

Frameworks of Urban System Evolution in Frontier Settings and the Ecuador Amazon

Lawrence A. Brown, Scott
Digiacinto and Randy Smith
Ohio State University*

Rodrigo Sierra
San Diego State University**

To what degree are general frameworks pertaining to urban system evolution in the frontier applicable to Third World settings? This paper summarizes several such frameworks, which were developed largely in reference to North American experiences of the late 18th to early 20th centuries. It then considers the Ecuador Amazon, finding that the fit is quite high. Specifically, universal conceptualizations, such as core-periphery formulations, are broadly relevant; context-dependent conceptualizations are partially so. The latter raises the question of whether Ecuador's government-based service sector is a mechanism for urban dominance, as wholesaling and finance were for North America? Moving further along the nomothetic-idiographic continuum, excerpts from selected case studies indicate the Ecuador Amazon urban system is representative of current-day frontier regions.

This paper addresses the evolution of frontier urban systems in terms of general frameworks, using Ecuador's Amazon Region, or *Oriente*, as a laboratory for empirical analyses. Here, as elsewhere in Latin America, rapid population growth in more settled areas combined with increasing use of frontier resources has led to high in-migration levels, new settlement, and an evolving frontier urban system. Our research on this important demographic process in the Ecuador Amazon is framed by three aspects of earlier work.

First, the degree to which existing frameworks of frontier urbanization apply to Third World locales remains an open question. These frameworks largely derive from research on North American settings of the late 18th to early 20th centuries, and tend to reflect more-developed portions of that frontier experience.

Second, although Third World frontier regions have received considerable attention in recent years, their urban component has been neglected. Studies of urban frontiers are few in number, rarely reference the experience of other Third World locales or North America, and give scant attention to formulating a conceptual framework of frontier urbanization and integration with national urban

* Department of Geography, Ohio State University, Columbus, OH, USA.

** Department of Geography, San Diego State University, San Diego, CA, USA.

systems. No study examines the *overall* urban system of a contemporary frontier region, unlike this paper. The importance of research on urban aspects of Third World frontiers also is recognized by others. For example,

... frontier towns of Amazonia provide important subjects ... [such] urbanization ... seldom has been examined on a broad scale; local case studies predominate ... more attention should be given to ... comparative urbanization of the settlement frontier, the nature of interregional linkages, the emerging regional hierarchy of settlement, and the degree to which local economies can survive efforts at national economic integration. (Godfrey, 1991: 248–249)

Third, examining frontier urbanization is an important complement to studies of urban systems in developing countries. Typically, these focus on the role of urban areas in, or impact of, development, but give minimal attention to small or frontier towns, their socio-economic function, and integration into the national urban system (e.g., Scott, 1982 on Mexico).

This paper represents an initial step towards addressing the aforementioned issues. It first reviews conceptual frameworks of urban system evolution in frontier settings and related generalizations. Presented next is an overview of Ecuador and its Amazon Region. Third, the applicability of conceptual frameworks to Ecuador's Amazon is evaluated. This considers changes in settlement pattern, urban size, and urban economic functions, aspects of urban system evolution highlighted by earlier work. The paper concludes with an assessment of the fit between general frameworks and urban system evolution in contemporary frontier settings such as the Ecuador Amazon.

CONCEPTUAL FRAMEWORKS OF FRONTIER URBANIZATION

Earlier approaches to urban aspects of the frontier can be divided into three research perspectives. One provides abstract frameworks that are *universally* applicable, but achieve this quality at the expense of substantive specificity. The second perspective provides *context-dependent* frameworks, which also may be referred to as *quasi-general* or *middle-range theory* (Wallace, 1971). These emphasize selected aspects of frontier settlement that emerge, or operate, differentially in diverse settings; such frameworks are

... couched at a lower level of abstraction [than universal theory] ... reveal clearly defined and operationalized concepts ... for a limited range of phenomena ... [are] abstract ... [but] connected to the empirical world, thus encouraging research necessary for the clarification of concepts and reformulation of theoretical generalizations. (Turner, 1986: 88)

The third perspective provides idiographic *case studies*; considered here are examples from the Brazilian Amazon and North America. In moving along this *nomothetic-idiographic* continuum, each step discloses more about the situation being studied but less about frontier urbanization, or the emergence of frontier urban places, as a general process.

UNIVERSAL CONCEPTUALIZATIONS

Universal models addressing frontier settlement fall into two groups. One represents frontier development as a three-stage process: *colonization*, comprised largely of migration from outside the frontier; *spread*, which involves migration from within and outside the frontier; and *competition* or *consolidation* (Bylund, 1960; Hudson, 1969; Olsson, 1968). This framework is concerned with the transition from frontier settlement to mature central place systems, which emerge at the consolidation stage. A complementary perspective focusses on local areas and individual behavior, but identifies similar stages: site selection, pioneering through initial clearing and cultivation, and consolidation wherein some settlers leave to settle elsewhere in the frontier (Findley, 1988; Henkel, 1982).

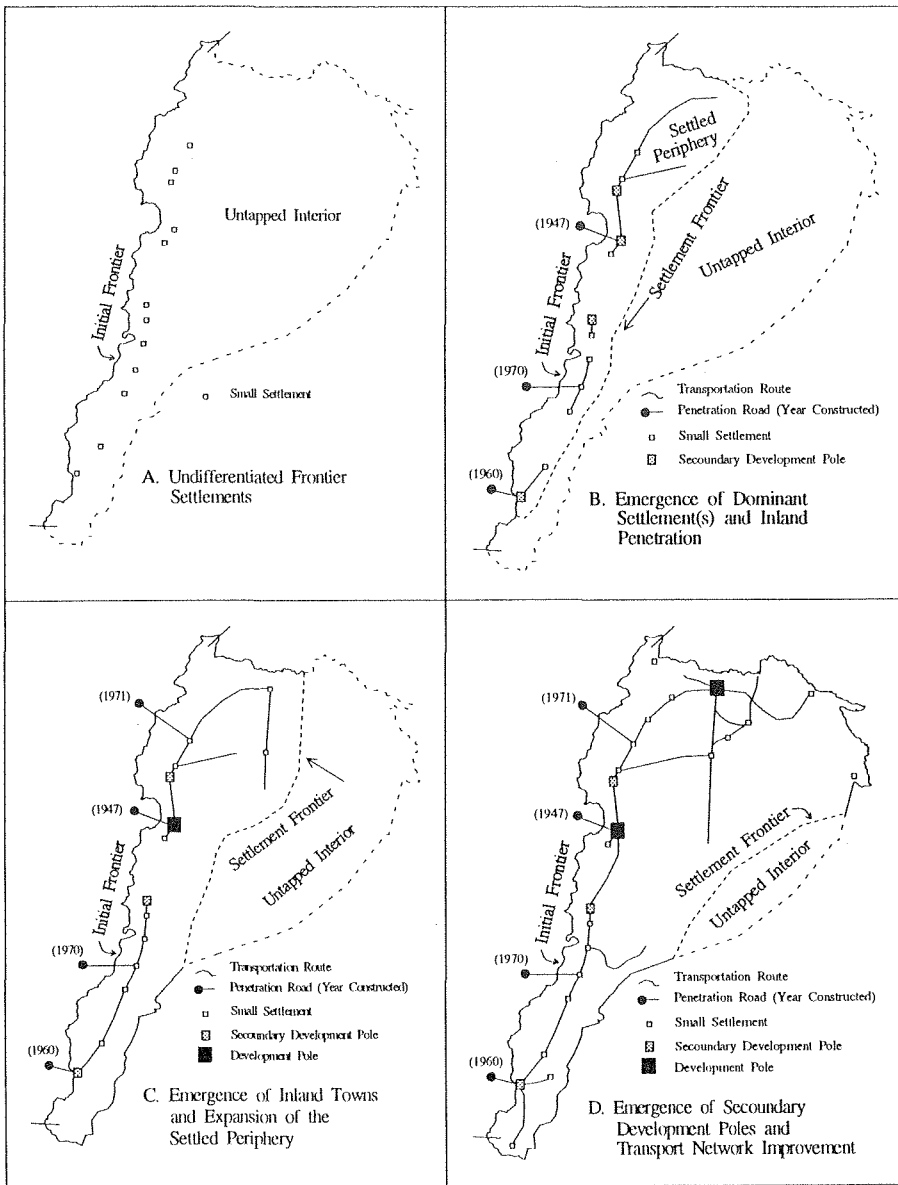
Another element of these models is the *niche space*, an expanding area where conditions are favorable to settlement (Hudson, 1969). Niche spaces typically are affected by transportation development, mineral discoveries, new economic activity, technological innovation, national policies, world economic and political circumstances, donor nation actions, and the like. Relevance of the niche space concept to frontier urban areas and evolution of the United States urban system between 1860 and 1920 is demonstrated by Meyer (1990).

