CHAPTER 5
MACROLEVEL STRESSES AND MICROLEVEL RESPONSES:
LINKING AZTEC IMPERIAL ECONOMY AND MARKET PARTICIPATION

Introduction

Imperial attempts to control strategic resources and to resolve the problems of urban supply in the imperial core altered the context of production and exchange in the Aztec heartland both directly and indirectly, by creating economic stresses and opportunities within the market system that favored certain economic developments and discouraged others. To understand the specific ways in which the imperial political economy affected production and exchange, this chapter attempts to define causal links between specific political processes and changes in the context of market participation.

In doing so, this analysis first focuses on decision-making processes of peasant producers as a means for modelling economic decisions among the vast majority of the commoner population engaged in agricultural production and/or craft production in Aztec times. It assumes that these producers were not merely passive by-standers, but rational reactors to economic problems, whose solutions to those problems were largely guided by concerns for income security and stability.1 The analysis begins with a general discussion of market system characteristics that would encourage or discourage market participation under a strategy of economic risk minimization.

The analysis then turns to an examination of how Aztec imperial political activities (or macrolevel forces) potentially altered those characteristics. It brings together the many-stranded argument presented in Chapter 4 to propose key points of articulation between Aztec political economy and market structure and to predict
changes in market system organization resulting from that articulation. Finally, predictions are set out concerning specific microlevel responses to those changes -- reflecting the decisions of individual producers -- that would affect the organization and energetics of craft production, and thus be visible in the archaeological record.

An overview of the argument followed is presented in schematic form in Table 5.1. As suggested in this diagram, macrolevel political forces associated with imperial consolidation, in conjunction with urban growth and ecological diversity, established the context of craft production. These factors combined to structure peasant production decisions through their impact on market system organization, market demand, and the distribution of agricultural resources, respectively. Microlevel responses to these factors involved decisions concerning what to produce, as well as how that production should be organized.

### Table 5.1
Factors Affecting the Regional Organization of Craft Production

<table>
<thead>
<tr>
<th>MACROLEVEL FORCES</th>
<th>LINKAGES</th>
<th>MICROLEVEL PROCESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>political consolidation</td>
<td>market system organization</td>
<td>Organization of Craft Production:</td>
</tr>
<tr>
<td>urban growth</td>
<td>market demand</td>
<td>- distribution</td>
</tr>
<tr>
<td>ecological diversity</td>
<td>agricultural resources</td>
<td>- scale/composition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- intensity</td>
</tr>
</tbody>
</table>

The argument assumes, based on ethnohistoric data, that craft specialists in Aztec society were predominantly male, the major exception being that spinning and
cloth-making were conducted by women (Hicks 1994). To date, the evidence suggests that the majority of these craft producers worked at their specialties on a part-time basis, and relied on their subsistence plots for their day-to-day livelihood (Cortés 1865:541-542; Hicks 1982b:241-242, 1987:93, 1994; Sanders and Webster 1988). Only a minority of specialists were full-time producers; these full-time specialists, however, appear to have engaged primarily in the production of elite prestige items (Carrasco 1978; Brumfiel 1987; Hicks 1987; Charlton, Nichols, and Charlton 1991).

The production of most utilitarian commodities, then, was constrained by a more primary concern, that of the cultivation of household plots for the maintenance of the household unit. This constraint governed both the total amount of time available for other production activities as well as the scheduling of available free-time according to the changing work load of the agricultural cycle. Further, it suggests that most producers were balancing opportunities to engage in craft production against the advantages of subsistence agriculture, as alternative ways of making a living in a variable physical and social environment.

**Production for Agrarian Market Systems**

**Preconditions for Market Participation**

In agrarian systems, peasant farmers aim at economic self-sufficiency by producing all or most of their subsistence needs. Although they may participate in market exchange as “target marketers” when they happen to have a surplus to exchange or need some item they do not produce, the market is not the source of everyday necessities (Bohannon and Dalton 1965; Kurtz 1974; Hicks 1987). In contrast, production for a market as a major component of subsistence activities usually involves a degree of specialization -- a channeling of productive energies into some aspect of either primary or secondary production that is perceived as likely to reward that investment, but that reduces the time available for producing staple goods.²
Specialization is generally held to be more productive than subsistence production since it implies the more efficient employment of the resources available; subsistence farming on the other hand implies an attempt to wrest from the soil products which it is not necessarily best suited to produce. The greater efficiency and productivity of specialized production promises increased income and hence improved welfare for the producer's family. However, such specialization entails the loss of self-sufficiency. If a subsistence farm family is to become more specialized in either primary or secondary production, it must give up some independence and control over its well-being (Plattner 1989:180). In an agrarian society where self-sufficiency is highly prized, the move from subsistence agriculture to a market economy is not an obvious step. Decisions concerning market participation (what to produce and how much) involve weighing the merits of self-sufficiency and security associated with subsistence farming against the increased efficiency and income accruing from specialized production.

Plattner (1989:181) suggests that in order for producers to commit themselves to a market economy, three preconditions for market trade must be met -- (1) regularity, (2) adequacy, and (3) security. First, the market must be regularly and predictably available and the demand or outlet for goods must be steady and sufficiently predictable for producers to schedule their production to meet that demand. In addition, the supply and assortment of goods desired or needed in exchange must be appropriate and sufficient to satisfy the needs of agrarian producers. Finally, market activity must be protected by authorities so that people can trade without fearing for their safety. Only when these three preconditions are met are people willing to entrust their future to it.

Factors Affecting Market Participation

Although imperial consolidation may guarantee the security of market interactions, a number of interrelated factors can affect the regularity and adequacy of
agrarian market systems under imperial rule. Primary among these are market structure, consumer demand, and agricultural productivity.³

**Market Structure.** One critical factor affecting market system participation is the existence of a reliable market network to bring primary and secondary components together on a consistent basis. As discussed in Chapter 3, economic geographers (Plattner 1989:203-204; C. Smith 1977) make a fundamental distinction between integrative and underdevelopmental market systems, resulting from differences in market structure and direction of commodity flow. In integrative market systems (characterized by both well-developed network and hierarchy), goods move both vertically and horizontally between communities. In contrast, underdevelopmental market systems (typified by predominantly hierarchical linkages), goods move vertically between core and periphery or between center and subordinate communities, with minimal lateral movement between centers at the same level of the hierarchy.

