

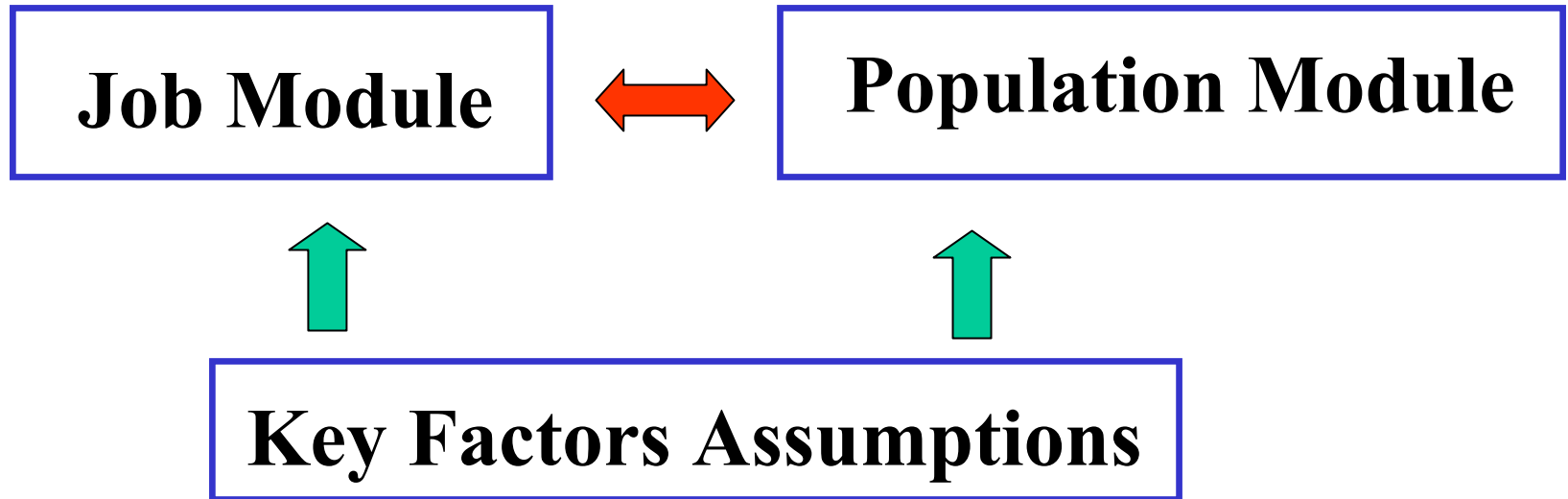
Metropolitan Washington Council of Government's

Econometric Model for Jobs, Population and Housing

Presented to the Baltimore Metropolitan Council's
Cooperative Forecasting Committee

March 17th 2004

MWCOG's ECONOMETRIC FORECASTING MODEL



Econometric Model

- **Job Module**
- Population Module
- Key Factors Assumptions

Job Module

- Regression equations for the “region” are developed at mostly a one-digit SIC detail
- National and local data as used as independent variables
- Results in projections of total wage & salary jobs by sector for Washington MSA

Sectoral Detail

- Construction
- Manufacturing
- TCPU
- Wholesale Trade
- Retail Trade
- F.I.R.E.
- Business Services
- Health Service
- Other Services
- Membership Organizations
- State & Local Government

Inputs into the Regression Equations

- Historical national and MSA CES-based jobs data, 1970 – 2000
- BLS, CES-based national projections to 2010 (now NAICS –based to 2012)
- W&P, BEA-based national projections to 2025 (now 2030, still SIC based)

