NEREUS

Núcleo de Economia Regional e Urbana
da Universidade de São Paulo

The University of São Paulo
Regional and Urban Economics Lab

Lecture 11: Trade Liberalization

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Outline

- ✓ Motivation
- Regional setting
- The CEER model
- Simulation results
- Final remarks

NEG models suggest that trade liberalization reduces regional inequality

Results from NEG models [Krugman and Livas-Elisondo (1996), Krugman (1994), Puga (1998), and Allonso-Vilar (2001)]:

Trade liberalization policies may reduce regional inequality in developing countries, especially by reducing the size of primate cities or at least reducing their relative growth.

Trade liberalization would also lead to more specialized regions.

Given the long-run nature of these models, a final result would be strongly related to population movements from the core region, which would ultimately increase welfare through reduction of congestion costs.

Empirical studies are not conclusive about NEG results

Ades and Glaeser (1995), using cross country data, did corroborate Krugman and Elisondo's predictions, showing that countries with high shares of trade in GDP or low tariff barriers (even holding trade levels constant) rarely have their population concentrated in a single city.

Hanson (1998) showed that trade reform appears to have contributed to the breakup of the Mexico City manufacturing belt and the formation of new industry centers in northern Mexico.

However, the reality of Brazil, another major Latin American country, seems to be more complex, as trade liberalization in the 1990s did not produce any relevant de-concentration from the core region (Haddad, 1999; Haddad and Azzoni, 2002). As Haddad and Hewings (2005) points out, one should consider some intermediate perspectives between a core-periphery model, on the one hand, and a perfectly competitive, homogeneous space model at the other extreme.

The Colombian case seems also to contradict the theory (Fernández, 1998)

One first attempt to test the Krugman and Livas-Elisondo model in Colombia was made by Fernández (1998). This author concludes that, contrary to the predictions of the theory, the empirical evidence suggests a **positive relationship between agglomeration and trade** for most sectors, excluding food, beverages and chemicals, which showed a negative association.

Fernández pointed out that further work should make a model more suitable for the Colombian case, and also **consider that the effects of changes in trade liberalization in agglomeration take longer to be seen**.

We try to reconcile theory and empirical work

The **short-term** growth consequences of a trade reform will depend on the structure of the reforming economy. From a spatial perspective, the short-run effects will also be heavily influenced by the respective regional structures. The first set of simulations in this paper will try to address some of these issues.

The second set of simulations is inspired by the work by Krugman and Livas-Elisondo (1996). We look at the Colombian case, from a **long-run** perspective.

We show the importance of different hypotheses on factor mobility and the role of price effects to better understand the consequences of trade opening in a developing economy.

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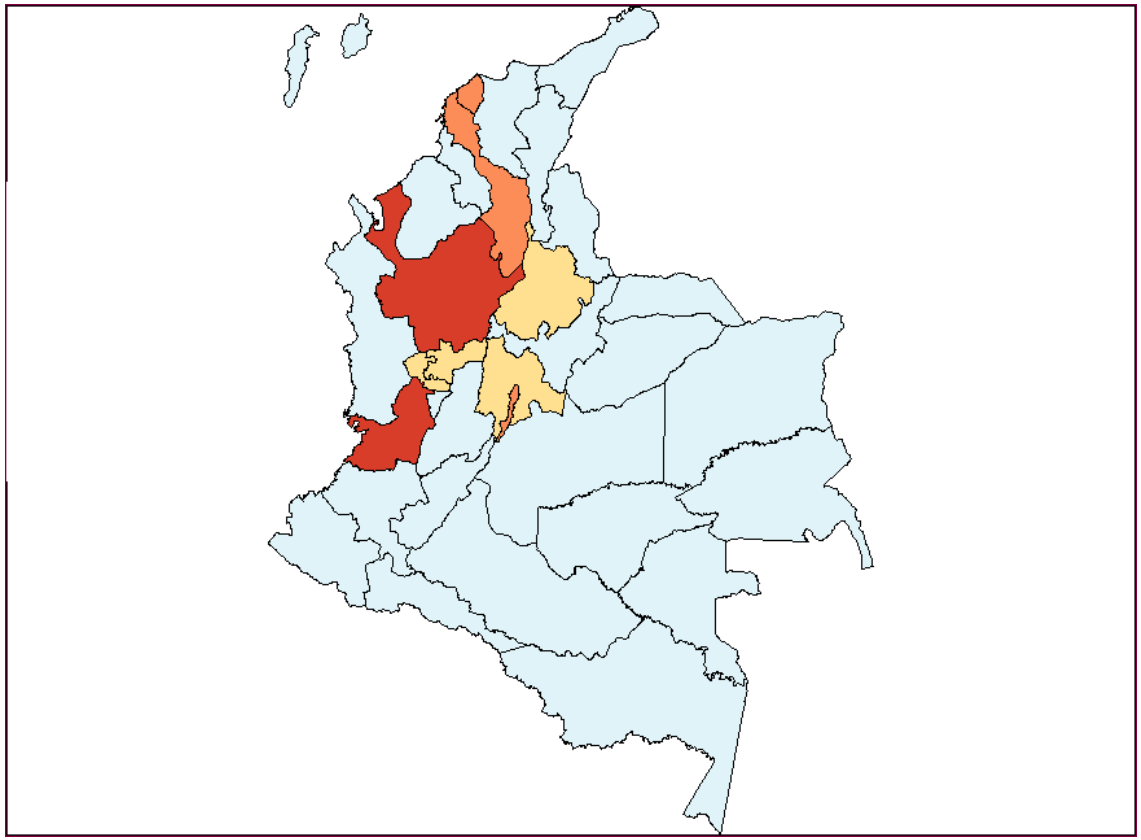
What do you see in this picture?



Things about ostriches...

In Ancient Egypt mythology, usually, the feather was a symbol of Maat, the goddess of truth and order. The goddess was always shown wearing an **ostrich feather** in her hair. The feather by itself was her emblem.

In popular mythology, the Ostrich is famous for hiding its head in the sand at the first sign of danger.

Why the “Running Ostrich”?

Things to think about the “Colombian Running Ostrich”:

- It is interesting to link the shape of such spatial cluster, very dynamic in economic terms, to the goddess of truth and justice – it gives a flavor of *efficiency*;
- The ostrich is running towards the north (Europe, USA): it is well known that Colombia has stronger economic ties with these areas – one may think also about *catch-up* (convergence);
- The cluster seems to be self-contained; spatial competition does not play a relevant role outside the cluster – “hiding the head” may be associated with *self-sufficiency*;
- The fact that the female ostrich may leave the nest unattended (because the eggs are too thick-shelled to be easily broken open by predators) was mentioned in the Bible as the reason why the bird was chastised as a bad parent in the Book of Job (Job 39:13-18); ostriches as proverbial examples of poor parenting may be a metaphor for the low HDI in the region.

