more number of employees), and the second type applies to businesses with less than 10 employees. A copy of each interview schedule is found in appendix 4.

Table 7. Response Rates of the Survey

Type of Business by Size	Brooke County		Mingo County		Total
	Services	Manufacturing	Services	Mining	
Businesses with = 10 employees					
Total in the list	19	11	18	28	76
Number disconnected	4	1	6	14	25
Number responding	9	7	9	5	30
Effective response rate	60.0	70.0	75.0	35.7	58.8
Businesses with < 10 employees					
Total in the list	114	14	250	6	384
Number disconnected	44	2	72	1	119
Number responding	54	7	103	1	165
Effective response rate	77.1	58.3	57.9	20.0	62.3
All Businesses					
Total in the list	133	25	266	34	458
Number disconnected	48	3	78	15	144
Number responding	63	14	112	6	195
Effective response rate	74.1	63.6	59.6	31.6	62.1

Source: Survey of the Demand for Educational Attainment, Regional Research Institute, 2000.

Table 7 provides a breakdown of response rates. Overall there were 458 businesses in the list, and 195 (42.6%) responded. However, among those not responding, 144 were wrong or disconnected phone numbers, so the overall effective response rate is actually 62.1%, which is considered high for a survey of private businesses.

There are two possible explanations for this high response rate. First, the project identified a local partner institution in each county. Local partner institutions are well respected entities that expressed interest in supporting the study and that were in a position to take actions based on the study results. For Brooke County, the local partner was the local Business Development Corporation. For Mingo County, the local partner was Southern West Virginia Community College. When interviewers called survey respondents, both West Virginia University and the local partner were mentioned in the introductory comments.

A second explanation for the high response may be that firms are facing tight labor markers and are therefore in general more inclined to participate in surveys related to workforce development than would otherwise be the case.

The fact that there are 31.4% businesses wrongly listed in the American Business Disc, even though this is fairly recently published (released in 1999), may reflect an inaccurate or out-of-date system of collecting information (the American Business Disc data are primarily based on bank loan information). The study here to some extent relies on the data provided in the disc. Although it doesn't seem that the data is accurate in absolute terms, however, in terms of percentage distribution hopefully it is still reliable.[9]

In general businesses in Brooke County have higher response rate than those in Mingo County. Businesses in the service industry in both counties have quite high response (74.1% in Brooke County and 59.6% in Mingo County). The reason is probably because most of the businesses are small businesses, so knowing the answers to questions about current employees is relatively simple. The lowest response rate comes from businesses in the mining sector in Mingo County, where the effective response rate is only 31.6%, but still quite high for a business survey. Many mining sector operations are large businesses, which as mentioned, might make it more difficult to respond to the survey questions. Another possibility is that in general, coal mining in West Virginia is undergoing restructuring with declining employment, so employers may be too distracted by these changes to respond to the survey. A final possibility is also somewhat related to declining employment in the sector. Wages in the coal mining sector are typically far above other occupations in the region, so mining sector employers may have no difficulty attracting a high quality workforce, leaving them less motivated to respond to questions about improving the quality of their workers.

Employers' Perception about the Quality of their Employees

Before answering the main question about the demand for educational attainment, some other results from the survey provide context. The survey tried to examine the 'real' employers' demand for educational attainment in both counties by asking if they in fact desire employees with a higher level of educational attainment or better training than their current employees. Surprisingly, of all 195 businesses interviewed only 8 businesses (4.1%) expressed as not being satisfied with the educational attainment of their employees. This proportion is quite low considering the existence of a general perception that there have been problems of matching between schools and skills required for jobs. The findings of the Educational Quality of the Workforce-National Employment Survey (EQW-NES) 1994 indicate that according to employers about 20% of their employees do not work proficiently.[10]

There are several possible explanations for why the survey found so few unsatisfied businesses. The first possibility is that most businesses in both counties are in fact small businesses, with about 5 employees. It is reasonable to believe that small businesses are more flexible, as well as more tolerant or less demanding about skills of the people they hire. This hypothesis is supported by the fact that all 8 businesses expressing dissatisfaction are larger businesses (those with 10 or

[9] The study relies on this disk to compute the percentage distribution of businesses by size and by sub-sector.
[10] EQW-NES 1994 Issues Number 10, page 3.

more employees). The second possibility might be related to the nature of phone interviews. It is possible that businesses tend not to reveal their dissatisfaction to end the interview sooner.

Being satisfied with the educational attainment of their employees does not directly mean that they are not interested in having their employees receive additional education or training. A large minority of businesses expressed their interest in having their employees trained or given additional education. Table 8 shows what the employers would like their employees to do to increase their productivity.[11]

Table 8. Employers' Human Capital Development Preferences

Occupations	Number of Businesses with the following occupations			Businesses desiring employees to have: More Education (in %)			Training (in %)		
	Brooke	Mingo	Total	Brooke	Mingo	Total	Brooke	Mingo	Total
Managers	66	82	148	4.5	4.9	4.7	22.7	14.6	18.2
Professionals	35	74	109	5.7	13.5	11.0	0.0	13.5	9.2
Sales	9	4	13	11.1	25.0	15.4	0.0	50.0	15.4
Clerks	33	61	94	6.1	16.4	12.8	3.0	23.0	16.0
Service Workers	30	26	56	6.7	0.0	3.6	0.0	3.8	1.8
Farm-Service Workers	0	2	2	0.0	0.0	0.0	0.0	0.0	0.0
Prod.-Precision Workers	19	4	23	5.3	50.0	13.0	10.5	50.0	17.4
Operators	7	9	16	14.3	22.2	18.8	28.6	11.1	18.8
Helpers/Laborers	17	13	30	0.0	15.4	6.7	17.6	15.4	16.7

Source: Demand for Educational Attainment Survey, WVU Regional Research Institute, 2000.

In general employers are more interested in having their employees trained rather than given additional education. This might suggest it is easier to increase skills by training rather than by going back to school full time. Table 8 breaks responses down by county; in what follows we aggregate the two counties for an overview. The highest demand for training pertains to managers (18.2%), which is much higher than desired for professionals (9.2%), although the demand for additional education for professionals (11.0%) is higher than that for managers (4.7%). Possibly such a combination occurs because in the main way to gain managerial skills is from training, rather than a formal degree program. Relatively higher demand for training for managers might also reflect the fact that the marginal benefit of training managers is greater than training professionals. The literature on training-need assessment for managers is much more developed than that for other types of occupations.

The demand for additional training or education for clerical workers is also high relative to other occupations: 16.0% and 12.8% respectively. A further look into the questionnaire shows that the most demanded type of training for these workers (12 out of 15 businesses) is computer training. Some of them even indicated that their workers' computer skill is about 20 years out of date. It

[11] Notice that not every individual firm has a complete composition of nine occupations. In fact there are 47 firms out of 195 firms do not really have managers running their businesses.

is also important to note that some of them expressed their dissatisfaction on the provision of the government training services as being not fairly distributed, or insufficient training slots.

There is very little interest from businesses in having their service workers trained or given more education (only 1.8% and 3.6% respectively). Included into service workers types of jobs are private household services (e.g. housekeepers), protective services (e.g. guards), food services (e.g. cooks), health services (e.g. nurses), etc. These types of skills are more specific and usually are obtained not from common training centers or schools. In other words few institutions train or educate these types of skills. In addition, people with these skills tend to be hired based on a more planned demand, and over time their assignments don't change as much as assignments for clerical workers. This all might explain why only a few employers want more training for their service-worker employees.

Comparing the Survey and the Non-Survey Results

We now return to the main study question, comparing the results obtained from the survey versus the estimates suggested by the non-survey method. The analysis first compares the distribution of estimated demand for types of occupations, and then compares the distribution of estimated demand for educational attainment, both in each individual sector. As mentioned above, three sectors are analyzed, starting with service sectors in both counties, followed by manufacturing sector in Brooke County, and then followed by the mining sector in Mingo County.

Service Sectors in Brooke and Mingo County.

Demand for occupations - Table 9 shows the comparison of the countywide occupational distribution in service sector between the one obtained from the non-survey and those from the survey method. It shows substantial differences.[12] The survey found that in the service sector both counties have higher share of employment in top-level occupations than the non-survey method predicts.

A much higher share in top-level occupations, however, occurs in Mingo County (53.5%), compared to 42.6% in Brooke County, as opposed to the 41.4% predicted by the non-survey method. The survey also found that businesses employ a lot more managers than the non-survey method predicts. The survey found about 20% of all workers hold managerial occupations, whereas the non-survey method predicts only 6.2% in managerial slots. One possible explanation for this is that most of the businesses in the service sector in both counties are small, and that scale matters. As indicated in Table 8 above, of all businesses captured in the survey, 85.7% and 92.0% in Brooke and Mingo County respectively are small businesses (those with less than 10 employees).[13] Because there are so many small businesses, with each of them needing at least one manager to run the businesses, then a lot of managers are needed. However,

[12] Note that this comparison is limited only in the services sector, where each county, according to the non-survey method, has the same pattern of occupational distribution. Recall that with the non-survey method, only the 'total' occupational distribution that varies across counties.

[13] Surprisingly, the sample distribution is very close to the real population distribution in general, as indicated in the American Business Disc. The disc indicates that 85.1% and 92.6% of businesses in Brooke and Mingo County respectively, are small businesses.

this argument can work only if the distribution by size found in the sample is indeed different from the statewide average distribution. Appendix 1 shows the comparison between sample distributions and the statewide average distribution. It shows that the survey indeed captured relatively higher portion of small businesses, but not that much. The portion of small businesses in the statewide is 83.6% on average, whereas in the survey it is 85.7% in Brooke County and 92.0% in Mingo County. This suggests that although the scale argument is still acceptable, but this argument alone cannot completely explain why much higher proportion of managers was found in the survey. It also does not explain why Brooke County, rather than Mingo County, has the higher proportion of managerial occupations.

Table 9. Percentage Distributions of the Demand for Occupations in the Service Sector

Occupations	Suggested by Non-Survey Method	Survey Results for:	
		Brooke	Mingo
Top-Level Occupations	41.4	42.6	53.5
Managers	6.2	22.3	20.0
Professionals	35.2	20.4	33.5
Middle-Level Occupations	57.2	53.2	39.0
Sales	2.1	1.6	1.3
Clerks	15.6	8.8	20.2
Service Workers	29.6	38.6	11.0
Farm-Service Workers	0.8	0.0	1.0
Prod.-Precision Workers	4.9	3.8	0.0
Operators	4.2	0.3	5.4
Low-Level Occupation	1.3	4.2	7.5
Helpers/Laborers	1.3	4.2	7.5
Total	100.0	100.0	100.0

Sources: Survey results are from the Survey of the Demand for Educational Attainment, Regional Research Institute, 2000; Non-Survey results are imputed from 1990 U.S. Census of Population and Housing PUMS (5%) and Regional Economic Information System.

Substantial differences also exist in the employment share of the two other dominant occupations in services sector: clerical workers and service workers. Brooke County businesses have a much higher share of service workers (38.6%), whereas Mingo County businesses have a much higher share of clerical workers (20.2), both are higher than what the non-survey method predicts (29.6% and 15.6% respectively). Obviously the 'business-size' argument cannot explain why such differences exist, because if it can both counties should have very similar types of deviations. This calls for another kind of explanation. One possibility is by looking at how businesses are distributed across sub-sectors within the sector.