The integrative and underdevelopmental market systems offer very different opportunities for market participation and hence production strategies, primarily to the extent to which they offer regular and adequate sources of subsistence goods. In an integrative market system, the free flow of goods through the marketing system means that any producer can specialize in the production of a single commodity, secure in the knowledge that the staples the local community does not produce will be forthcoming from the market (Plattner 1989:203). In contrast, the absence of horizontal linkages between communities in the underdevelopmental market system means that communities do not have access to subsistence goods to buffer local fluctuations in supply or to exchange for specialized produce. Thus, the rural population is more likely to retain its self-sufficiency by engaging in subsistence agriculture and petty commodity production.

**Consumer Demand.** Incentives to participate in a market economy also depend on the kinds of goods desired in the market and in what volume, and the
individual's or household's ability to produce for that market. In an integrated market system, every producer can potentially specialize in a marketable product, knowing that the basic necessities not locally produced will be obtainable through the market (C. Smith 1977). Producers can thus concentrate on whatever product their resources and skills render most profitable. In contrast, when the market is structured by and for an urban elite, consumer demand will be greatest for agricultural produce and other foodstuffs (see for example Appleby 1976). Obviously, the rural producer's ability to meet that demand depends on the productivity of his agricultural lands or his access to other food-producing resources.

The volume of consumer demand also affects decisions concerning market participation. Specialized producers of either primary or secondary goods need to be able to supply a sufficiently large number of consumers that are willing and able to purchase a sufficiently large quantity of their goods, such that the volume of exchange meets or exceeds the subsistence needs for their own households. With sufficient consumer demand, specialized suppliers are supported; below that point, part-time or mixed production strategies are called for (C. Smith 1974).4

Consumer demand for a subsistence or utilitarian good is largely a function of population density. An overall increase in population size and density potentially contributes to the regularity of a market system by increasing total consumer demand. But consumer demand, and hence opportunities to engage in specialized production, also vary spatially according to settlement size and market access. Dense urban centers create a large and stable consumer demand for foodstuffs, and may select for the greater efficiency and productivity of specialty farming in adjacent agricultural regions (von Thünen 1966; French 1964:128-132; Hassig 1985:21-28). Similarly, these population centers would be more likely to support specialized craft production than would less densely settled areas. But in either case, full-time specialty production to meet urban demand depends on whether the market system was structured to deliver
subsistence goods required in exchange. Even under conditions of a large consumer demand, part-time specialization will persist if specialists need to be buffered against fluctuations in supply and demand, or if exchange is not sufficiently stable to provide reliable quantities of subsistence goods or raw materials (Brumfiel 1986; Brumfiel and Earle 1987:5).

**Agricultural Productivity.** At the general level, market participation depends on a reliable supply of staple food surpluses entering the market system to receive in exchange for specialty foods or manufactured goods, as noted above. Again, this availability is a function of both overall productivity and of market structure: a region may be capable of producing surpluses, but if the market system is poorly articulated, those surpluses will not reach consumers.

Agricultural potential also clearly affects decisions concerning production strategies at the level of the individual rural producer. Several agricultural factors combine here to create different opportunities and incentives for production and hence market participation. These are: (1) the overall productivity of agricultural lands, (2) the reliability of agricultural productivity; (3) the intensity and scheduling of agricultural activities, and (4) the demand for agricultural supplies. Agricultural productivity determines what and how much agricultural surplus can be produced for market exchange, while agricultural reliability and scheduling affect whether surplus production for exchange is feasible and desirable.

An obvious contrast in the level of agricultural productivity, reliability, and intensity of effort is between extensive and intensive forms of agricultural production. Extensive forms of cultivation may be characterized as requiring lower labor inputs, but may also be less productive and less predictable in yield. In contrast, more intensive forms of cultivation aim not only at increasing productivity but also at evening out productivity through greater investments in labor and resources. These different agricultural regimes provide different incentives and opportunities for market
participation, reflecting two different strategies for alleviating economic uncertainty: diversification and intensification.

In areas of extensive agriculture, natural interannual variability in agricultural output may call for the development of alternative resources (both agricultural and non-agricultural) to supplement shortfalls and to alleviate agricultural uncertainties (Arnold 1980, 1985:168; Feinman and Nicholas 1990; Netting 1974:40). In addition, the naturally busy and slow times in the agricultural cycle can accommodate the incorporation of other types of production, on a part-time or seasonal basis (Waddell 1972:218). Thus, there is both more incentive and more opportunity to develop alternative sources of income, i.e. to diversify. Efforts to diversify production may involve the addition of back-up (specialty) crops, alternative food resources (such as hunting, fishing, salt-making), or part-time production of utilitarian commodities that can be utilized by the family or for exchange.

Intensive agriculture, in contrast, provides a relatively more productive and more reliable agricultural base. In addition, the pace of agricultural activity is more continuous, with less time for other types of production. In this case, there is less incentive as well as less opportunity to diversify subsistence pursuits or to engage in craft production as a supplemental form of income. As a result, under a strategy of intensification, regions focusing on intensive agriculture increase their agricultural production for market exchange and hence their reliance on the market to deliver desired commodities in exchange for surplus foodstuffs (Blanton et al. 1982:22-23; Blanton 1985).

In summary, in agrarian market systems, decisions concerning market participation (what to produce and how much) are conditioned by three primary considerations: consumer demand, sufficient and reliable primary production, and a reliable market network to bring primary and secondary components together. To the extent that any of these factors are variable in space, market system participation can
be expected to vary spatially as well. Thus, we cannot expect to see a uniform response in regions of diverse economic potential. Finally, these responses affect both the organization of production (in terms of the distribution, scale, and intensity of productive activities), as well as the type and quality of good produced -- factors that allow us to monitor economic responses along several dimensions.

Microlevel Responses: Predicting Regional Patterns in the Organization of Craft Production

The impact of market structure, urban demand, and agricultural productivity on the regional organization of craft production can be examined in modern peasant marketing systems. For example, the organization of rural productive strategies (in both agricultural and non-agricultural goods) in relation to regional variations in exchange systems and consumer demand has been demonstrated by Carol Smith (1977, 1989) for Western Guatemala. Western Guatemala contains a variety of market system structures, three of which have relevance here (Table 5.2).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Market Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Core</td>
</tr>
<tr>
<td>market structure</td>
<td>top-heavy</td>
</tr>
<tr>
<td>distance to major market</td>
<td>0-15 km</td>
</tr>
<tr>
<td>local vehicles per # families</td>
<td>1:85</td>
</tr>
<tr>
<td>farm size (cuedras)</td>
<td>35.3</td>
</tr>
<tr>
<td>annual farm income ($)</td>
<td>313</td>
</tr>
</tbody>
</table>

The core zone is representative of urbanized areas and/or areas at the centers of regional systems adjacent to the highest order center. Most residents are located within easy walking distance of a major urban market (Table 5.2) where market attendance is regular and predictable and where consumer demand for rural produce is high.