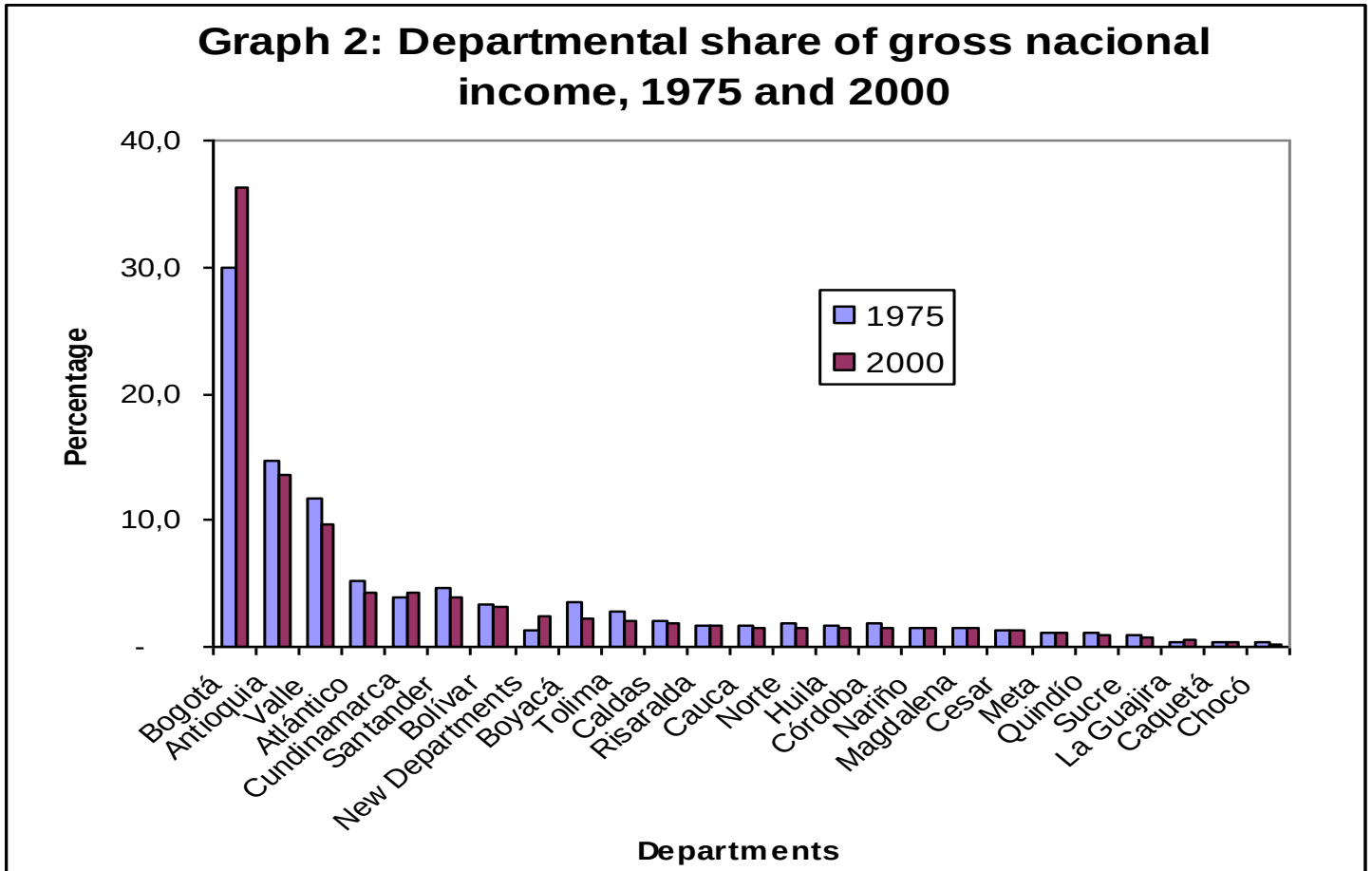
Colombia: political division

Colombia: geography

Aggregate domestic trade flows in Colombia

ORIGIN \ DESTINATION	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28	D29	D30	D31	D32	D33	Total
D1	0.6304	0.0409	0.0169	0.1059	0.0192	0.0554	0.0097	0.0346	0.0334	0.1107	0.0169	0.2930	0.0348	0.1149	0.0378	0.0197	0.0572	0.0257	0.0626	0.0703	0.0468	0.0837	0.0319	0.0499	-	0.0043	0.0109	-	0.0393	0.0385	0.0487	-	0.0549	0.1414
D2	0.0318	0.6408	0.0157	0.0290	0.0213	0.0113	0.0125	0.0055	0.1011	0.0863	0.0090	0.0003	0.0431	0.0299	0.0116	0.0121	0.0099	0.0169	0.0043	0.0117	0.0503	0.0541	0.0119	0.0125	-	-	0.0485	-	-	-	0.0106	-	0.0783	0.0552
D3	0.0779	0.1014	0.7815	0.1259	0.2459	0.0395	0.1501	0.0370	0.1227	0.0829	0.0619	0.0281	0.0906	0.1023	0.0891	0.2309	0.1034	0.1799	0.0681	0.0551	0.1251	0.1384	0.1538	0.1241	0.4484	0.3598	0.3747	-	0.4180	0.3179	0.1328	-	0.1489	0.2681
D4	0.0374	0.0167	0.0169	0.5396	0.0253	0.0053	0.0101	0.0167	0.0350	0.0343	0.0017	0.0024	0.0298	0.0196	0.0077	0.0207	0.0061	0.0094	0.0203	0.0043	0.0178	0.0249	0.0116	0.0102	0.0053	-	0.0526	-	-	0.0073	0.0125	-	-	0.0419
D5	0.0055	0.0095	0.0080	0.0117	0.4454	0.0018	0.0016	0.0051	0.0204	0.0054	0.0542	-	0.0060	0.0037	0.0033	0.0066	0.0031	0.0077	0.0074	0.0051	0.0095	0.0068	0.0043	0.0061	-	0.0112	0.0417	-	-	0.0006	0.0057	-	0.0026	0.0209
D6	0.0053	0.0082	0.0134	0.0164	0.0037	0.6848	0.0021	0.0069	0.0017	0.0021	0.0053	0.0017	0.0137	0.0175	0.0020	0.0009	0.0058	0.0039	0.0142	0.0334	0.0019	0.0009	0.0176	0.0068	0.0128	0.0008	0.0051	-	-	0.0301	0.0068	-	-	0.0239
D7	0.0006	0.0004	0.0026	0.0014	0.0025	0.0003	0.5176	0.0012	0.0034	-	0.0009	-	0.0079	-	-	-	-	-	0.0011	0.0006	0.0006	-	0.0050	0.0054	-	-	0.0029	-	0.0415	-	0.0001	-	-	0.0046
D8	0.0024	0.0012	0.0021	0.0011	0.0002	0.0068	0.0133	0.6946	0.0018	0.0016	0.0031	-	0.0218	0.0111	0.0019	0.0022	0.0121	0.0009	0.0095	0.0039	0.0035	0.0035	0.0030	0.0150	-	-	0.0017	-	-	0.0005	0.0008	-	-	0.0179
D9	0.0036	0.0166	0.0068	0.0076	0.0018	0.0035	0.0013	0.0001	0.4620	0.0013	0.0032	0.0007	0.0004	0.0236	0.0948	0.0001	0.0006	0.0061	0.0003	0.0044	0.0246	0.0328	0.0025	0.0016	-	0.0004	0.0033	-	-	-	0.0042	-	-	0.0141
D10	0.0116	0.0093	0.0098	0.0367	0.0003	0.0023	0.0001	0.0037	0.0097	0.5737	0.0034	0.0007	0.0025	0.0119	0.0009	0.0002	0.0005	0.0015	0.0007	0.0017	0.0086	0.0167	0.0009	0.0045	-	-	0.0021	-	-	-	0.0058	-	-	0.0199
D11	0.0124	0.0308	0.0060	0.0069	0.1426	0.0040	0.0101	0.0097	0.0007	0.0032	0.6985	-	0.0404	0.0025	0.0063	0.0198	0.0077	0.0131	0.0132	0.0009	0.0273	0.0058	0.0666	0.0211	-	0.0010	0.0407	0.0857	0.0115	-	0.0209	-	-	0.0430
D12	0.0024	-	0.0001	0.0002	-	0.0010	0.0089	-	-	-	0.0024	0.5357	0.0001	-	-	-	-	0.0001	-	0.0048	0.0009	-	0.0003	0.0011	-	-	-	-	-	-	-	-	-	0.0033
D13	0.0025	0.0032	0.0024	0.0042	0.0006	0.0025	0.1101	0.0184	0.0033	-	0.0032	-	0.5079	-	0.0001	0.0001	0.0082	0.0011	0.0081	0.0068	0.0022	0.0003	0.0100	0.0144	-	0.0137	0.0027	-	-	0.2129	0.0005	-	0.1773	0.0156
D14	0.0051	0.0126	0.0019	0.0016	0.0002	0.0021	-	0.0001	0.0155	0.0021	0.0047	0.0007	0.0061	0.5496	0.0682	0.0002	0.0014	0.0007	-	0.0020	0.0024	0.0073	0.0027	0.0035	-	0.0002	0.0025	-	-	0.0029	0.0025	-	-	0.0078
D15	0.0073	0.0061	0.0084	0.0019	0.0087	0.0011	-	-	0.0061	0.0016	0.0010	-	0.0002	0.0033	0.6102	0.0015	0.0004	0.0017	-	0.0002	0.0167	0.0009	0.0021	0.0021	0.0094	-	0.0068	-	-	0.0017	0.0009	-	-	0.0142
D16	0.0033	0.0035	0.0165	0.0058	0.0055	0.0014	0.0024	0.0035	0.0016	0.0061	0.0037	-	0.0015	0.0057	0.0018	0.6039	0.0021	0.0007	-	0.0007	0.0014	0.0023	0.0061	0.0027	-	0.0019	0.0167	-	0.0973	0.0052	0.0009	0.5596	0.1832	0.0166
D17	0.0062	0.0047	0.0067	0.0025	0.0010	0.0076	0.0122	0.0184	0.0004	0.0045	0.0030	-	0.0128	0.0083	0.0001	0.0004	0.5727	0.0046	0.0081	0.0076	0.0027	0.0001	0.0038	0.0176	-	-	0.0008	-	-	-	0.0012	-	-	0.0171
D18	0.0029	0.0159	0.0045	0.0028	0.0025	0.0011	0.0033	0.0018	0.0093	0.0006	0.0035	-	0.0028	0.0014	0.0031	0.0008	0.0007	0.5801	0.0020	0.0011	0.0117	0.0023	0.0024	0.0032	0.0025	0.0886	0.0058	-	-	0.0008	0.0039	-	-	0.0147
D19	0.0023	0.0005	0.0023	0.0004	0.0009	0.0057	0.0071	0.0007	0.0021	-	0.0035	0.0034	0.0048	0.0010	0.0001	-	0.0055	0.0012	0.5994	0.0004	0.0009	0.0002	0.0056	0.0087	-	-	0.0001	-	0.0009	-	0.0002	-	-	0.0083