A second, less austere group of universal models includes the ideal-typical sequence of transportation development (Taaffe, Morrill, and Gould, 1963), mercantile model (Vance, 1970), Monte Carlo simulations (Morrill, 1963, 1965), and core-periphery formulations (Brown, Sierra, Southgate, and Lobao, 1992; Knight and Newman, 1976; Stohr, 1975). These highlight selected substantive attributes, differ in emphasis, but posit a similar scheme of frontier development, depicted in Figure 1 and henceforth referred to as *Core-Periphery-type* frameworks.

CONTEXT-DEPENDENT CONCEPTUALIZATIONS

Context-dependent frameworks of urban system evolution in frontier settings represent a continuum from embryonic to more mature economies. For embryonic phases, stages by which "*a dependent peripheral region becomes incorporated into the larger national economy*" are set out by Browder and Godfrey (1990), who draw on the Brazilian Amazon. This links socioeconomic and landscape

Figure 1: The spatial spread of frontier settlement as a core-periphery phenomenon based on the Ecuador Amazon.



maturity with urban forms: Native Subsistence Economy–Pre-Urban Village; Resource Extraction Frontier–Expeditionary Resource Settlement; Peasant Pioneer Agriculture–Pioneer Settlement; Consolidated Landholdings (Relic Frontier)–Local Service Center; Rural Depopulation and Urban Primacy–County Service Center.

A complementary framework focussed on more advanced economies has been put forth by Muller (1977), drawing on 19th century North America. Its initial stage is the *pioneer periphery*. There are many local service centers, but some become more important, largely due to location at nodal points in the transportation system. Denoted as *entrepôts*, these are reception and distribution points for goods from outside the frontier, frontier goods destined for external markets, and goods moving within the frontier itself. Aside from trading function variations, towns are similar in economic base. Stage two is the *specialized periphery* wherein towns become differentiated in a broad range of economic functions due to variation in resource endowments, comparative advantage, and inertia; sharper distinctions in size and importance also arise. Transportation continues to be critical, as does the level (and rate) of rural settlement which provides a market for, and source of, goods. Stage three is the *transitional periphery* wherein selected towns become closely connected with the national urban system and emerge as dominant regional centers; industrial activities and unique functional specializations are critical elements of this transition.

Whereas universal and context-dependent frameworks reviewed thus far posit distinct stages of evolution, Meyer (1980) focusses on mechanisms underlying differential urban growth, drawing again on the North American experience. A major element is *control over the exchange* of goods and services, which is closely related to economic specialization, transportation, communications, and agglomeration economies; *physical movements* of travelers, consumers, and commodities also are an element of the schema. In an early stage of frontier urbanization, specialization is minimal, entrepreneurs only control exchange in the local hinterland, and physical movements are limited. Over time a selected town(s) acquires more specialized economic activities and entrepreneurs who control exchange over an extensive area. Lower-order economic activities and entrepreneurs serving local hinterlands still function, giving rise to an urban hierarchy within the frontier. Finally, as the frontier becomes settled, its major town(s) becomes a *gateway*, the external supplier of goods and services, to the next frontier zone. In a modification to Meyer's framework, Wyckoff (1988a) proposes that the role of some gateway centers will be *curtailed*, or *eclipsed*, with frontier expansion.

To summarize these context-dependent conceptualizations, major elements of urban system evolution include the locus of socioeconomic control, type of economic activity, net direction of population movements, and the shifting role, or prominence, of particular towns. Hence, Browder-Godfrey's most advanced urban places are controlled externally and largely carry out local (central place-type) service functions (Godfrey, 1990). Emerging urban places in the Muller and

Meyer frameworks exert control (or influence) in selected economic and political spheres, exhibit local metropolitan dominance, have a mix of economic activity wherein wholesaling and financial services are important components, and fluctuate in importance (Conzen, 1975a, 1975b, 1977; Glasmeier, 1990; Meyer, 1980, 1990; Muller, 1977; Pred, 1977, 1980; Vance, 1970; Wyckoff, 1988a, 1988b). Transportation is a critical element at all stages of urban system evolution.

IDIOGRAPHIC CASE STUDIES OF FRONTIER TOWNS: SELECTED EXAMPLES

Case studies of frontier towns are few in number, highly detailed, and rarely invoke frameworks such as those summarized above. They do, however, provide a source of data by which universal and context-dependent conceptualizations can be evaluated, and common threads can be identified. Consider, for example, Lisansky's (1990) study of Santa Terezinha, a town of approximately 3,000 people in the Brazilian Amazon. In summary,

- ** The town's existence is precarious. Its build-up was strongly related to state policy concerning economic advancement of, and expansion into, the Amazon; to related actions of land development and cattle companies; and to its river location. Following an initial visit in the late-1970s, Lisansky (1990) thought the town's existence was threatened by a road eighty kilometers away that would supersede river transport. But by 1987 the town had become better established and population increased 50 percent. Underlying this were actions of cattle and speculation companies which shored up the local economy through economic diversification, an influx of government projects, and construction of a feeder connecting Santa Terezinha and the main road. Current good fortune could, however, easily be reversed.
- ** Santa Terezinha experienced a high level of population turnover, both in original settlers and temporary workers attracted by short-term wage-labor opportunities related to clearing land for cattle enterprises and the like. But by 1987, its population base had stabilized.
- ** Commerce is a major economic activity of the town itself. Initial stimuli were provided by large landholdings which needed a transshipment point for goods from the outside, entertainment for transient workers, and shelter for workers entering or leaving the area. A stronger, locally oriented commercial base appeared later with bakeries, beauty parlors, garages, restaurants, markets, banking, and demise of the red-light district. Local industry in the form of a sawmill also appeared.
- ** In the intervening ten years between Lisansky's visits, Santa Terezinha had become the seat of its own municipality, and this gave rise to government-sponsored initiatives and support.

Godfrey's (1990) study of Amazon towns in the Brazilian state of Para identifies similar factors—high rates of in-migration and population turnover, a precarious economy that is highly dependent on external forces and exhibits a 'boom and bust' pattern, transportation as a critical element in urban fortunes, and commerce oriented towards servicing dominant resource-extraction enterprises. With (some) economic stability, commercial activity shifts to usual central place functions such as banks, restaurants, food markets, repair shops, retail goods, etc.; but dependence on outside forces such as truck and bus traffic continues.