The central zone has an interlocking hierarchy of markets, characteristic of regional market systems providing both vertical and horizontal integration among producers and consumers. Market demand is regular and predictable, but distance to urban markets (and to urban demand for rural produce) is significantly greater than in the core zone.

Finally, the peripheral zone of the regional system is dendritic in structure. Commodity flows are primarily vertical, with minimal articulation among market centers of the same order. The reliability and consumer demand in local markets is low, while distance to the major urban market is great.

In all market zones, the rural population engages primarily in agricultural production. In addition, virtually all rural households produce some non-agricultural goods, most of which are sold. For both these activities, however, the scale and intensity of production vary significantly across the different market zones.

Differences in agricultural production indicate a tendency toward intensification near the urban core and extensive land-use systems in the periphery, although land qualities are roughly equivalent. Core-zone farmers have smaller field sizes, but take in a much higher income from their land (Table 5.2). This is due to both land improvements such as terracing and fertilizing, as well as the fact that farmers put a larger percentage of their land under cash crops (nearly two-thirds) (C. Smith 1989:797-798). In contrast, farmers in the periphery produce less income on more land, partly as a function of extensive fallow field systems as well as a tendency to plant subsistence rather than cash crops.
In examining the organization of non-agricultural production, C. Smith (1989:798-799) distinguishes two types of production, handicrafts and artisanry, that also differ in scale and intensity. In handicraft production (e.g. baskets, mats, rope, some pottery, and certain other household goods), the individual is generally the unit of production. Inputs consist of materials produced by the household itself, such that investments (and associated risk factors) are low, but returns tend to be very low as well. Production is part-time, and Smith comments that it fits in especially well with non-intensive agriculture.

In contrast, artisanal production (e.g. clothing and shoes) is a larger-scale and more intensive enterprise. The production unit tends to be either the household or a small workshop (C. Smith 1977:139) and requires a greater investment in the purchase of raw materials and equipment (such as a sewing machine). Investments (and risk levels) are therefore higher, but so are the potential returns. To warrant this risk and to pay-off capital investments, more time is devoted to production efforts, such that production is more intensive.

By monitoring the distribution of handicraft vs. artisanal production across market zones, Smith demonstrates that the distribution, scale, and intensity of independent production vary significantly with regional variations in market system structure and access to urban markets. These trends are quite strong (Table 5.3).

In terms of the distribution of producers, artisanal production is concentrated in the core zone. Greater than 70% of full-time craft producers in the region live in or near the core zone, although this area supports only 38% of the population (C. Smith 1977:125). In terms of scale, a much greater percentage of producers are engaged in the larger-scale artisanal enterprises in the core zone (Table 5.3A), while artisanry is relatively rare in the peripheral zone. Finally, the intensity of production is affected: a much greater percentage of work-time is devoted to the more intensive artisanal production in the core, as compared with the central and peripheral zones (Table 5.3B).
Table 5.3
Differences in Craft Production Concentration and Intensity by Market Zone in Western Guatemala

A. Number of producers as a measure of concentration:
(% male heads of households in household survey [N=2525])

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Market Zone</th>
<th>Core</th>
<th>Central</th>
<th>Periphery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td></td>
<td>22.7</td>
<td>46.2</td>
<td>45.0</td>
</tr>
<tr>
<td>Commerce</td>
<td></td>
<td>26.9</td>
<td>20.1</td>
<td>19.2</td>
</tr>
<tr>
<td>Handicraft</td>
<td></td>
<td>1.8</td>
<td>5.6</td>
<td>16.7</td>
</tr>
<tr>
<td>Artisanry</td>
<td></td>
<td>43.7</td>
<td>15.1</td>
<td>9.0</td>
</tr>
<tr>
<td>Commodity(^b)</td>
<td></td>
<td>45.8</td>
<td>20.7</td>
<td>25.7</td>
</tr>
</tbody>
</table>

\(^a\)Data from C. Smith (1989:Table 6).

\(^b\)Handicraft plus artisanal production.

B. Allocation of time invested as a measure of intensity:
(% of total time worked by household members)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Market Zone</th>
<th>Core</th>
<th>Central</th>
<th>Periphery</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handicraft:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td>4.3</td>
<td>3.0</td>
<td>5.6</td>
<td>5132</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td>11.3</td>
<td>11.7</td>
<td>13.9</td>
<td>4422</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>7.5</td>
<td>7.0</td>
<td>9.4</td>
<td>9554</td>
</tr>
<tr>
<td>Artisanry:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td></td>
<td>37.2</td>
<td>20.0</td>
<td>21.2</td>
<td>5132</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td>55.1</td>
<td>35.9</td>
<td>21.6</td>
<td>4422</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>45.5</td>
<td>27.3</td>
<td>21.4</td>
<td>9554</td>
</tr>
<tr>
<td>Ratio (H:A):</td>
<td></td>
<td>1:6.0</td>
<td>1:3.9</td>
<td>1:2.2</td>
<td></td>
</tr>
<tr>
<td>Commodity(^d)</td>
<td></td>
<td>53.0</td>
<td>34.3</td>
<td>30.4</td>
<td></td>
</tr>
</tbody>
</table>

\(^c\)Data from C. Smith (1989:Table 8).

\(^d\)Handicraft plus artisanal production.
Thus, in the core zone, more producers are involved in larger scale and more intensive forms of craft production (artisanry vs. handicrafts), and these non-agricultural activities take up a significant proportion of their work time (mean = 53%). In the central zone, artisanal production still dominates over handicrafts, but the total amount of time devoted to non-agricultural production drops to 34%. Finally, in the periphery, the small scale, low intensity handicraft production is more common; total time invested in non-agricultural activities declines slightly to an average of 30%.6

The relative balance of agricultural and non-agricultural production reflects the strategies noted earlier: intensification vs. diversification. In the core zone, proximity to urban markets and high consumer demand means that agricultural systems reward additional inputs of effort that increase salable outputs. The result is both intensification of effort and increasing agricultural specialization in the form of cash crops. Proximity to urban markets, however, also supplies sufficient demand for craft production, leading to intensification of efforts in secondary production. In this context, scheduling conflicts will eventually arise that require the would-be artisan-farmer to choose between these two economic pursuits for more intensive exploitation; in these cases, some artisans will opt for yet more intensive (i.e., full-time) craft production (Costin 1991:17).

In the periphery, in contrast, local forms of agricultural production do not reward additional inputs of labor because local consumer demand is low. In addition, the dendritic market system is not structured to deliver a reliable supply of subsistence goods needed in exchange for more specialized production. Producers accordingly rely more heavily on subsistence agriculture, and diversify their income with primarily low investment/low risk handicraft production.