Round 7 Regression Equations by Sector

MSA Retail =	-3.7044 + 0.95715*Ln(U.S. Retail) + 0.01592*Ln(MSAPopCng-1)	Adj R² = .9648
	(-9.18) (22.37) (2.09)	
MSA Retail =	8.6713 + 0.0166*U.S. Retail	Adj R² = .9470
	(0.65) (22.39)	
MSA Wholesale =	-4.36006 + 0.6755*Ln(MSA Retail-1) + 0.54214*Ln(U.S. Wholesale)	Adj R² = .9429
	(-3.05) (3.44) (1.89)	
MSA FIRE =	-7.90976 + 0.017117*US FIRE + 0.164764*MSAConst-1	Adj R² = .9908
	(-3.72) (30.59) (5.56)	
MSA Construction =	-5.64317 + 1.214477*Ln(U.S.Construction)	Adj R² = .7862
	(-5.82) (10.55)	
MSA TCPU =	-50.2830 + 0.0172*US TCPU + 0.6375*MSAMfg	Adj R² = .9551
	(-7.47) (9.16) (7.20)	
MSA Memb Org * =	14.4078 + .00207*US Membership	Adj R² = .9299
	(3.68) (11.56)	
MSA St & Loc Govt. =	7.55375 + 0.013659*US St&Loc Govt	Adj R² = .9511
	(0.94) (24.17)	
MSA Manufacturing =	7869.251 + 139.0399*Ln(USPrint &Pub) - 1158.93*Ln(Year)	Adj R² = .9614
	(2.96) (12.36) (-3.22)	
MSA Health Services =	-122.193 + 0.007525*USHealthServ. + 0.045838*MSAPop-1	Adj R² = .9851
	(-5.21) (3.57) (4.49)	
MSA Business Service =	22.03063 + 0.03108*USBusServ.	Adj R² = .9841
	(6.26) (43.16)	
MSA Other Services =	-122.1557 + 0.03644*USOtherServ	Adj R² = .9636
	(-6.83) (25.77)	

Job Module

**Regression Equations
by sector**



Total non-federal wage & salary jobs

+

Federal civilian jobs

Key factors

=

Total wage & salary civilian jobs

+

**Total Omitted Jobs/self employed
(as a pct.of total civilian jobs)**

Key factors

Job Module (continued)

= **Total Civilian Jobs**

+ **Military Jobs**

Key factors

= **Total Jobs by Place of Work**

- **Multiple Job Holders**

Key factors

= **Total Employed Persons, 16 +**

Job Module (continued)

Total Employed Persons, 16 +

**— Net Commuters
(as a pct.of employed persons)**

Key factors

= Total Employed Residents, Age 16 +

Econometric Model

- Jobs Module
- **Population Module**
- Key Factors Assumptions

Population Module

From jobs module

Key factors

Total Employed
Residents, Age 16 +



Emp. Residents, as a
pct of total pop, ages 16-64

=

Total pop ages 16-64

Key factors

Total pop ages 16-64

X

Pop < 16 as a pct of total pop,
ages 16-64

=

Total population < 16

Population Module (continued)

Key factors

Total pop ages 16-64

X

Pop 65+ as a pct of total pop,
ages 16-64

=

Total population ages 65+

Population Module (continued)

Total population < 16

+ Total population, ages 16-64

+ Total population ages 65+

= Total population **—** **GQ pop**

Key factors

= Total Household Population

Population Module

Key factors

Total Household Population



Household Size



Total Households

Econometric Model

- Jobs Module
- Population Module
- **Key Factors Assumptions**

Key Factors

- Pct omitted jobs/self-employed
- Pct multiple job holders
- Net commuting as a percent of total employed persons
- Employment rate (employed residents as a pct of total population 16-64)
- Elderly pop as percent of total pop 16-64

Key Factors (continued)

- Youth pop as a percent of total pop, 16-64
- Group quarters population (as a pct of total population)
- Average household size
- Federal civilian employment
- Military employment

