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Núcleo de Economia Regional e Urbana
da Universidade de São Paulo

Recent developments in the construction of the interregional input- output system for Sao Paulo Metropolitan Region (SPMR)

*International Workshop on Urban Modeling
Sao Paulo, July 10, 2012*

Eduardo Haddad

Outline

- ✓ Motivation

 - The IIOS for SPMR

 - Structural indicators

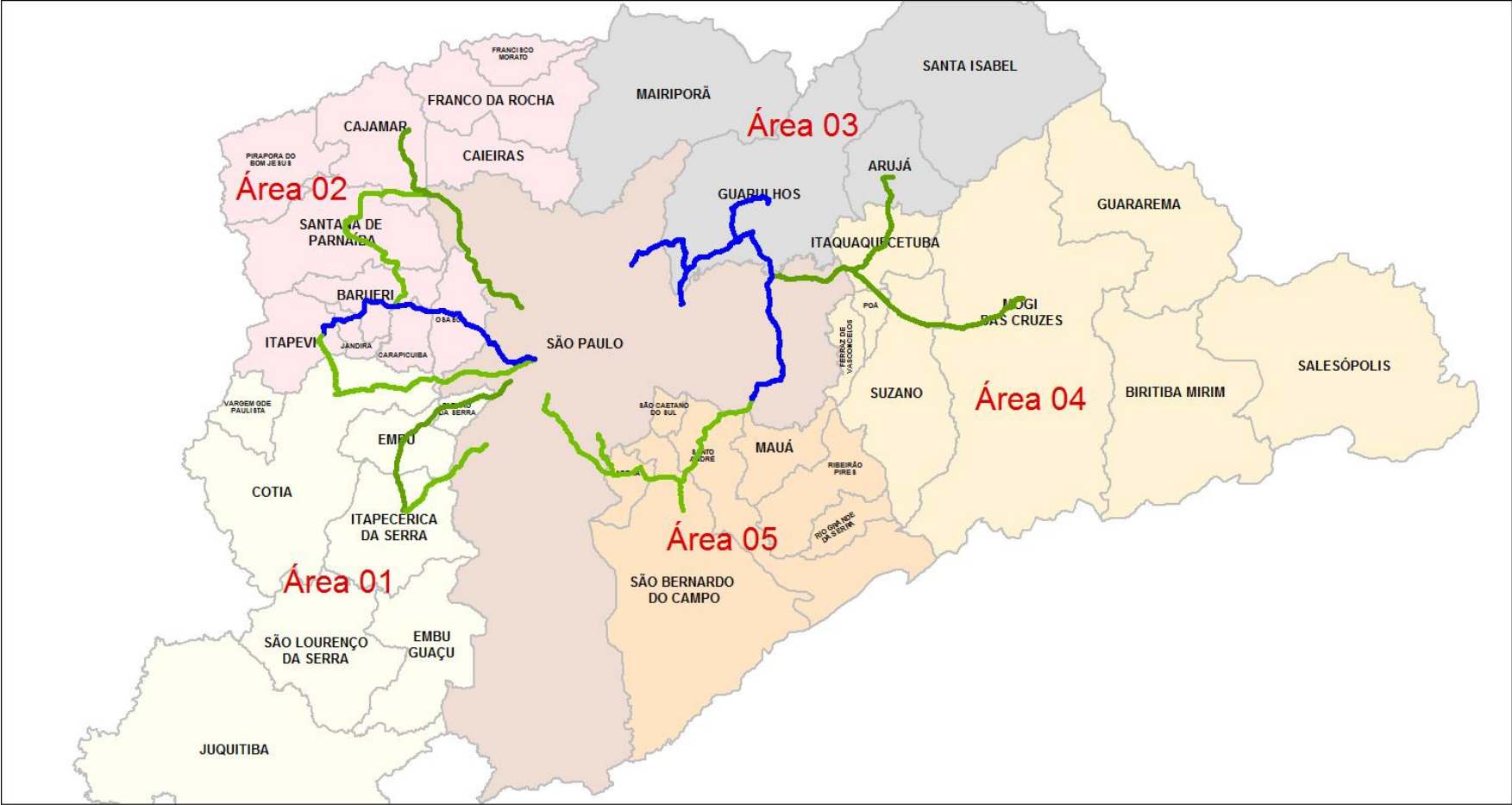
 - Final remarks

Necessary step in the process of building a spatial computable general equilibrium model for SPMR

FIPE project with EMTU

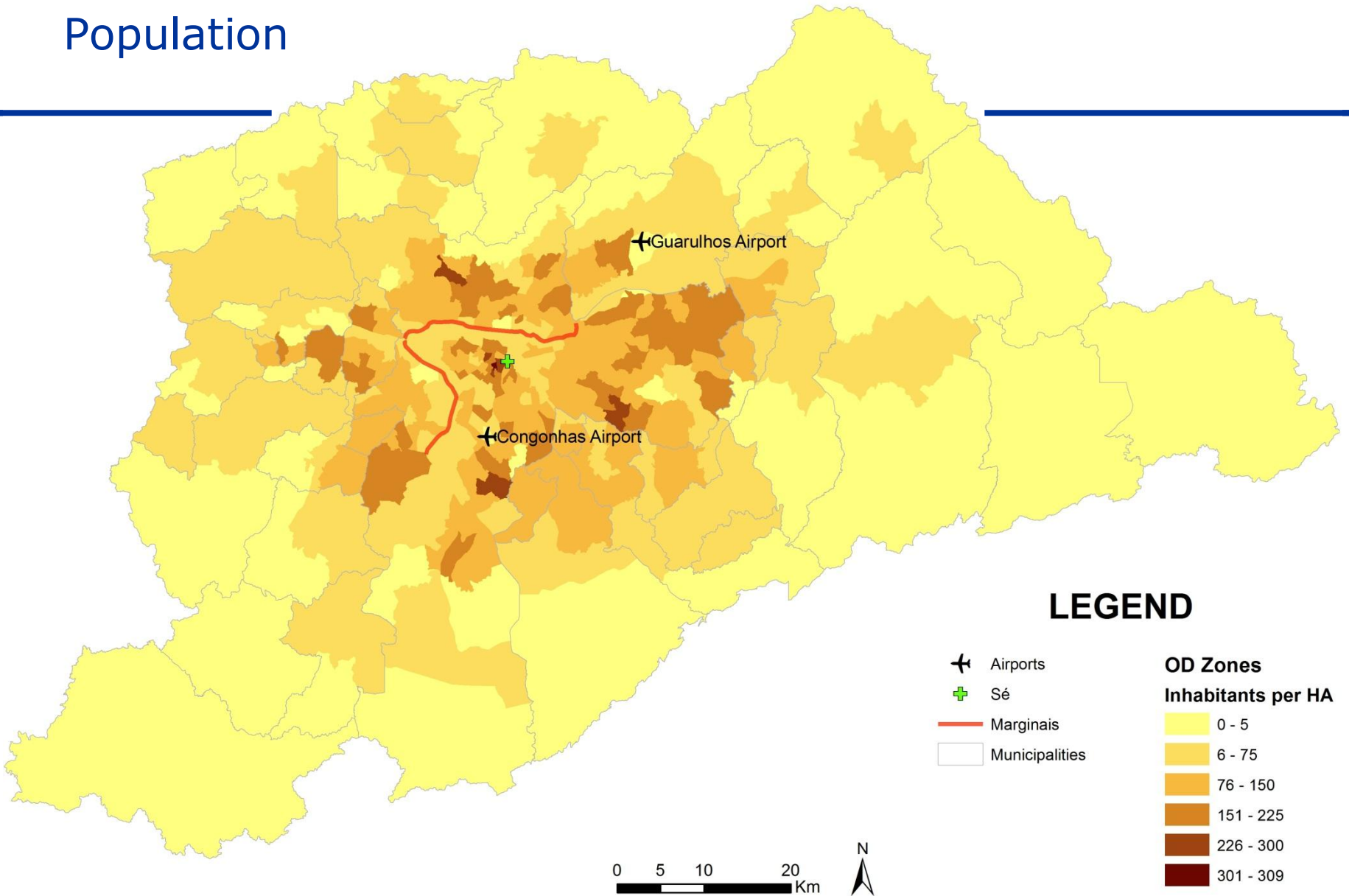
- Assess the economic impacts of new metropolitan bus corridors in SPMR
- Employment and income systemic effects in each of the 39 municipalities
- MSM integrated to CGE model
- Accessibility-productivity link