Appendix 1 also shows the comparison of the distribution by sub-sector in the service sector between the survey sample and the population of the state on average. Brooke County has a very different distribution by sub-sector, whereas Mingo surprisingly has a very similar one. The notable differences are that Brooke County has a much higher portion of "Business and Repair Services" (39.7%, compared to 20.5% in Mingo County, and 21.3% in the state on average), and

a smaller portion of "Professional and Related Services" (52.4%, compared to 60.7% in Mingo County and 61.0% in the state on average). Also Mingo County has a relatively, although not much, higher portion of "Personal Services" (16.1%, compared to 0.0% in Brooke County, and 13.4% in the state on average).

Included in "Business and Repair Services" are businesses such as advertising, data processing services, business services, automotive rental, repair, etc. For these types of services, service workers rather than clerical workers, are the kinds of middle-level occupations more frequently needed. This should explain why Brooke County has relatively higher employment share for service workers. In addition, a further look at the survey results (shown in Appendix 2), it was found that this particular sub-sector, on average, employs a larger portion of managerial occupations (the proportion is 45.7% in Brooke County, and 66.7% in Mingo County).[14] Since the survey sample of Brooke County captured relatively more of "Business and Repair Services" businesses, then Brooke County would end up having a higher portion of managerial occupations, which is what the survey found.

On the other hand, included in "Professional & Related Services" are offices of physicians, schools, accounting services, etc. Appendix 2 shows that for this particular sub-sector, a larger portion of professional occupations, on average, is needed (31.3% in Brooke County and 41.6% in Mingo County). Since few of them are included in the Brooke County survey sample, in total Brooke County should have smaller portion of professional occupations, which is what the survey found.

Similarly, included in "Personal Services" are businesses such as hotels, beauty shops, etc. For such services clerical workers rather than service workers are more frequently needed. This, by the same token, should explain why Mingo County has relatively higher employment share of clerical workers.

The discussion above yields an important finding. Local businesses distribution by size as well as by sub-sector seems to be important in affecting the local demand for types of occupations. Non-survey estimation should then take these two factors into account, which is technically doable because information on both factors is publicly available. Of course a further examination is required to determine the roles of these two factors in the estimation.

Demand for Educational Attainment - Now that the pattern of the demand for occupations is revealed, one can make inferences about the pattern of the demand for educational attainment in the service sector. Based on the non-survey method, this can be done by multiplying the real demand for types of occupations obtained from the survey (Table 9) by the percentage distribution imposed by the method (Table 2), and then summing them by category of educational attainment.[15] Table 10 shows the results, compared with the distributions suggested by the non-survey method. Looking at the sub totals might be deceiving. The non-survey method suggests that Brooke County businesses require 54.4% of their workers to have HS-

[14] About 25 businesses belong to "Business and Repair Services" sub-sector, so a measure of the mean of this sample size should be acceptable, considering also the standard deviations are small.

[15] Note again that in this case the computation is based on the real demand for occupations as obtained from the survey, not the ones obtained from the secondary data as was shown in Table 2 for Brooke and Mingo County.

graduates or lower educational attainment, and 45.6% to have some years of college or higher educational attainment. The survey found that the portions of these categories are 54.3% and 45.7%, meaning that they are very close to what the non-survey method suggests. Similarly, the non-survey method suggests Mingo County businesses would require 45.6% of their workers to have HS-graduate or lower educational attainment, and 54.4% to have some-years-of-college-or-higher educational attainment. The survey found that the proportions of these categories are 46.7% and 53.3%, which again are very close to what the non-survey method suggests.

Table 10. The Percentage Distribution of the Total Demand for Educational Attainment in the Service Sector

Educational Attainment	Suggested by the Non-Survey Method		Survey Results	
	Brooke	Mingo	Brooke	Mingo
Less Than HS Graduate	54.4	45.6	54.3	46.7
Less Than High School	5.1	3.5	0.0	0.0
Some Years of High School	15.1	10.3	0.2	2.5
High School Graduate	34.2	31.9	54.2	44.2
Higher than HS Graduates	45.6	54.4	45.7	53.3
Some Years of College	20.1	21.2	13.1	27.3
College Graduates or Higher	25.5	33.2	32.5	26.0
Total	100.0	100.0	100.0	100.0

Sources: Survey results are from the Survey of the Demand for Educational Attainment, Regional Research Institute, 2000; Non-Survey results are imputed from 1990 U.S. Census of Population and Housing PUMS (5%) and Regional Economic Information System.

Looking at further details, however, the survey findings are not necessarily very close to the numbers suggested by the non-survey method. The first case, the survey found fewer workers in the two lowest educational attainment categories: less-than-high-school and some-years-of-high-school. The survey found in both counties no workers that have less-than-HS educational attainment, whereas the non-survey method suggests they are 5.1% and 3.5% in Brooke and Mingo County respectively. The survey also found only 0.2% and 2.5% in Brooke and Mingo County respectively workers with some-years-of-HS educational attainment, whereas the non-survey method suggests 15.1% and 10.3%.

For the two top level education categories: some-years-of-college and college-graduates-or-higher educational attainment, substantial differences also exist. The survey found more workers with college-graduate or higher educational attainment in Brooke County (32.5%) than in Mingo County (26.0%) workers, whereas the non-survey method suggests workers in this category would be (25.5% and 33.2% respectively).

What does all this suggest? In the first case, it is reasonable to believe that as time passes and the economy continues to develop, there will be fewer workers without high school degrees. Even if they cannot go back to a traditional high school, there are ways for adults to obtain the equivalent degree while maintaining their work and family obligations. It is also reasonable to

believe that businesses might not want to consider applicants who don't have high school degree. In other words, the survey findings of fewer workers with no high school degree might reflect the real trend in the labor market in general.[16] So technically speaking, having these two categories of educational attainment in the non-survey method might no longer be a problem as more up-to-date census data become available. The updated industrial classification system (NAICS) does a better job of reflecting the characteristics of today's service sector, which might also improve the accuracy of the non-survey method when year 2000 census data become available.

On the other hand, it is not easy to explain the substantial differences exist in the distribution of the demand for the two top levels of educational attainment. The distribution imposed by the non-survey method on managerial and professional occupations does not seem to be very accurate. The non-survey method (as described in Table 2) imposes that professional rather than managerial occupations require more workers with the highest level of education: college-graduates-or-higher. Consequently since businesses in Mingo County have a higher demand for professionals than those in Brooke County, then they should also have higher demand for college-graduates-or-higher educational attainment. However, Table 10 above shows that the survey found the opposite, where Brooke County's demand is higher.

Table 11 shows how workers in each educational category are distributed across occupations, and compares the results obtained from the survey to numbers suggested by the non-survey method. The table shows that among all workers with college-graduate-or-higher educational attainment in Brooke County, most of them (42.4%) hold managerial occupations, a proportion which is much higher than in Mingo County (22.4%) and much higher than the proportion suggested by the non-survey method (7.6%). On the other hand only 29.6% of them hold professional occupations, much smaller than in Mingo County (68.0%) or the proportion suggested by the non-survey method (76.7%). Also note that a much higher proportion of them also hold service worker occupations (18.7%), compared to in Mingo County (4.8%) or the proportion suggested by the non-survey method (5.9%). Since, as described earlier, a lot more managerial occupations were found in the survey on both counties, and there are many more service workers found in Brooke County, then it makes sense that Brooke County would have greater demand for college-graduate-or-higher educational attainment than Mingo County on the survey, and that the proportion in both counties would be higher than the proportion predicted by the non-survey method. The same types of arguments can be used to explain why there is so little demand for some-years-of-college educational attainment found in Brooke County; much less than in Mingo County or what the non-survey method suggests.

[16] Recall that the matrix used in this survey is based on the 1990 Census. In 1990, most likely more workers with such low levels of educational attainment were still in the workforce.

Table 11. The Percentage Distribution of Workers with Some-Years-of-College and College-Graduate-or-Higher Educational Attainment by Occupations in the Service Sector

Occupations	Some Years of College			College Graduates or Higher		
	Suggested by Non-Survey Method	Survey Results		Suggested by Non-Survey Method	Survey Results	
		Brooke	Mingo		Brooke	Mingo
Managers	8.1	26.8	22.1	7.6	42.4	22.4
Professionals	30.4	25.6	30.5	76.7	29.6	68.0
Sales	2.7	2.4	1.5	1.0	2.5	0.0
Clerks	25.3	8.5	26.0	6.9	4.4	4.8
Service Workers	25.8	26.8	15.3	5.9	18.7	4.8
Farm-Service Workers	0.5	0.0	0.0	0.2	0.0	0.0
Prod.-Precision Workers	3.7	6.1	0.0	1.1	0.5	0.0
Operators	2.6	1.2	3.1	0.5	0.0	0.0
Helpers/Laborers	0.9	2.4	1.5	0.1	2.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Survey results are from the Survey of the Demand for Educational Attainment, Regional Research Institute, 2000; Non-Survey results are imputed from 1990 U.S. Census of Population and Housing PUMS (5%) and Regional Economic Information System.

A general explanation as to why workers with college-graduate-or-higher educational attainment in Brooke County are distributed differently from those in Mingo County and in the state on average is not immediately evident. The deviation cannot be fully explained by differences in distributions by business size and by sub-sector. In terms of the application of the non-survey method, this becomes problematic because it basically says that the assumption of fixed proportions of demand for educational attainment for each occupation (as described in Table 2 above) is not reliable.

One could potentially mitigate the problem by reducing the number of categories of educational attainment to two instead of five, for example: high-school-graduates or lower; and some-years-of-college or higher. As mentioned above it might be reasonable to just eliminate the two lowest education categories: less-than-high-school and some-years-of-high-school because over time these two categories become less and less relevant. Combining the two top-level categories into one category, however, might reduce the usefulness of the method for local educational policy decisions. The two categories in fact can be very different from each other. However, this is so far a possible modification of the non-survey method. In the future, it might be a good idea to break down the category of "some-years-of-college" into further detail such as 1-2 years of college and 3-4 years of college, or others. This might yield a more reliable assumption of fixed distributions of the demand for educational attainment per each occupation than what is now suggested by the non-survey method.

Manufacturing Sector in Brooke County

Demand for occupations – Table 12 shows the distribution of estimated demand for types of occupations in the manufacturing sector, comparing the survey findings and the non-survey estimates. First, notice that there is no substantial difference found in the proportion of managerial occupations between the survey and the non-survey results. The survey found it was 6.4%, a little higher than what the non-survey method suggests: 5.2%, although for such a small proportion they might not be significantly different from each other. As argued above, deviation from the non-survey method is affected by the differences in the distribution of businesses by size between the state on average and the survey. The distribution in the state on average is 58.4% small and 41.6% larger businesses, whereas the survey captured exactly 50% small and 50% larger businesses, suggesting the distributions, while different are not substantially different. It should not be surprising that the survey found the proportion of managerial occupations to be close to the state average. On the other hand the distributional difference might become substantial when one compares the proportions of operator occupation, which is the main occupation in the manufacturing sector. So this sample distributional difference might explain why the survey found a smaller portion of operator occupations (29.3%, compared to 40.4% suggested by the method).