The central zone does not fit the neat dichotomy between intensification and diversification. Land productivity levels are slightly higher here than elsewhere in Western Guatemala (C. Smith 1989:793). Most rural households produce food for
market sale, while relatively few adult males (20%) engage in either handicraft or artisanal production. Thus, there would appear to be no strong pressures on households to increase productivity through either intensification or diversification. Alternatively, had land productivity or land availability been poor in this region, we might expect to find more intensive craft production emerge as a response to agricultural insufficiency, as found elsewhere (Arnold 1985:192-193; Feinman et al. 1992; Finsten 1983). In this case, the degree of market integration noted in the central zone could be relied on to supply craft specialists with subsistence goods needed in exchange. Local specializations based on non-subsistence resources could be supported.

Carol Smith (1989:791) summarizes her findings in Western Guatemala with the statement that “it is the organization of marketing that explains variations in rural employment and income better than any other factor.” Her regional data therefore support the observations of other economic geographers: (1) that peasant survival strategies are strongly conditioned by regional market system organization; and (2) that peasant responses to specific marketing patterns generate predictable regional patterns in the organization of agricultural and craft production.

Although her case study does not provide specific expectations for the full range of marketing systems, the three market zones investigated in her study are applicable to the Aztec case. In particular, differences between the core zone and the peripheral zone are directly relevant for developing expectations concerning the differential organization of craft production if the Aztec market system was dendritic in structure.

**Macrolevel Forces: The Aztec Case**

The macrolevel forces affecting marketing structure in the Aztec case were obviously complex. As we have seen in the preceding chapter, the rulers of the emerging Aztec empire faced two problems. The first resulted from the dependency of imperial rulers on traditional rulers for the administration and taxation of their subject
populations. The second problem was the dependency of the empire's urban core on the rural hinterland for agricultural produce. Further, imperial attempts to resolve the problems of imperial integration and urban supply were directly linked through two flows of goods: (1) the transformation of exotic raw materials into prestige items via tribute assessments, and (2) the market exchange of foodstuffs for the raw materials needed to meet tribute demands in manufactured goods.

Because the market system provided the point of articulation for these two flows, the market system was of vital concern to the empire both politically and economically. Let us turn now to an examination of how these political and economic concerns affected market participation, by assessing their impact on market structure, consumer demand, and agricultural productivity.

**Market Structure**

The Aztec market system was responding to political and economic forces that were potentially, but not necessarily, in conflict. On one hand, the urgent food needs of urban populations could be expected to select for the greater economic efficiency of specialization and a market-integrated economy. Urban food demand is frequently cited as a factor increasing rural production and stimulating regional trade (Appleby 1976; C. Smith 1974, 1976a; von Thünen 1966). Several conditions, including internal security resulting from the *pax mexica*, administrative investments in transportation routes such as roads and canals (Hassig 1985:31-32, 56-60), and ecological diversity, could have supported urbanization in leading to a rapid increase in the degree of interaction among communities along both horizontal and vertical dimensions. The result would be a market structure characterized by both well developed network and hierarchy, leading to the stimulation and development of the rural hinterland, apparent in the emergence of full-time craft specialization and economies of scale.

Such a pattern, however, is not consistent with much of what we now know about Aztec production in hinterland areas. As Brumfiel (1987b:110) comments,
“Ecological diversity and population density ought to have made full-time specialization profitable; the apparent reluctance of hinterland peoples to engage in full-time specialization seems to violate the canons of economic rationality.” Brumfiel further suggests that we account for this apparent irrationality by referring to structural imperfections in the market system.

The analyses of political process under Aztec rule as presented earlier identified two main factors that directly or indirectly affected market system structure. Political concerns over the circulation of exotic raw materials, as well as the prestige items fashioned from those materials that served as the bases and symbols of power and status in Aztec society, could potentially distort market system structure along vertical lines. As C. Smith (1977:129) notes, when flows of essential goods are controlled by merchants external to the local system, who hold their goods in monopoly and distribute them directly, market competition cannot exist and distortion of the local market economy will occur.

Three attributes of the trade in exotics, taken together, could well lead to market imperfections that locally favored vertical commodity flows. These are (1) the conditions of near monopolistic control over wholesale trade in exotic raw materials; (2) tribute assessments that required the purchase of these goods by the rural populace; and (3) administrative controls over the rights to market traffic in prestige goods that restricted their availability to specific urban centers. Locally, under these conditions, the primary flow of goods would have been vertical between rural producer and urban center: rural agricultural produce flowed into the center in exchange for the exotic raw materials that flowed out again to meet tribute requirements in manufactured goods. As predicted by Brumfiel (1987b), this market structure would intensify market exchange within the region, but it would not lead to a corresponding regional division of labor characterized by specialization.
Although the primary concern may have been controlling the lucrative (and politically important) trade in exotics, the restricted availability of exotic raw materials also (perhaps incidentally) generated centripetal flows of foodstuffs into centers dealing in those goods. In this case, the exotics needed to complete tribute assessments functioned as a form of currency. By controlling the flow of that “currency,” it was also possible to control and direct the flows of foodstuffs, in a manner not unlike that utilized by Athens in the 5th century B.C. to encourage centripetal flows of desired goods at the expense of transprovincial exchange. From the perspective of urban supply, these centripetal flows may have been less efficient than an interlocking market network for generating agricultural surpluses at the regional level. But at the local level, the alignment of political and economic interests could favor development of vertical rather than horizontal linkages -- an arrangement that satisfied urban needs but led to the underdevelopment of the rural hinterland.

It is unlikely, however, that monopolistic controls over exotics would have led to a dendritic market system focused solely on the capital at Tenochtitlan-Tlatelolco (cf. Hassig 1985). Rather, several important factors (including the size and richness of the market) that attracted merchant trade and thus commodity flows argue for at least a dual market hierarchy. Two cities in the Valley had daily markets -- Tenochtitlan and Texcoco -- reflecting their distinctive size and political status. Although historic accounts have focused our attention on the Tlatelolco market, Texcoco almost certainly had a daily market comparable in size and organizational complexity to that described at Tenochtitlan-Tlatelolco (J. Parsons 1971:228; Hicks 1982b).

Further, the imperial capitals operated independently in their sponsorship and deployment of *pochtéca* trade (Berdan 1986:284). While state involvement in long-distance trading ventures is best demonstrated for the Tenochca, Texcoco also actively defended the interests of her merchants, and provinces conquered by Texcoco were obligated to permit merchant traffic within the confines of their territories (Alva
Ixtlilxochitl 1965, Vol. II:190-191; Berdan 1975:167). If, as van Zantwijk (1985:134) and Berdan (1986:284) have suggested, the merchants maintained close ties with the Triple Alliance subdivision to which their guild belonged and to which they owed their livelihood, merchants may have been obligated to give preferential treatment to the dual political centers of empire. Thus, population size, economic potential, and political position could favor a regionally bifurcated market system structure within the Valley, focused on Tenochtitlan and Texcoco.