Metropolitan bus corridors whose economic impacts are to be assessed

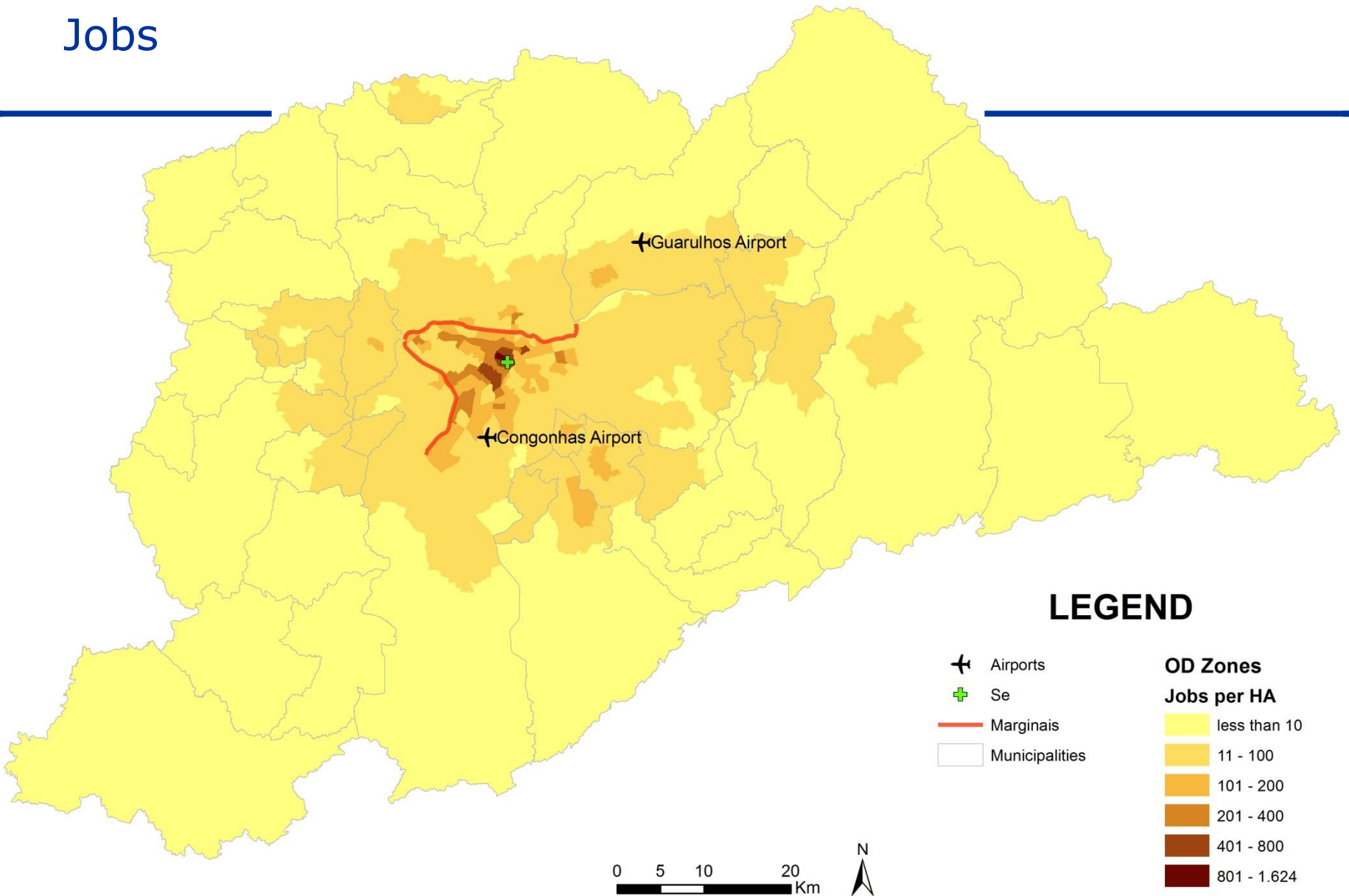


Source: EMTU

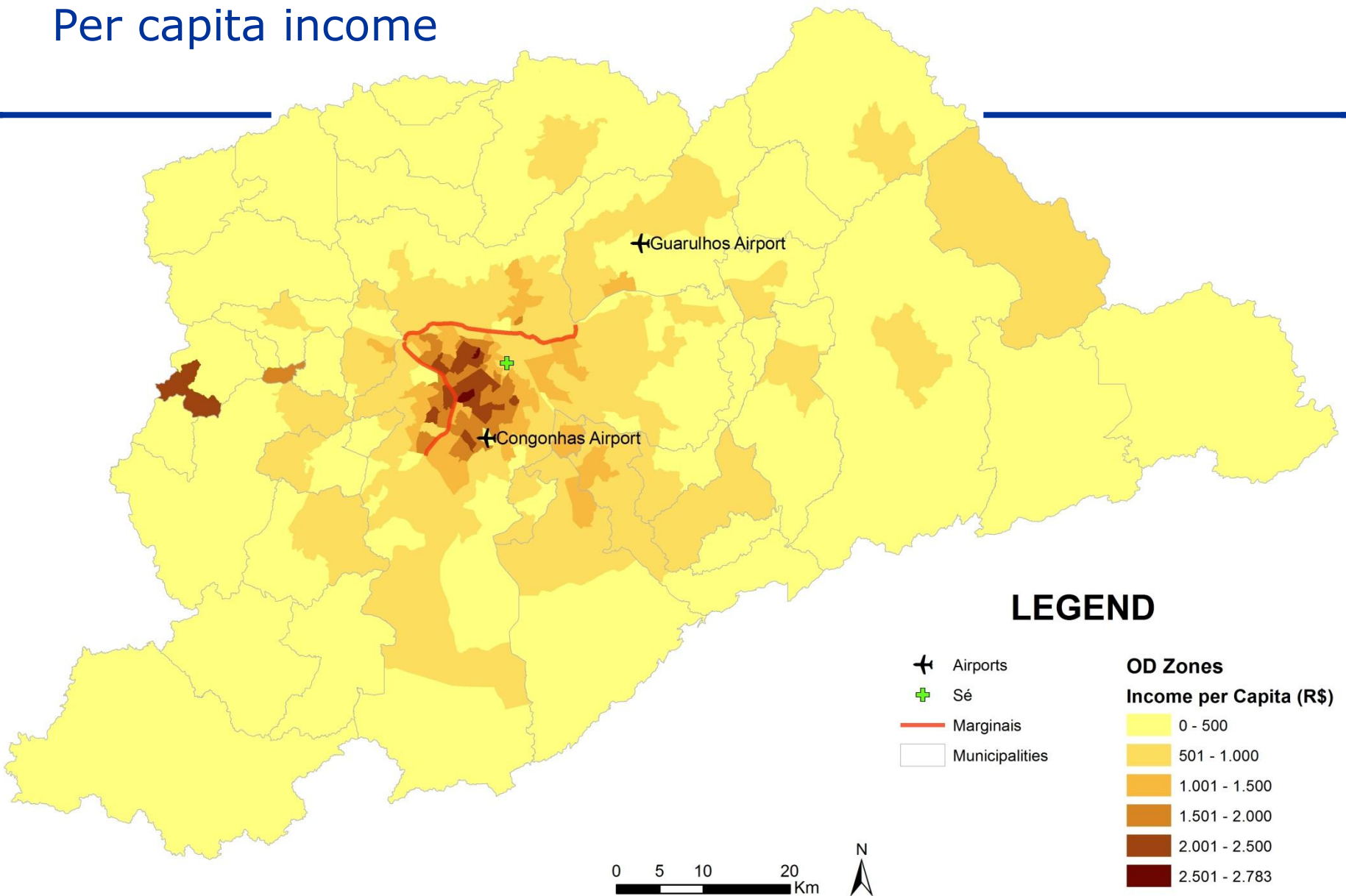
Population



Jobs



Per capita income



Challenges

Different production structures in each municipality

- How are they related (trade flows)?

Need to recognize that local output and income differ

- Income generated by production in a local area may often go to residents outside the area
- The income of an area's resident may come from outside of the area

Challenges

Take into account that a proportion of the generated income in one area is re-spent in other areas, leading to further induced spending elsewhere

- The amount of economic activity may be overestimated/underestimated because we have the wrong model!
- Separate (labor) income by place of work from income by place of residence (Census 2010 data)

How important is income earned outside the region?