Table 12. Percentage Distributions of Demand for Occupations in Manufacturing Sector, Brooke County

Occupations	Non-Survey Results	Survey Results
Top-Level Occupations	14.2	8.8
Managers	5.2	6.4
Professionals	9.0	2.4
Middle-Level Occupations	76.5	59.0
Sales	3.1	3.4
Clerks	9.7	4.1
Service Workers	2.3	7.5
Farm-Service Workers	1.5	0.0
Prod.-Precision Workers	19.5	14.5
Operators	40.4	29.5
Low-Level Occupation	9.1	32.3
Helpers/Laborers	9.1	32.3
Total	100.0	100.0

Sources: Survey results are from the Survey of the Demand for Educational Attainment, Regional Research Institute, 2000; Non-Survey results are imputed from 1990 U.S. Census of Population and Housing PUMS (5%) and Regional Economic Information System.

The non-survey method suggests the distribution of occupations in the manufacturing sector is concentrated on low-level types of occupations. The non-survey method predicts 69% of workers hold the three lowest levels of occupations: production-precision, operator, and helper/laborer occupations. The survey found this proportion to be 76.3%, or only about 7% difference. Looking at further details, however, quite substantial differences exist. A much

smaller proportion of operator occupations were found in the survey (29.5%) than predicted by the non-survey method (40.4%). On the other hand, a much higher proportion of helper/laborer occupations were found in the survey (32.3%) than suggested by the non-survey method (only 9.1%). One way to do explain such differences is by looking at the distribution of businesses within manufacturing sector, by sub-sector as was done above.

The distribution by sub-sector of the state on average is found to be substantially different from the survey. The distribution in the state is 40.0% non-durable and 60.0% durable, whereas the survey captured 71.4% non-durable and 28.6% durable. Included in non-durable sub-sector are manufacturing businesses producing items such as food, textile, apparel, paper, printing, chemicals, petroleum, rubber, leather, etc, whereas in the durable sub-sector are those producing large items such as wood, furniture, stone clay, glass, metal, machinery, electrical equipment, transportation equipment, etc. Does the fact that more non-durable businesses are included tell us why such differences come up? One would have to be familiar with these manufacturing business operations to determine which sub-sector employs more of operators or helpers, and which employs less. In other words, common knowledge might not be good enough.

However, as also done above, we can try to predict differences within a sector by computing the mean of the proportions of each occupation within each sub-sector as obtained from the survey, which is shown in Appendix 2. It shows some notable differences between non-durable and durable sub-sectors. Non-durable sub-sector employs a larger portion of managers (38.3% compared to 15.3% in durable sub-sector), but a much smaller portion of production and precision occupations (4.8% compared to 41.4% in durable sub-sector). Consequently, since more of non-durable businesses were captured in the survey, the survey results should find a larger portion of managers but a smaller portion of production-precision occupations. This is exactly what the survey found, although the differences are not as big as might be implied by distributional differences of the sample.

Some other less notable differences shown in Appendix 2 are that the non-durable sub-sector, as compared to durable sub-sector, employs a larger proportion of operators (13.4% versus 8.3%), helpers (18.9% versus 10.2%). This may help explain why the survey found a larger proportion of helpers, but contradicts the fact that the survey found a smaller portion of operators.

In general, in the case of manufacturing sector, distribution by business size and sub-sector to some extent still explains why the survey findings differ from the non-survey predictions. It, however, is not as convincing as in the case of the service sector. This might be due to the smaller sample size available in the manufacturing sector.

Demand for Educational Attainment – As done in the case of the service sector above, we can now examine the demand for educational attainment in the manufacturing sector, comparing the survey versus non-survey results. The same method of computation applies, as it does in the case of the service sector. Table 13 shows the distributions computed using the non-survey method, compared with those found with the survey.

Table 13. The Percentage Distribution of the Total Demand for Educational Attainment in the Manufacturing Sector, Brooke County

Educational Attainment	Non-Survey Results	Survey Results
Less Than HS Graduate	76.0	84.0
Less Than High School	9.1	0.0
Some Years of High School	21.2	1.9
High School Graduate	45.8	82.1
Higher than HS Graduates	24.0	16.0
Some Years of College	15.6	9.0
College Graduates or Higher	8.4	7.1
Total	100.0	100.0

Sources: Survey results are from the Survey of the Demand for Educational Attainment, Regional Research Institute, 2000; Non-Survey results are imputed from 1990 U.S. Census of Population and Housing PUMS (5%) and Regional Economic Information System.

A quite similar case as in the service sector also emerges. In terms of sub-total figures, the distributions obtained from the survey and non-survey method are quite similar. The survey found 84.0% of manufacturing workers have HS-graduate education or less and 16.0% have higher-than-HS education, whereas the non-survey method suggests they would be 76.0% and 24.0% respectively, meaning that they are less than 10 percent different. The differences seem to be rooted in the fact that the manufacturing sector in general employs a lot more workers who are less educated than the service sector. As mentioned before, there is a strong argument for believing there will be a significant change in this type of worker as time passes--there will likely be fewer less-educated workers available in the labor market. The non-survey method suggests that there would be 30.3% workers having less-than-HS graduate education, whereas the survey found it was only 1.9%.

The survey also found a relatively smaller portion of workers having some-years-of-college education among the highly educated workers (9% out of 16%, compared to 15.6% out of 24.0% as suggested by the non-survey method). There is no clear explanation for this result. It might just reflect that the labor market situation in Brooke County is not as good as in the state on average, or it might again indicate that these particular groups of educational categories need to be re-classified.

Mining Sector in Mingo County

Demand for Occupations - We now discuss in the same manner the mining sector in Mingo County. Table 14 shows the distributions of the demand for types of occupations in the mining sector, comparing the survey findings and the non-survey estimates. It shows that the survey results differ quite substantially from the non-survey estimates. The most notable difference is that the survey found the proportion of operator occupation to be the largest in the mining sector (55.6%, compared to only 21.4% suggested by the non-survey method), whereas the non-survey

method suggests the largest occupation would be the production-precision (52.5%, but only 10.6% found by the survey). Another notable difference is that the survey found 11.1% portion of manager, larger than the portion suggested by the non-survey method, 3.8%.

Table 14. Percentage Distribution of the Demand for Occupations in the Mining Sector, Mingo County

Occupations	Non-Survey Results	Survey Results
Top-Level Occupations	9.5	18.3
Managers	3.8	11.1
Professionals	5.7	7.2
Middle-Level Occupations	81.8	69.8
Sales	0.3	0.3
Clerks	5.0	2.7
Service Workers	2.1	0.6
Farm-Service Workers	0.1	0.0
Prod.-Precision Workers	52.8	10.6
Operators	21.4	55.6
Low-Level Occupation	8.7	11.8
Helpers/Laborers	8.7	11.8
Total	100.0	100.0

Sources: Survey results are from the Survey of the Demand for Educational Attainment, Regional Research Institute, 2000; Non-Survey results are imputed from 1990 U.S. Census of Population and Housing PUMS (5%) and Regional Economic Information System.

Differences in the distribution of businesses by size found in the survey versus the statewide average need to be examined as a potential explanation of differences in the distribution of demand by occupations shown in Table 14. Appendix 1 shows that the survey captured relatively fewer small businesses (16.7%) than (for the mining sector in) the state on average (51.1%). This would suggest that there should be fewer managers found in the survey, which is contrary to our findings. The survey has more large businesses than the state on average. It is reasonable to believe that based on the nature of work in mining operations, one should expect to find a larger proportion of operational occupations such as operator, production-precision, as well helper occupations in larger scale operations. However, again this is contrary to the survey findings. The survey found the total proportion of the three occupations was 78.0%, whereas according to the non-survey method it would be 82.9%. Looking at further details as described in the Appendix 2, it shows that indeed large businesses found on average have a larger proportion of operator occupation (48.3%) and small proportions of production-precision (23.8%) and helpers (9.6%), which partly explains why the survey found more of operator occupations and less of the other two.

So far differences in the distribution by size do not satisfactorily explain the deviations of the survey from the non-survey estimates. We now examine whether differences in the distribution of businesses by sub-sector partly explain the deviations. As shown in Appendix 1, the distribution of survey respondents is quite close to the distribution in the state on average. The survey had 50% businesses in coal mining and 50% in non-metallic & quarrying sub-sectors, whereas in the statewide average they are 52.8% and 41.7% respectively, plus 5.6% of businesses in oil and gas extraction sub-sector. The differences do not seem to be substantial. This means the only notable distributional difference by sub-sector is that there are more of non-metallic quarrying businesses found in the survey (although the difference is quite small, 11.1%). Appendix 2 shows that this particular sub-sector has a larger proportion of operator occupation (58.6%). This should contribute to explaining why the survey found more operator occupations. Again, why this happens, however, is not clearly explained. One possible explanation is that in practice the survey respondents could not perfectly distinguish operator occupations from production-precision occupations since both occupations, in the manufacturing case, deal with operating machineries.

Overall, however, differences in the distribution by size and by sub-sector cannot convincingly explain the differences between the survey and the non-survey estimates. One of the possible reasons is because the sample size of businesses in the mining sector found in the survey was very small such that the sample does not really reflect the average distribution of the countywide population.

Demand for Educational Attainment – Table 15 shows the distribution of the demand for educational attainment in the mining sector, comparing the survey and the non-survey results. Almost exactly the same findings as in the case of the service and the manufacturing sector emerge. In terms of sub-total figures, survey results are very close to the non-survey method estimates. The survey found 69.7% workers having HS-graduate-or-less education, whereas the non-survey method suggests it would be 72.7%.

Table 15. The Percentage Distribution of the Total Demand for Educational Attainment in Mining Sector, Mingo County

Educational Attainment	Non-Survey Results	Survey Results
Less Than HS Graduate	72.7	69.7
Less Than High School	8.8	0.0
Some Years of High School	18.7	1.9
High School Graduate	45.2	67.8
Higher than HS Graduates	27.3	30.3
Some Years of College	15.0	20.2
College Graduates or Higher	12.2	10.0
Total	100.0	100.0

Sources: Survey results are from the Demand for Educational Attainment survey, WVU Regional Research Institute, 2000; Non-Survey Results are imputed from 1990 U.S. Census of Population and Housing PUMS (5%) and Regional Economic Information System.

The same kind of differences emerges for the less educated workers as in the case of service and manufacturing sector. The survey found a much smaller portion of less-than-HS-graduate education, only 1.9%, whereas the non-survey method suggests it would be 27.4%. The same argument as in the case of the service and manufacturing sectors should also apply here. In the case of the highly educated workers, surprisingly only slight differences emerge. The survey found over 20% of some-years-of-college, which is only a little larger than what the non-survey method suggests, 15.0%. This might just reflect that a lot more of these educated workers ended up working for mining business, indicating the poor situation of the labor market in Mingo County. Another explanation is the relatively high wages found in the mining sector (average hourly earnings in West Virginia's mining sector in April, 2000 were $17.72 according to the State's Bureau of Employment Programs). However, as proposed earlier, a finer re-classification of the educational category might yield a different but a closer estimate.

Overall, however, the survey results show that in the service sector Mingo County, which is considered more rural, has a larger share of top-level occupations than what the non-survey method predicts, whereas Brooke County has roughly the same share as predicted. In the manufacturing sector, Brooke County has a smaller share of top-level occupations, whereas in the mining sector, Mingo County has also a larger share of top-level occupations. This contradicts the general impression that rural areas are more specialized in low-skill jobs.

One might argue that the titles of occupations themselves do not really reflect skill differentials. What about looking at differences in the educational requirements? A further look at the survey results for the distribution of demand for educational attainment, shows that in the service sector both counties have very similar demand distribution as suggested by the non-survey method. In the manufacturing sector, however, it is found that Brooke County has a smaller share of jobs requiring higher level of education, whereas in the mining sector Mingo County has a little larger share of such jobs. These facts contradict the hypothesis of the spatial-differential of division of labor even more strongly.