In sum, it is anticipated that at the local level, imperial efforts to control the traffic in exotic raw materials and elite prestige goods indirectly distorted market structure, stressing the development of vertical commodity flows between urban center and dependent communities, while undermining the development of a market network among settlements at the lower end of the hierarchy. At the regional level, however, the dual division of political power and economic status within the Valley would be expected to prevent the development of a unilineal dendritic market structure. Rather, economic subregions could develop centered on the major political and economic centers within the Valley.

**Consumer Demand**

Under Aztec rule, the consolidation of the empire was paralleled by a general increase in population size and density, as well as an increase in the non-productive administrative sector -- a trend that culminated in the emergence of sizable urban centers. This process of urbanization in turn generated a high consumer demand for rurally produced foodstuffs. While food stress was admittedly greatest for Tenochtitlan, Tenochtitlan was not the only city in the Valley. J. Parsons (1976) suggests that a high demand for food existed almost everywhere in the imperial core, placing pressures on the agricultural sector to produce. Demands of the state contributed to these pressures, through increased tribute assessments in agricultural supplies. As a result, consumer
demand placed great emphasis on foodstuffs, and rural producers were stressed to meet the demands of market and tribute, in addition to their own subsistence needs.

As consumer demands for foodstuffs increased, the value of foodstuffs increased, and agricultural surpluses and other food resources became a major exchange commodity for the rural populace. But ability to produce to meet that demand varied according to two other interrelated factors: market structure and agricultural productivity. As we have seen, market structure was a major factor determining a producer's ability to specialize in a marketable commodity. Within the context of a competitive, interlocking market system, producers can profitably specialize in any commodity, either primary or secondary, while relying on the market system to deliver subsistence goods in exchange. Conversely, if the development of vertical commodity flows constrained producers' ability to specialize, then the extent to which they were drawn into the market system depended on their ability to produce for the urban market, that is, on their ability to produce agricultural surpluses.

**Agricultural Productivity**

Agricultural productivity and reliability in the Valley of Mexico result from the interaction of a number of factors, principally precipitation (or soil moisture) and frosts (J. Parsons 1971; Sanders 1957, 1976a; Sanders, Parsons, and Santley 1979). In general, precipitation increases from north to south and from lower to higher elevations, ranging from 500-600 mm per year in the drier northern third of the basin to 1500 mm per year on the southeastern basin slopes. Soils tend to be deeper and hence more moisture retentive at lower elevations; conversely, lower areas are more subject to frost damage than hill slopes.

Interannual variability in the timing and the adequacy of the rainy season, as well as the timing of spring and fall frosts, is high in the Valley -- with potentially disastrous results for agricultural activities (Sanders 1957, 1976a). If a late rainy
season delays planting, the crop may not mature before the first killing frosts of autumn. Given this critical relationship between rainfall and frost in determining agricultural productivity and dependability, it should come as no surprise that the Aztec developed a range of cultivation practices (varying in labor intensity and output) designed to deliver adequate moisture to cultivars during the critical planting stage.

**Levels of Agricultural Intensity.** Agricultural practices utilized in late prehispanic times in the Valley of Mexico have been presented in detail (J. Parsons 1971; Parsons et al. 1982; Sanders 1976b; Sanders, Parsons, and Santley 1979). Within our area of concern (corresponding to the Texcoco, Ixtapalapa, and Chalco-Xochimilco survey zones), three major types were of particular importance.

The least labor intensive agricultural practices included rainfall (*temporal*) and floodwater cultivation developed in alluvial and gently sloping lower piedmont areas. In areas of adequate precipitation, as in the south, most piedmont cultivation was apparently rainfall based during Aztec times (Parsons et al. 1982:377). In the drier north, in contrast, adequate moisture was obtained by utilizing rainy season run-off from adjacent slopes for floodwater irrigation. On sloping terrain without adequate floodwater irrigation sources, cultivation was more casual, with crop yields reflecting variability in annual rainfall. Cultivation on well-watered and irrigated slopes is presumed to have been annual (Williams 1989:719); in areas of inadequate moisture, cultivation was extensive following a short 1:1 fallow cycle (Sanders 1976b:143-144). Lands cultivated with this suite of agricultural techniques presumably represents traditional *calpulli* or *tlaxilacalli* lands (Williams 1991).

More intensive forms of agricultural production included terraces and *chinampas.* Chinampa or raised field cultivation is a highly labor intensive method of converting poorly-drained soils into highly productive agricultural fields, by laboriously raising masses of soil and aquatic vegetation and consolidating them into
planting surfaces at a level above the water table of the surrounding canals (Rojas Rabiela 1984; Parsons et al. 1982). Adequate moisture levels result from high water tables (controlled with dikes and sluice gates) or with irrigation from the canals, while long-term productivity is maintained through a complex pattern of crop rotation (in which soil nutrients depleted by one type of crop are replaced by another) and fertilization with lake muck and night soil (Sanders 1957; Parsons et al. 1982:20).

Through the use of seed beds and nurseries, two crops of maize are possible per year. As a result, the intensity of chinampa agriculture is rewarded by extraordinary productivity: up to 3 metric tons or more per ha of maize annually (J. Parsons 1982:20).

The principal area of chinampa construction within the Valley of Mexico was the Chalco-Xochimilco lakebed; localized areas of chinampas are also known from Tenochtitlan, Chimalhuacan, and Xaltocan (Sanders, Parsons, and Santley 1979:280-281). Although some small-scale chinampa construction is recorded for the period preceding Aztec imperial consolidation, the main period of land reclamation and chinampa construction within the Chalco-Xochimilco lakebed has been dated to ca. A.D. 1426-1467 based on ethnohistoric and archaeological data (J. Parsons 1976:237, 1991; Parsons et al. 1982; Parsons et al. 1985). At its fullest extent, these chinampas provided an estimated 9500 ha of cultivable land. The large-scale alignment of these chinampas and the complex hydraulic controls (in the form of dikes and sluices) necessary to maintain proper water levels argue strongly that these chinampas were built under the sponsorship or the direct administration of the Aztec state (Armillas 1971; Sanders, Parsons, and Santley 1979:281; Parsons et al. 1982:23).10

Settlement remains within the Chalco-Xochimilco lakebed suggest that the organization of chinampa labor utilized two distinct social classes. The predominant settlement type within the lakebed consists of small, widely scattered clusters of housemounds, that are interpreted as the residences of landless persons of mayeque...
status, who were not organized on a corporate (calpulli or tlaxilacalli) basis, but who existed as dependent tenants on the landed estates of powerful nobles (J. Parsons 1976; Parsons et al. 1982:356; Brumfiel 1991a).\textsuperscript{11} This class of landless commoners apparently resulted from the confiscation and break-up of corporate landholdings following Triple Alliance conquests within the Valley (Berdan 1975:60); later, these tenants were recruited as a labor force and resettled in key agricultural areas to work the nobles' estates.