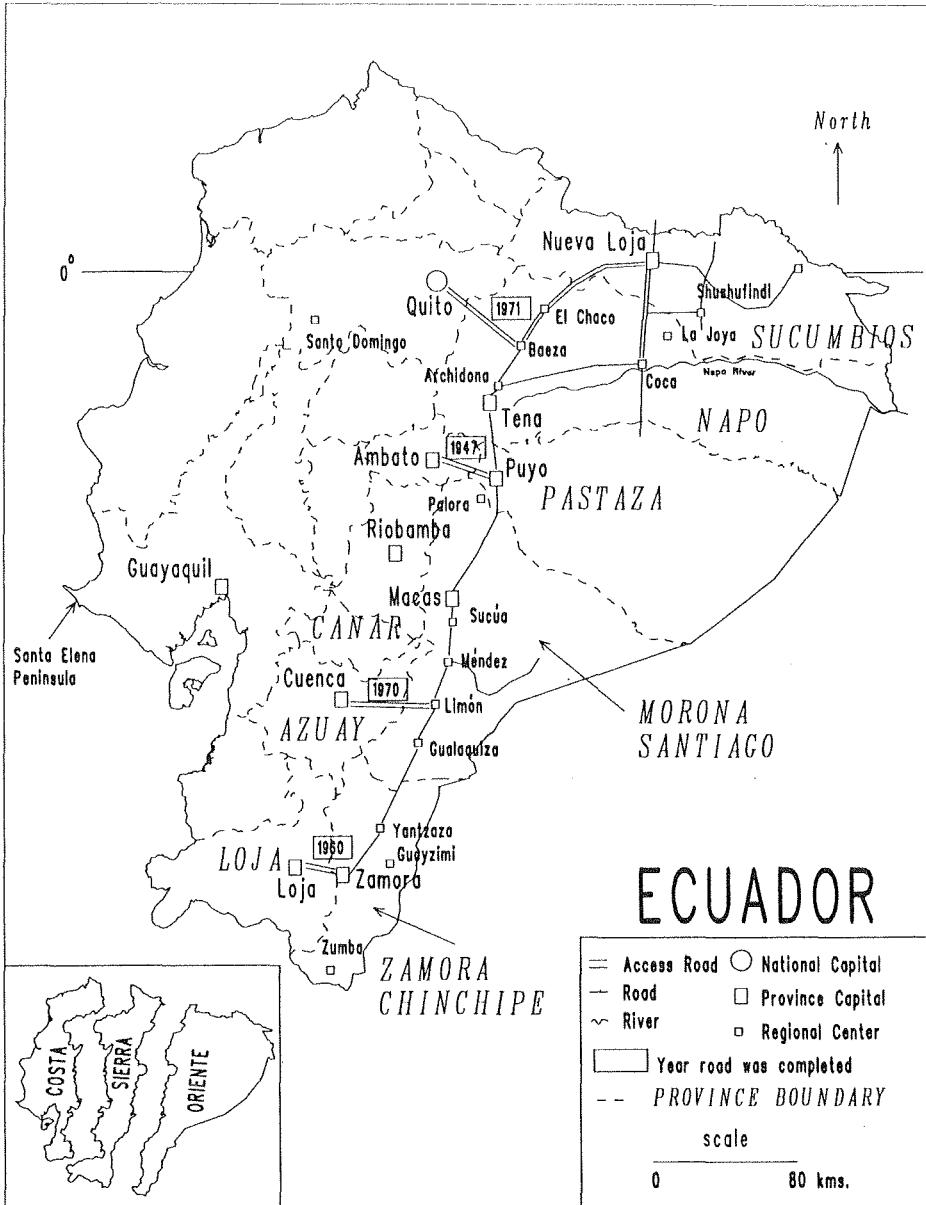
Another set of case studies portray the North American experience. Examples include Dakota towns (Hudson, 1985), river towns in the Midwest (Mahoney, 1990), cities in the Midwest (Wade, 1959), and Western New York State (Wyckoff, 1988b). All echo the importance of transportation, tertiary activity, entrepot functions in trade, exogenous regional-national forces, and the precarious nature of a town's existence. Hence, although these North American settings are widely separated temporally and geographically from the Amazon, there are numerous similarities in their experiences.

ECUADOR AND ITS AMAZON REGION: AN OVERVIEW

To evaluate general aspects of *universal*, *context-dependent*, and *idiographic* studies in greater detail, attention turns to the Ecuador Amazon. Ecuador is comprised of three distinct regions: the coastal lowlands or *Costa*, Andean Cordillera and its intermontane basins or *Sierra*, and the Amazon basin or *Oriente* (Fig. 2). The Oriente includes eastern slopes of the Andes and Ecuador's portion of the Amazon basin; encompasses more than one-half the national territory; but contains only three percent of the population. From 1950 through 1990, however, its population grew 432 percent or 10.8 percent per year, an enormous increase: 70,000 people in 1950, 97,000 in 1962, 173,469 in 1974, 263,797 in 1982, and 372,533 in 1990 (Bromley, 1972; INEC, 1990, 1992). This growth, largely from in-migration, was accompanied by a significant shift in the spatial distribution of Oriente population, shown here for 1972, 1984, and 1990 (Fig. 3). A major factor was petroleum discoveries from 1967 onward in the Northeast which led to increased road construction, agricultural colonization, and related economic activities.

Primary urban settlements in the area, transportation arteries that played an important role in enhancing accessibility, and the approximate year each road was constructed are shown in Figure 2. This information will be drawn on later, but four points should be highlighted. First, Oriente roads are largely unpaved; that is, while accessibility is much improved, it remains rudimentary. Second, comparing Figures 2, 3, and 4 indicates that high population concentrations are associated with province capitals: Tena in Napo, Puyo in Pastaza, Macas in Morona Santiago, Zamora in Zamora Chinchipe, and Nueva Loja in Sucumbios,

Figure 2: Informational map of Ecuador.



a province created since 1982. Third, population concentrations have shifted over time to favor northern and northeastern Amazon locales. Fourth, the region contains many towns, but Puyo (the largest) had only 14,438 inhabitants in 1990 followed by Nueva Loja (13,165), Macas (8,246), Zamora (8,048), Tena (7,873), and Coca (7,805). As a basis for comparison, Quito (the national capital) had a 1990 population of 1,100,847; Guayaquil (the largest city) had 1,508,444; but important intermediate-size cities such as Ambato and Riobamba in the Sierra or Esmeraldas in the Costa are much smaller, in the 100,000 range.

Urbanization is an important force in the Amazon. From 1974 to 1990 composite population growth for Tena, Puyo, Macas, and Zamora was 237.6 percent, compared with 114.7 percent for the Oriente as a whole, and the difference is understated since this calculation does not include Coca and Nueva Loja, urban areas which became prominent since 1974 (Table 1). A similar calculation for 1982–90, which includes Nueva Loja and Coca, shows urban population growing 62.1 percent (Table 1) compared with 41.2 percent for the region overall. Although less dramatic than the 1974–90 difference, the point remains that urbanization is significant in today's Oriente. Likewise for Brazil's Amazon where growth in urban compared to rural portions of the region was approximately 43 percent greater in the 1960–70 decade and 80 percent in the 1970–80 decade (Browder and Godfrey, 1990; Ozorio de Almeida, 1992).

Also relevant is the historical isolation of locales within Ecuador (Rudel, 1993). Sierran provinces operated in a semi-autonomous fashion, in part because transportation links were poor. Until the 1940s, for example, there was no road linking Loja with provinces to its north, and today, the Loja-Cuenca road is only partially paved (Fig. 2). Such isolation (and other factors) led to strong regional loyalties, limited national identity, and extension of Sierran regional divisions into the Oriente. Hence, Oriente lands immediately to the east of Cuenca (capital of Azuay province) were referred to as '*Oriente Azuayo*'; until the 1960s transportation links were predominantly east-west, connecting Sierran highland with adjacent Amazon areas; and a south-north road along the Andean base from Zamora to Baeza ('*marginal de la selva*'; Fig. 2) was not completed until 1982.

In contrast, petroleum-related development since the early-1970s was carried out by large-scale corporate and government enterprises, cut across regional loyalties, and imposed a rapid pace of change on Oriente locales, particularly its central and northern portions. Thus, the Amazon shifted from isolated towns that were extensions of adjacent highland provinces, to an early-stage urban system where intra-Oriente movements increase but highland-lowland movements continue in dominance, to a later stage where linkages among Amazon towns become more prominent and provide the basis for an integrated space-economy (Brown and Sierra, 1994). The Ecuador Amazon, then, offers an opportunity to study an emerging urban sub-system in its formative years.