To sum up, this study does not find evidence supporting the hypothesis that rural areas are more specialized in low-skill jobs. Although the study found that non-survey estimates tend to support the spatial division of labor hypothesis, survey results, however, show that it is not necessarily the case.

Using Alternative Public Data Sets

As mentioned in the methods discussion, the Census no longer produces one of the key tables used by Goetz and Debertin when they developed the non-survey method. So far we have focused on an alternative source of the requirements matrix, the 1990 Census PUMS data. In this section we briefly describe the results when two other alternative sources, the Current Population Survey and the Occupational Employment Survey are used instead. In principle, these two sources might be superior to the Census PUMS data because both surveys date from 1997, so the data should better reflect the increased educational levels of the workforce than the 1990 data. As noted above, several of the inconsistencies between the survey and non-survey

results seem to be related to an over-estimate of the demand for workers with very low levels of educational attainment.

Occupational Distribution - Table 15 shows the comparison of the occupational distributions obtained from 1990 Census, CPS 1997, OES 1997, and the survey. Here the study focuses on analyzing the differences among the three non-survey estimates. Surprisingly, in general the three occupational distributions look very similar. All the three types of distributions agree in terms of which type of occupation is the largest, and which types follow afterwards. In the service sector, all three types of distribution indicate that professional occupation is the largest occupation, followed by the other two dominant occupations: service worker and clerical occupations. In the manufacturing sector all three data sets indicate that operator & laborer, followed by production-precision occupations dominate the sector, whereas in the mining sector production-precision, followed by operator & laborer occupations dominate. This suggests that assumption of fixed occupational distribution per sector is quite a reliable assumption.[17]

However, the main purpose of Table 15 is to examine whether there is a consistent change of occupational distribution over time. Table 15 shows that there seems to be consistent changes of occupational distribution in the service sector. The more current data sets, CPS 1997 and OES

[17] There might exist slight differences in categorizing the two top-level occupations: managerial and professional occupations between 1990 Census and CPS 1997. The fact that CPS 1997 indicates a higher portion of managerial occupation might partly be due to a different way of classification.

Table 15. Occupational Distributions Obtained from Different Data Sets[18]

SERVICE SECTOR					
	Non-Survey			Survey	
Occupations	Census90	cps97	oes97	Brooke	Mingo
Top-Level Occupations	41.4	50.9	46.2	42.7	53.5
Managers	6.2	14.4	5.6	22.3	20.0
Professionals	35.2	36.5	40.7	20.4	33.5
Middle-Level Occupations	58.5	49.1	53.8	57.3	46.4
Sales	2.1	2.7	2.0	1.6	1.3
Clerks	15.6	15.3	15.7	8.8	20.2
Service Workers	29.6	24.1	24.7	38.6	11.0
Farm-Service Workers	0.8	0.3	0.5	0.0	1.0
Prod.-Precision Workers	4.9	2.7	4.5	3.8	0.0
Operator + Laborers	5.5	4.1	6.3	4.5	12.9
Total	100.0	100.0	100.0	100.0	100.0
MANUFACTURING SECTOR					
	Non-Survey			Survey	
Occupations	Census90	cps97	oes97	Brooke	Mingo
Top-Level Occupations	14.2	21.6	12.9	8.8	--
Managers	5.2	5.9	5.8	6.4	--
Professionals	9.0	15.8	7.2	2.4	--
Middle-Level Occupations	85.6	78.4	87.1	91.3	--
Sales	3.1	1.4	3.0	3.4	--
Clerks	9.7	9.3	8.9	4.1	--
Service Workers	2.3	0.0	1.6	7.5	--
Farm-Service Workers	1.5	0.0	2.8	0.0	--
Prod.-Precision Workers	19.5	19.8	19.8	14.5	--
Operator + Laborers	49.5	47.8	51.0	61.8	--
Total	100.0	100.0	100.0	100.0	--
MINING SECTOR					
	Non-Survey			Survey	
Occupations	Census90	cps97	oes97	Brooke	Mingo
Top-Level Occupations	9.5	20.9	8.4	--	18.3
Managers	3.8	17.3	5.1	--	11.1
Professionals	5.7	3.6	3.3	--	7.2
Middle-Level Occupations	90.5	79.1	91.6	--	81.6
Sales	0.3	0.0	0.1	--	0.3
Clerks	5.0	10.1	4.8	--	2.7
Service Workers	2.1	0.0	0.7	--	0.6
Farm-Service Workers	0.1	0.0	0.1	--	0.0
Prod.-Precision Workers	52.8	47.8	50.1	--	10.6
Operator + Laborers	30.2	21.1	35.9	--	67.4
Total	100.0	100.0	100.0	--	100.0

Sources: Imputed from 1990 Census of Population and Housing PUMS (5%), Current Population Survey 1997, Occupational Employment Statistics 1997, Regional Economic Information System (REIS) 1997, and the Demand for Educational Attainment survey, WVU Regional Research Institute, 2000

[18] Due to technical difficulties in the OES occupational classification, the two lowest occupational categories: operator and laborer occupations, are combined into one category: Operator + Laborer.

1997, indicate that businesses in the service sector now have higher demand for the top-level occupations and smaller demand for service worker occupations. The change, however, is considered small in magnitude (only 5% in seven years), which raises an interesting question because service sector is the sector consistently grow over time anywhere. Overall, however, in relation to the comparison with the survey results, this partly explains why the survey found larger portion of top-level occupations.

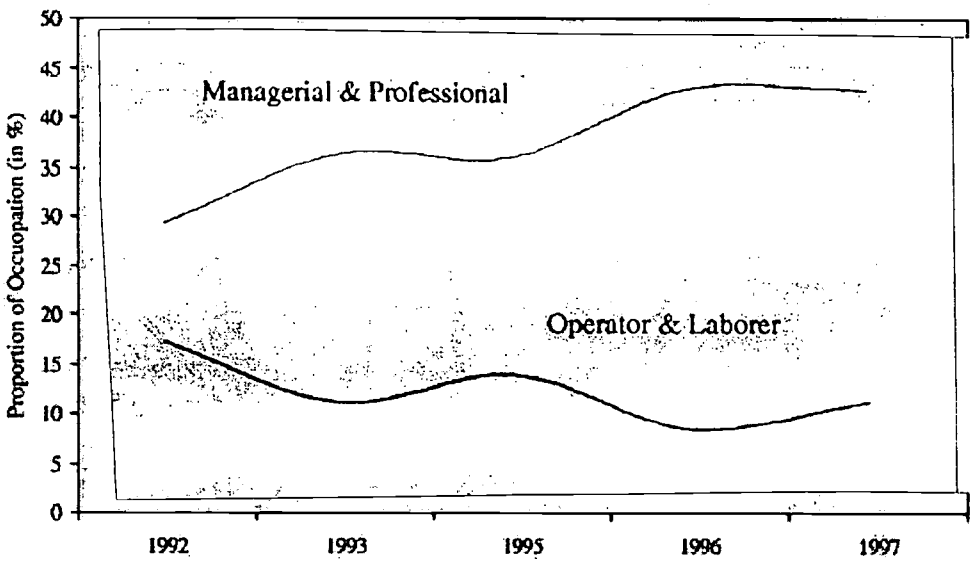
On the other hand no consistent changes of the distribution in the manufacturing sector found in the CPS 1997 and OES 1997 estimates. CPS 1997 indicates that there would be a larger portion of top-level occupations in 1997, whereas OES 1997 indicates that basically there would be no changes. Which distribution should the study rely on? Surely there is no clear answer for that. One thing to be considered is the fact that in the OES survey business response rates in particular sectors are low. However, this does not mean that its estimates are always less accurate. In comparison with the survey results, it might not be worth answering this question because the change seems rather small (about 7%). This would not change the explanation of why the survey findings differ from the non-survey estimates, as noted above.

The most inconsistencies are found in the mining sector case. CPS 1997 indicates that there is substantial change of distribution, from 9.5% of top-level occupations estimated by 1990 Census to 20.9% estimated by CPS 1997. OES 1997, on the other hand, indicates that the distribution basically does not change. Which estimates should the study rely on? Relying on the CPS 1997 estimates would make the non-survey estimates closer to the survey findings. However, as mentioned above, the study can not rely too much on the survey findings because the survey sample size is small, so that having closer estimates to the survey findings does not necessarily make CPS 1997 estimates more reliable.

Overall, notice that CPS 1997 consistently estimates a growing demand for top-level occupations and a declining demand for middle level occupations in 1997, in all three sectors discussed here. This sounds a reasonable trend considering that over time economy develops and technology advances. However, one can also come up with an opposing argument noting that some sectors might not really experience technology advancement such that proportions of inputs do not really change over time. Examining how the occupational distributions estimated by CPS evolve over time might help determine whether the differences from the 1990 Census are stable. Figure 1 below shows the trend of the proportion of occupations within the three sectors: mining, manufacturing, and service as estimated using CPS data sets. Although the trend is not smooth, it indeed shows that managerial and professional occupations are growing, whereas operator & laborer occupations are declining overtime.[19]

[19] Due to some technical difficulties, the 1990, 1991, and 1994 estimates could not be made available.

Figure 1. The Proportions of Managerial & Professional Occupations and Operator & Laborer Occupations in the Service, Manufacturing, and Mining Sectors, 1992 to 1997, Estimated with CPS Data Sets.



Sources: March 1991, 1992, 1993 Annual Demographic Survey, Current Population Survey; Income and Poverty: 1993, 1995, 1994, and 1997, Current Population Survey.

This gives a very important lesson that there seem to be secular changes in the occupational distribution over time, changes of which are not taken into account when one estimates the demand for the year 1997 based on the 1990 Census data sets. Up to this point, it suggests that when it comes to estimating the demand for years away from the decennial census years, one should rely on the CPS data sets instead.

Distribution of Educational Attainment – Table 16 shows the comparison of the educational distributions estimated by 1990 Census, CPS 1997, and the survey. In this case no different educational distribution estimated by OES 1997 is available.[20]

As expected, CPS 1997 estimates consistently indicate higher demand for highly educated workers. This makes the CPS 1997 estimates, in general, closer to the survey findings. Looking at further details, however, substantial differences still emerge. The declining demand for workers with lower levels of education suggested by CPS 1997 turns out to be not as large as found in the survey.

[20] The OES 1997 non-survey method differs from the 1990 Census non-survey method only in the use of its own occupational distribution. It, however, uses the same educational distribution as the 1990 Census method uses. It is important to note that its final non-survey estimates of the demand for educational attainment are different from those obtained based on the 1990 Census data set.