Share of local (labor) earnings by local residents (place of residence)

Setor		Mora															
		3503901	3505708	3506607	3509007	3509205	3510609	3513009	3513801	3515004	3515103	3515707	3516309	3516408	3518305	3518800	3522208
Todos		ARUJÁ	BARUERI	BIRITIBA-I	CAIEIRAS	CAJAMAR	CARAPICL	COTIA	DIADEMA	EMBU DA	EMBU-GU	FERRAZ D	FRANCISC	FRANCO I	GUARARE	GUARULH	ITAPECER
Trabalha	3503901 ARUJÁ	0.4835	0.0001	0.0049	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000	0.0020	0.0002	0.0000	0.0258	0.0025	0.0000
	3505708 BARUERI	0.0000	0.6623	0.0016	0.0086	0.0197	0.1298	0.0330	0.0022	0.0075	0.0020	0.0004	0.0042	0.0036	0.0000	0.0038	0.0048
	3506607 BIRITIBA-MIRIM	0.0011	0.0000	0.6847	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0007	0.0000	0.0000
	3509007 CAIEIRAS	0.0001	0.0006	0.0000	0.4666	0.0089	0.0003	0.0001	0.0000	0.0001	0.0000	0.0002	0.0282	0.0652	0.0000	0.0000	0.0000
	3509205 CAJAMAR	0.0000	0.0015	0.0000	0.0132	0.7582	0.0031	0.0001	0.0000	0.0006	0.0000	0.0002	0.0092	0.0139	0.0000	0.0002	0.0008
	3510609 CARAPICUBA	0.0002	0.0131	0.0000	0.0013	0.0017	0.3941	0.0062	0.0001	0.0008	0.0014	0.0003	0.0007	0.0005	0.0000	0.0000	0.0001
	3513009 COTIA	0.0000	0.0107	0.0000	0.0021	0.0004	0.0283	0.5288	0.0008	0.0212	0.0002	0.0005	0.0003	0.0005	0.0000	0.0003	0.0110
	3513801 DIADEMA	0.0015	0.0006	0.0000	0.0006	0.0000	0.0010	0.0001	0.5495	0.0006	0.0007	0.0015	0.0004	0.0002	0.0000	0.0013	0.0014
	3515004 EMBU DAS ARTES	0.0000	0.0006	0.0000	0.0006	0.0000	0.0018	0.0084	0.0003	0.4414	0.0050	0.0000	0.0000	0.0005	0.0000	0.0001	0.0433
	3515103 EMBU-GUAÇU	0.0001	0.0000	0.0000	0.0001	0.0000	0.0003	0.0009	0.0000	0.0010	0.6583	0.0000	0.0000	0.0000	0.0000	0.0001	0.0060
	3515707 FERRAZ DE VASCONCELOS	0.0023	0.0000	0.0056	0.0000	0.0000	0.0001	0.0005	0.0001	0.0000	0.0002	0.4039	0.0001	0.0000	0.0000	0.0002	0.0000
	3516309 FRANCISCO MORATO	0.0000	0.0000	0.0000	0.0247	0.0009	0.0004	0.0001	0.0000	0.0002	0.0000	0.0007	0.3752	0.0235	0.0000	0.0000	0.0000
	3516408 FRANCO DA ROCHA	0.0000	0.0003	0.0000	0.0549	0.0090	0.0003	0.0001	0.0001	0.0001	0.0013	0.0004	0.0396	0.4939	0.0000	0.0003	0.0000
	3518305 GUARAREMA	0.0000	0.0000	0.0021	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.8660	0.0001	0.0000
	3518800 GUARULHOS	0.1734	0.0014	0.0084	0.0028	0.0002	0.0030	0.0046	0.0025	0.0013	0.0004	0.0206	0.0043	0.0034	0.0058	0.7276	0.0037
	3522208 ITAPECERICA DA SERRA	0.0000	0.0001	0.0000	0.0010	0.0005	0.0009	0.0055	0.0003	0.0140	0.0221	0.0000	0.0002	0.0000	0.0000	0.0001	0.4853
	3522505 ITAPEVI	0.0000	0.0088	0.0000	0.0003	0.0003	0.0080	0.0104	0.0001	0.0004	0.0005	0.0008	0.0006	0.0001	0.0000	0.0002	0.0012
	3523107 ITAQUAQUECETUBA	0.0528	0.0000	0.0049	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000	0.0101	0.0000	0.0000	0.0014	0.0015	0.0000
	3525003 JANDIRA	0.0000	0.0182	0.0000	0.0011	0.0018	0.0072	0.0030	0.0002	0.0015	0.0007	0.0000	0.0011	0.0006	0.0000	0.0000	0.0000
	3526209 JUQUITIBA	0.0000	0.0000	0.0000	0.0000	0.0010	0.0000	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0026
	3528502 MAIRIPORÃ	0.0004	0.0000	0.0000	0.0032	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0020	0.0078	0.0000	0.0003	0.0000
	3529401 MAUÁ	0.0000	0.0000	0.0000	0.0002	0.0000	0.0007	0.0009	0.0031	0.0004	0.0000	0.0019	0.0004	0.0002	0.0000	0.0005	0.0001
	3530607 MOGI DAS CRUZES	0.0188	0.0003	0.1753	0.0003	0.0000	0.0002	0.0001	0.0001	0.0001	0.0000	0.0184	0.0000	0.0009	0.0440	0.0012	0.0003
	3534401 OSASCO	0.0012	0.0430	0.0017	0.0153	0.0170	0.0935	0.0245	0.0025	0.0066	0.0011	0.0028	0.0139	0.0133	0.0000	0.0018	0.0046
	3539103 PIRAPORA DO BOM JESUS	0.0000	0.0004	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	3539806 POÁ	0.0017	0.0000	0.0023	0.0000	0.0006	0.0002	0.0000	0.0000	0.0001	0.0000	0.0220	0.0000	0.0000	0.0002	0.0003	0.0000
	3543303 RIBEIRÃO PIRES	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006	0.0000	0.0000	0.0013	0.0000	0.0000	0.0000	0.0000	0.0002
	3544103 RIO GRANDE DA SERRA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0007	0.0000	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0000
	3545001 SALESÓPOLIS	0.0000	0.0000	0.0129	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	3546801 SANTA ISABEL	0.0098	0.0000	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0002	0.0001	0.0000	0.0055	0.0002	0.0000
	3547304 SANTANA DE PARNAÍBA	0.0003	0.0237	0.0000	0.0014	0.0762	0.0122	0.0022	0.0003	0.0001	0.0003	0.0006	0.0013	0.0021	0.0000	0.0001	0.0003
	3547809 SANTO ANDRÉ	0.0007	0.0005	0.0007	0.0006	0.0018	0.0003	0.0012	0.0182	0.0007	0.0010	0.0043	0.0023	0.0007	0.0000	0.0007	0.0004
	3548708 SÃO BERNARDO DO CAMPO	0.0066	0.0015	0.0000	0.0016	0.0013	0.0033	0.0027	0.1333	0.0007	0.0004	0.0025	0.0010	0.0019	0.0000	0.0021	0.0007
3548807 SÃO CAETANO DO SUL	0.0006	0.0001	0.0000	0.0006	0.0004	0.0013	0.0002	0.0088	0.0001	0.0003	0.0037	0.0011	0.0019	0.0000	0.0008	0.0004	
3549953 SÃO LOURENÇO DA SERRA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0004	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0032	
3550308 SÃO PAULO	0.2370	0.2097	0.0733	0.3986	0.0994	0.3057	0.3457	0.2741	0.4327	0.2991	0.4727	0.5122	0.3644	0.0435	0.2526	0.4018	
3552502 SUZANO	0.0070	0.0001	0.0208	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0000	0.0275	0.0003	0.0008	0.0071	0.0005	0.0000	
3552809 TABOÃO DA SERRA	0.0010	0.0011	0.0000	0.0005	0.0008	0.0022	0.0075	0.0010	0.0666	0.0048	0.0000	0.0009	0.0002	0.0000	0.0002	0.0273	
3556453 VARGEM GRANDE PAULISTA	0.0000	0.0014	0.0000	0.0000	0.0000	0.0011	0.0124	0.0003	0.0002	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000	0.0003	
0000000 OUTROS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0002	0.0006	0.0001	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001	0.0002	
		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

(...)

Outline

Motivation

✓ The IIOS for SPMR

Structural indicators

Final remarks

General features

Fully specified interregional input-output system (trade flows)