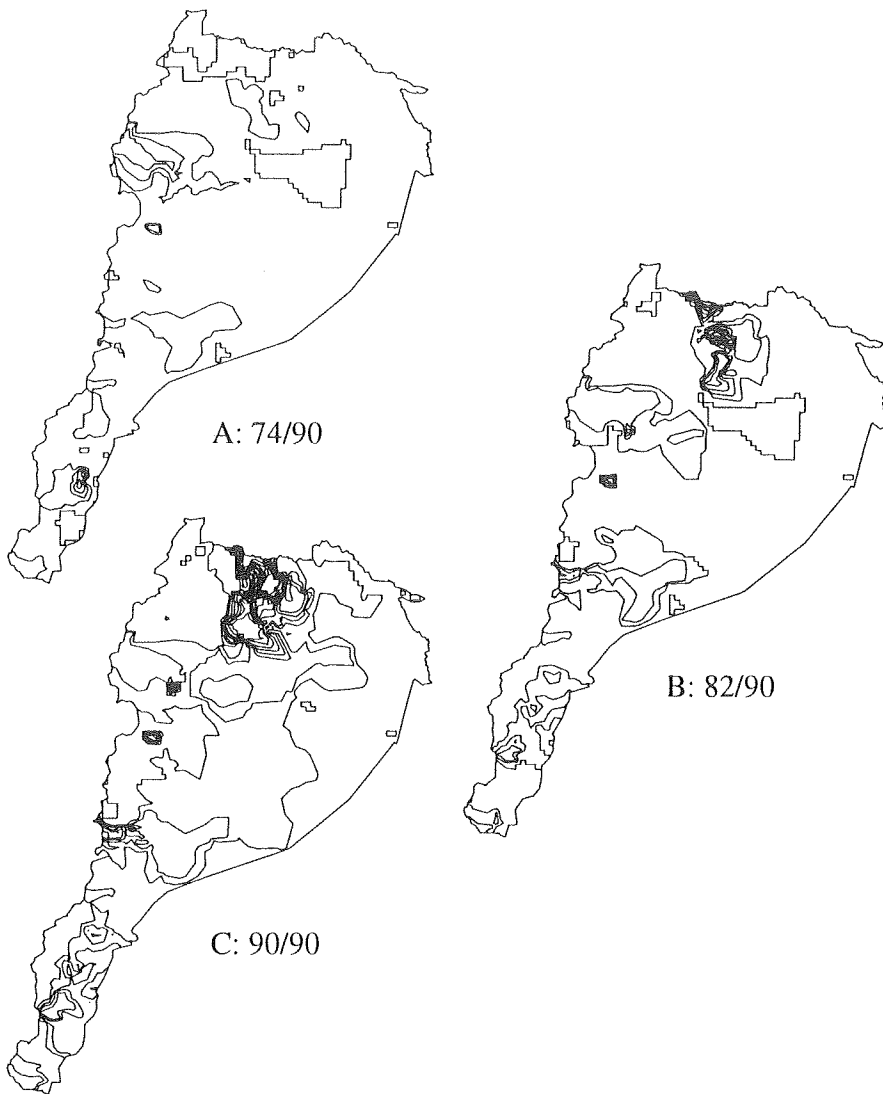
TABLE 1

Economic Structure for Selected Oriente Towns (Parroquias) in 1974, 1982, 1990

(indicated by percent of the work force employed in each economic sector)

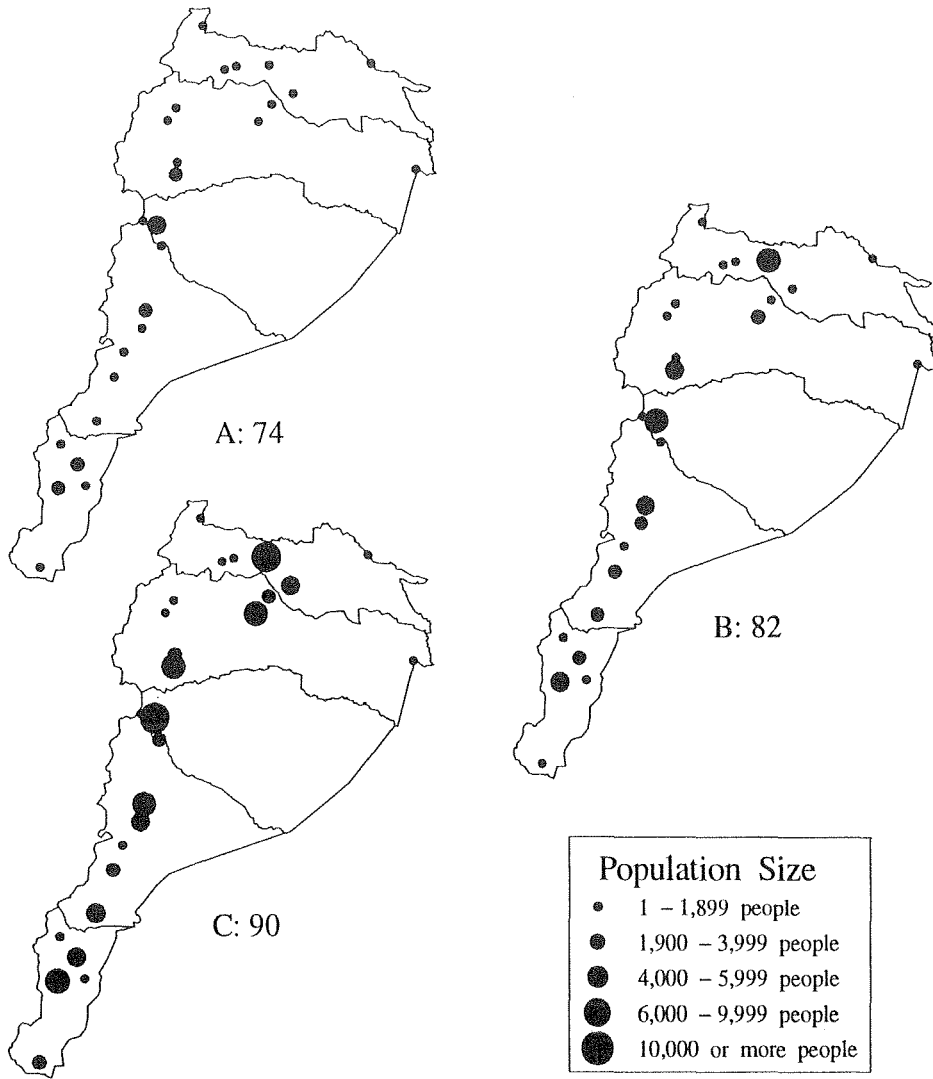
Economic Sector	Tena			Puyo			Macas			Zamora			Nueva Loja			Coca			Composite Oriente			Costa-Sierra 1990
	1974	1982	1990	1974	1982	1990	1974	1982	1990	1974	1982	1990	1974	1982	1990	1974	1982	1990	1974	1982	1990	
Manufacturing																						
Wood Processing	6.6	4.1	4.0	4.7	4.4	7.2	7.3	4.3	4.7	2.7	1.7	3.4	--	3.9	3.3	--	3.8	3.7	5.1	3.8	4.5	3.6
Food Products	0.7	1.0	0.5	9.3	2.5	2.8	2.1	0.9	0.7	1.2	0.4	0.5	--	1.1	1.7	--	0.9	2.5	4.8	1.2	1.6	2.1
Textile Products	1.4	2.5	2.9	2.7	2.2	2.8	2.7	2.1	2.8	1.5	1.8	2.5	--	2.4	2.4	--	1.9	1.6	2.2	2.2	2.5	6.5
Other	0.3	0.6	2.2	1.1	1.9	4.2	1.3	1.8	1.6	2.2	0.6	1.2	--	1.8	1.3	--	2.6	0.6	1.2	1.6	2.0	4.6
	9.0	8.2	9.6	17.8	11.0	17.0	13.4	9.1	9.8	7.6	4.5	7.6	--	9.2	8.7	--	9.2	8.4	13.3	8.8	10.6	16.8
Utilities	0.2	0.8	0.7	0.2	0.8	0.4	0.6	0.7	0.4	1.4	0.2	0.2	--	0.7	0.6	--	0.5	0.6	0.6	0.7	0.5	0.6
Construction	9.6	13.0	8.9	8.7	16.6	6.9	5.9	21.1	11.2	7.6	9.2	10.0	--	15.9	7.7	--	5.8	6.8	8.2	14.2	8.3	7.7
Commerce																						
Wholesale	0.4	1.4	0.1	0.5	1.1	0.2	0.0	1.1	0.2	0.1	0.6	0.1	--	1.2	0.2	--	1.1	0.1	0.3	1.1	0.2	1.0
Retail	9.2	7.1	14.0	9.8	8.8	15.0	10.3	7.4	14.9	7.6	5.0	10.9	--	14.1	26.1	--	8.5	16.1	9.3	9.1	17.3	21.9
Restaurants-Hotels	2.0	2.1	3.2	4.2	2.1	2.5	2.1	1.9	2.7	2.7	1.2	2.4	--	4.3	3.2	--	2.6	4.7	3.1	2.6	3.1	2.0
	11.6	10.6	17.3	14.5	12.0	17.7	12.4	10.4	17.8	10.4	6.8	13.4	--	19.6	29.5	--	12.2	20.9	12.7	12.8	20.6	24.9
Transportation, Communications	5.1	5.2	5.4	6.3	9.9	7.3	5.3	8.1	6.5	2.8	3.2	3.5	--	10.0	6.9	--	7.0	7.6	5.1	7.7	6.4	6.4
Finance	2.6	1.3	1.1	2.4	2.0	2.4	2.9	2.1	2.0	2.2	1.0	1.4	--	1.0	1.6	--	0.8	1.4	2.5	1.4	1.7	3.2
Service																						
Public Administration	20.5	19.9	22.8	19.6	14.5	18.2	24.2	19.2	20.0	25.3	24.0	18.4	--	7.6	9.1	--	9.2	9.2	21.6	15.0	15.6	9.1
Military	0.1	4.1	0.2	0.3	1.4	1.3	1.1	3.1	0.3	13.1	22.1	19.0	--	19.3	12.3	--	34.1	22.8	3.0	12.8	8.8	2.1
Community Service	26.0	26.4	23.9	14.1	19.8	17.3	19.1	16.1	19.1	17.5	21.7	17.2	--	7.6	9.6	--	12.8	10.6	18.0	16.8	15.6	15.0
Household Service	15.3	10.5	10.1	16.1	12.0	11.5	15.1	10.1	12.9	12.1	7.3	9.3	--	9.1	14.0	--	8.4	11.7	15.0	9.8	11.9	14.2
	61.9	60.9	57.0	50.1	47.7	48.3	59.5	48.5	52.3	68.0	75.1	63.9	--	43.6	45.0	--	64.5	54.3	57.6	54.4	51.9	40.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	--	100.0	100.0	--	100.0	100.0	100.0	100.0	100.0	100.0
Population Growth Rates																						
1974-82 (w/o Nueva Loja, Coca)		159.1%			106.3%			159.3%			98.6%		--			--			123.2%			
1982-90			44.3%			48.0%			64.4%			52.0		81.9%			95.3%			62.1%		
1974-90 (w/o Nueva Loja, Coca)			273.8%			205.2%			326.4%			201.8%		--			--			237.6%		

Figure 3: Population distribution in the Amazon Region of Ecuador.