Table 16. Distributions of Educational Attainment Obtained from Different Data Sets

Educational Attainment	Suggested by the Non-Survey Method				Survey Results	
	Census 1990		CPS 1997			
	Brooke	Mingo	Brooke	Mingo	Brooke	Mingo
SERVICE SECTOR						
Less Than HS Graduate	54.4	45.6	53.1	41.5	54.3	46.7
Less Than High School	5.1	3.5	2.5	1.9	0.0	0.0
Some Years of High School	15.1	10.3	13.2	7.3	0.2	2.5
High School Graduate	34.2	31.9	37.3	32.3	54.2	44.2
Higher than HS Graduates	45.6	54.4	46.9	58.5	45.7	53.3
Some Years of College	20.1	21.2	16.0	16.9	13.1	27.3
College Graduates or Higher	25.5	33.2	31.0	41.7	32.5	26.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
MANUFACTURING SECTOR						
Less Than HS Graduate	76.0	--	70.1	--	84.0	--
Less Than High School	9.1	--	6.1	--	0.0	--
Some Years of High School	21.2	--	17.5	--	1.9	--
High School Graduate	45.8	--	46.5	--	82.1	--
Higher than HS Graduates	24.0	--	29.9	--	16.0	--
Some Years of College	15.6	--	16.7	--	9.0	--
College Graduates or Higher	8.4	--	13.2	--	7.1	--
Total	100.0	--	100.0	--	100.0	--
MINING SECTOR						
Less Than HS Graduate	--	72.7	--	65.9	--	69.7
Less Than High School	--	8.8	--	4.4	--	0.0
Some Years of High School	--	18.7	--	17.3	--	1.9
High School Graduate	--	45.2	--	44.2	--	67.8
Higher than HS Graduates	--	27.3	--	34.1	--	30.3
Some Years of College	--	15.0	--	17.6	--	20.2
College Graduates or Higher	--	12.2	--	16.5	--	10.0
Total	--	100.0	--	100.0	--	100.0

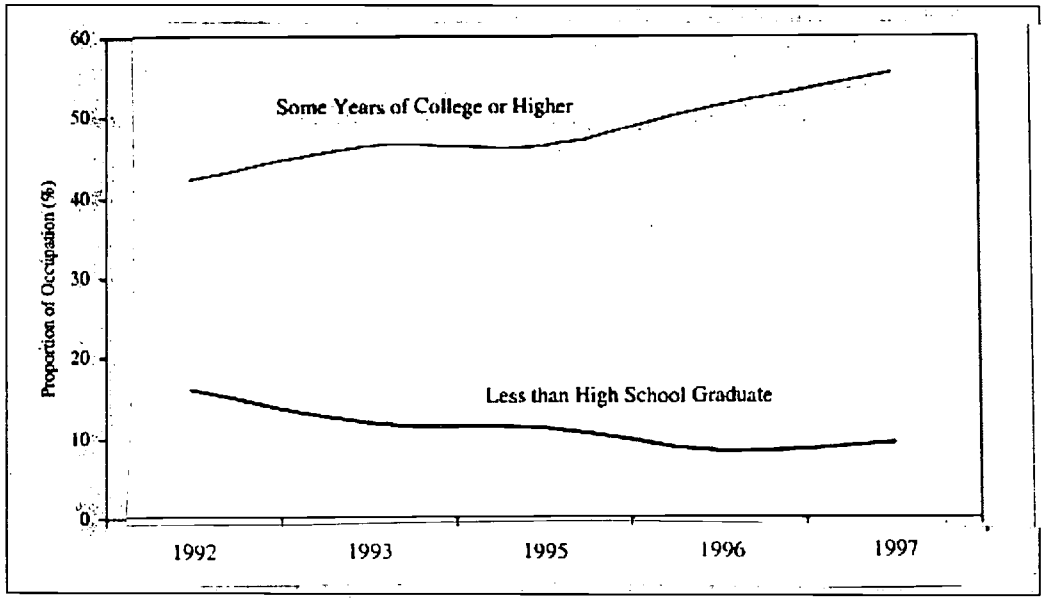
Sources: Imputed from 1990 Census of Population and Housing PUMS (5%), Current Population Survey 1997, Occupational Employment Statistics 1997, Regional Economic Information System (REIS) 1997, and the Demand for Educational Attainment survey, WVU Regional Research Institute, 2000

CPS 1997 still finds quite large proportions of workers having less than HS graduate education (from 10% to over 20%), whereas the survey found it is always less than 3%. In other words, despite suggesting a larger (smaller) demand for highly educated (not highly educated) workers, CPS 1997 estimates of educational distribution are not far different from the 1990 Census estimates. Figure 2 shows the trend of the CPS estimates of the proportions of the educational distributions from 1992 to 1997. It clearly shows an upward trend of the proportions of highly educated workers, and a declining trend of the less-than-HS-graduate workers.

However, more important lessons arise when one examines the figures in detail. In 1997, according to the CPS estimates, only 9.3 % of workers would have less-than-HS-graduate

education. This is smaller than the number given in Table 16 above, which on estimates the figure is 12.5%. Obviously 9.3% is now closer to the survey findings. What causes the difference? This is because these estimates come only from the three sectors being discussed here, whereas those presented in Table 16 are computed based on the fixed educational distribution derived based on the distributions of the whole sector. In other words, it says that the three sectors being discussed exhibits a smaller proportion of workers with less-than-HS-graduate education than the whole sectors on average.[21] This suggests that it might not be accurate to assume a fixed educational distribution per occupation across sectors as the non-survey method does. The work nature of certain occupations in different sectors might substantially differ so that different compositions of educational attainment might be needed. Technically speaking, with respect to the Goetz-Debertin method, this still can be done by directly creating a three-way cross tabulation matrix rather than starting with two matrices then combine them into a three-way cross tabulation as the standard method does. However, this surely requires further examination.

Figure 2. The Proportions of Some-Years-of-College-or-Higher and Less-Than-HS-Graduate Education Categories, 1990 to 1997, Estimated with CPS Data Sets.



Sources: March 1991, 1992, 1993 Annual Demographic Survey, Current Population Survey; Income and Poverty: 1993, 1995, 1994, and 1997, Current Population Survey.

Similar patterns are observed in the distribution of the two top-level educational categories. No clear pattern is available to explain why their distributions found in the survey are substantially

[21] Again, table for these figures is not provided in the text. The estimate indicates that the average proportion of workers having less-than-HS-graduate education in the three sectors is 9.3%, whereas in the whole sectors it is 28.6%. Also notice that due to some technical difficulties, the 1991, 1992, and 1994 estimates could not be made available.

different from the non-survey (CPS 1997) estimates. This further suggests that finer educational classification for these two educational categories is indeed necessary to get more accurate estimates of demand.

Overall this suggests that there might indeed exist a substantial change in the proportion of inputs over time. The fact that OES 1997 estimates are very close to the 1990 estimates questions its reliability. It is true that the study has not examined how the OES estimates evolve over time (does it also show the same trend?). However, even if it shows the same trend, the magnitude of the distributions are still questionable. Perhaps this is because its reliability depends on the response rates of its survey of businesses, which not only usually is low but also can change substantially over time.[22] So far the study shows that to a certain extent it would be more reliable to utilize the CPS data sets than the Census date sets, to capture changes that might happen over time.

A Fit Between Survey and Non-Survey-Based Distributions of Demand

To examine the overall "fit" between the survey and non-survey estimates, a simple correlation of each of the elements of the demand estimates was computed as shown in Table 17. Despite the differences discussed above, the distributions of the demand suggested by the non-survey methods have very strong correlation with that found in the survey (about 0.9). This suggests that both survey and non-survey observations track one another quite well across the various estimates. In other words, both agree in terms of which of the part of the demand is dominant and which is less dominant. It is not clearly shown, however, which of the three alternative data sets provides the closest estimates. In general the estimate of the total demand of each data set is as good as others (each of them has a correlation coefficient of about 0.9).

As expected, the correlation coefficients for the distributions of the requirements matrix are smaller than that of the total demand for requirements matrix, which deals with much more detailed distributions. As in the case of the total demand, it is not clearly evident which of the three data sets provides the closest estimates to the survey findings. It does show that OES data sets seem to produce closer estimates, however, the difference is not substantial. One should interpret this fact with caution. The way of computing the correlation coefficients is by treating each cell of the matrix the same importance, regardless of how large the proportion of the cell in the matrix. In other words a one percent difference for a small cell is the same importance as a one percent difference for a large cell. Overall, each of the three non-survey data sources seem to be a roughly equivalent for use in the non-survey method.

[22] OES survey has been through a lot of changes, which can be in terms of the sampling as well as the system of occupational code.

Table 17. Correlation Coefficients between Distributions of Demand (in the Service, Manufacturing and Mining Sectors) of the Survey and the Non-Survey Methods Using Alternative Data Sets

Types of Distribution	Correlation Coefficients		
	Census 90	CPS 97	OES 97
Distribution of Total Demand for Occupations	0.908	0.908	0.909
	(N=36)	(N=36)	(N=36)
Distribution of Total Demand for Educational Attainment	0.931	0.929	--
	(N=20)	(N=20)	--
Requirements Matrix	0.594	0.556	0.675
	(N=180)	(N=180)	(N=160)

Sources: Imputed from 1990 Census of Population and Housing PUMS (5%), Current Population Survey 1997, Occupational Employment Statistics 1997, Regional Economic Information System (REIS) 1997, and the Demand for Educational Attainment survey, WVU Regional Research Institute, 2000.

Simple correlation describes whether two different series fluctuate at the same fashion over observations, but it doesn't explain whether the two series are close or distant to each other. Regression analysis, on the other hand, can describe this later relationship. Table 18 shows the results of regression of the non-survey distributions on the survey distributions. Despite the small number of observations, the value of the R^2 is quite high (over 80%) for the first two regressions, indicating that the non-survey-based distributions closely describe the variations of the survey-based distributions (which is indicated by having high correlation coefficients as noted above).

All the three data sets produce quite similar close regression results, except in the case of the first model, regressing the non-survey distributions of the total demand for occupation. A perfect match between non-survey and survey-based estimates would yield a a coefficient of zero and, more importantly, a ß coefficient of one. In the first model, the coefficient of ß is almost one for regression using Census and OES data sets, but it is 0.86 for that using CPS data sets. In addition, regression using CPS data sets yields also a significant intercept (a = 3.73), whereas those using the other data sets yield insignificant intercepts. A significant intercept in this case indicates systematic bias in the level of demand. This suggests that CPS data sets estimates are more distant to the survey-based estimates in terms of estimating the demand for occupation.

Table 18. Results of Regression of Non-Survey Distributions on Survey Distributions

Types of Distribution	Paramaters	Parameter Coefficients		
		Census 90	CPS 97	OES 97
Distribution of Total Demand for Occupations	a	2.09	3.73**	1.68
	ß	0.98*	0.86*	0.97*
	R^2	0.82	0.82	0.82
Distribution of Total Demand for Educational Attainment	a	10.92*	9.92*	--
	ß	0.45*	0.50*	--
	R^2	0.87	0.86	--
Requirements Matrix	a	1.25*	1.17*	1.37*
	ß	0.44*	0.47*	0.45*
	R^2	0.35	0.31	0.46

Notes: The regression takes the form of: Non-Survey = a + ß Survey + e; *: significant at 1% level; **: significant at 10% level.
Sources: Imputed from 1990 Census of Population and Housing PUMS (5%), Current Population Survey 1997, Occupational Employment Statistics 1997, Regional Economic Information System (REIS) 1997, and the Demand for Educational Attainment survey, WVU Regional Research Institute, 2000.

In the second regression for the distributions of the demand for educational attainment, the coefficient of ß is about 0.5, much lower than one, and the intercept is quite high and significant, about 10%.[23] This describes that for low proportions of demand the non-survey-based results overestimate, but for high-proportions of demand underestimate the survey-based results.

In short, overall this indicates that the non-survey method produces quite close estimates of the total demand for occupations, but different estimates of the total demand for educational attainment. There is obviously room for refining the non-survey method.