By J. Parsons' (1976) own accounting, however, these tenants would have been insufficient in number (as estimated from settlement remains) to provide adequate labor for chinampa cultivation. Thus, it is likely that part of the population living in traditional aggregated settlements located in and near the lakebed was also engaged in chinampa cultivation (J. Parsons 1991). In either case, it is likely that these chinampa agriculturalists were full-time specialists, since productive chinampa cultivation demands a high level of experience, somewhat analogous to that possessed by skilled craftsmen, acquired through long apprenticeship (Parsons et al. 1982:23).

A second important (but less well known) form of agricultural intensification involved the construction of terraces on steeper piedmont slopes to reduce soil erosion and improve soil depth and moisture retention, thereby increasing both the total hectarage of soils in cultivation as well as the productivity of those soils. Terraced embankments of packed earth (bancal) frequently stabilized by maguey plantings are sufficient for gentle slopes, while stone-faced terraces provide greater structural support on steeper slopes. Stone-walled terraces were encountered during regional surveys in several areas, including upper piedmont settlements east and northeast of Texcoco (J. Parsons 1971:221), and in the Tenango subvalley (Parsons et al. 1982:357).\textsuperscript{12} However, it is likely that virtually all piedmont areas within the northern and central portions of the Valley were covered with bancal or stone terraces in late prehispanic times (Sanders, Parsons, and Santley 1979:251). In the north, terrace
productivity may have been associated with floodwater irrigation as has been
documented for the Teotihuacan Valley (Sanders 1957; T. Charlton 1970; Williams
1989), although maguey and nopal are two important crops which would have
flourished under conditions of terrace agriculture wholly dependent upon rainfall (J.
Parsons 1971:221; Evans 1992). In the south, substantially higher rainfall amounts
would have made irrigation of terraces unnecessary.

The construction history of these terraces is virtually unknown, but they appear
to be primarily associated with Late Aztec sites, and may represent processes of
agricultural intensification in response to urban food needs (J. Parsons 1971:221;
Parsons et al. 1982:357; Sanders, Parsons, and Santley 1979:251). For example,
Parsons et al. (1982:357) tentatively suggest that the terrace features encountered in the
Tenango area “could represent state-directed efforts...to improve and expand
productive agricultural land in little-used piedmont areas in order to expand the base
for supporting a growing administrative bureaucracy.” There are several lines of
evidence that support this interpretation of the Tenango terraces. First, the dispersed
rural settlements found here could represent the residential quarters of landless tenants
(Parsons et al. 1982:357), suggesting that the organization of labor in this region was
similar to that employed in areas of state-sponsored chinampa agriculture.

In addition, the location of the Tenango terraces relative to major transportation
route argues that they were established with a concern for supplying Tenochtitlan. The
Tenango subvalley, although less productive than the seemingly far more fertile
piedmont to the northeast, abuts directly on the southeastern corner of the chinampa
district (J. Parsons 1982:358) and (according to the Santa Cruz map) was directly
linked to metropolitan commerce via the trans-lake canal port at Ayotzinco (Blanton
1994). Thus, it would have been relatively easy to channel flows of foodstuffs from
this area directly into the Tenochtitlan-Tlatelolco market. To date, however, although
the presence of these terraces is recorded for numerous sites, their total hectarage and hence their contribution to meeting rising food demands remains unknown.

**Regional Variability in Agricultural Productivity.** The overall configuration of cultivation practices, combined with the north-south trend in total precipitation, generated regional differences in agricultural productivity. Within the Texcocan heartland, comprising much of the east-central side of the Valley, several studies have concluded that agricultural carrying capacity had been reached or exceeded under Aztec rule. Regularly poor crop yields documented for early colonial times (Offner 1980) combined with a high incidence of disastrous years (Hicks 1987:100), suggests that many commoners may have been living at the margin of subsistence.

One of the more detailed studies to reach this conclusion is Williams' (1989) analysis of landholdings of a rural *tlaxilacalli* located on the lower-middle piedmont slopes, 8 km northeast of Texcoco. Based on maps and records of family size, landholdings, and soil type dating to ca. A.D. 1540, Williams found that carrying capacity under viable, long-term strategies (i.e. assuming some sort of fallow on poorer lands) had been exceeded for poor and average agricultural years in the Contact period. At the *tlaxilacalli* level, maize deficits of greater than -50% were projected for poor years even with the most intensive strategy, with a -28% deficit to +11% surplus in average years, and surpluses of 11-74% in good years (Williams 1989:715). Given the high incidence of bad years reported for the Valley of Mexico, these figures indicate a considerable imbalance between population and agricultural resources. Williams argues that such rural overpopulation may have been typical of many piedmont communities. Thus, the intensification of agricultural production in the marginal upper piedmont in the form of terraces may have resulted from local food stress, rather than from state-directed efforts to meet urban food needs. Williams (1989:730) concludes that it is difficult to see how Texcocan piedmont communities could have
contributed significantly to the support of nonfood-producing urban populations in the Valley.\textsuperscript{15}

Overall, the Texcocan heartland was experiencing some degree of population pressure, and may not have been entirely self-sufficient in maize cultivation (Offner 1983:18). It is noteworthy in this regard that Texcocan conquests outside the Valley incorporated a band of territory to the northeast that was more than self-sufficient agriculturally and that provided important tribute in maize. The fact that one of the tribute districts (Tepepolco) responsible for supplying the royal court at Texcoco with large amounts of food for seventy days each year (Alva Ixtlilxochitl 1952, Vol.II:168-169; Offner 1983:13) was located so far from the center suggests that maize resources closer to home were inadequate.

The apparent marginal productivity of the central and northern piedmont contrasts markedly with the south. The \textit{chinampa} zone of Lakes Chalco-Xochimilco was clearly the tortilla basket of metropolitan Tenochtitlan. With 9500 ha under cultivation, this area was capable of producing an annual surplus of 20,000 metric tons (20 million kg) of maize, much of which apparently entered the market system (J. Parsons 1976:246). The agricultural terraces of the Tenango subvalley, although less productive, appear to have been an extension of the urban supply system, and were directly linked via canal to the urban market. The overall productivity of both areas was enhanced by the efficiency of canoe transport, which permitted the shipment of large volumes of foodstuffs at low cost in human labor and time (Hassig 1985:56-64).