Round 7 Key Factors Summary							
	2000	2005	2010	2015	2020	2025	2030
% Multiple Job Holders	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Employment Rate	78.5%	79.7%	80.9%	81.3%	80.7%	80.8%	80.9%
% Youth Pop (< 16 years)	33.1%	31.9%	31.1%	32.1%	33.6%	35.2%	36.1%
% Elderly Pop (65 years +)	13.0%	12.9%	13.5%	15.3%	17.7%	20.3%	22.0%
Net In-Commuting Rate	6.12%	6.26%	6.39%	6.53%	6.66%	6.80%	6.93%
Self-Employed	5.41%	5.41%	5.41%	5.41%	5.41%	5.41%	5.41%
Group Quarters	2.01%	2.01%	2.01%	2.01%	2.01%	2.01%	2.01%
HH size	2.62	2.62	2.61	2.61	2.60	2.60	2.60

RND 7.0 “Problems” Associated With Initial Model Output

- Initial job forecasts “too high” in outer years
- Too much population generated from jobs in outer years
- Short term: too much job growth in the second half of this decade

	PROJECTED EMPLOYMENT TRENDS - WASHINGTON - MSA						
	(Draft - Round 7 - INTERMEDIATE Scenario)						
<u>Sector</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2025</u>	<u>2030</u>
Manufacturing	85.3	65.6	62.5	60.6	58.9	57.3	55.7
Construction	144.4	162.7	180.7	191.5	201.9	211.7	221.0
TCPU	129.6	117.3	132.0	141.5	147.8	153.9	159.6
Wholesale Trade	80.2	90.7	100.7	108.6	115.9	123.3	130.7
Retail Trade	377.3	414.9	448.6	475.1	502.4	530.4	559.2
F.I.R.E.	143.1	154.1	162.4	170.4	178.0	185.5	192.8
Services	1,084.4	1,212.3	1,457.8	1,626.5	1,809.7	2,008.3	2,220.9
Business Services	350.7	369.4	485.8	567.6	669.7	786.4	919.5
Health Services	161.8	179.2	210.2	244.0	283.7	326.9	371.0
Membership Org	67.8	68.0	71.1	73.5	75.9	78.4	80.9
Other Services	504.1	595.7	690.7	741.4	780.4	816.7	849.5
Government	666.7	682.1	692.6	706.3	720.1	734.0	748.8
Federal Civilian Govt.	342.6	333.3	332.4	331.7	331.1	330.4	330.4
Military Govt.	79.3	80.6	82.0	83.0	83.6	83.8	83.8
State & Local Govt.	244.8	268.2	278.2	291.6	305.5	319.8	334.6
Omitted Employment	142.4	152.5	170.7	183.8	197.5	212.1	227.5
TOTAL JOBS	2,853.4	3,052.1	3,408.0	3,664.3	3,932.2	4,216.5	4,516.2
TOTAL POPULATION	4,544.9	4,749.0	5,235.1	5,718.7	6,346.0	6,991.5	7,619.8
TOTAL HOUSEHOLDS	1,707.8	1,776.1	1,965.4	2,146.9	2,391.6	2,634.9	2,871.7

	PROJECTED EMPLOYMENT TRENDS - WASHINGTON - MSA						
	(Draft - Round 7 - INTERMEDIATE Scenario)						
<u>Sector</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2025</u>	<u>2030</u>
Manufacturing	85.3	65.6	62.5	59.0	54.6	49.7	42.4
Construction	144.4	162.7	180.7	188.8	194.3	198.3	196.8
TCPU	129.6	117.3	132.0	138.7	140.1	140.3	135.3
Wholesale Trade	80.2	90.7	100.7	107.1	111.4	115.1	116.1
Retail Trade	377.3	414.9	448.6	468.2	483.7	497.6	502.1
F.I.R.E.	143.1	154.1	162.4	168.3	172.2	175.1	174.2
Services	1,084.4	1,212.0	1,456.3	1,586.0	1,709.5	1,834.2	1,914.7
Business Services	350.7	369.4	485.8	555.7	637.4	726.1	809.4
Health Services	161.8	178.9	208.6	235.5	263.7	291.9	314.4
Membership Org	67.8	68.0	71.1	72.2	72.9	73.4	73.8
Other Services	504.1	595.7	690.7	722.5	735.5	742.8	717.1
Government	666.7	682.1	692.6	703.1	710.9	717.6	719.1
Federal Civilian Govt.	342.6	333.3	332.4	331.7	331.1	330.4	330.4
Military Govt.	79.3	80.6	82.0	83.0	83.6	83.8	83.8
State & Local Govt.	244.8	268.2	278.2	288.3	296.3	303.4	304.9
Omitted Employment	142.4	152.5	170.6	180.5	189.0	197.1	201.1
TOTAL JOBS	2,853.4	3,051.8	3,406.3	3,599.6	3,765.7	3,924.9	4,001.9
TOTAL POPULATION	4,544.9	4,737.4	5,193.5	5,561.4	6,000.6	6,410.8	6,634.8
TOTAL HOUSEHOLDS	1,707.8	1,771.8	1,949.8	2,087.9	2,261.5	2,416.0	2,500.4