Concluding Remarks

The Goetz-Debertin method is indeed a nice way to utilize general information to generate valuable information for local policy makers. This method allows people to estimate the demand for occupations and educational attainment by county through manipulation of available secondary data. The most current publications of the census (1990 Census) already provide estimates of occupations and educational attainment of the workforce at the county level. However, the method can offer things that are not available from the regular 1990 Census publications. First, the Goetz-Debertin method focuses the estimation on the demand side coming from private businesses, whereas the census publications do not separate private businesses and public institutions, and they provide estimates of supply rather than demand.

[23] Notice that CPS data sets have a little larger ß coefficient (0.5, compared to 0.45 of the Census data sets). This might indicate that in terms of estimating the total demand for educational attainment, CPS data sets give a closer estimate.

Secondly, and more importantly, this method allows one to conveniently make a reasonable forecast of demand. The method links the demand estimation with the local economic situation described in the structure of the local industry. Once the future forecast of local industry (growth) is available, one can compute the estimate of the demand for occupations and educational attainment.

The Goetz-Debertin method, however, provides only a general picture. Its estimates apply to employment within aggregate sectors. Despite the theoretical support from the El-Hodiri and Nourzad proof, its two main assumptions of fixed proportions seem questionable. The method assumes fixed proportions of occupation per sector, and fixed proportions of education per occupation.

Aggregation always simplifies relationships. In this case, however, the Goetz-Debertin assumption might oversimplify the relationships. The study found that the estimates provided by the method sometimes differ quite substantially from the survey results. The differences can be partially explained by differences in the sample distribution of businesses by size and by sub-sector. Business size and finer classification by sub-sector need to be taken into account. How these factors might play role in improving the method requires more research. Their roles can be different depending on the sector. Common sense sometimes explains part of the differences. Small businesses, on average, tend to have a larger proportion of managers than large businesses, because no matter how small a business, there is likely to be at least one manager needed to run it. Probably it is true that the manager of the three-person business spends less time in true management activities than does the manager of a one hundred-person operation, so the theory of fixed proportions may be more valid than outward appearances would suggest. Small business managers likely engage in some line work in addition to performing their managerial roles, a subtlety not captured in mere titles.

Different sample distribution by sub-sector also matters. The "Business and Repair Services" sub-sector within the service sector, for instance, is more likely to employ a larger proportion of service workers than clerical workers. On the other hand "personal services" and "professional and related services" tend to employ a larger proportion of clerical workers than service workers. There might exist more complex relationships than just this common sense. Although common sense is acceptable, it, however, is not enough to explain all the differences, and is surely not scientifically justifiable. A further examination on how these two factors exactly affect demand would be an interesting research agenda. Future research might need to focus more on how production functions differ among businesses of different sectors or sizes.

The assumption of fixed proportions of education per occupation to some extent is supported by the survey results. The survey found quite consistently that distributions of demand in terms of sub-total educational category are very close to the Goetz-Debertin estimates. However, at a finer level of classification, substantial differences emerge. The survey always found a smaller proportion of less-educated workers (those having less-than-HS-graduate education) than the non-survey method. This, however, is justifiable considering that the Goetz-Debertin method results were estimated based on old data, in which less-educated workers were still available. Using newer data will more likely yield closer estimates because obviously fewer less-educated workers are absorbed in the current labor market.

On the other hand the study cannot really explain why the proportions of the two top-level educational categories: some-years-of-college and college-graduate-or-higher education, found in the survey differ substantially from the non-survey estimates. A possible cause, proposed by the study, is that the two top-level educational categories are not really accurate in classifying quality differences that exist within these categories. Since in the future workers are more likely to have at least high school graduate education, it might be a good idea to just leave out the two lowest categories, and set up finer categories for educations higher than high school graduates. This surely needs a further examination.

A big question regarding this assumption of fixed proportions of education per occupation is whether what it implies is true. In other words "is occupation X in sector A is the same as in sector B in terms of its requirement for educations?" There is indication found in the study that this might not be true. In other words, there is room for the method to leave out the second assumption of the fixed educational distribution per occupation. However, this still requires further examination. In addition, this study does not find evidence supporting the hypothesis that rural areas are more specialized in low-skill jobs. Although the study found that non-survey estimates tend to support the spatial division of labor hypothesis, survey results, however, show that it is not necessarily the case.

The study also found evidence that there might indeed exist a substantial change in the proportion of inputs over time. In light of this fact, in certain cases it is suggested to rely on the CPS data sets than the Census data sets. On the other hand, the study did not find enough that suggests utilizing OES data sets.

Finally, through out this study we have implied that local surveys provide better information than the non-survey results. However, all surveys introduce their own forms of bias. The survey method should also be checked against other indicators of local demand for educational attainment.

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Appendix 1. Distribution of Businesses by Size and Sub-Sector, Comparing the Survey Sample and the Statewide on Average

Business Size and Sub-Sector	Population			Sample	
	WV	Brooke	Mingo	Brooke	Mingo
SERVICE SECTOR					
By Business Size					
Having 1-9 employees	83.6	85.0	92.5	85.7	92.0
Having 10 employees or more	16.3	15.0	7.5	14.3	8.0
By Sub-Sector					
Personal Services	13.4	15.1	15.4	0.0	16.1
Business and Repair Services	21.3	17.4	16.8	39.7	20.5
Entertainment and Recreation Services	4.3	5.4	4.1	7.9	2.7
Professional & Related Services	61.0	62.0	63.7	52.4	60.7
MANUFACTURING SECTOR					
By Business Size					
Having 1-9 employees	58.4	55.6	--	50.0	--
Having 10 employees or more	41.6	44.4	--	50.0	--
By Sub-Sector					
Non-Durable	40.0	48.3	--	71.4	--
Durable	60.0	51.7	--	28.6	--
MINING SECTOR					
By Business Size					
Having 1-9 employees	51.1	--	22.2	--	16.7
Having 10 employees or more	48.9	--	77.8	--	83.3
By Sub-Sector					
Metal Mining	0.2	--	0.0	--	0.0
Coal Mining	30.4	--	52.8	--	50.0
Oil & Gas Extraction	38.7	--	5.6	--	0.0
Nonmetallic Mining & Quarrying	30.7	--	41.7	--	50.0

Source: Imputed from the results of the Survey of the Demand for Educational Attainment, Regional Research Institute, 2000.

Appendix 2. The Survey Sample Mean of the Proportion of Individual Occupations by Business Size and Sub-Sector

SERVICE SECTOR								
Proportion of the Following Occupations:	Small Businesses				Big Businesses			
	Brooke (N=54)		Mingo (N=103)		Brooke (N=9)		Mingo (N=9)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Managers	38.0	33.1	34.4	36.2	14.7	11.7	10.9	7.9
Professionals	20.2	26.1	30.8	29.8	10.4	16.8	28.6	28.8
Sales	0.0	0.0	0.5	4.9	5.2	10.3	2.8	6.2
Clerks	10.9	16.6	19.5	23.4	15.1	29.7	22.3	22.4
Service Workers	13.3	23.3	8.6	20.0	48.9	33.5	10.3	14.6
Farm-Service Workers	0.0	0.0	1.4	9.8	0.0	0.0	0.0	0.0
Prod.-Precision Workers	7.5	18.4	0.0	0.0	3.6	9.7	0.0	0.0
Operators	1.4	7.5	1.7	12.3	0.0	0.0	12.8	22.2
Helpers/Laborers	8.7	22.1	3.4	12.5	2.0	5.9	12.3	22.8
	Personal Services				Business and Repair Services			
	Brooke (N=0)		Mingo (N=18)		Brooke (N=25)		Mingo (N=23)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Managers	0.0	0.0	22.7	36.0	45.8	30.5	66.7	38.3
Professionals	0.0	0.0	0.0	0.0	3.3	9.3	8.3	22.8
Sales	0.0	0.0	3.6	12.1	1.8	6.5	3.3	10.9
Clerks	0.0	0.0	16.6	32.1	7.1	16.0	4.4	14.5
Service Workers	0.0	0.0	0.0	0.0	5.3	14.7	0.0	0.0
Farm-Service Workers	0.0	0.0	0.0	0.0	0.0	0.0	3.3	15.6
Prod.-Precision Workers	0.0	0.0	0.0	0.0	16.8	24.6	0.0	0.0
Operators	0.0	0.0	8.8	21.9	3.0	11.0	8.3	20.8
Helpers/Laborers	0.0	0.0	0.0	0.0	16.9	27.9	5.7	14.2
	Entertainment and Recreation Services				Professional and Related Services			
	Brooke (N=5)		Mingo (N=3)		Brooke (N=33)		Mingo (N=68)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Managers	45.8	33.1	26.9	5.8	24.7	30.4	17.4	21.1
Professionals	13.3	29.8	0.0	0.0	31.3	26.2	41.6	24.5
Sales	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
Clerks	2.5	5.6	0.0	0.0	16.2	20.9	30.1	22.6
Service Workers	22.5	31.1	26.9	27.8	27.7	31.2	8.7	17.1
Farm-Service Workers	0.0	0.0	22.2	38.5	0.0	0.0	0.0	0.0
Prod.-Precision Workers	2.5	5.6	0.0	0.0	0.1	0.3	0.0	0.0
Operators	0.0	0.0	0.0	0.0	0.0	0.0	1.5	12.1
Helpers/Laborers	13.3	29.8	24.1	25.1	0.0	0.0	1.4	8.5

→ to be continued

...Appendix 2. continued.

MANUFACTURING SECTOR								
Proportion of the Following Occupations:	Small Businesses				Big Businesses			
	Brooke (N=7)		Mingo (N=0)		Brooke (N=7)		Mingo (N=0)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Managers	54.8	43.8	--	--	8.7	6.5	--	--
Professionals	9.5	25.2	--	--	2.2	2.2	--	--
Sales	0.0	0.0	--	--	8.4	11.7	--	--
Clerks	0.0	0.0	--	--	5.5	3.4	--	--
Service Workers	14.3	37.8	--	--	9.3	15.0	--	--
Farm-Service Workers	0.0	0.0	--	--	0.0	0.0	--	--
Prod.-Precision Workers	11.9	31.5	--	--	18.7	18.2	--	--
Operators	0.0	0.0	--	--	23.9	21.1	--	--
Helpers/Laborers	9.5	25.2	--	--	23.3	21.3	--	--
	Non-Durable				Durable			
	Brooke (N=10)		Mingo (N=0)		Brooke (N=4)		Mingo (N=0)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Managers	38.3	44.3	--	--	15.3	3.2	--	--
Professionals	7.6	20.8	--	--	1.4	2.8	--	--
Sales	0.7	1.2	--	--	12.9	14.5	--	--
Clerks	1.5	2.1	--	--	6.0	5.1	--	--
Service Workers	14.7	32.8	--	--	4.4	3.0	--	--
Farm-Service Workers	0.0	0.0	--	--	0.0	0.0	--	--
Prod.-Precision Workers	4.8	8.4	--	--	41.4	34.8	--	--
Operators	13.4	20.4	--	--	8.3	16.7	--	--
Helpers/Laborers	18.9	26.1	--	--	10.2	16.9	--	--
MINING SECTOR								
Proportion of the Following Occupations:	Small Businesses				Big Businesses			
	Brooke (N=0)		Mingo (N=1)		Brooke (N=0)		Mingo (N=5)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Managers	--	--	--	--	--	--	8.8	5.0
Professionals	--	--	--	--	--	--	3.6	4.8
Sales	--	--	--	--	--	--	0.4	0.9
Clerks	--	--	--	--	--	--	3.9	2.6
Service Workers	--	--	--	--	--	--	1.6	2.5
Farm-Service Workers	--	--	--	--	--	--	0.0	0.0
Prod.-Precision Workers	--	--	--	--	--	--	23.8	33.7
Operators	--	--	--	--	--	--	48.3	28.7
Helpers/Laborers	--	--	--	--	--	--	9.6	20.8
	Coal Mining				Oil and Gas Extraction			
	Brooke (N=0)		Mingo (N=3)		Brooke (N=0)		Mingo (N=3)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Managers	--	--	39.9	52.1	--	--	8.0	6.8
Professionals	--	--	0.0	0.0	--	--	5.9	5.1
Sales	--	--	0.0	0.0	--	--	0.7	1.2
Clerks	--	--	3.7	4.2	--	--	2.8	1.2
Service Workers	--	--	1.9	3.3	--	--	0.7	1.2
Farm-Service Workers	--	--	0.0	0.0	--	--	0.0	0.0
Prod.-Precision Workers	--	--	32.5	44.6	--	--	7.2	6.7
Operators	--	--	21.9	37.9	--	--	58.6	13.2
Helpers/Laborers	--	--	0.0	0.0	--	--	16.0	26.8

Source: Imputed from the results of the Survey of the Demand for Educational Attainment, Regional Research Institute, 2000.