D20	0.0094	0.0028	0.0013	0.0033	0.0030	0.0432	0.0008	0.0058	0.0026	0.0022	0.0006	0.0689	0.0019	0.0003	0.0014	0.0003	0.0064	0.0060	0.0022	0.6613	0.0015	-	0.0013	0.0135	-	0.0008	-	-	-	-	0.0019	-	-	0.0191
D21	0.0168	0.0189	0.0097	0.0208	0.0244	0.0067	0.0240	0.0171	0.1201	0.0047	0.0259	-	0.0083	0.0409	0.0267	0.0094	0.0091	0.0460	0.0095	0.0080	0.5645	0.0112	0.0299	0.0136	-	0.1298	0.0171	-	-	0.0265	0.0119	-	-	0.0510
D22	0.0060	0.0042	0.0010	0.0083	0.0002	0.0001	-	-	0.0019	0.0363	0.0034	-	0.0006	0.0012	0.0008	0.0001	-	0.0004	0.0013	0.0004	0.0001	0.5665	0.0001	0.0003	-	0.0006	0.0041	-	-	0.0001	0.0018	-	-	0.0074
D23	0.0120	0.0082	0.0070	0.0075	0.0114	0.0345	0.0265	0.0046	0.0108	0.0028	0.0255	0.0012	0.0284	0.0127	0.0039	0.0054	0.0123	0.0018	0.0113	0.0036	0.0096	0.0032	0.5274	0.0056	-	0.0006	0.0050	0.4621	0.0166	0.0189	0.0031	-	-	0.0229
D24	0.0987	0.0380	0.0386	0.0381	0.0137	0.0756	0.0723	0.1085	0.0288	0.0329	0.0289	0.0616	0.1188	0.0365	0.0256	0.0373	0.1708	0.0768	0.1516	0.1059	0.0531	0.0348	0.0780	0.6491	-	0.0025	0.0089	-	-	0.0533	0.0313	-	-	0.1274
D25	-	-	-	-	-	-	-	0.0021	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0005	0.0002	0.5210	-	-	-	-	0.0004	-	-	-	0.0007
D26	0.0002	0.0001	0.0014	0.0004	0.0037	-	-	0.0002	-	-	0.0197	-	0.0002	-	-	0.0006	-	0.0110	0.0003	0.0013	0.0139	-	0.0001	-	-	0.3729	0.0108	-	-	-	-	-	-	0.0044
D27	0.0029	0.0043	0.0129	0.0183	0.0133	0.0017	-	0.0020	0.0007	0.0021	0.0121	0.0011	0.0042	0.0003	0.0002	0.0219	0.0005	0.0016	0.0029	0.0032	0.0011	0.0019	0.0199	0.0064	-	0.0106	0.3300	-	-	-	0.0031	-	-	0.0115
D28	-	-	-	0.0001	0.0001	0.0001	-	0.0001	0.0001	-	-	0.0001	-	0.0002	0.0001	-	0.0001	0.0001	0.0002	0.0001	-	0.0001	-	-	0.0003	0.0001	-	0.4523	-	0.0001	0.0003	-	-	0.0003
D29	-	-	0.0014	-	-	-	0.0034	-	-	-	-	-	-	-	-	0.0034	-	-	-	-	-	0.0003	-	-	-	-	-	-	0.3749	-	-	-	-	0.0011
D30	0.0006	0.0002	0.0012	-	0.0003	-	-	0.0004	-	-	-	-	0.0085	0.0001	-	-	0.0029	-	0.0004	0.0001	0.0003	0.0001	0.0001	0.0004	-	-	-	-	-	0.2817	-	-	-	0.0019
D31	0.0024	0.0003	0.0012	0.0017	0.0018	0.0003	0.0005	0.0009	0.0041	0.0023	0.0007	-	0.0017	0.0004	0.0001	0.0006	0.0002	0.0005	0.0002	0.0002	0.0009	0.0008	0.0005	0.0004	0.0002	-	0.0043	-	-	0.0003	0.6862	-	0.0020	0.0025
D32	0.0001	0.0002	-	0.0003	0.0004	0.0004	0.0001	0.0002	0.0003	0.0002	0.0002	0.0004	0.0001	0.0011	0.0003	0.0001	0.0003	0.0005	0.0006	0.0006	0.0001	0.0002	0.0002	0.0001	0.0001	0.0002	0.0002	-	0.0001	0.0003	0.0013	0.4404	0.0001	0.0004
D33	-	-	0.0021	-	0.0001	-	-	-	-	-	-	-	-	-	0.0020	0.0004	-	-	-	-	-	-	-	-	-	-	0.0003	-	-	-	-	-	0.3526	0.0010
Total	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	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	1.0000	1.0000

Bogotá increased its share in GNI between1975 and 2000



Source: Authors' estimations based on CEGA (2006).

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The CEER model

The first fully operational spatial CGE model for Colombia.

Similar approach to Haddad and Hewings (2005) to incorporate recent theoretical developments in the new economic geography.

Experimentation with the introduction of scale economies, market imperfections, and transportation costs provide innovative ways of dealing explicitly with theoretical issues related to integrated regional systems.

Regarding the regional setting, the main innovation in the CEER model is the detailed treatment of interregional trade flows in the Colombian economy, in which the markets of regional flows are fully specified for each origin and destination. The model recognizes the economies of the 32 Colombian Departments and the capital city, Bogotá.

General features of the CEER model

Interstate bottom-up CGE model for Colombia

- 33 regions
- 7 sectors/goods

Interregional flows of goods and services

Interregional factor mobility

Explicit modeling of transportation costs based on origin-destination pairs

Regional and Central government

Regional labor markets

Non-constant returns to scale (agglomeration economies)

Inclusion of congestion costs

New-economic-geography-type closure (long-run)

CEER, a bottom-up spatial CGE model of Colombia

A multi-sectoral, multi-regional bottom-up CGE model of Colombia's 32 Departments and the capital city, Bogotá