Focus on SPMR

- 39 municipalities + rest of the State of Sao Paulo + rest of Brazil

56 sectors, 110 commodities

Basic database at the municipality level

Mapping labor payments from place of work to place of residence

Different patterns of household consumption by place of residence

Structure of the IIOS for SPMR

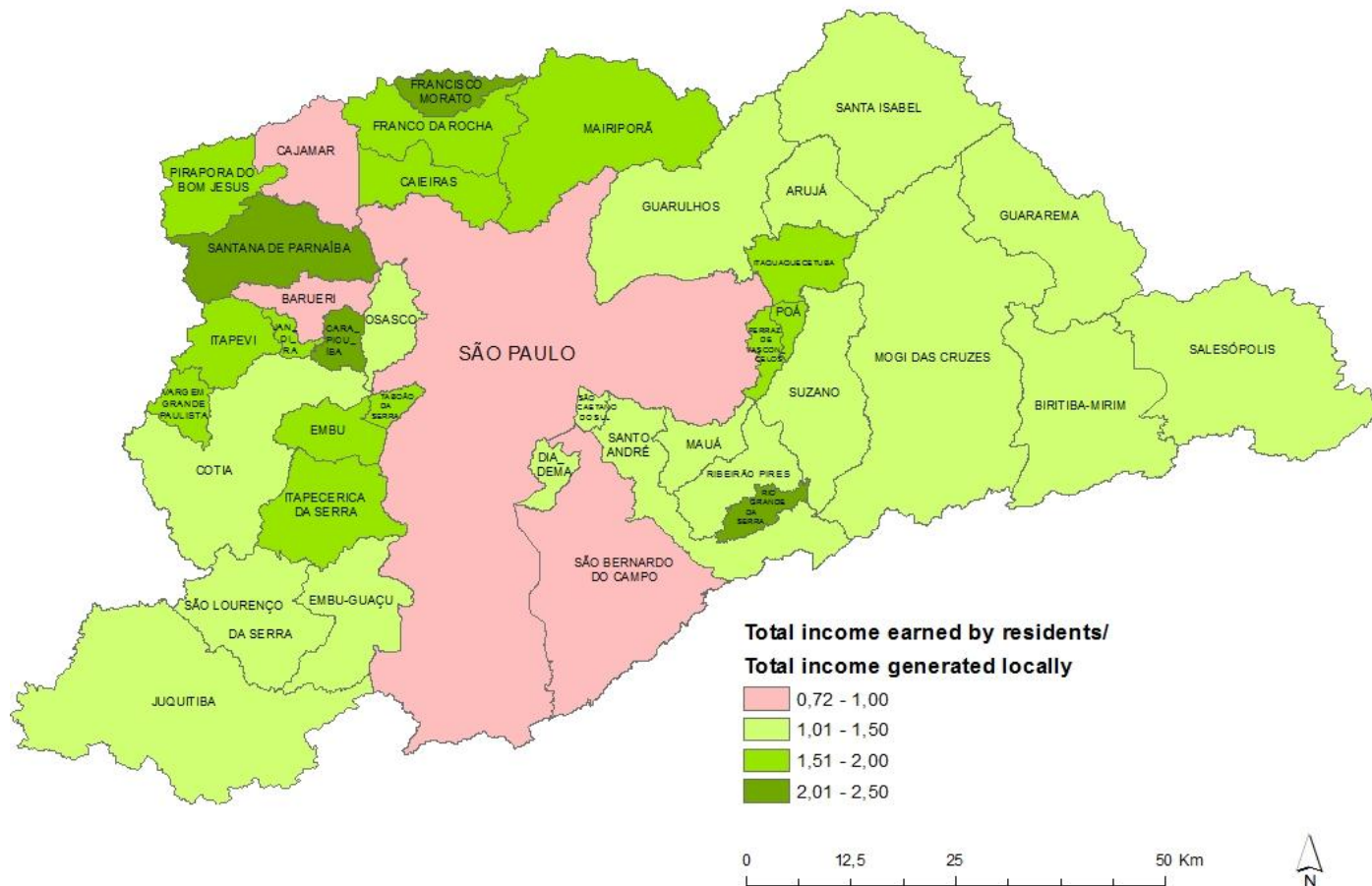
			User 1			User 2			User 3			User 4	User 5			User 6	
			Producers			Investors			Household			X	Government			Other demands	
			Size	56	56	56	56	56	56	1	1	1		1	1	1	
			Source/ Destination	R1	...	R41	R1	...	R41	R1	...	R41	1	R1	...	R41	1
			Size														
Basic Flows	110	R1	BAS1			BAS2			BAS3		BAS4		BAS5		BAS6		
	110	...															
	110	R41															
	110	ROW															
Margins (Trade and transport)	110	R1	MAR1			MAR2			MAR3		MAR4		MAR5		MAR6		
	110	...															
	110	R41															
	110	ROW															
Taxes	110	R1	TAX1			TAX2			TAX3		TAX4		TAX5		TAX6		
	110	...															
	110	R41															
	110	ROW															
Labor	41		LABR														
Capital	1		CPTL														
Other costs	1		OCTS														

*Mapping of labor income from place
of work to place of residence*

*Mapping of consumption patterns
by place of residence*

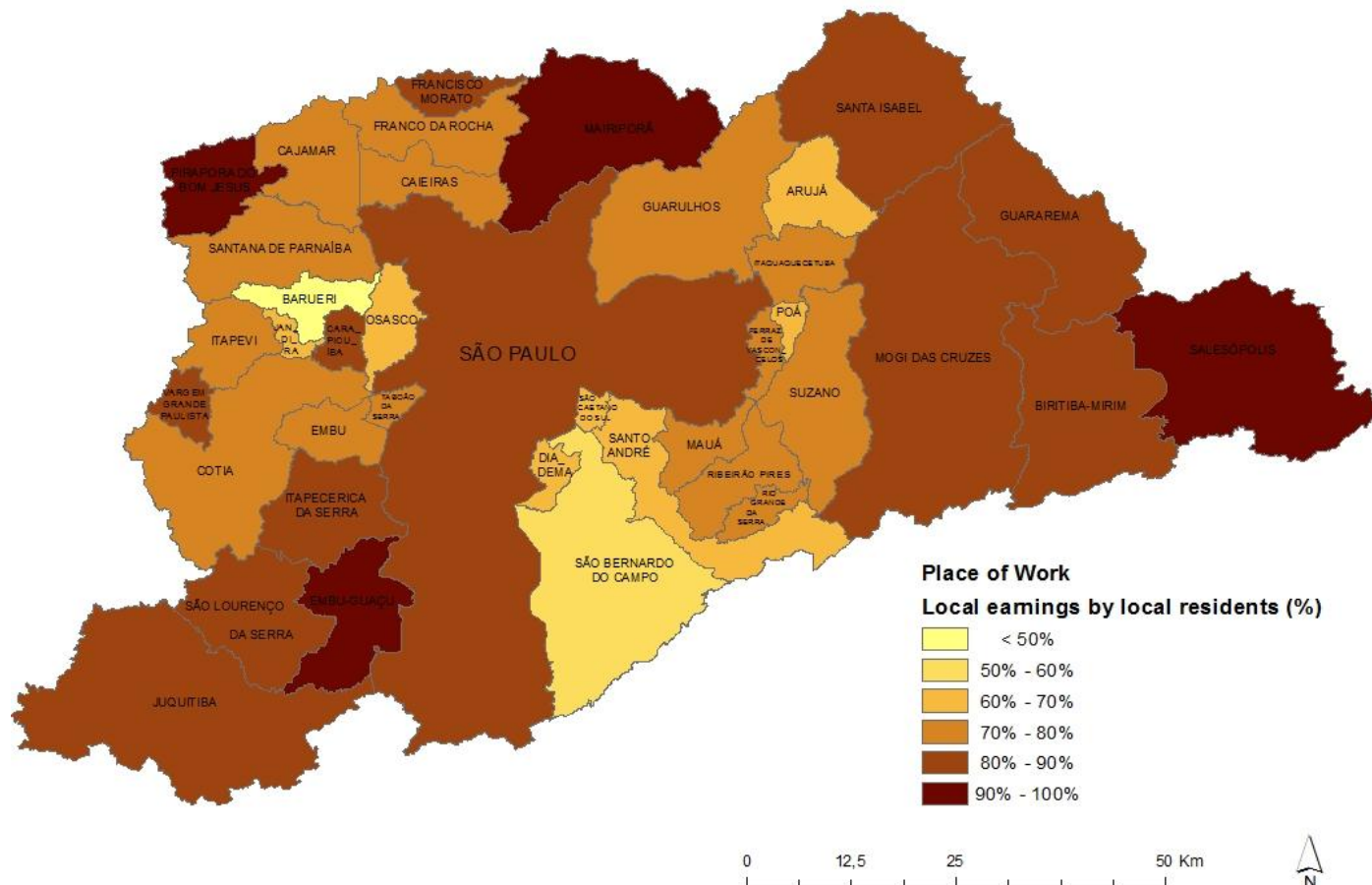
Few municipalities are net exporters of labor income