Appendix 3. How the Method Estimates

State-Level Data:

Data 1:

	Industry-P	Industry-Q
Occupation-a	Pa	Qa
Occupation-b	Pb	Qb

Data 2:

	Education-1	Education-2
Occupation-a	1a	2a
Occupation-b	1b	2b

The Requirement Matrix.

	Industry-P		Industry-Q	
	Educ-1	Educ-2	Educ-1	Educ-2
Occup-a	[Pa*1a]	[Pa*2a]	[Qa*1a]	[Qa*2a]
Occup-b	[Pb*1b]	[Pb*2b]	[Qb*1b]	[Qb*2b]

Note: [..] => The sum of employment in one industry is normalized to 1 ==>[Pa*1a]+[Pa*2a]+[Pb*1b]+[Pb*2b] = 1

County-Level Data:

Data 3:

Industry-P	Cp
Industry-Q	Cq

Data 3 'Kronecker' the requirement matrix

The County-Level Demand for Educational Attainment

	Industry-P		Industry-Q	
	Educ-1	Educ-2	Educ-1	Educ-2
Occup-a	[Pa*1a]*Cp	[Pa*2a]*Cp	[Qa*1a]*Cq	[Qa*2a]*Cq
Occup-b	[Pb*1b]*Cp	[Pb*2b]*Cp	[Qb*1b]*Cq	[Qb*2b]*Cq

Assumptions:

1. Fixed proportion of occupation per sector across counties within West Virginia.
2. Fixed proportion of education per each occupation, regardless of the sector.

PHONE SURVEY ON THE ASSESMENT OF TRAINING NEEDS IN _____ COUNTY

Introduce yourself to the operator
Hello, my name is _____ and I'm a student at West Virginia University. I'm working for the Regional Research Institute at West Virginia University. The Institute is collaborating with the (insert name of local organization) to assess current and future **training needs** in _____ County. To do that, the best person for me to speak with would be the person responsible for making hiring decisions at your company. Is that person available?

[[*Once you get to the right person*]]

A. Reintroduce yourself
Hello, my name is _____ and I'm a student at West Virginia University. I'm working for the Regional Research Institute at West Virginia University. The Institute is collaborating with (insert name of local organization) to assess current and future **training needs** in _____ County. I'm surveying _____ County businesses to find out what kind of employees they have and the kinds of employees they need. The results of the survey will help _____ County set priorities on the kinds of training programs that are needed to help businesses compete in today's economy.

Participation in the survey is voluntary and the results will be completely confidential. Only an overview of countywide results will be released to the public. You may skip any questions that you think inappropriate. If you have any questions about this survey, you may call Dr. Scott Loveridge, who is in charge of the study, at the Institute, at: 304-293-8734.

For this survey, we would like to collect general information on the educational attainment and the occupation titles of your employees. In general we will ask questions such as how many of the employees are managers, professionals or clerical workers, and then for those managers or others, what level of education that they have.

0.01. Do you think you can provide us such information? Or do you think you need time to prepare for the information? For your information, provided that the information is ready, this survey will take about fifteen minutes.

[W*ait for his/her response. He/she may refuse, need more time, or be willing to do the survey right away. If he/she is ready, go to the next question*]

If he/she NEEDS TIME, don't forget to ask for his/her identification, and to schedule the time you can re-contact him/her:
May I know whom I am speaking with?
Mr. _____/ Ms. _____,
Title: _____
Phone: _____
When to contact again: Date_____. Hour:_____
Then in the next contact, continue with **0.03.**

0.02. May I know whom I am speaking with?
Mr. _____/ Ms. _____
Title: _____
Phone: _____

0.03. First, We'd like to verify your company's main product/service? My record indicates that you line of business is _____, is this correct?

0.04. [if *CORRECT, go to Q05*] [*if NOT CORRECT*] → Could you specify the product/service for us?
_____

0.05. Now we begin asking about your employees.
What is the total number of employees working for this company?

0.06. Are all of them full time employees or are there some that are part time?
All Not All → Full time _____ ((_____%)); Part Time _____ ((_____%))

If Number of Employees is MORE THAN 10 → USE Q-PART 1 (page 2);
EQUAL OR LESS THAN 10 → USE Q-PART-2 (page 8).

Q-PART 1 (for businesses with more than 10 employees)

In this survey we use a standard category to categorize employees occupations. We hope you are familiar with these categories, but that's not necessary because we will go through them as we begin collecting the information. So there are 9 categories, and they are:

1. Managers,
2. Professionals & Technicians,
3. Sales workers,
4. Clerical workers,
5. Service workers,
6. Farm-Service workers,
7. Production-Precision Workers & Repairers,
8. Operators, and
9. Helpers or Laborers.

Managers

Let's start with employees in the first category, the managers. They can be the chief executives, general administrators, financial managers, personnel managers, and any other kinds of managers.

1.01. How many of your employees are managers?

Professionals & Technicians

Employees in the second category are the professionals or technicians. They can be engineers, accountants, financial specialists, scientists, planners, lawyers, math/computer specialists, & other kinds of technologists.

1.02. How many of your employees are working as professionals or technicians?

Sales

Employees in the third category are those holding sales positions, including the supervisors. They can be your sales supervisors, sales representatives, sales workers, and other sales positions.

1.03. **How many of your employees are sales or sales supervisors?**

Clerical Workers

Employees in the forth category are clerical workers. They can be secretaries, information clerks, records processing clerks, computer equipment operators, mail distributing clerks, other clerical positions, including their supervisors.

1.04. How many of your employees are clerical or clerical supervisors?

Service Workers

Employees in the fifth category are service workers. They can be guards, janitors/cleaners, cooks, waiters, health assisting service workers, and also their supervisors.

1.05. How many of your employees are service workers or service-worker supervisors?

Farm-Service Workers

Now we get to the employees in the sixth category, farm-service workers. Included in this category are those whose services are related to farm. They can be groundskeepers & gardeners, animal caretakers, graders& sorters, inspectors, etc., and their supervisors.

1.06. How many of your employees are farm-service workers or their supervisors?

Production Precision Workers & Repairers

Employees in the seventh category are production precision workers & repairers. They can be the mechanics, the repairers, precision workers, construction trade workers such as carpenters, plumbers, etc., extractive workers such as drillers, and including also their supervisors for all the above positions.

1.07. How many of your employees are production precision workers & repairers, or their supervisors?

Operators

Employees in the eighth category are operators. Employees in this category can be any machine operators, fabricators, assemblers, testers, etc, including their supervisors.

1.08. How many of your employees are operators or their supervisors?

Helpers or Laborers

Now we get to the employees in the last category, helpers or laborers. SUPERVISORS are NOT INCLUDED. Employees in this category can be helpers or laborers for production & construction-trade, freight, stock & material handlers, garbage collectors, hand packers, vehicle washers, machine feeders etc.

1.09. How many of your employees are helpers/laborers?

MANAGERS

As you mentioned above, there are _____ managers in your business.

1.10. How many of them live in this county?
_____

1.11. Do they all work full-time?
FULL TIME workers _____
Or in % _____

1.12. Can you tell me their level of education? [Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____
- Some College but no degree?
  _____
  OR in % _____
- Graduated only from HS?
  _____
  OR in % _____
- Some HS but not graduated?
  _____
  OR in % _____
- Less than HS?
  _____
  OR in % _____

PROFESSIONALS & TECHNICIANS

As you mentioned above, there are _____ professionals & technicians in your business.

1.13. How many of them live in this county?
_____

1.14. Do they all work full-time?
FULL TIME workers _____
Or in % _____

1.15. Can you tell me their level of education? [Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____
- Some College but no degree?
  _____
  OR in % _____
- Graduated only from HS?
  _____
  OR in % _____
- Some HS but not graduated?
  _____
  OR in % _____
- Less than HS?
  _____
  OR in % _____

SALES

As you mentioned above, there are _____ sales workers & supervisors in your business.

1.16. How many of them live in this county?
_____

1.17. Do they all work full-time?
FULL TIME workers _____
Or in % _____

1.18. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

CLERICAL WORKERS

As you mentioned above, there are _____ clerical in your business.

1.19. How many of them live in this county?
_____

1.20. Do they all work full-time?
FULL TIME workers _____
Or in % _____

1.21. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

SERVICE WORKERS

As you mentioned above, there are _____ service workers in your business.

1.22. How many of them live in this county?
_____

1.23. Do they all work full-time?
FULL TIME workers _____
Or in % _____

1.24. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

FARM-SERVICE WORKERS

As you mentioned above, there are _____ farm service workers in your business.

1.25. How many of them live in this county?
_____

1.26. Do they all work full-time?
FULL TIME workers _____
Or in % _____

1.27. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

PRODUCTION PRECISION WORKERS & REPAIRERS

As you mentioned above, there are _____ production precision workers & repairers in your business.

1.28. How many of them live in this county?
_____

1.29. Do they all work full-time?
FULL TIME workers _____
Or in % _____

1.30. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

OPERATORS

As you mentioned above, there are _____ operators in your business.

1.31. How many of them live in this county?
_____

1.32. Do they all work full-time?
FULL TIME workers _____
Or in % _____

1.33. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

HELPERS OR LABORERS

As you mentioned above, there are _____ helpers or laborers in your business.

1.34. How many of them live in this county?
_____

1.35. Do they all work full-time?
FULL TIME workers _____
Or in % _____

1.36. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

OVERALL, are you satisfied with the quality of education of your employees? Do you think it's good enough for them to handle their tasks? Or would you prefer that they have more education or some other training?

YES, Satisfied.
NO. If No, could you tell me a little more about issues that you have?