(Isolines represent the percentage share of Amazon population in each parroquia for the period indicated. To compute percentages, the population for each parroquia (in 1974, 1982, or 1990) was divided by the total population of the Amazon region for 1990; i.e., 74/90 indicates that population percents for 1974 are calibrated relative to 1990.)

Figure 4: Size of the 26 largest urban areas in the Amazon region of Ecuador.



(Circles represent the population size of each urban area, which ranges from 78 for Shushufindi in 1974 to 14438 for Puyo in 1990.)

Finally, Oriente urban areas are elements of a national system that has undergone tremendous change in recent decades. This includes shifts in the role of Guayaquil and Quito (Klak, 1992, 1993); increasing importance of intermediate-size cities such as Ambato, Riobamba, and Santo Domingo (Fig. 2); and significant economic and population growth throughout the system (Armstrong and McGee, 1985). The way these dynamics reverberate in Oriente towns, a similarly robust but lower level of Ecuador's urban structure, is important for understanding Third World urban systems.

ECUADOR'S AMAZON REGION AND APPLICABILITY OF GENERAL FRAMEWORKS

That *universal conceptualizations* apply to settlement in the Ecuador Amazon is evident from Brown, Sierra, Southgate, and Lobao (1992) and Brown and Sierra (1994). Consider the following observations linking Core-Periphery-type frameworks (Fig. 1) and the Oriente.

- ** Early population movements and missionary activity led to several Undifferentiated Frontier Settlements along the Andean fringe, corresponding with Stage I of Core-Periphery-type frameworks (Fig. 1A). Such settlements include Zamora, Yantzaza, Gualaquiza, Limon, Mendez, Macas, Puyo, Tena, and Archidona (Fig. 2).
- ** By 1974, some towns emerge as development poles and focal points of settlement, corresponding with Stage II (Fig. 1B). In terms of settlement overall, Zamora played this role in the south where inland penetration and hinterland development were then most prominent; also conspicuous is settlement focussed on Tena and Puyo, bolstered by the earliest Sierra-Amazon road (Fig. 3A). In terms of urban size, Zamora, Yantzaza, Macas, Puyo, and Tena eclipse other towns (Fig. 4A).
- ** By 1982, this picture changes dramatically. Following petroleum discovery in 1967 and related developments, highest settlement concentrations are now found in the northeast Amazon around Nueva Loja, settlement focussed on Puyo and Tena is more prominent than earlier, as is settlement proximate to Limon and Macas (Fig. 3B). Urban size differentials follow a similar pattern with noticeable growth in Nueva Loja, Coca, Tena, Puyo, Macas, and Limon (Fig. 4B). Also interesting is growth in the string of towns from Zamora north to Macas, even though settlement in the area is relatively light (Figs. 3B, 4B). In terms of Core-Periphery-type frameworks, the Oriente now corresponds with Stage III (Fig. 1C).
- ** By 1990, Stage IV (Fig. 1D) is well in evidence. The northeast Amazon continues to dominate the overall settlement pattern, but that concentration has spread to encompass Coca and Sushufindi as well as Nueva Loja;

secondary focal points occur around Puyo and Tena; and an emerging concentration is found near Macas, reflecting completion of the Puyo-Macas road in 1982 (Fig. 3C). Changes in urban size are even more dramatic (Fig. 4C), separating out four distinct tiers. Puyo and Nueva Loja dominate; Zamora, Macas, Tena, and Coca occupy a second tier; Yantza, Gualaquiza, Sucua, and Sushufindi comprise the third tier.

The preceding observations prompt four conclusions concerning Amazon development through 1990 and *universal conceptualizations*. First, Nueva Loja emerges as the focal point of a *mineral resource* hinterland and *secondary development pole*; extension of the road network to it and Coca initiated development of the northeast Oriente's hitherto untapped interior; and by 1990, the economic frontier had moved beyond Nueva Loja and Coca. Second, Puyo resembles a major *gateway* urban area. Essential here are its road connections in all directions—to the south through Macas, following that link's completion in 1982; to the north and northeast through Tena, bolstered by the recently completed Tena-Archidona-Coca road but established earlier by the Tena-Baeza-Nueva Loja route; and to major Sierra towns through the Puyo-Ambato road completed in 1947. Third, population growth in towns northward from Zamora suggest a *transportation corridor*, another element of Core-Periphery-type frameworks. Finally, it is clear that *universal conceptualizations* of frontier development provide a relevant perspective on the Amazon space-economy's evolution.

Concerning *context-dependent conceptualizations* the Pioneer Settlement and Local Service Center stages of Browder-Godfrey encompass central place emergence. In this regard, Wesche (1989) considers population size, urban functions, and rural service areas for Napo province, finding a well-defined hierarchy of towns but functional regions that are discrete rather than integrated. Brown, Sierra, Southgate, and Lobao (1992) surmise that Oriente urban places are at Browder-Godfrey's most advanced stage and probably moving beyond it. Similarly, Brown and Sierra (1994) and earlier observations in this paper indicate escalating interaction among Amazon locales and increasingly integrated functional regions.

A fit with the framework articulated by Muller also is evident. Dominance of Zamora, Macas, Puyo, Tena, and Nueva Loja by 1982 suggest his *pioneer periphery* stage (Figs. 3B, 4B). Petroleum's importance in the economy of Nueva Loja, Sushufindi, and to some degree Coca suggest they function as elements of a *specialized periphery*. All these places operate as *entrepot* towns. As indicated earlier, however, Puyo seems to be emerging as the dominant regional center of the *transitional periphery* (Figs. 3C, 4C)

The Ecuador Amazon also provides a good example of Wycoff's modification to the Meyer framework, i.e., that the role of some gateway centers will be curtailed, or eclipsed, with frontier expansion. Before 1968 development occurred primarily along the Andean fringe; after 1968, following major petroleum discoveries, it shifted to the northeastern interior. Zamora, Limon, and Puyo served as

gateway centers initially (Figs. 3A, 4A). By 1982 focus moved northward to Puyo, Tena, and Nueva Loja (Figs. 3B, 4B). By 1990 Sucumbios is established as a new province; Coca joins Nueva Loja as a secondary gateway to the east central and northeast interior; Macas, with its recently completed road connection to Puyo, also approaches secondary gateway status; and Puyo appears to be the *primary gateway*, with road connections to all parts of the Amazon (Figs. 3C, 4C).

This discussion amply demonstrates the relevance of *universal* and *context-dependent* frameworks for comprehending the overall *pattern* and *structure* of frontier urban systems. But general frameworks also pertain to a more local, particularized scale represented by the economic configuration of individual urban centers, an essential ingredient of frontier evolution and transformation.

URBAN ECONOMIC FUNCTIONS IN THE AMAZON

A *central element* of context-dependent conceptualizations is urban functions and changes therein. Accordingly, we now examine the mix of economic activities to identify *economic structure*, by town and for all towns together (Table 1). A secondary analysis focusses on each economic activity to assess whether it is concentrated in a particular town(s) or evenly spread.

This is done for the six largest Amazon towns: Zamora, Macas, Puyo, Tena, Nueva Loja, and Coca. All but Coca are province capitals. Nueva Loja and Coca are the focus of post-petroleum Amazon penetration, represent *secondary development poles* in core-periphery parlance, and achieved prominence in the Amazon urban system since the mid-1970s.

Urban functions are measured by the number of persons employed in urban-based economic sectors for 1974, 1982, and 1990. Aside from being primarily interested in urban functions, bypassing primary economic activity compensates for changes in parroquia boundaries and the fact that each 'urban' parroquia includes non-urban/rural areas as well, the proportion of which differs among parroquias. A constructive supplement to the analysis would be provided by monetary data on economic sectors, but such data are not presently available.