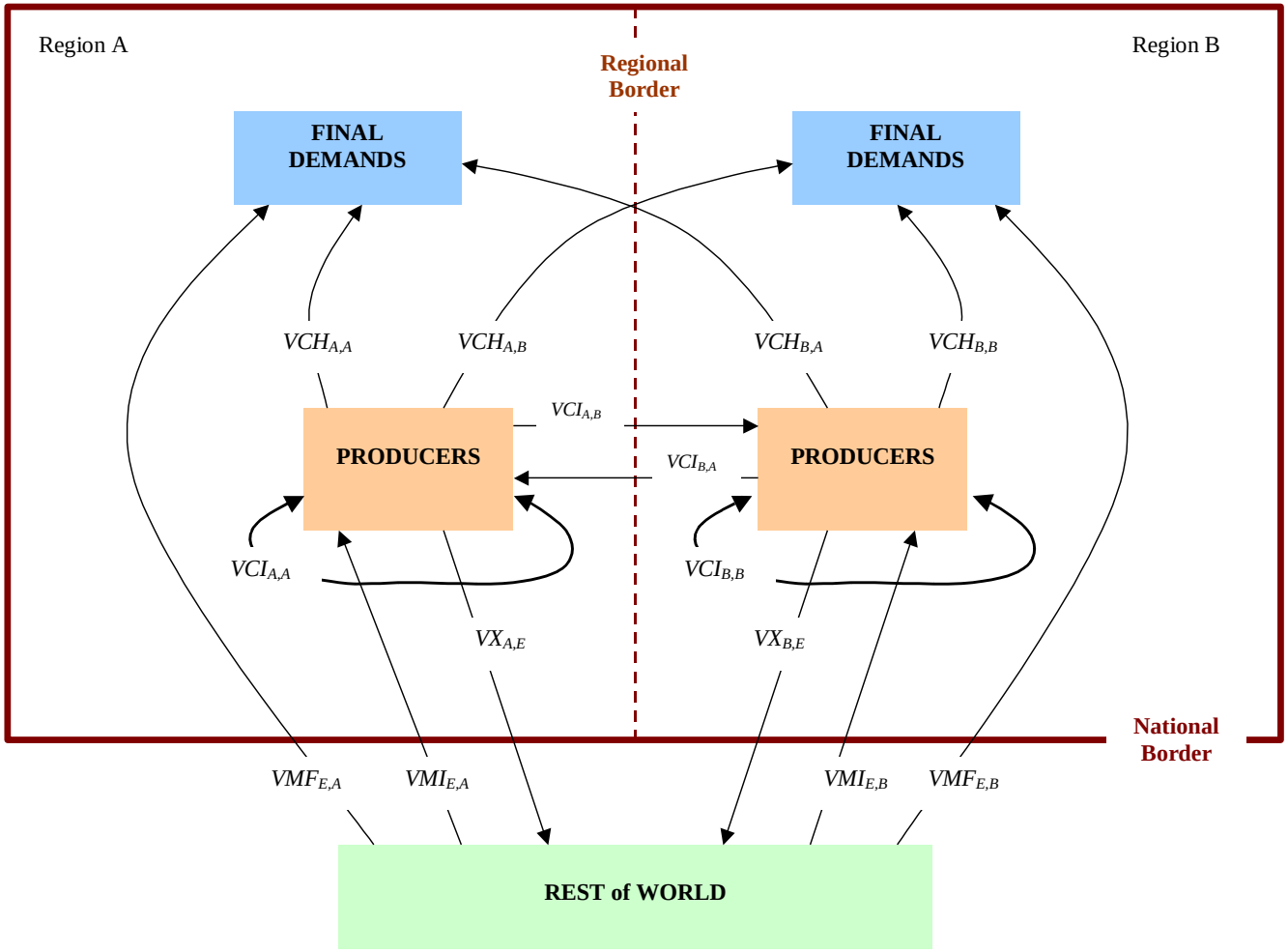
- each region is modeled as an economy in its own right
- region-specific prices
- region-specific industries
- region-specific consumers

Based on the comparative-static B-MARIA and MMRF models

Database makes allowance for interregional, intra-regional and international trade

- explicit representations of regional and Central government financial accounts

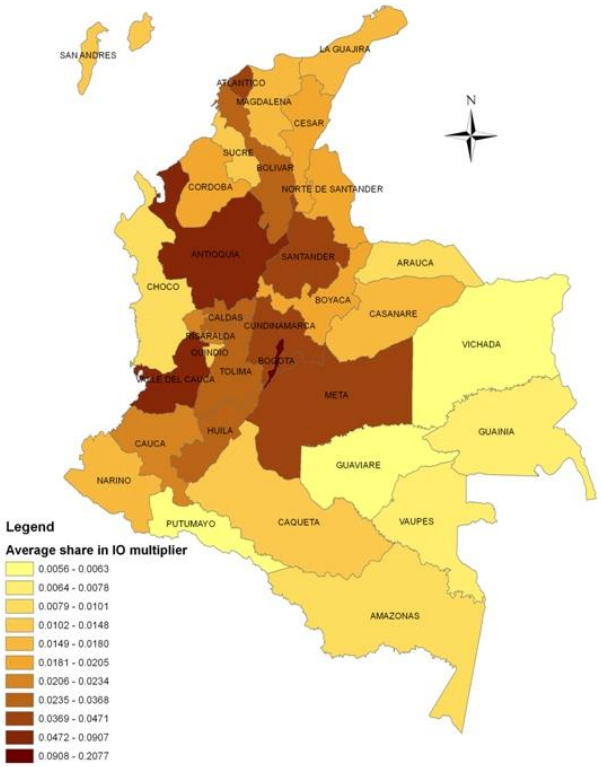
Stylized flows



Regional setting

Departmental share in GNI, 2000

Linkages in Colombia
(Average % share in net I-O output multipliers)



Source: Bonet and Meisel (2006)

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Simulations

The CEER model is used to simulate the impacts of tariff changes in the Colombian economy. The model is applied to analyze the effects of a **uniform 25% decrease in all tariff rates**. All exogenous variables are set equal to zero, except the changes in the power of tariffs, i.e., one plus the tariff rates, which were set such that the percentage change decrease in each tariff rate was 25%.

Results of the simulation computed via a four-step Euler procedure with extrapolation, under **short-run and long-run closures**.

The analysis is concentrated on the effects on spatial activity and welfare levels, and on some general macro variables.

Short-Run Effects on Selected Macro Variables

Real GDP	0.177
Real Household Consumption	0.483
Activity Level	0.149
Employment: Persons	0.264
Unemployment Rate (% point change)	-0.251
Nominal Wage Paid by Producers	-0.336
GDP Price Index	-0.380
Consumer Price Index	-0.336
Export Volume	0.380
Import Volume	1.017
Balance of Trade (percentage of GDP)	-0.174

Short-Run Effects on Selected Spatial Variables

		GRP	*Activity level*	*Equivalent variation*
D1	Antioquia	0.136	0.112	364,628
D2	Atlántico	0.147	0.135	112,651
D3	Bogotá D. C.	0.292	0.262	1,187,467
D4	Bolívar	0.113	0.093	86,795
D5	Boyacá	0.156	0.113	62,240
D6	Caldas	0.106	0.106	28,371
D7	Caquetá	0.052	0.053	3,184
D8	Cauca	0.064	0.053	19,940
D9	Cesar	0.115	0.110	30,169
D10	Córdoba	0.131	0.100	76,318
D11	Cundinamarca	0.275	0.258	214,639
D12	Chocó	0.046	0.042	3,805
D13	Huila	0.055	0.051	15,576
D14	La Guajira	0.110	0.100	33,038
D15	Magdalena	0.153	0.146	27,142
D16	Meta	0.121	0.115	26,222
D17	Nariño	0.119	0.090	33,091
D18	Norte Santander	0.105	0.097	24,256
D19	Quindío	0.087	0.086	8,416
D20	Risaralda	0.097	0.089	28,357
D21	Santander	0.198	0.132	286,486
D22	Sucre	0.084	0.083	7,527
D23	Tolima	0.101	0.090	33,516
D24	Valle	0.117	0.107	226,986
D25	Amazonas	0.064	0.065	533
D26	Arauca	0.274	0.139	11,584
D27	Casanare	0.060	0.061	28,015
D28	Guanía	0.054	0.053	301
D29	Guaviare	0.116	0.124	1,218
D30	Putumayo	0.092	0.092	2,811
D31	San Andrés y Providencia	0.181	0.174	4,878
D32	Vaupés	0.045	0.047	159
D33	Vichada	0.167	0.174	1,552