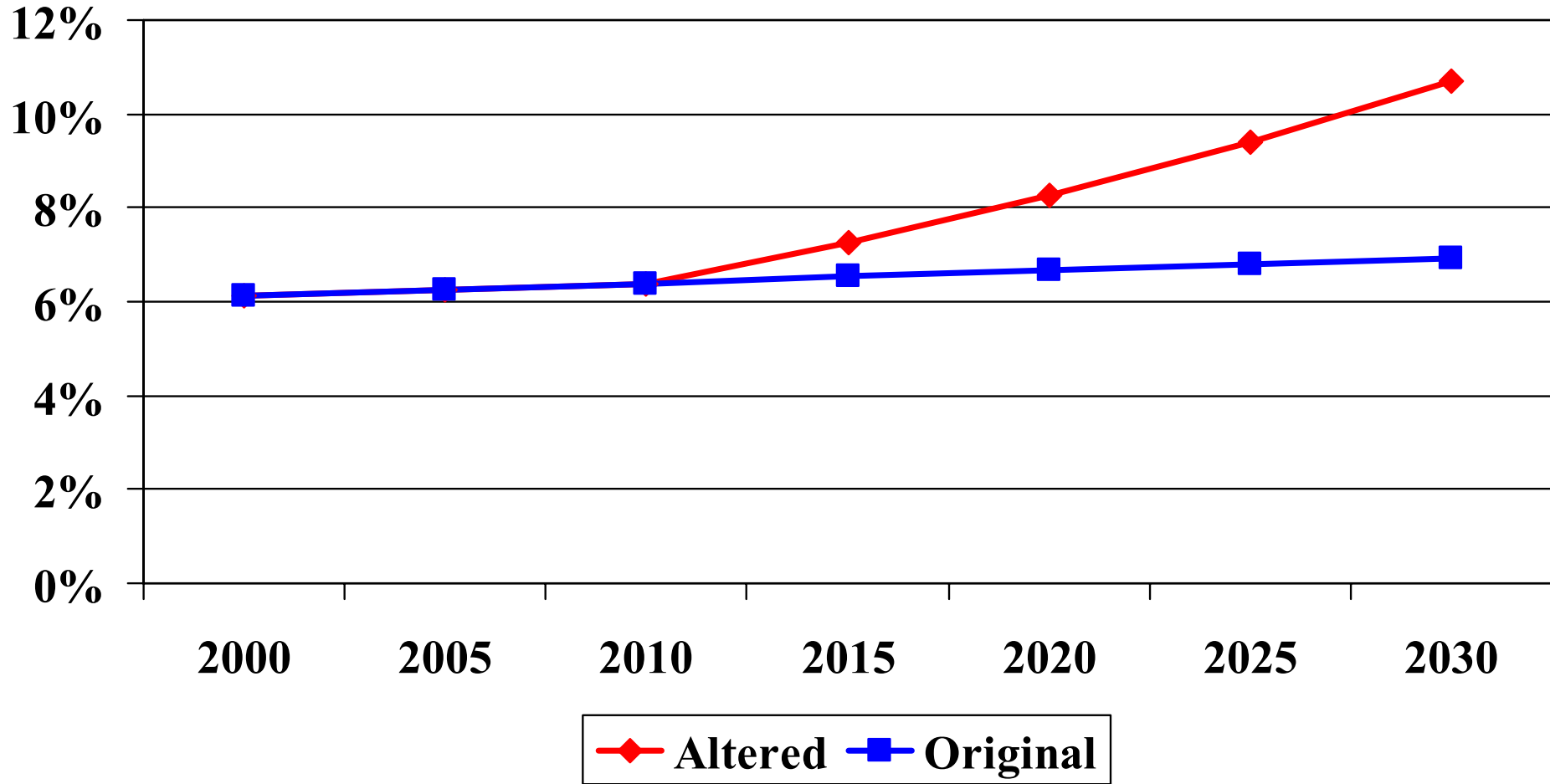
Sensitivity on 2030 totals *		
For every 1.0 percentage point rise in:	Pop Changes by (1,000s)	Jobs Change by (1,000s):
Multiple Job Holding Rate	-76.6	-3.7
Employment Rate ^	-88.7	-4.2
Dependency Ratio **	44.4	2.2
Commuting Rate	-77.2	-3.7
Self Employment Rate	67.4	40.5