Table 1 provides the following observations.

- ** In Manufacturing, there are shifts over time among specific sectors and towns, but for each town and the six together (Composite), the percentage employed in the Manufacturing overall is approximately 10 percent.
- ** The Construction sector was much stronger in 1982 than in 1974 and 1990 (14.2 percent compared to 8.2/8.3 percent Composite). This corresponds with settlement expansion trends, but varies among towns. Tena, Puyo, Macas, and Nueva Loja were expansion foci in 1982, whereas Zamora had stabilized and Coca had not yet experienced a settlement expansion impact in its Construction sector.

- ** Commerce is an expanding sector. Between 1974 and 1982 its proportions held steady, but jumped significantly between 1982 and 1990 in all towns and the Composite. However, expansion is largely in retail activity; contrary to expectations of context-dependent models, wholesaling activity is minimal! Indeed, that approximately 20 percent of the 1990 workforce is employed in retail-restaurants-hotels suggests Amazon towns have emerged primarily as *central place*-type service centers.
- ** Transportation-Communications activity is related to settlement expansion and, in general, parallels Construction activity. Hence, we see a 1982 spike in Puyo, Macas, Nueva Loja, and the Composite measure.
- ** Service, dominated by government activity (Public Administration, Military, Community Service), is the most significant sector; it employs over 50 percent of the workforce in each town and time period, except in Nueva Loja at ~45 percent. An interesting aspect is importance of the Military. This is particularly strong in Zamora, near ongoing border conflicts with Peru; also in Nueva Loja and Coca which represent the fringe of frontier expansion. By contrast, a low percent of military employment is found in more settled areas such as Tena-Puyo-Macas.
- ** How does the Amazon compare with other regions in Ecuador? The column labeled 'Costa-Sierra 1990' is a composite for province capitals of those regions, which excludes the primate cities of Guayaquil and Quito but otherwise ranges from economically vibrant intermediate-size cities to towns comparable in size with our Amazon sample. Costa-Sierra has somewhat more of its labor force in the manufacturing (>6.2 percent) and retail sectors (>4.3 percent), somewhat less in service (<11.5 percent). Greater differences might be anticipated. More significantly, Service remains the leading sector, at 40.4 percent compared to 24.9 percent for Commerce and 16.8 percent for Manufacturing. Also noteworthy, Wholesale employs only 1.0 percent in the Costa-Sierra (1.4 percent if Guayaquil-Quito are included) which suggests the sector is either under-represented by Census tabulations, or small in employment both for Ecuador and the Amazon.

To complement this depiction of urban economic structure, we now consider *functional specialization* among Amazon towns, using Location quotients (LQs) for major economic sectors in 1974–82–90 (Table 2). If economic sector *k* were spread evenly among the six Amazon towns, it would have a location quotient of 1; that is, the percent of *k* employment in town *j* would equal the percent of town *j*'s population (both computed in terms of the six towns). Location quotients less than 1 indicate economic sector *k* is less important in town *j*; location quotients greater than 1 indicate sector *k* is more important.

TABLE 2

Economic Sector Location Quotients
for Selected Oriente Towns (Parroquias) in 1974, 1982, 1990

Economic Sector	Tena			Puyo			Macas			Zamora			Nueva Loja			Coca		
	1974	1982	1990	1974	1982	1990	1974	1982	1990	1974	1982	1990	1974	1982	1990	1974	1982	1990
Manufacturing	0.7	0.9	0.9	1.3	1.3	1.6	1.0	1.0	0.9	0.6	0.5	0.7	--	1.1	0.8	--	1.1	0.8
Utilities	0.6	1.2	1.4	0.3	1.4	0.8	1.2	1.2	0.9	2.9	0.2	0.4	--	1.0	1.1	--	0.8	1.4
Construction	1.2	0.9	1.1	1.1	1.2	0.8	0.7	1.5	1.4	0.9	0.7	1.2	--	1.1	0.9	--	0.4	0.8
Commerce	0.9	0.8	0.8	1.1	0.9	0.9	1.0	0.8	0.9	0.8	0.5	0.7	--	1.5	1.4	--	1.0	1.0
Transportation, Communications	1.0	0.7	0.8	1.2	1.3	1.2	1.0	1.0	1.0	0.5	0.4	0.5	--	1.3	1.1	--	0.9	1.2
Finance	1.0	0.9	0.6	1.0	1.5	1.4	1.2	1.6	1.2	0.9	0.7	0.9	--	0.7	1.0	--	0.6	0.8
Service	1.1	1.1	1.1	0.9	0.9	0.9	1.0	0.9	1.0	1.2	1.4	1.2	--	0.8	0.9	--	1.2	1.0

Puyo consistently has LQs greater than 1.0 for Manufacturing, Transportation-Communications, and Finance; Macas holds this distinction for Finance; Tena, Zamora, and Coca for Service; Nueva Loja for Commerce and Transportation-Communications. Aside from its Service function, Zamora consistently has LQs less than 1.0! Other LQs tend to be at or near 1.0, although Construction varies considerably from year to year and town to town reflecting shifts in expansionary activity. Evaluating these findings, in terms of activities highlighted by context-dependent conceptualizations of frontier settlement, leads to the conclusion that Puyo and Nueva Loja are cardinal urban areas and constitute the Amazon's *specialized* or *transitional periphery*. Tena, Macas, and Coca are important secondary towns; Zamora is important, but to a much lesser extent.

Considering these findings in terms of context-dependent conceptualizations of frontier urbanization, one major issue is local control. Personal knowledge suggests this probably remains external to the Amazon, and evidence presented here would not offset that assumption. A second major issue is emergence of a *lead economic activity(ies)*. Conceptualizations highlight wholesaling and finance. Amazon employment in these sectors is unimpressive, but this also holds for Ecuador overall. On the other hand, service activity is considerably greater than expected, which reflects an overall difference between today's Latin America and pre-20th century United States (Brown, Sierra, Southgate, and Lobao, 1992).

CONCLUDING OBSERVATIONS AND AN INTEGRATIVE FRAMEWORK

General frameworks of frontier urbanization largely derive from research on North American settings of the late 18th to early 20th centuries. This paper addresses their applicability to contemporary frontier settings, using the Ecuador Amazon as a laboratory for empirical analysis. Two types of framework were identified: *universal* and *context-dependent*. We also reviewed *case studies* in terms of factors highlighted by general frameworks. In moving along this *nomothetic-idiographic* continuum, each step discloses more about the situation being studied but less about frontier urbanization, or the emergence of frontier urban places, as a general process.

Universal conceptualizations of frontier urbanization are clearly relevant. Empirical data corresponded exceptionally well with Core-Periphery-type frameworks, as well as more abstract formulations embodying stages such as colonization-spread-consolidation and expansion of the *niche-space*.

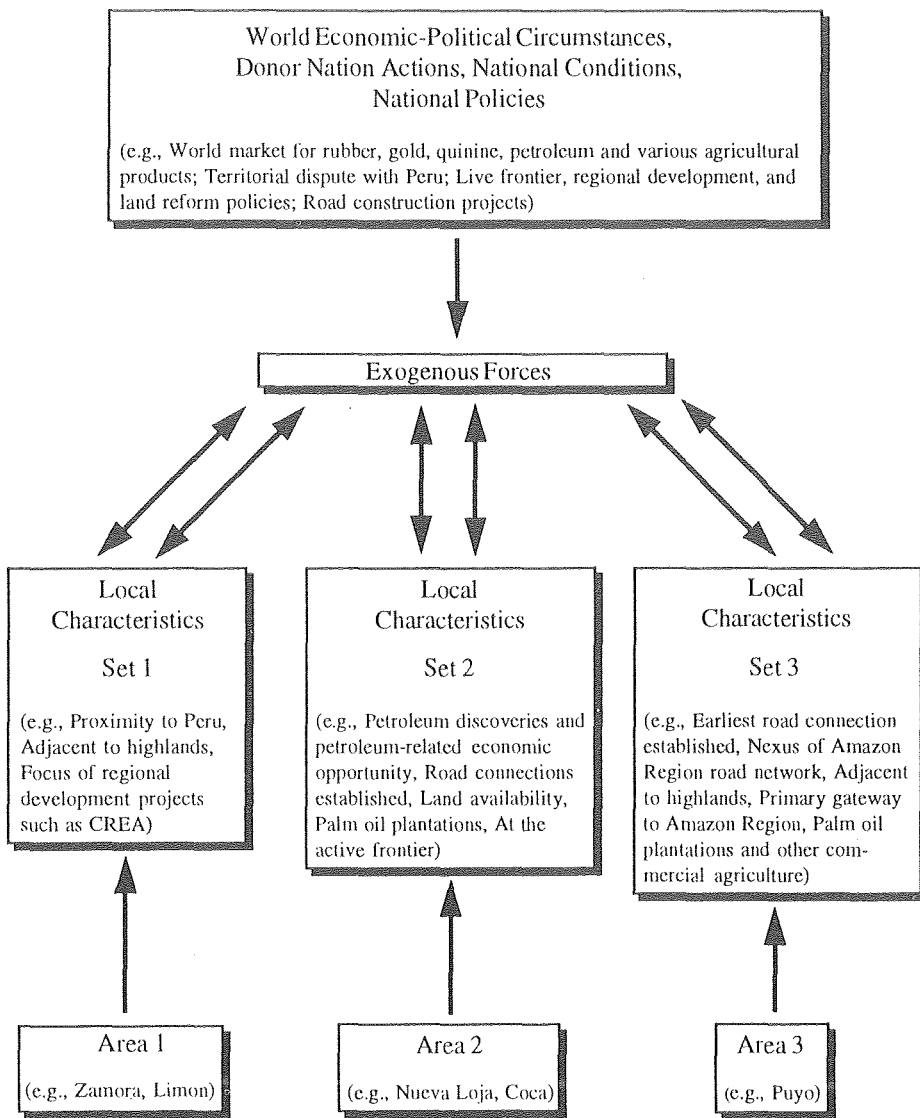
The fit with context-dependent conceptualizations was satisfactory, but observed discrepancies raise several questions for future consideration. Economic activity in Wholesaling was consistently weak in the 1974-90 period, Service activity was exceptionally strong and consistently so, while Commerce, particularly retailing, grew significantly to become a distinctly robust sector, positioned between Service and other economic activities.