In addition to these areas of intensive agriculture, favorable soil conditions and ample precipitation boosted the general productivity of rainfall and floodwater agriculture within the Chalco province. According to imperial tribute roles, the province of Chalco gave the richest food tribute of the whole empire (Barlow 1949:75). This high productivity continued into the colonial period, as the commercial
maize hacienda reached its most highly developed form in Chalco province (Gibson 1964:328).

These regional comparisons of agricultural productivity indicate that the ability to produce surplus foodstuffs to meet household, tribute, and exchange needs varied greatly within the Valley, according to differences in precipitation, soils, and intensity of cultivation practices. Contrasts in agricultural productivity are particularly strong between the Texcocan heartland and more intensive and more productive areas of the south. These areas accordingly offered very different opportunities for market participation as well as their incentives to develop supplemental forms of income.

Under pressure to increase productivity, these areas of extensive and intensive agricultural regimes also enabled alternative strategies for buffering and/or supplementing agricultural output. Blanton (1994) suggests that where local forms of primary production did not permit substantial additional inputs of labor, attempts to increase productivity took the form of diversifying by adding specialty food production or craft production activities to rural subsistence production. In Europe, this strategy led to the distribution of secondary production in both cities and in the countryside, where it took the form of “cottage industry” (Thirsk 1961; Tilly 1975). This strategy of diversification of primary and secondary production may typify the more arid and less productive north and central portions of the Valley, including the Texcocan heartland.

An alternative strategy for rural producers was specialization. Where agricultural systems rewarded intensification of effort, the result was more complete rural specialization in primary production. In this case, rural families became more dependent on urban production for secondary goods they no longer produced within the household. Within the Valley of Mexico, areas of intensive chinampa cultivation may be characterized by this response.
Predicting Microlevel Responses: Regional Patterns in Aztec Craft Production

How did these factors of market structure, consumer demand, and agricultural productivity combine to affect strategies of market participation and commodity production under Aztec rule? It is suggested here that market structure and consumer demand affected the regional organization of production, while individual ability to produce for that market determined strategies of market participation and commodity production. Administrative controls over exotic raw materials and elite prestige goods indirectly distorted market structure, concentrating market traffic and commodity flows into the centers where these goods were available. At the same time, processes of population growth and urbanization generated a high consumer demand for rurally produced foodstuffs, increasing the value of foodstuffs and converting food resources into a major exchange commodity for the rural populace.

Rural commoners of the Valley of Mexico were drawn into the market system by the necessity to procure exotic raw materials to meet tribute requirements, but their ability to participate in a market economy was contingent on their ability to produce foodstuffs as a major commodity of exchange desired in urban settings. We can therefore expect to see two general patterns of production and market participation, that largely covary with agricultural productivity and intensity.

Inhabitants of areas with low agricultural productivity (such as those of the Texcocan heartland) have a limited ability to produce for urban food demands and hence a more limited ability to participate in the urban market system. The agriculturalist's low productivity translates into low purchasing power and limited ability to buy goods produced in or imported into urban centers. In the Aztec case, where market participation was required or enforced by the necessity to purchase raw materials for tribute assessments, the ability to purchase other goods in addition to those materials declined accordingly.
Under a strategy of diversification, rural producers may supplement their income through part-time production of specialty food items for exchange in the urban market. In this case, many small lots of foodstuffs are bulked for local resale or for shipment to larger urban markets to meet urban food needs (Appleby 1976). Alternatively, rural attempts to diversify productive activities to supplement low or variable agricultural income may include petty or part-time commodity production in the form of cottage industry. Such activities would be fitted around and strictly secondary to demands of the agricultural schedule. But because these part-time craft producers were not wholly dependent on income from the sale of craft goods (as would be the case for urban specialists) they can cope with the rural seasonality of purchasing power and demand for craft goods. Conversely, without steady rural demand for urban craft goods, specialist producers of utilitarian commodities are not well supported in the center, although the urban concentration of elite will support specialists producing higher class and better quality goods. In this case, then, we can expect a pattern of dispersed, part-time production of lower order goods and centralized, more intensive production of higher order goods.

In contrast, rural producers in areas of more intensive agricultural production (characterized by the chinampa district) that generate surplus foodstuffs are better suited to participate in urban market exchange and to utilize surpluses to purchase desired goods in addition to materials required to meet tribute assessments. Further, agriculturalists in areas of more intensive cultivation would have less time and less incentive to boost their income by engaging in supplementary production, so they become more dependent on external sources for those goods.

In this context, full-time specialists of a broad range of goods will be supported. Because of the concentration of commerce in secondary and urban centers, full-time specialists would be best supported in those central locations. With the concentration of specialist producers of both higher order (elite) craft goods as well as
lower order (non-elite) craft goods in centers, a pattern of rural-urban symbiosis in primary-secondary production will develop.

Finally, these productive strategies may affect the energetics of craft production, as well. Where producers must compete to attract a portion of the market, producers can attempt to make their products more attractive and hence gain a competitive edge by increasing product value while holding cost steady, or by decreasing product cost (Arnold 1985; P. Rice 1981). The first strategy leads to elaboration and diversity, while the second leads to a reduction of energy investment resulting in a serviceable, but low cost, product. The choice of strategy may partially depend on the purchasing power of the targeted consumers. In areas of high market participation and rural market dependence we might expect to find producers manufacturing a full line of goods to meet the full range of consumer preferences in appearance and cost. In contrast, in areas where production is divided among the countryside and the center, we might expect to find a corresponding spatial division in competitive strategies between cost-minimization (simplification) and value-maximization (elaboration), respectively.

**Predictions in Review**

Based on the preceding model, the following expectations are advanced for systems of commodity production and exchange under imperial rule:

(1) The operation of a dual market hierarchy in the Valley, centered on the two dominant political, economic, and urban centers, Tenochtitlan and Texcoco. These market hierarchies will be apparent as two distinct zones of exchange interaction whose boundaries are congruent with administrative divisions within the Valley.

(2) Within each of these zones, market structure will be organized in a dendritic pattern, designed to channel agricultural produce and other foodstuffs up the hierarchy into the major urban centers.

(3) Market participation and the organization of craft production will vary according to the regional distribution of agricultural systems within the study area.

(4) Organizational differences in craft production will create observable differences in the number of producers, their scale of production, and their
location in rural vs. urban settings; production and marketing strategies will be reflected in the quality and diversity of goods produced.