Short-run Spatial Results

Figure 5.1. Short-run Effects on GRP

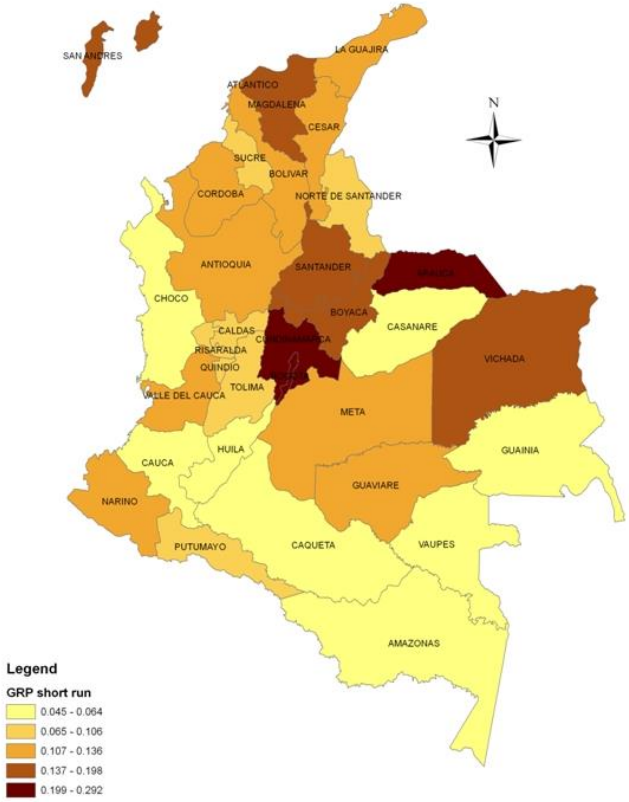
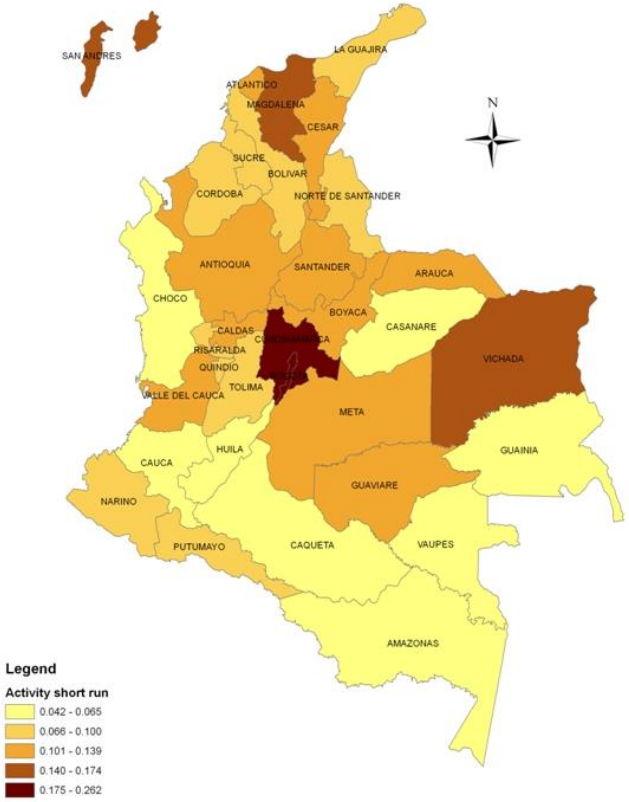


Figure 5.2. Short-run Effects on Activity Level



Short-run Spatial Results (Welfare)

Figure 5.3. Short-run Effects on Equivalent Variation

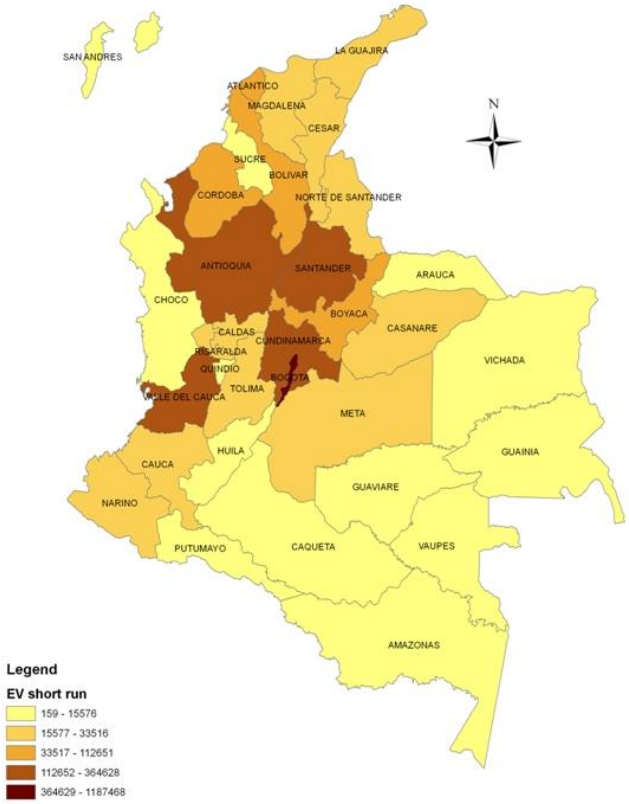
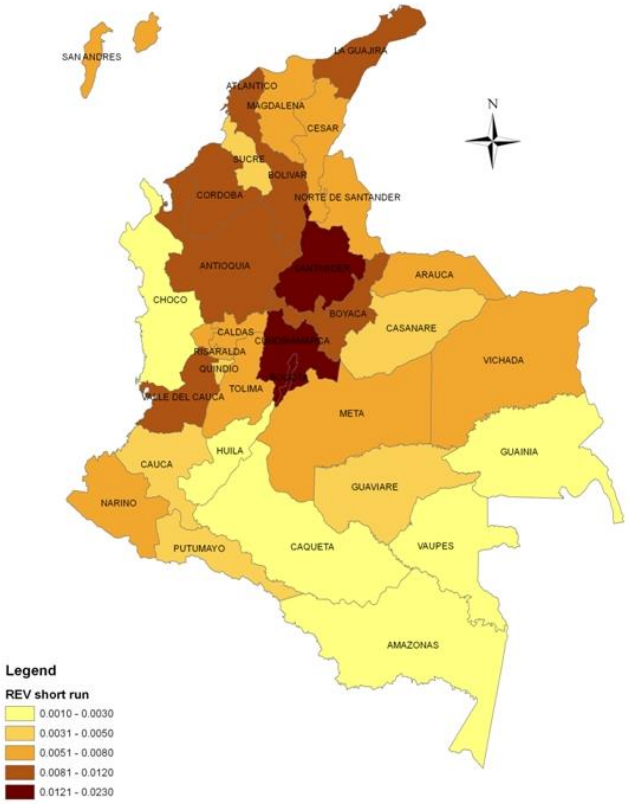


Figure 5.4. Short-run Effects on Relative Equivalent Variation



Structural Analysis of Short-run Activity Level Results

How important is the existing economic structure to explain short-run results associated with a trade liberalization policy in Colombia?

Do backward and forward linkages matter?

Dependent Variable: ACT_SR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.157437	0.083251	-1.891106	0.0698
IMPSH_3	-0.666530	0.342087	-1.948421	0.0622
IMPSHTOT	1.310548	0.430980	3.040852	0.0053
SH_1	0.390297	0.106954	3.649206	0.0012
SH_3	0.370619	0.124310	2.981411	0.0062
SH_4	0.407252	0.095772	4.252299	0.0002
KL	-0.064311	0.020033	-3.210213	0.0035
R-squared	0.758846			

ACT_SR = percentage change in regional activity level; **IMPSH_3** = import penetration in household consumption; **IMPSHTOT** = import penetration in total consumption; **SH_1** = intermediate inputs share in total sales; **SH_3** = household share in total sales; **SH_4** = export share in total sales; **KL** = capital to labor ratio.