Does this reflect the Oriente's *embryonic* stage? We are inclined to believe otherwise. Employment profiles in the Oriente are more severe but generally mirror those of Ecuador overall where Service dominates, albeit less so, followed by Commerce and Manufacturing. This raises, then, a fundamental issue. *Could Ecuador's Government-based service sector be a mechanism for urban dominance, as wholesaling and finance were for North America?* The question applies to frontier urbanization, but also is relevant for understanding Latin American urbanization in general. Alternatively, does the question become moot as Ecuador follows currently-popular economic strategies such as structural adjustment and privatization; how will these policies affect Amazon towns, or the space-economy overall? And would our findings be markedly altered if data were available to gauge economic sector strength in monetary rather than employment units? While there are no immediate answers to these queries, they *underscore* the *context-dependency* of urban system evolution in frontier settings.

Another issue concerns changing fortunes of Amazon towns: why certain urban areas become more important, others less so, and some maintain a steady-state in the economic hierarchy. A *context-dependent* framework for understanding this issue, and other transformation in frontier urban systems, is provided by Brown (1988, 1991; Brown and Sierra, 1994). Diagrammed in Figure 5, this states that change in Third World regions results from the interaction of local (or endogenous) characteristics with exogenous forces related to world economic-political circumstances, donor nation actions, national conditions, and policies of Third World governments. Change varies from locale to locale, *contingent* on the endogenous-exogenous mix at each. Among exogenous forces affecting Oriente towns are *world demand* for (in order of occurrence) rubber, gold, quinine, and petroleum, the last of which led to the 1947 Ambato-Puyo and 1971 Quito-Baeza-Nueva Loja-Coca roads; *international political circumstances* such as Ecuador's territorial dispute with Peru which resulted in *policies* to preserve national security, military installations/settlements, construction of the 1960 Loja-Zamora road, and encouragement of *live frontiers*; and other *national policies* establishing regional development agencies. *Donor nation actions* also have been important in colonization and road construction projects: for example, the 1970 road from Cuenca to Limon and recently completed Coca-Archidona-Tena road. Also important are *exogenous forces* that *fueled Oriente-bound migration* from the Sierra and Costa such as land reform (Brown, Brea, and Goetz, 1988), curtailment of world demand for Panama-Toquilla Palm hats, and adverse climatic conditions such as drought.

More specifically, Zamora and other southern Oriente towns (represented by Local Area 1 in Figure 5) benefitted initially by Ecuador's territorial dispute with Peru, out-migration from adjacent provinces such as Azuay and Loja in the Sierra, and government-donor nation development projects through agencies such as CREA (Center for the Economic Reconversion of Azuay, Canar, and Morona Santiago) (Rudel, 1993). While these factors remained important, focus shifted to

Figure 5: Scheme of the landscape-change process in third world settings, applied to evolution of a frontier urban system in the Ecuador Amazon.



Change in local areas 1,2 and 3 differs according to their respective (endogenous) characteristics and the nature of the exogenous force(s).

the north and northeast Oriente as petroleum became more prominent in the economy. Roads were built, economic opportunity increased (as the need for workers grew and new land became accessible/available), and migration streams shifted accordingly. Growth occurred in towns such as Nueva Loja and Coca (Local Area 2 in Figure 5) which were simultaneously focal points of the petroleum economy, outposts at the edge of frontier expansion, and in general, *secondary development poles*. Closer to the Andes, Puyo (Local Area 3 in Figure 5) currently appears to be the *primary Amazon gateway*. It had the earliest (1947) transportation link to Ambato and Quito, major urban centers in Ecuador's economy, but then lost ground to Tena which was better placed vis-à-vis the Quito-Baeza-Nueva Loja road (1971) linking petroleum areas to the highlands. In the last decade, however, Puyo regained prominence with completion (1982–90) of roads linking Macas-Puyo and Coca-Tena-Puyo, which effectively shifted the focus of development to central Amazon locales within Puyo's hinterland and eastward.

Concerning applicability of the context-dependent framework depicted in Figure 5 to areas other than the Oriente, consider Delavaud's (1980) study of Ecuador's Costa. Its frontier settlement was driven by world demand for export staples such as cacao in the early 1900s (for which Ecuador was the largest exporter), bananas in the 1940s and later. Boom periods were followed by downturns, and state intervention encouraged both crop diversification and modernization of production practices. The national government, together with financial-technical assistance from donor nations, also initiated irrigation projects and improved infrastructure. A similar argument could be made for the case of Santa Terezinha Brazil, summarized above (Lisansky, 1990).

Finally, the *universal* and *context-dependent* frameworks on which this paper has built are, like regional development frameworks in general, *parables of progress* (Brown, 1991; Wilber and Jameson, 1988) that imply a monotonic trend of continuous frontier expansion and urban development. As we have seen, however, the pace, direction, and form of development in fact reflects economic-political occurrences in other locales and overall; that is, frontiers function in a national or macro context (Fig. 5). Prosperity, stagnation, recession, and market changes nationally and internationally affect the impetus to build infrastructure, settle new lands, favor some locales over others, or neglect the frontier entirely. In this regard, Ecuador's economic growth since World War II encompasses divergent oscillations. Price variations in the world petroleum market, for example, contributed to robust economic conditions in the 1970s, but weakness in the 1980s; petroleum finds in the late 1960s shifted Amazon development from a southern- to northern-Oriente focus; and imposition of structural adjustment, monetary reform, and privatization policies in the 1980s altered economic structure throughout Ecuador. Hence, to better understand Ecuador's frontier expansion, urban growth, and shifts in urban prominence, an appropriate conceptual framework might integrate long term economic cycles such as *Kondratiev Waves*,

short term business fluctuations, and the role of economic structure in buffeting or magnifying economic cycle impacts on local areas (Berry, 1991; Casetti, King, and Jeffrey, 1971; Jones, 1983; Krakover and Morrill, 1992). Earle's framework for studying early American frontiers (Earle, 1977, 1992a, 1992b; Earle and Cao, 1993) provides an example. Application of this framework is not feasible with the data at hand; it is, however, an important perspective for future research.

ACKNOWLEDGMENTS

Research reported here was funded by NSF Grant SBR-9211531 and the Ohio State University Office of the Vice President for Research. An earlier version of the paper was presented at the Conference on Regional Development: Challenge of the Frontier, organized by the Ben-Gurion University Negev Center for Regional Development. Helpful comments were provided by Roy Ryder.