Ratio of total income earned by residents to total income generated locally



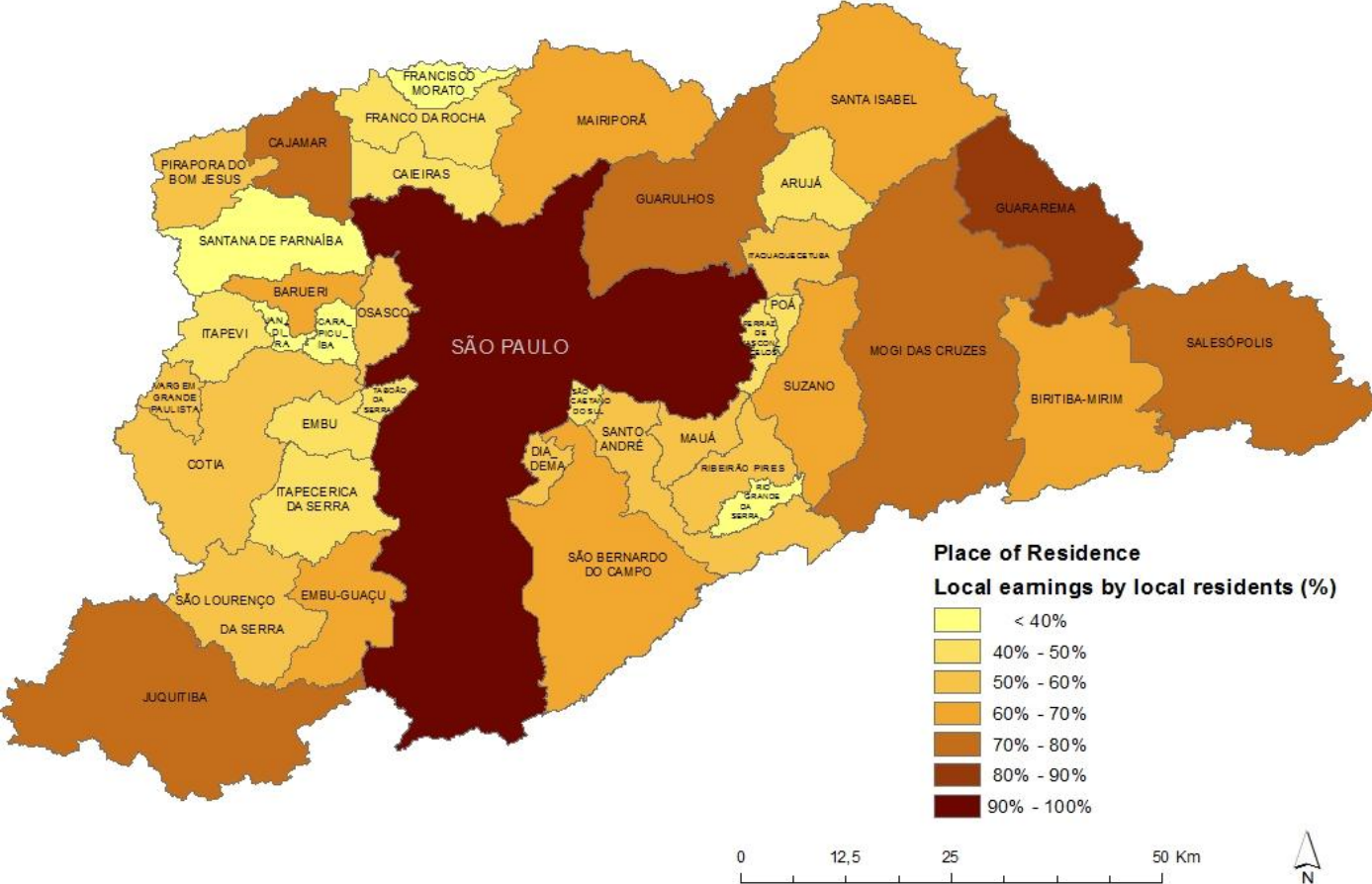
From a place of work perspective, local residents tend to absorb a higher share of locally-generated income in peripheral municipalities

Proportion of local labor payments to local residents



From a place of residence perspective, the capital city is the most "self-sufficient" municipality

Proportion of local earnings by local residents



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Preliminary results

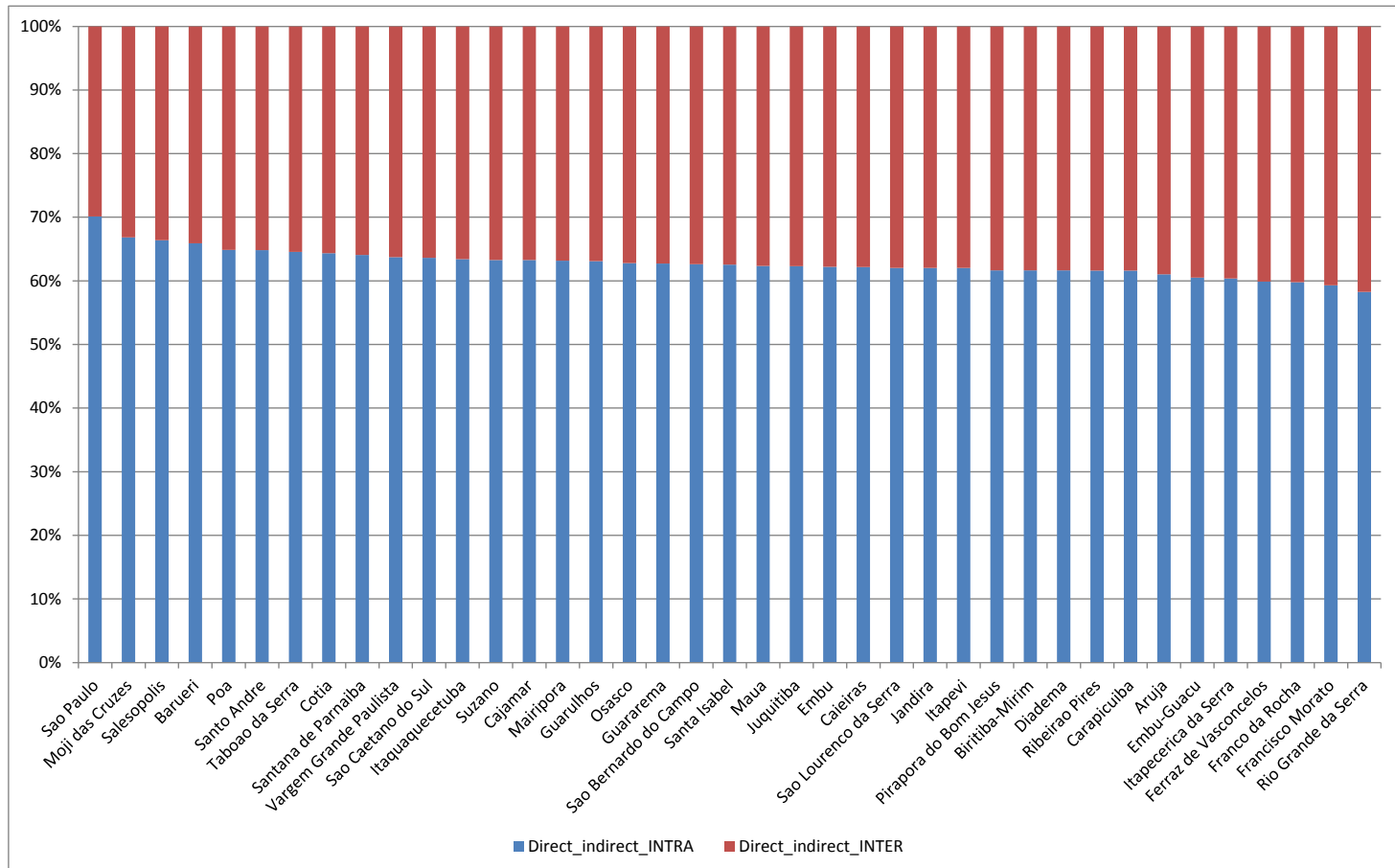
Two models: household exogenous (no income induced effects) and endogenous (includes induced effects)

Calculate output multipliers

1. Average multiplier, by municipality (region versus rest of the country decomposition)
2. Spatial distribution of net multiplier effects (São Paulo and Francisco Morato)

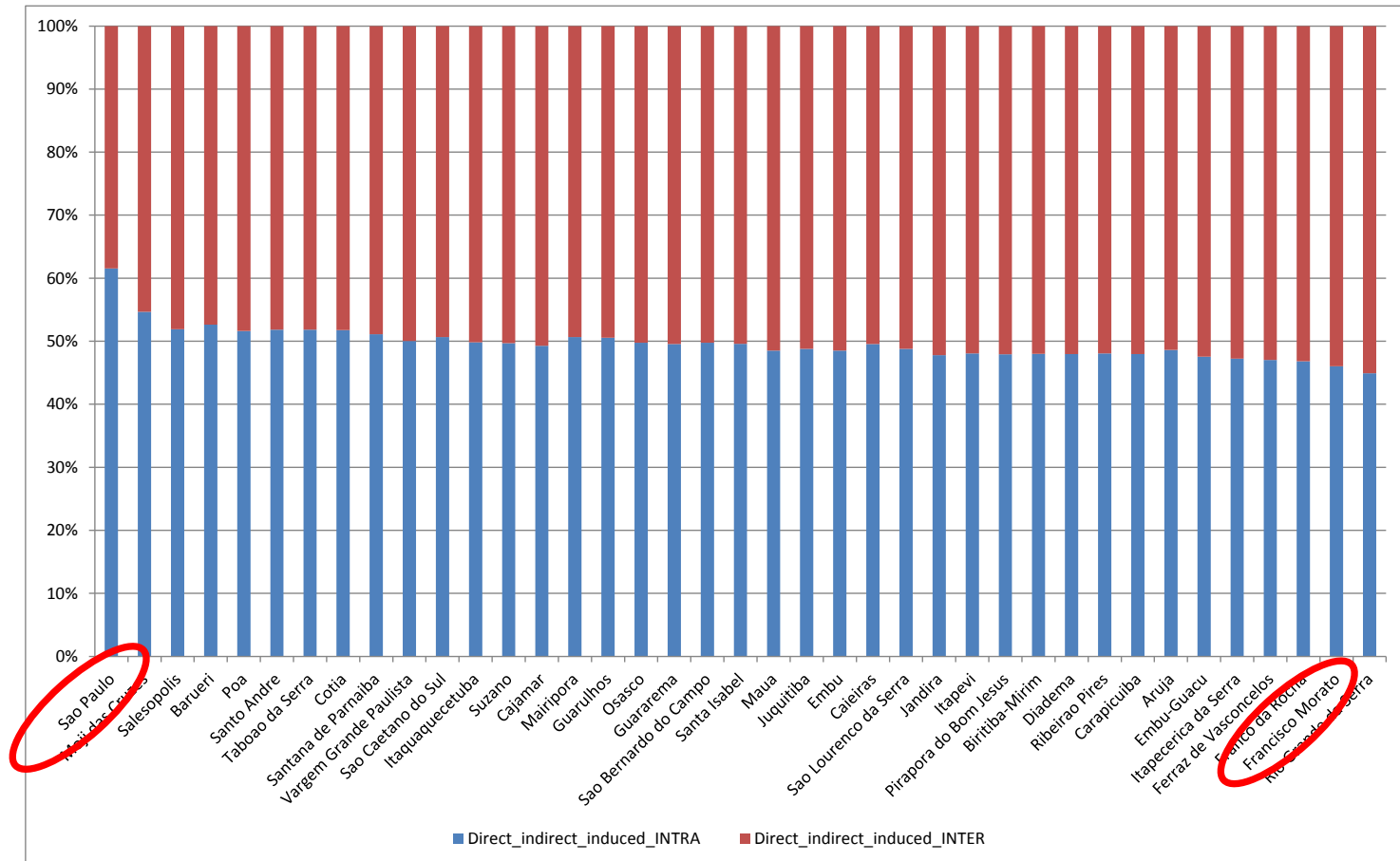
Stronger interregional leakages are perceived...