*alterations to key factor rates made for the 2005 - 2030 period. Only one modification to a key factor made at a time.

^ = total pop ages 16-64 as a pct of total employed residents 16+ (i.e. it is NOT the LFPR of 16-64 year olds)

** = .5 percentage point increase each in pop < 16 and pop >=65+

Increase Necessary to Net Commutation Rate to “Balance” Jobs and Population*



* In addition to other changes made to multiple job holders and dependency ratios

Increase Necessary to Net Commutation to “Balance” Jobs and Population*



* In addition to other changes made to multiple job holders and dependency ratios

<i>Change in mult job holders</i>	PROJECTED EMPLOYMENT TRENDS - WASHINGTON - MSA						
<i>cng in dep ratio</i>	(Draft - March 8, 2004: Round 7 - INTERMEDIATE Scenario)						
<i>cng in commutation rate</i>							
Sector	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2025</u>	<u>2030</u>
Manufacturing	85.3	65.6	62.5	59.0	54.6	49.7	42.4
Construction	144.4	162.7	180.7	188.8	194.3	198.3	196.8
TCPU	129.6	117.3	132.0	138.7	140.1	140.3	135.3
Wholesale Trade	80.2	90.7	100.7	107.1	111.4	115.1	116.1
Retail Trade	377.3	414.9	448.6	468.2	483.7	497.6	502.1
F.I.R.E.	143.1	154.1	162.4	168.3	172.2	175.1	174.2
Services	1,084.4	1,211.9	1,455.8	1,583.1	1,703.1	1,823.6	1,899.5
Business Services	350.7	369.4	485.8	555.7	637.4	726.1	809.4
Health Services	161.8	178.8	208.1	232.7	257.3	281.3	299.2
Membership Org	67.8	68.0	71.1	72.2	72.9	73.4	73.8
Other Services	504.1	595.7	690.7	722.5	735.5	742.8	717.1
Government	666.7	682.1	692.6	703.1	710.9	717.6	719.1
Federal Civilian Govt.	342.6	333.3	332.4	331.7	331.1	330.4	330.4
Military Govt.	79.3	80.6	82.0	83.0	83.6	83.8	83.8
State & Local Govt.	244.8	268.2	278.2	288.3	296.3	303.4	304.9
Omitted Employment	142.4	152.5	170.6	180.3	188.6	196.6	200.3
TOTAL JOBS	2,853.4	3,051.7	3,405.8	3,596.6	3,758.9	3,913.9	3,986.0
TOTAL POPULATION	4,544.9	4,734.9	5,181.1	5,485.7	5,843.0	6,159.3	6,282.6
TOTAL HOUSEHOLDS	1,707.8	1,779.6	1,952.6	2,067.4	2,210.5	2,330.2	2,376.8