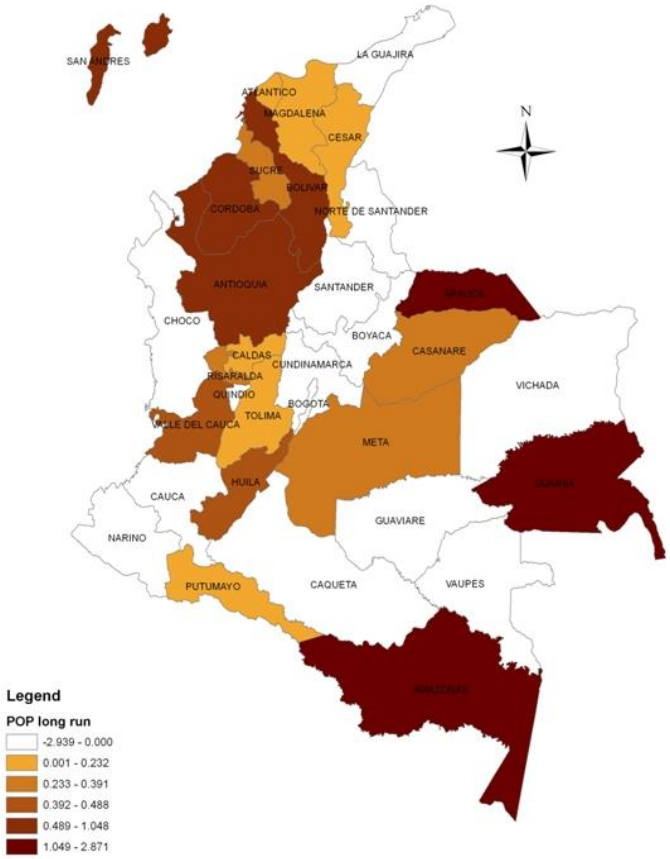
Long-Run Effects on Selected Macro Variables

Real GDP	0.027
Real Household Consumption	-0.269
Real Investment	0.937
Capital Stock	0.149
Activity Level	0.043
Regional Government Consumption	-0.168
Central Government Consumption	-0.269
Consumer Price Index	0.326
International Export Volume	0.704
International Import Volume	0.349
Balance of Trade (percentage of GDP)	-
Nominal Wage	-0.416
GDP Price Index	0.319

Long-Run Effects on Sectoral Activity

Sector	*%*
AGR	0.332
MNE	0.374
IND	0.140
CNT	0.849
TRN	-0.117
ADP	-0.244
OTS	-0.135

Long-run Effects on Population Growth



Short-run Spatial Results

Figure 5.6. Long-run Effects on GRP

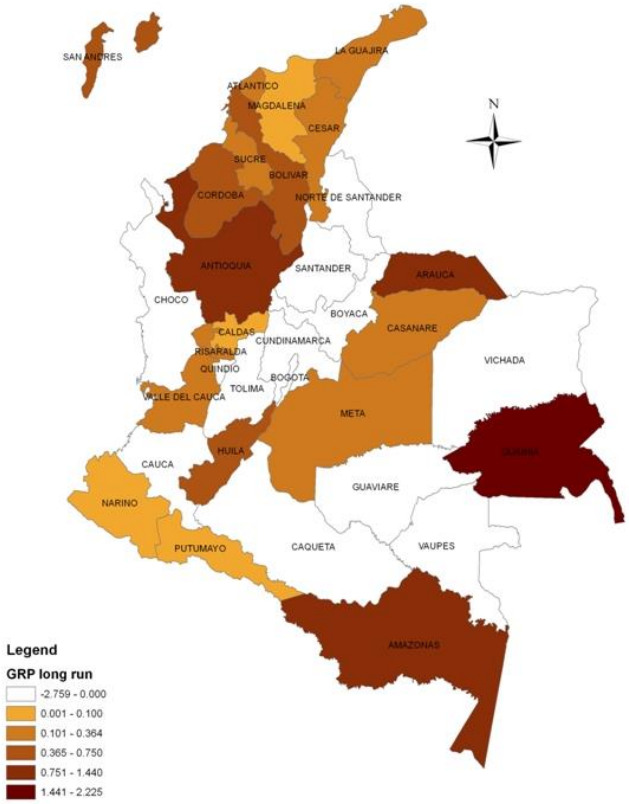
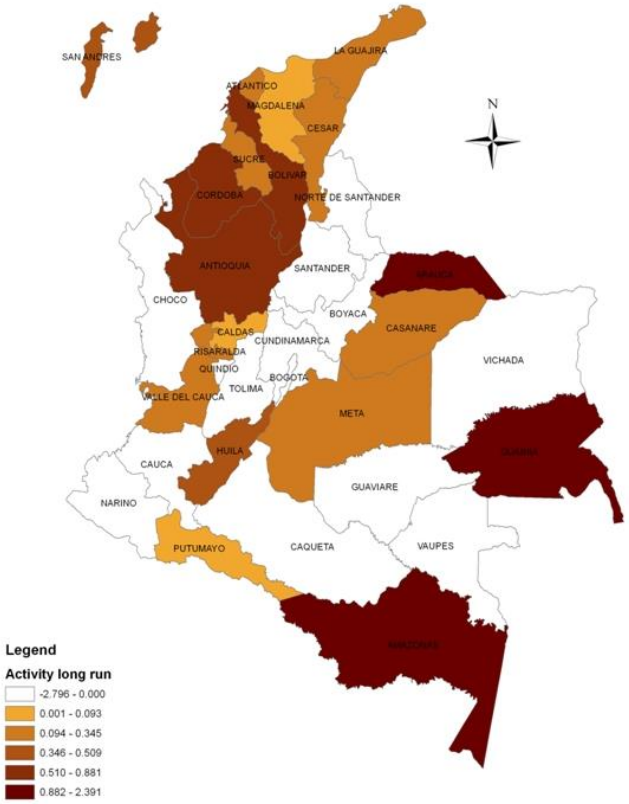


Figure 5.7. Long-run Effects on Activity Level



Short-run Spatial Results (Welfare)

Figure 5.8. Long-run Effects on Equivalent Variation

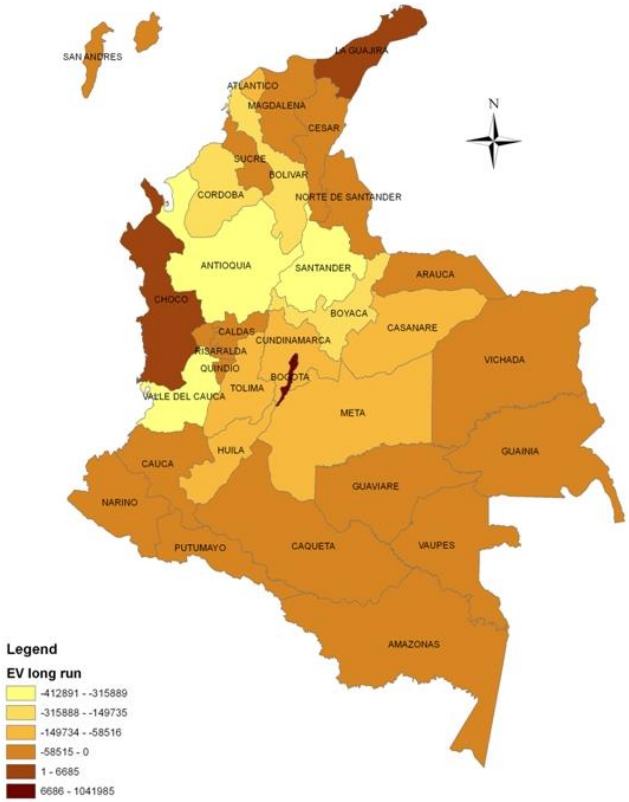
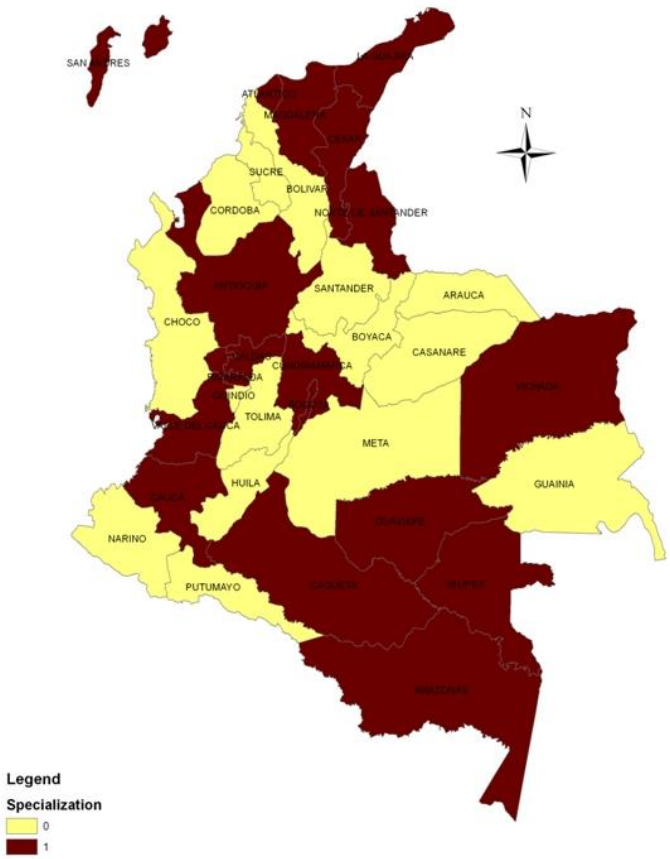


Figure 5.9. Long-run Effects on Relative Equivalent Variation

Long-run Effects on Regional Specialization (1 = more specialized)



Systematic Sensitivity Analysis

The scenarios related to the tariff cut experiments discussed above were employed using the Gaussian quadrature approach to establish confidence intervals for the main results.