**Interregional decomposition of the average output multiplier, by municipality
(households exogenous)**



... when we also take into consideration induced effects

**Interregional decomposition of the average output multiplier, by municipality
(households endogenous)**



São Paulo and Francisco Morato

	São Paulo	Francisco Morato
Population	11,337 K	156 K
Per capita GRP	BRL 35,271	BRL 5,492

Average output multiplier:

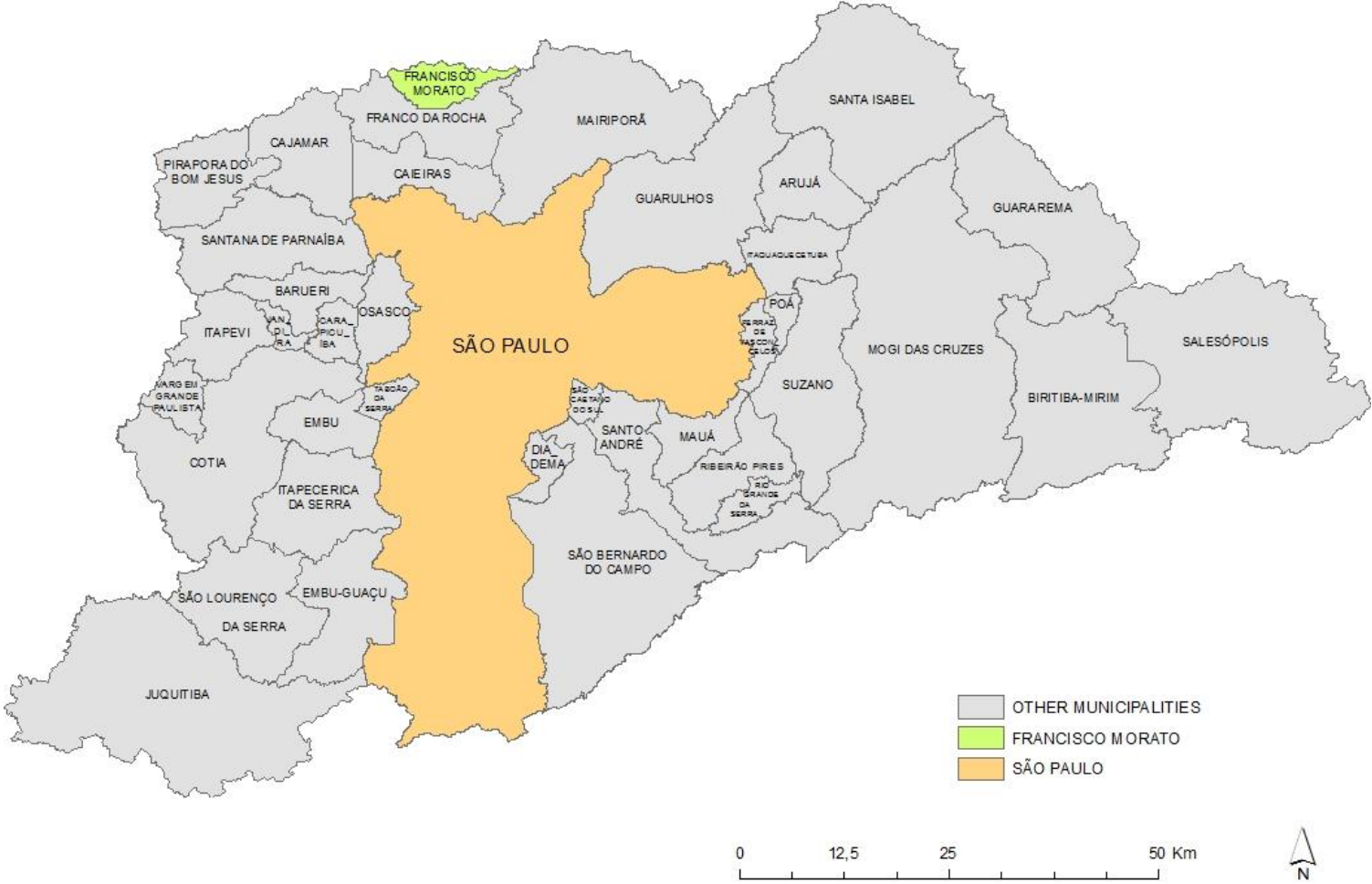
São Paulo: 1.81 (2.40) – 70% (62%) intraregional

Francisco Morato: 1.75 (2.29) – 59% (46%) intraregional

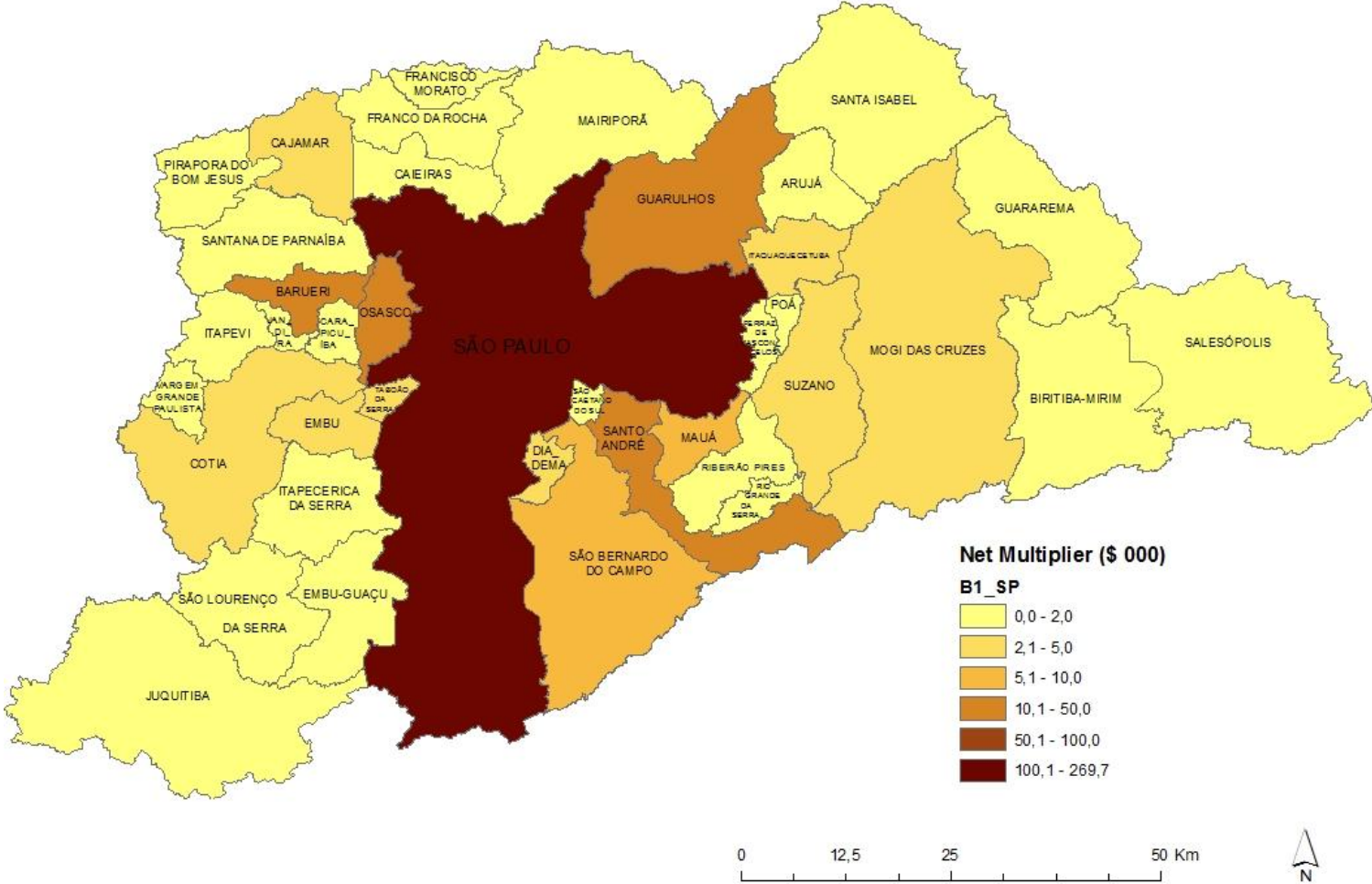
Spatial distribution of net multiplier effects:



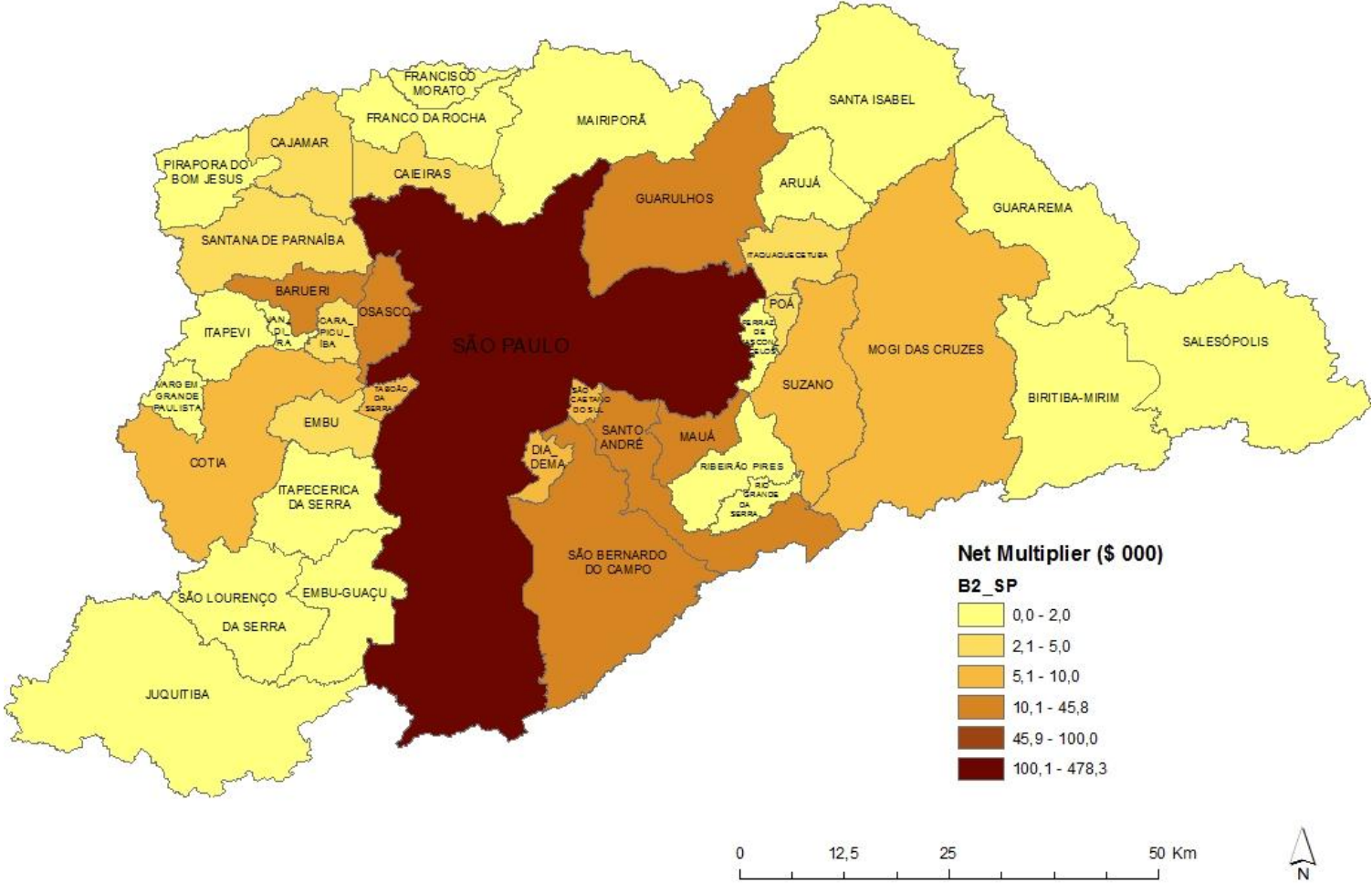
São Paulo and Francisco Morato



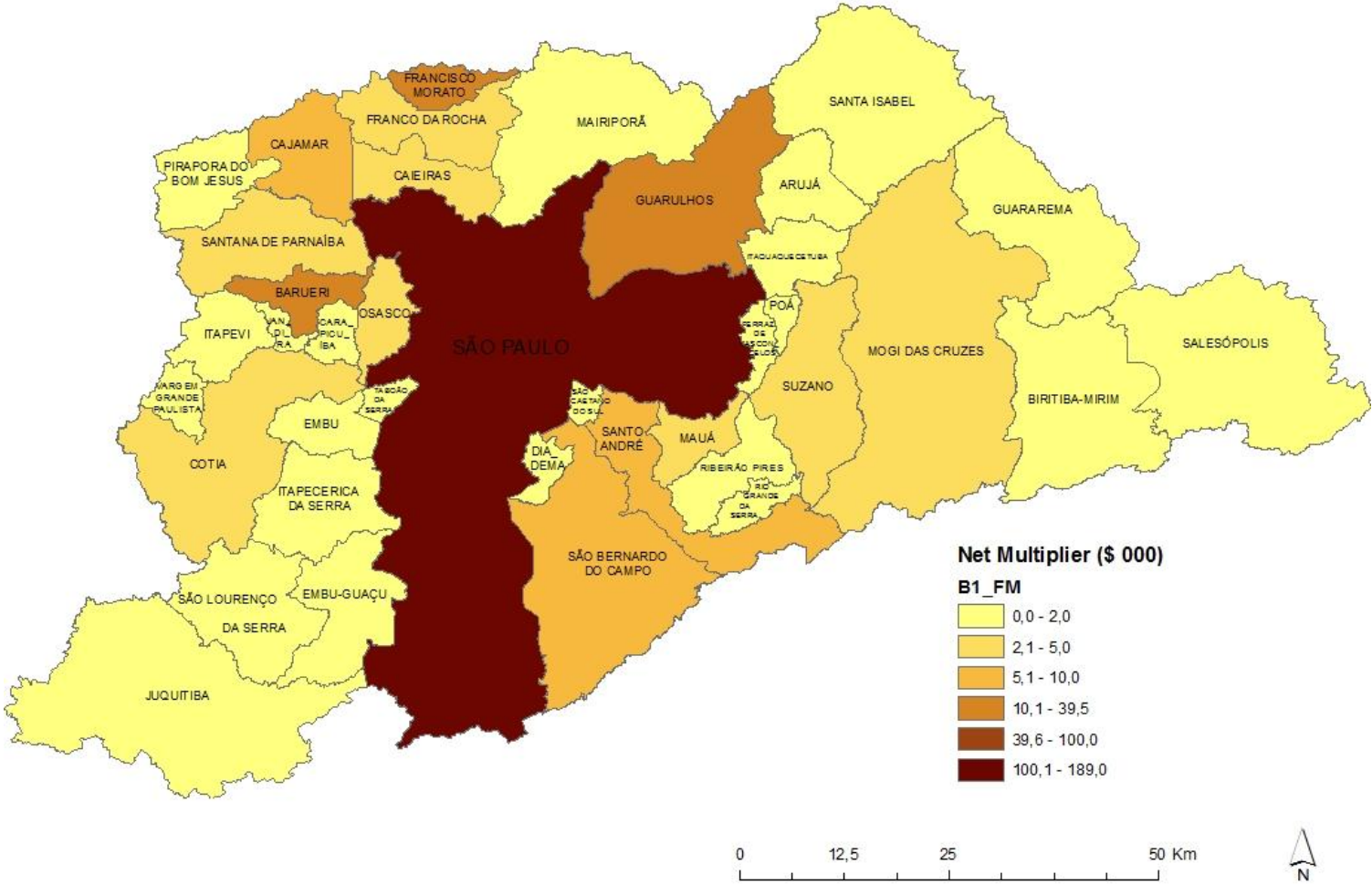
Spatial decomposition of the net output multiplier, São Paulo (households exogenous)