	CHANGE IN PROJECTED EMPLOYMENT - WASHINGTON - MSA						
	(Draft - Round 7 - INTERMEDIATE Scenario)						
	2000-	2005-	2010-	2015-	2020-	2025-	
<u>Sector</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2025</u>	<u>2030</u>	
Manufacturing	-19.7	-3.1	-3.4	-4.5	-4.8	-7.3	
Construction	18.3	18.0	8.1	5.5	4.0	-1.5	
TCPU	-12.3	14.8	6.7	1.4	0.2	-4.9	
Wholesale Trade	10.5	10.0	6.4	4.3	3.6	1.1	
Retail Trade	37.6	33.6	19.6	15.5	13.9	4.4	
F.I.R.E.	11.0	8.3	5.9	3.9	2.9	-0.9	
Services	127.6	244.3	129.7	123.5	124.7	80.6	
Business Services	18.7	116.4	69.8	81.8	88.7	83.3	
Health Services	17.1	29.7	27.0	28.1	28.3	22.5	
Membership Org	0.1	3.2	1.1	0.7	0.5	0.4	
Other Services	91.7	95.0	31.8	13.0	7.2	-25.7	
Government	15.4	10.5	10.5	7.9	6.6	1.5	
Federal Civilian Govt.	-9.3	-0.9	-0.7	-0.7	-0.7	0.0	
Military Govt.	1.3	1.4	1.0	0.6	0.2	0.0	
State & Local Govt.	23.4	10.0	10.1	7.9	7.1	1.5	
Omitted Employment	10.1	18.1	9.9	8.5	8.1	4.0	
TOTAL JOBS	198.5	354.4	193.3	166.1	159.2	77.0	
TOTAL POPULATION	192.5	438.1	367.9	439.2	410.2	224.0	
TOTAL HOUSEHOLDS	64.0	178.0	138.1	173.6	154.6	84.4	

	CHANGE IN PROJECTED EMPLOYMENT - WASHINGTON - MSA						
New BLS to 2012	(Draft - Round 7 - INTERMEDIATE Scenario)						
	2000-	2005-	2010-	2015-	2020-	2025-	
<u>Sector</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2025</u>	<u>2030</u>	
Manufacturing	-20.4	-6.6	0.6	-4.5	-4.8	-7.3	
Construction	17.4	12.6	14.4	5.5	4.0	-1.5	
TCPU	-13.4	9.1	13.4	1.4	0.2	-4.9	
Wholesale Trade	10.3	7.1	9.5	4.3	3.6	1.1	
Retail Trade	35.7	22.8	32.3	15.5	13.9	4.4	
F.I.R.E.	10.3	4.1	10.8	3.9	2.9	-0.9	
Services	122.4	204.2	175.0	123.5	124.7	80.6	
Business Services	17.1	104.6	83.2	81.8	88.7	83.3	
Health Services	17.1	22.9	33.8	28.1	28.3	22.5	
Membership Org	-0.1	1.8	2.7	0.7	0.5	0.4	
Other Services	88.3	74.9	55.3	13.0	7.2	-25.7	
Government	20.6	17.6	-1.9	7.9	6.6	1.5	
Federal Civilian Govt.	-9.3	-0.9	-0.7	-0.7	-0.7	0.0	
Military Govt.	1.3	1.4	1.0	0.6	0.2	0.0	
State & Local Govt.	28.6	17.1	-2.2	7.9	7.1	1.5	
Omitted Employment	9.8	14.6	13.7	8.5	8.1	4.0	
TOTAL JOBS	192.8	285.6	267.9	166.1	159.2	77.0	
TOTAL POPULATION	183.6	351.5	481.4	439.2	410.2	224.0	
TOTAL HOUSEHOLDS	60.6	138.7	180.7	173.6	154.6	84.4	