Managers
-More Education
-Training of _____
-(other comments) _____
_____

Professionals/Technicians
-More Education
-Training of _____
-(other comments) _____
_____

Sales
-More Education
-Training of _____
-(other comments) _____
_____

Clerical Workers
-More Education
-Training of _____
-(other comments) _____
_____

Service Workers
-More Education
-Training of _____
-(other comments) _____
_____

Farm-Service Workers
-More Education
-Training of _____
-(other comments) _____
_____

Production-Precision/Repairers
-More Education
-Training of _____
-(other comments) _____
_____

Operators
-More Education
-Training of _____
-(other comments) _____
_____

Helpers/Laborers -More Education
-Training of _____
-(other comments) _____
_____

That's all the information that we need. We really appreciate your time and your cooperation. We will utilize this information to generate something that we hope will be beneficial for _____ County businesses in general or your business in particular. Again if there are any questions about the survey, you may call Dr. Scott Loveridge at the Regional Research Institute, tel. 304-293-8734, who is in charge of the study. Do you have anything that you'd like to mention with regard to this survey?"

_____
_____
_____

"THANK YOU VERY MUCH, GOOD BY

Q-PART 2 (for businesses with employees of 10 or less)

OWNERS OR MANAGERS

2.01. Are you the owner of this business?
1. YES → [Go to 2.02 – He/She is the manager]
2. NO → [Go to 2.04]

2.02. May I know your educational attainment?
1. Bachelor degrees or higher?
2. Some College but no degree?
3. Graduated only from HS?
4. Some HS but not graduated?
5. Less than HS?

2.03. Do you think you still need another training to help you maintain your business?
1. YES. _____
2. NO

2.04. Please tell us about the jobs within your business! Do you have some people work as MANAGERS?
YES → How many of them
NO → [Go to 2.09]

2.05. How many of them live in this county?
_____

2.06. Do they all work full-time?
FULL TIME workers _____
Or in % _____

2.07. Can you tell me their level of education? [Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____
- Some College but no degree?
  _____
  OR in % _____
- Graduated only from HS?
  _____
  OR in % _____
- Some HS but not graduated?
  _____
  OR in % _____
- Less than HS?
  _____
  OR in % _____

2.08. What do you think about their education? Do you think it's good enough for them to handle their tasks? Or would you prefer that they have more education or some other training?

_____

_____

_____

2.09. Please tell us about THE REST OF THE EMPLOYEES based on the kinds of jobs that they do, such as secretaries, counters, cooks, waiters, janitors or accountants, engineers, computer specialists, or just helpers etc.

[[Just write down the "names" of the jobs as the person is telling you and don't forget to ask the number of employees holding the jobs. Do the categorization later on after the interview]].

Type of job 1: _____

How many: _____

Type of job 2: _____

How many: _____

Type of job 3: _____

How many: _____

Type of job 4: _____

How many: _____

Type of job 5: _____

How many: _____

Type of job 6: _____

How many: _____

JOB TYPE 1 _____

Please tell us about the employees with the job type 1.

2.10. How many of them live in this county?
_____

2.11. Do they all work full-time?
FULL TIME workers _____
Or in % _____

2.12. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

JOB TYPE 2 _____

Please tell us about the employees with the job type 2.

2.13. How many of them live in this county?
_____

2.14. Do they all work full-time?
FULL TIME workers _____
Or in % _____

2.15. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

JOB TYPE 3 _____

Please tell us about the employees with the job type 3.

2.16. How many of them live in this county?
_____

2.17. Do they all work full-time?
FULL TIME workers _____
Or in % _____

2.18. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

JOB TYPE 4 _____

Please tell us about the employees with the job type 4.

2.19. How many of them live in this county?
_____

2.20. Do they all work full-time?
FULL TIME workers _____
Or in % _____

2.21. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

JOB TYPE 5 _____

Please tell us about the employees with the job type 5.

2.22. How many of them live in this county?

_____

2.23. Do they all work full-time?
FULL TIME workers _____
Or in % _____

2.24. Can you tell me their level of education?
[Remember you are to identify the NUMBER of the employees with the following education!]

- Bachelor degrees or higher?
  _____
  OR in % _____

- Some College but no degree?
  _____
  OR in % _____

- Graduated only from HS?
  _____
  OR in % _____

- Some HS but not graduated?
  _____
  OR in % _____

- Less than HS?
  _____
  OR in % _____

OVERALL. are you satisfied with the quality of education of your employees? Do you think it's good enough for them to handle their tasks? Or would you prefer that they have more education or some other training?

YES. Satisfied.
NO. If No, could you tell me a little more about issues that you have?

Managers
-More Education
-Training of _____
-(other comments) _____
_____

Professionals/Technicians
-More Education
-Training of _____
-(other comments) _____
_____

Sales
-More Education
-Training of _____
-(other comments) _____
_____

Clerical Workers
-More Education
-Training of _____
-(other comments) _____
_____

Service Workers
-More Education
-Training of _____
-(other comments) _____
_____

Farm-Service Workers
-More Education
-Training of _____
-(ather comments) _____
_____

Production-Precision/Repairers
-More Education
-Training of _____
-(other comments) _____
_____

Operators
-More Education
-Training of _____
-(ather comments) _____
_____

Helpers/Laborers -More Education
-Training of _____
-(ather comments) _____
_____

That's all the information that we need. We really appreciate your time and your cooperation. We will utilize this information to generate something that we hope will be beneficial for _____ County businesses in general or your business in particular. Again if there are any questions about the survey, you may call Dr. Scott Loveridge at the Regional Research Institute, tel. 304-293-8734, who is in charge of the study. Do you have anything that you'd like to mention with regard to this survey?"

_____

_____

_____

"THANK YOU VERY MUCH, GOOD BYE"

Appendix 4: Definitions of Occupational Categories and Industrial Classifications

Occupational Categories[24]:

1. **Managers** (representing Managerial and Administrative Occupations): Included in this category are top and middle managers, administrators, and executives whose primary duties are policy making, planning, staffing, directing or controlling business operations. Types of occupations in this category are for example financial managers, personnel and labor relations managers, purchasing managers, marketing managers, public relations managers, production managers, general managers and top executives, etc.

2. **Professionals** (representing Professional and Technical Occupations): Included in this category are persons considered to be practically specialized in such fields as science, art, education, law, and business relations, whose skills are usually attained from substantial postsecondary educational preparation. Types of occupations in this category are for example accountants, auditors, financial specialists, personnel, training, and labor relation specialists, engineers (of any kinds), natural scientists, computer programmers, teachers, health practitioners, designers, etc. Unlike this study, the original 1990 Census categorizes some of these professional occupations into managerial-administrative occupations, and classified them as "Management Related Occupations". Included in this category are accountants, underwriters, management analysts, personnel specialists, and other management related occupations.

3. **Sales Occupations**. Included in this category are persons whose main assignment is dealing with selling goods or services. Sales supervisors are also included in this category. Other types of occupations included in this category are sales engineers, sales representatives, sale workers, and other sales or related workers.

4. **Clerks** (representing Clerical and Administrative Support Occupations). Included in this category are persons performing office and plant clerical tasks such as typing, filing, computer operating, record keeping, mail preparation and distributing. This category also includes clerical supervisors. Other type of occupations included are customer service representatives, secretaries, receptionists, typists, personnel clerks, file clerks, order clerks, data-entry keyers, bank tellers, bookkeeping or accounting clerks, payroll clerks, general office clerks, etc.

5. **Service Worker Occupations**. Included in this category are occupations relating to protective service, food service, health assisting service, cleaning and building service, and personal service. Supervisors are also included in this category. Other types of occupations are guards, bartenders, waiters, cooks, dental assistants, nurses, janitors and cleaners, maids, barbers, hairdressers, guides, ushers, child care providers, etc.

6. **Farm-Service Worker Occupations**. Included in this category are service workers whose service is related to farm. Farm-service worker supervisors are included in this category. The other types of occupations included are farm operators, farm workers,

[24] Definitions of these occupations are summarized from both 1990 Census Technical Documentation and OES 1997 Booklet of Definitions.

ground keepers, gardeners, animal caretakers, inspectors for agricultural products, forestry workers, logging workers, timber cutting workers, fishers, hunters and trappers, etc.

7. **Production – Precision Worker** (representing Precision Production, Craft, and Repair Occupations). Included in this category are workers performing machine or manual tasks involving production, construction and repairs. A wide range of sub-categories of occupations are included in this category, such as mechanics and repairers, electrical and electronic equipment repairers, construction trades, extractive occupations (oil drillers, explosives workers), precision metal, woodworking, apparel, textile, food production occupations, etc.

8. **Operators** (representing Operators and Fabricators Occupations). A wide range of operators are included in this category, such as machine operators and tenders, metal and plastic processing operators, woodworking machine operators, etc., as well as fabricators such as welders, cutters, assemblers, hand painting, hand molding, etc.

9. **Helpers/Laborers Occupations**. This category includes occupations that require least skilled workers. This is the category for workers whose main duty is to be helpers for any kinds of business operation, and whose skills do not require specific educational preparation. Included in here are for example mechanics helpers, construction trade helpers, construction laborers, vehicle washers, hand packers, garbage collectors, etc.

Industrial Categories (1987 Standard Industrial Classification = SIC)[25]:

1. **Agriculture** (representing Agriculture, Forestry, and Fisheries (SIC-01 to SIC-09)). Included in this category are agricultural production, veterinary services, landscape and horticultural services, agricultural services, forestry, fishing, hunting, and trapping.

2. **Mining** (SIC-10 to SIC-14). Included in this category are metal mining, coal mining, oil and gas extraction, and non-metallic mining and quarrying, except fuels.

3. **Construction** (SIC-15 to SIC-17).

4. **Manufacturing** (SIC-20 to SIC-39). Manufacturing businesses operate on two main products, non-durable and durable products. Non-Durable Manufacturing includes food and kindred products, tobacco manufacturers, textile and mill products, apparel and other finished textile products, paper and allied products, printing, publishing, and allied industries, chemicals and allied products, etc., or industries ranging from SIC-20 to SIC-31, except SIC-24 and SIC-25. Durable manufacturing includes lumber and wood products, stone, clay, glass, and concrete products, metal industries, etc., or industries ranging from SIC-32 to SIC-39 plus SIC-24 and SIC-25.

[25] This is based on the classification described in the 1990 Census Technical Documentation.

5. **Transportation** (representing Transportation, Communications, and Other Public Utilities (SIC-40 to SIC-49)). Included in this category are railroad, bus service and urban transit, taxicab service, warehousing and storage, U.S. postal service, radio and television broadcasting and cable, telephone communications, electric light and power, gas and steam supply systems, sanitary services, etc.

6. **Wholesale Trade** (SIC-50 to SIC-51). Wholesale-trade for durable goods includes motor vehicles and equipment, furniture and home furnishing, lumber and construction materials, electrical goods etc. Wholesale-trade for non-durable goods includes paper and paper products, drugs chemicals and allied products, apparel, fabric and notions, petroleum products, alcoholic beverages, etc.

7. **Retail Trade** (SIC-52 to SIC-59). Included in this category are lumber and building material retailing, hardware store, department stores, retail bakeries, grocery stores, and various kinds of stores.

8. **Finance** (representing Finance, Insurance, and Real Estate (SIC-60 to SIC-65). Included in this category are banking, savings institutions including credit unions, credit agencies, security, commodity brokerage, and investment companies, insurance, and real estate.

9. **Services** (SIC-73 to SIC-89). Included in this category are business and repair services, personal services, entertainment and recreation services, and professional and related services.

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Signature:	Printed Name/Position/Title: Christiadi, Research Assistant	
Organization/Address: Regional Research Institute West Virginia University 511 N. High Street, Morgantown WV 26505	Telephone: 304-293-8539	Fax: 304-293-6699
	E-mail Address: christia@be.wvu.edu	Date: 01-22-2001

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