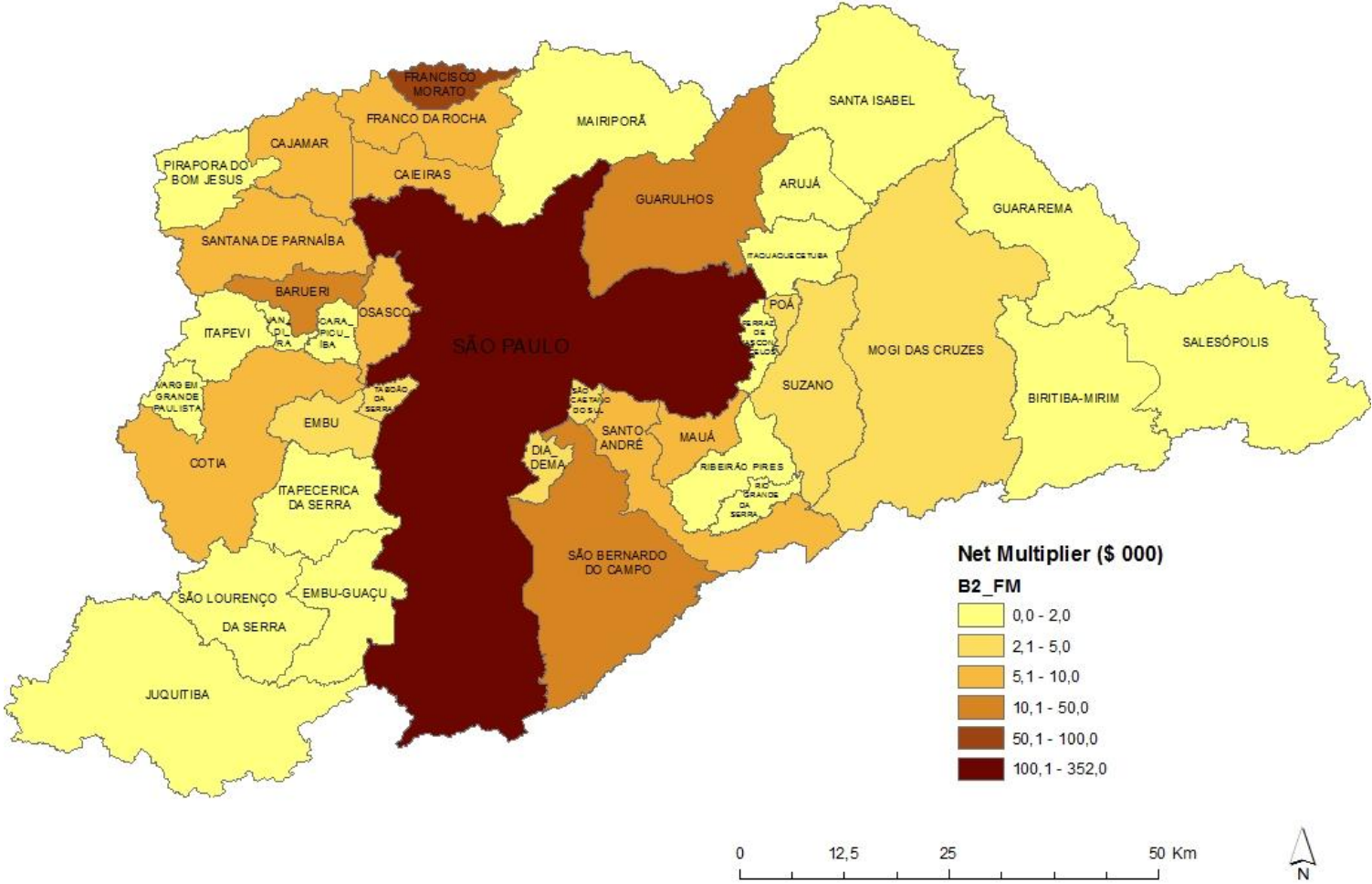
Spatial decomposition of the net output multiplier, São Paulo (households endogenous)



Spatial decomposition of the net output multiplier, Francisco Morato (households exogenous)



Spatial decomposition of the net output multiplier, Francisco Morato (households endogenous)



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✓ Final remarks

Next steps

Detailed macro-spatial picture of the SPMR

Calibrate spatial CGE model

Micro (MSM) macro (IO-CGE) integration

How to incorporate an accessibility-productivity link?

Other research projects – e.g. Eliane Teixeira



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Foco das discussões será a Região Metropolitana de São Paulo

1 2 3

PROGrame-se

X ENABER ocorrerá em Recife, de 8
a 10 de outubro de 2012
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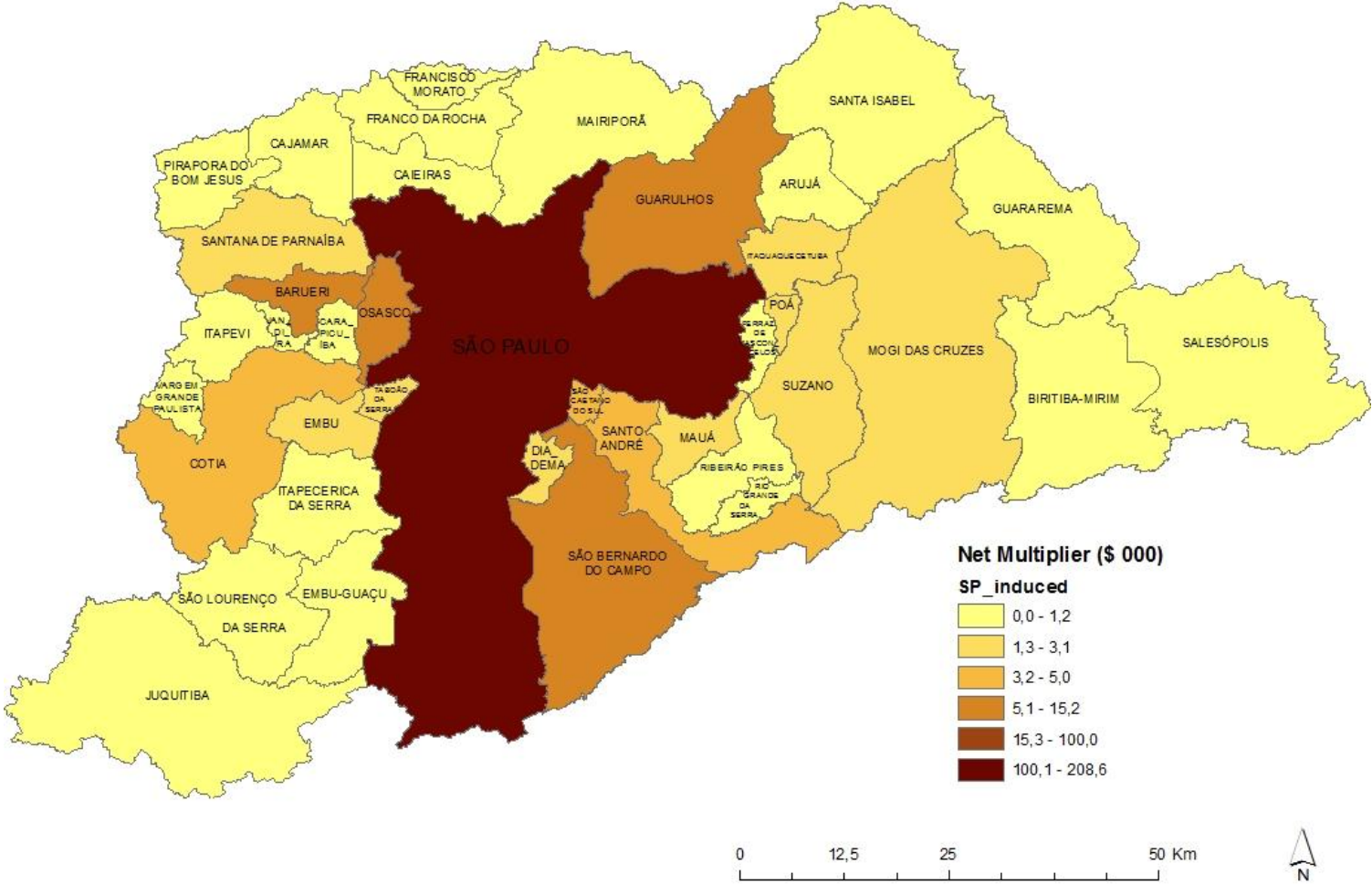
Outras notícias

JULY 2, 2012 | NOTÍCIAS, WORKSHOPS
International Workshop on Urban Modeling

JUNE 26, 2012 | NOTÍCIAS, PREMIAÇÕES
Professor Flávio Vilela Vieira recebe o Prêmio de Pesquisa Professor Warwick
Estevam Kerr 2012

MAY 2, 2012 | NOTÍCIAS, WORKSHOPS
1st Austrian-Brazilian Workshop on Applied Economic Modeling

Spatial decomposition of the induced effects multiplier, São Paulo



Spatial decomposition of the induced effects multiplier, Francisco Morato