The range for the parameters in the first group of sensitivity analyses was set to +/- 25% around the default values, with independent, symmetric, triangular distributions for three sets of parameters, namely the **export demand elasticities** for the various products, and **Armington elasticities of substitution** between goods from different domestic regions, and between imported and domestic goods.

The second group of sensitivity analyses was carried out in the **scale economies parameters** in the regional manufacturing sectors (+/- 25%).

Systematic Sensitivity Analysis: GRP/GDP changes (%)

	Trade elasticities				Scale economies parameters			
	Short run		Long run		Short run		Long run	
	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bour
Antioquia	0.13106	0.14167	0.84223	1.01114	0.13437	0.13836	0.90154	0.95183
Atlántico	0.14105	0.15212	0.17045	0.20303	0.14647	0.14670	0.17966	0.19381
Bogotá D. C.	0.27741	0.30735	-0.57592	-0.52666	0.29072	0.29404	-0.57735	-0.52523
Bolívar	0.10766	0.11905	0.56298	0.71104	0.11315	0.11355	0.62688	0.64713
Boyacá	0.14578	0.16566	-0.69320	-0.52807	0.15310	0.15834	-0.67065	-0.55061
Caldas	0.09895	0.11313	0.07267	0.12802	0.10589	0.10619	0.08606	0.11463
Caquetá	0.03958	0.06512	-0.86085	-0.67442	0.05115	0.05354	-0.78556	-0.74971
Cauca	0.05733	0.07111	**-1.61065**	**0.24679**	0.06420	0.06424	-0.87050	-0.49336
Cesar	0.11146	0.11908	0.22671	0.30767	0.11359	0.11694	0.24758	0.28680
Córdoba	0.12454	0.13707	0.68171	0.81830	0.12883	0.13279	0.71318	0.78683
Cundinamarca	0.25878	0.29208	-1.18673	-0.68512	0.25609	0.29476	-1.10418	-0.76767
Chocó	0.04031	0.05150	**-6.00005**	**2.06926**	0.04501	0.04680	-2.61918	-1.31161
Huila	0.04998	0.05944	0.17573	0.71194	0.05346	0.05596	0.38752	0.50015
La Guajira	0.10622	0.11351	0.19313	0.30085	0.10878	0.11095	0.22695	0.26703
Magdalena	0.14572	0.16117	**-0.00466**	**0.04203**	0.15193	0.15496	0.00193	0.03544
Meta	0.11400	0.12711	0.28130	0.36048	0.11892	0.12219	0.31226	0.32952
Nariño	0.11181	0.12708	**-0.05509**	**0.14726**	0.11424	0.12464	0.00651	0.08566
Norte Santander	0.09992	0.10949	-0.15220	-0.09168	0.10378	0.10563	-0.13748	-0.10640
Quindío	0.08089	0.09335	-0.19703	-0.10284	0.08606	0.08818	-0.18234	-0.11753
Risaralda	0.09273	0.10176	**-0.13238**	**0.77173**	0.09707	0.09743	0.20565	0.43371
Santander	0.18896	0.20755	-0.54192	-0.33773	0.19712	0.19939	-0.51375	-0.36591
Sucre	0.07751	0.09137	0.20091	0.31687	0.08304	0.08584	0.19209	0.32568
Tolima	0.09252	0.10932	**-0.67090**	**0.54223**	0.09921	0.10264	-0.07549	-0.05318
Valle	0.11063	0.12433	0.31131	0.41675	0.11678	0.11818	0.33682	0.39124
Amazonas	0.05964	0.06933	1.00127	1.63128	0.06380	0.06517	1.26571	1.36684
Arauca	0.21969	0.32812	1.26506	1.61526	0.26288	0.28493	1.39586	1.48445
Casanare	0.05409	0.06590	0.23381	0.28761	0.05865	0.06134	0.25952	0.26189
Guanía	0.04981	0.05777	**-11.80199**	**16.25231**	0.05312	0.05446	1.83696	2.61336
Guaviare	0.10619	0.12582	-3.12476	-2.39250	0.11438	0.11764	-2.76846	-2.74880
Putumayo	0.08807	0.09549	**-0.02026**	**0.12526**	0.09045	0.09311	0.04432	0.06068
San Andrés y Providencia	0.17729	0.18469	0.46830	0.60757	0.17999	0.18199	0.52974	0.54613
Vaupés	0.03808	0.05204	-0.77122	-0.50942	0.04377	0.04634	-0.71516	-0.56548
Vichada	0.15074	0.18322	-1.31811	-1.08386	0.16499	0.16897	-1.20236	-1.19960
National	0.17054	0.18302	0.01558	0.03743	0.17411	0.17944	0.01925	0.03376

Outline

Motivation

Regional setting

The CEER model

Simulation results

✓ Final remarks

Final remarks

The results of tariff cut simulations confirmed the asymmetric impacts that trade liberalization has on a spatial economy in which one region, Bogotá, is able to more fully exploit scale economies vis-à-vis the rest of Colombia.

The analysis also revealed the importance of different hypotheses on factor mobility and the role of price effects to better understand the consequences of trade opening in a developing economy. We found considerable differences from short-run and long-run impacts. While in the short-run structural constraints impose a spatial trap that leads to more concentration, in the long-run factor mobility enables spatial re-location of production in a way that regional disparities tend to diminish.

In summary, long-run results using the spatial CGE approach has shown to be able to reconcile theoretical predictions based on recent economic geography models with empirical applications to real economies.

Epilogue: FTA Colombia-USA

Results represent a simulation of a pragmatic implementation of a FTA between Colombia and US; i.e. we have assumed that tariff rates were abolished for *tradables* (agriculture, mining and manufacturing) in both countries

The following maps present the short-run and long-run effects for real GDP and activity level in the Colombian regions

They are presented in the form of choropleth maps

- darker colors represent regions that perform above the average (relative gainers)
- lighter colors represent regions that perform below the average (relative losers)

Spatial aspects of Colombia-USA trade (origin and destination shares)

	Imports		Exports	
	USA	ROW	USA	ROW
Pacifico	0.288	0.712	0.194	0.806
Central Oeste	0.359	0.641	0.359	0.641
Costa Caribe	0.541	0.459	0.337	0.663
Nuevos Departamentos	0.670	0.330	0.520	0.480
Bogota	0.420	0.580	0.244	0.756
Central Norte	0.387	0.613	0.713	0.287
Central Sur	0.275	0.725	0.423	0.577
Total	0.398	0.602	0.400	0.600

Spatial aspects of Colombia-USA trade (regional shares)

	Imports		Exports	
	USA	ROW	USA	ROW
Pacifico	0.089	0.146	0.005	0.014
Central Oeste	0.131	0.154	0.610	0.303
Costa Caribe	0.258	0.145	0.185	0.412
Nuevos Departamentos	0.009	0.004	0.066	0.150
Bogota	0.402	0.368	0.019	0.016
Central Norte	0.019	0.020	0.010	0.009
Central Sur	0.093	0.164	0.106	0.096
Total	1.000	1.000	1.000	1.000