REFERENCES

- Armstrong, W. and McGee., T.G. (1985) *Theatres of Accumulation: Studies in Asian and Latin American Urbanization*. London and New York: Methuen.
- Berry, B.J.L. (1991) *Long-Wave Rhythms in Economic Development and Political Behavior*. Baltimore and London: Johns Hopkins University Press.
- Bromley, R.J. (1972) Agricultural colonization in the Upper Amazon Basin: The impact of oil discoveries. *Tijdschrift voor Economische en Sociale Geografie*, 63:278-294.
- Browder, J.O. and Godfrey, B.J. (1990) Frontier urbanization in the Brazilian Amazon: A theoretical framework for urban transition. *Yearbook of the Conference of Latin Americanist Geographers*, 16:56-66.
- Brown, L.A. (1988) Reflections on Third World development: Ground level reality, exogenous forces, and conventional paradigms. *Economic Geography*, 64:255-278.
- Brown, L.A. (1991) *Place, Migration, and Development in the Third World: An Alternative View*. London and New York: Routledge.
- Brown, L.A., Brea, J.A. and Goetz, A.R. (1988) Policy aspects of development and individual mobility: Migration and circulation from Ecuador's rural Sierra. *Economic Geography*, 64:147-170.
- Brown, L.A., Sierra, R., Southgate, D., and Lobao, L. (1992) Complementary perspectives as a means of understanding regional change: Frontier settlement in the Ecuador Amazon. *Environment and Planning, A* 24:939-961.
- Brown, L.A. and Sierra, R. (1994) Frontier migration as a multi-stage phenomena reflecting the interplay of macro forces and local conditions: The Ecuador Amazon. *Papers in Regional Science*, 73.
- Bylund, E. (1960) Theoretical considerations regarding the distribution of settlement in inner north Sweden. *Geografiska Annaler B*, 42:225-231.

- Casetti, E., King, L. and Jeffrey, D. (1971) Structural imbalance in the U.S. urban-economic system, 1960–1965. *Geographical Analysis*, 3:239–255.
- Conzen, M.P. (1975a) A transport interpretation of the growth of urban regions: An American example. *Journal of Historical Geography*, 1:361–382.
- Conzen, M.P. (1975b) Capital flows and the developing urban hierarchy: State bank capital in Wisconsin, 1854–1895. *Economic Geography*, 51:321–338.
- Conzen, M.P. (1977) The maturing urban system in the United States, 1840–1910. *Annals of the Association of American Geographers*, 67:88–108.
- Delavaud, A.C. (1980) From colonization to agricultural development: The case of coastal Ecuador. In Preston, D.A. (ed.) *Environment, Society, and Rural Change in Latin America: The Past, Present, and Future in the Countryside*. Chichester and New York: John Wiley, pp. 67–81.
- Earle, C. (1977) The first English towns of North America. *Geographical Review*, 67:34–50.
- Earle C. (1992a) *Geographical Inquiry and American Historical Problems*. Stanford: Stanford University Press.
- Earle, C. (1992b) Pioneers of Providence: The Anglo-American experience, 1492–1792. *Annals of the Association of American Geographers*, 82:478–499.
- Earle, C. and Cao, C. (1993) Frontier closure and the involution of American society, 1840–1890. *Journal of the Early Republic*, 13:163–179.
- Findley, S.E. (1988) Colonist constraints, strategies, and mobility: Recent trends in Latin American frontier zones. In Oberai, A.S. (ed.) *Land Settlement Policies and Population Redistribution in Developing Countries: Achievements, Problems, and Prospects*. New York: Praeger, pp. 271–316.
- Glasmeyer, A. (1990) The role of merchant wholesalers in industrial agglomeration formation. *Annals of the Association of American Geographers*, 80:394–417.
- Godfrey, B.J. (1990) Boom towns of the Amazon. *Geographical Review*, 80:103–117.
- Godfrey, B.J. (1991) Review of *Migrants to Amazonia*, by Judith Lisansky. *Geographical Review*, 81:247–249.
- Henkel, R. (1982) The move to the Oriente: Colonization and environmental impact. In Ladman, J.R. (ed.) *Modern-Day Bolivia: Legacy of the Revolution and Prospects for the Future*. Tempe: Arizona State University Center for Latin American Studies, pp. 277–299.
- Hudson, J.C. (1969) A location theory for rural settlement. *Annals of the Association of American Geographers*, 59:365–381.
- Hudson, J.C. (1985) *Plains Country Towns*. Minneapolis: University of Minnesota Press.
- INEC. (1990) *Division Politico-Administrativa de la Republica del Ecuador 1990*. Quito: Instituto Nacional de Estadística y Censos.

- INEC. (1992) *Division Politico-Administrativa de la Republica del Ecuador 1992*. Quito: Instituto Nacional de Estadística y Censos.
- Jones, D.W. (1983) Mechanisms for geographical transmission of economic fluctuations. *Annals of the Association of American Geographers*, 73:35–50.
- Klak, T. (1992) Recession, the state, and working class shelter: A comparison of Quito and Guayaquil during the 1980s. *Tijdschrift Voor Economische en Sociale Geografie*, 83:120–137.
- Klak, T. (1993) Why do shelter conditions differ in Ecuadorian cities and how do we know that they do? A comparative locality study. *Environment and Planning A*, 25:1115–1129.
- Knight, C.G. and Newman, J.L., eds. (1976) *Contemporary Africa: Geography and Change*. Englewood Cliffs: Prentice-Hall.
- Krakover, S. and Morrill, R.L. (1992) Long-wave spatial and economic relationships in urban development. In Jones III, J.P. and Casetti, E. (eds.) *Applications of the Expansion Method*. London and New York: Routledge, pp. 161–184.
- Lisansky, J. (1990) *Migrants to Amazonia: Spontaneous Colonization in the Brazilian Frontier*. Boulder: Westview.
- Mahoney, T.R. (1990) *River Towns in the Great West: The Structure of Provincial Urbanization in the American Midwest, 1820–1870*. Cambridge: Cambridge University Press.
- Meyer, D.R. (1980) A dynamic model of the integration of frontier urban places into the United States system of cities. *Economic Geography*, 56:120–140.
- Meyer, D.R. (1990) The rise of the industrial metropolis: The myth and the reality. *Social Forces*, 68:731–752.
- Morrill, R.L. (1963) The development of spatial distributions of towns in Sweden: An historical-predictive approach. *Annals of the Association of American Geographers*, 53:1–14.
- Morrill, R.L. (1965) *Migration and the Spread and Growth of Urban Settlement*. Lund: Gleerup, Lund Studies in Geography B-26.
- Muller, E.K. (1977) Regional urbanization and the selective growth of towns in North American regions. *Journal of Historical Geography*, 3:21–39.
- Olsson, G. (1968) Complementary models: A study of colonization maps. *Geografiska Annaler B*, 50:1–18.
- Ozorio de Almeida, A.L. (1992) *The Colonization of the Amazon*. Austin: University of Texas Press.
- Pred, A. (1977) *City-Systems in Advanced Economies: Past Growth, Present Processes, and Future Development Options*. New York: John Wiley, Halsted.
- Pred, A. (1980) *Urban Growth and the Circulation of Information: The United States System of Cities, 1790–1840*. Cambridge: Harvard University Press.
- Rudel, T.K. (1993) *Tropical Deforestation: Small Farmers and Land Clearing in the Ecuadorian Amazon*. New York: Columbia University Press.

- Scott, I. (1982) *Urban and Spatial Development in Mexico*. Baltimore: Johns Hopkins University Press.
- Stohr, W. (1975) *Regional Development Experiences and Prospects in Latin America*. The Hague: Mouton.
- Taaffe, E.J., Morrill, R.L. and Gould, P.R. (1963) Transport expansion in underdeveloped countries: A comparative analysis. *Geographical Review* 53:503–529.
- Turner, J.H. (1986) *The Structure of Sociological Theory*. Fourth edition. Chicago: Dorsey Press.
- Vance, J.E. (1970) *The Merchant's World: The Geography of Wholesaling*. Englewood Cliffs: Prentice Hall.
- Wade, R.C. (1959) *The Urban Frontier: The Rise of Western Cities, 1790–1830*. Cambridge: Harvard University Press.
- Wallace, W.L. (1971) *The Logic of Science in Sociology*. Chicago: Aldine.
- Wesche, R. (1989) Los Lugares Centrales en Una Zona de Colonizacion Amazonica: La Provincia de Napo, Ecuador. *Paisajes Geograficos*, 10:5–52.
- Wilber, C.K. and Jameson, K.P. (1988) Paradigms of economic development and beyond. In Wilber, C.K. (ed.) *The Political Economy of Development and Underdevelopment, Fourth Edition*. New York: Random House, pp. 3–27.
- Wyckoff, W. (1988a) Revising the Meyer model: Denver and the national urban system, 1859–1879. *Urban Geography*, 9:1–18.
- Wyckoff, W. (1988b) *The Developer's Frontier: The Making of the Western New York Landscape*. New Haven: Yale University Press.