Figure 1. Short-run relative impacts on GRP

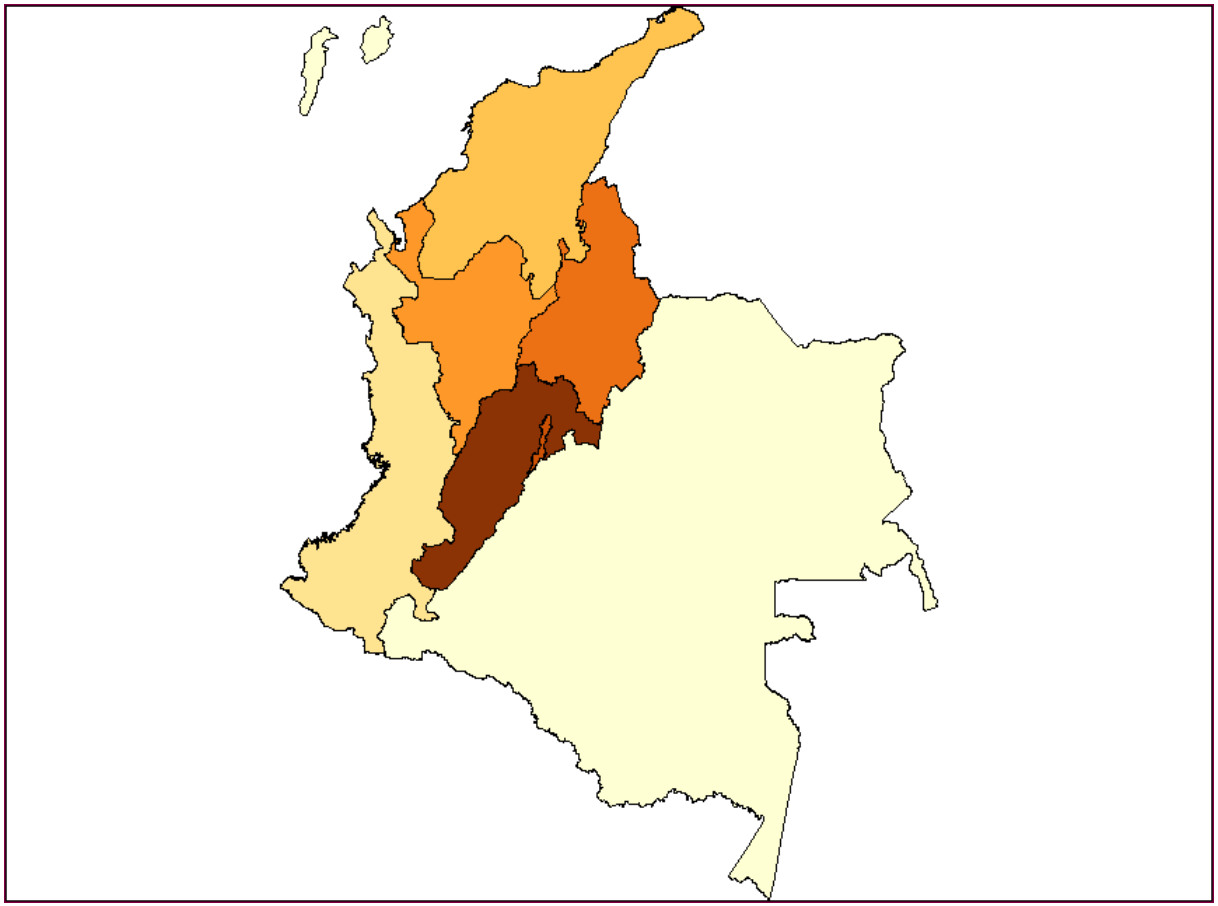
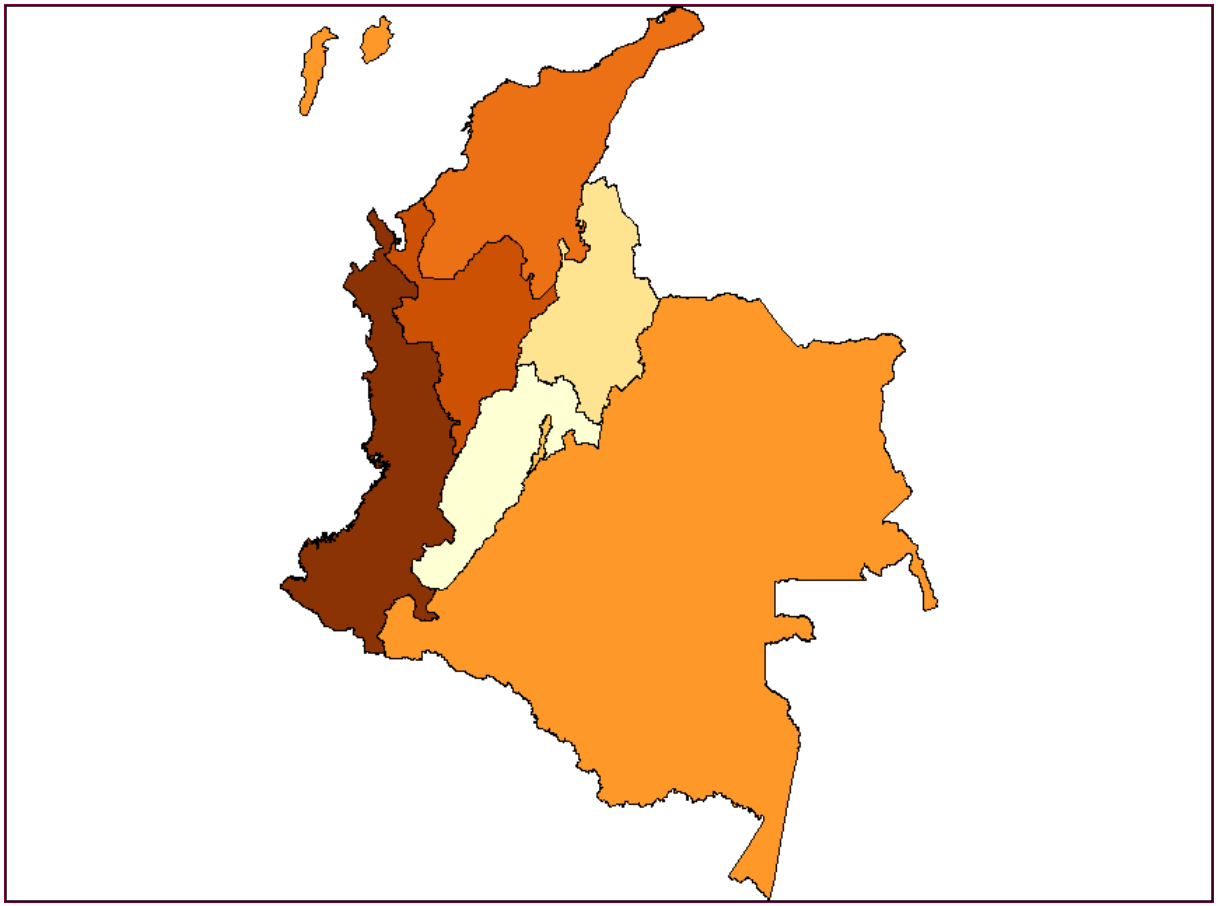


Figure 2. Long-run relative impacts on GRP



Summary

	Ranking	
	Short-run	Long-run
Pacifico	6	1
Central Oeste	4	2
Costa Caribe	5	3
Nuevos Departamentos	7	4
Bogota	2	5
Central Norte	3	6
Central Sur	1	7

Dynamic effects – productivity gains

One should consider not only the likely impacts of changes in relative prices in the production functions of Colombian firms but also productivity gains – dynamic effects

Expectation of productivity gains

"Dynamic" simulations with the CEER model (simulating output growth with hypothetical overall gains in productivity in Colombia)

That is a delicate/unresolved issue

What is the size of the impact?

- Moreira (2004): **productivity** (through technical progress) and investment in capital stock

New simulations of technical progress under long-run closure (see graph)

- Above-the-average: Central Oeste and Central Norte
- Average: Costa Caribe and Pacifico
- Below-the-average: Bogotá, Nuevos Departamentos and Central Sur

Long-run GDP/GRP effects of overall TFP growth