(5) In areas of less productive and less reliable rain-fall agriculture, such as the Texcocan heartland, we can expect evidence of craft production in both urban and rural settings, but both the scale and intensity of production as well as the demand population targeted will differ.

(a) Craftsmen located in or near urban centers are expected to engage in more intensive production and to produce a greater volume of goods. Further, they are expected to produce higher class and better quality goods because they have access to consumers with higher socioeconomic statuses and purchasing powers.

(b) Rural producers are expected to engage in their craft only part-time. In addition, they are expected to produce serviceable but relatively inexpensive products to meet the needs of rural consumers with relatively lower purchasing power.

(6) In areas dominated by intensive agricultural systems, such as the highly productive chinampa zone of Lakes Chalco-Xochimilco, we can expect that both utilitarian and elite goods will be produced by full-time craft specialists located in urban centers. In this situation, craft production will be nucleated, potentially on a larger scale, and more intensive.

Summary

This chapter has attempted to delineate the complex ways in which imperial political economy altered market structure and function within the Valley of Mexico under Aztec rule. This analysis suggests that the dual problems of political control (effected in part through controls over strategic elite goods) and urban supply were articulated through the flows of two classes of goods: (1) the transformation of exotic raw materials into prestige items via tribute assessments, and (2) the market exchange of foodstuffs for the raw materials needed to meet tribute demands in manufactured goods. As the point of articulation for these two flows, the market system was of vital concern to the empire both politically and economically, and thus it was responding to both political and economic forces.

In the absence of political controls, rising urban demand for rurally produced foodstuffs is expected to select for the greater efficiency and productivity of an integrated market network. Such a horizontally articulated market structure would permit
specialization in either primary or secondary production, and the development of large economies of scale in a full range of goods throughout the empire. This is a trend, however, that we do not see in the archaeological record.

The model developed here, in contrast, argues that the convergence of political interests and urban needs distorted market structure by strongly reinforcing vertical links between urban centers and dependent communities at the expense of horizontal market articulation. These market imperfections affected strategies of market participation by the rural populace. Although the rural population was drawn into the market system in order to meet tribute assessments, their degree of market participation and market reliance depended on their ability to produce for the urban market. Thus I argue that rural responses were largely constrained by the productivity of their agricultural resources, resulting in two distinct patterns of market participation and rural production.

This model generally conforms with aspects of production and exchange as they emerge in current research. Although commercial models and central place analyses have argued for the beginnings of a market integrated economy, the sites where we have the best data on production suggest a different picture of declining market participation and dispersed, part-time craft production (Brumfiel 1976, 1986, 1991c; C. Charlton 1994; Charlton et al. 1991, 1993; Spence 1985). Thus the model developed here fits some hitherto puzzling aspects of Aztec domestic economy, while generating testable hypotheses for larger patterns of commodity production and exchange that will be examined in the latter portion of this work.
Notes to Chapter 5

1A number of cross-cultural studies have indicated that peasant producers generally forego short-term profit maximization in the interests of long-term income security (Wolf 1966; Barlett 1980:556-557, 1982; Ellis 1988; Netting 1974:44; Roseberry 1989).

P. Rice (1991:262-263) defines four types of specialization: (1) site specialization (referring to the specialized use of a site based on the non-uniform distribution of raw materials); (2) resource specialization (representing the selective use of particular resources); (3) functional or product specialization (where the producer specializes in producing a limited number of forms or types of a given commodity); and (4) producer specialization (where production of a commodity is limited to a few skilled producers).

She notes that most analysts of “specialization” are really concerned with the degree of intensification within producer specialization, including the distinction between part-time and full-time production, and between household industries and mass production or economies of scale. However:

“Specialization does not necessarily imply intensification. What scholars really seek to distinguish in their studies of production organization is relative levels of intensification, in part because this differentiation occurs as part of evolving societal complexity. Specialization, in a more narrowly defined sense of skill or restrictedness, can occur on a number of different sociopolitical levels” (Rice 1991:265).

In this text, the terms “specialist” and “specialized producer” represent Rice’s category of producer specialization. The term “specialty production” corresponds roughly with the concept of functional or product specialization, and is contrasted with generalized or subsistence production. Finally, “specialization” refers to either the move from subsistence to specialty production or to intensification with the category of producer specialization.

3These three factors are roughly equivalent to the factors identified by Blanton (1983; Blanton et al. 1982:22-23) as critical for the emergence of specialized production in Formative Oaxaca: access to markets, population growth (a measure of consumer demand), and agricultural intensification. The linkages between agricultural intensification and craft specialization have long been recognized in anthropology (e.g. Hole and Flannery 1967) and continues to be of theoretical interest (e.g. Dow 1985).

4The point at which consumer demand in a region becomes sufficient to support specialized producers is referred to as the “demand threshold.” Above this threshold, specialized suppliers are supported; below this point, the specialized producer will not survive without a change of strategy (C. Smith 1974). In the case of low consumer demand, producers may survive through part-time production (thereby reducing dependency on specialty production for survival), generalized production (by carrying multiple goods, each with a different demand threshold, consumer demand can be multiplied), or itinerant marketing (by becoming mobile, a producer can tap a wider area of demand).

5The fourth system (a primate market structure designed to export cash crops to a world market) is not considered relevant for the precolonial case and is not discussed here.
The difference in production strategies between core and periphery is captured admirably by Xenophon (4th century B.C.):

“In small towns the same workman makes chairs and doors and ploughs and tables, and often this same artisan builds houses, and even so he is thankful if he can only find employment enough to support him....In large cities, on the other hand, one trade alone, and very often even less than a whole trade, is enough to support a man: one man, for instance, makes shoes for men, and another for women; and there are places even where one man earns a living by only stitching shoes, another by cutting them out, another by sewing the uppers together, while there is another who performs none of these operations but only assembles the parts” (cited in Starr 1977:86-87).

Administrative meddling is frequently cited as a major cause of market imperfections in agrarian market systems (C. Smith 1976d:333-338), but direct meddling on the part of Aztec imperial rulers is generally seen as inadequate to have generated substantial market imperfections. Brumfiel (1987b:110-111), for example, argues that administrative intervention in the form of market taxes, fixed prices, and prohibitions against trading outside of the market would affect both part-time and full-time producers, and not necessarily favor the development of one over the other.

For example, historic records show that from 1521 to 1600, droughts occurred on the average every six years (Williams 1989:728), while killing frosts that destroyed an entire crop overnight are reported throughout late preconquest and colonial times (Gibson 1964:316, Appendix V). Hicks (1987:100), based on an analysis of Gibson (1964), records 23 years in which adverse conditions seriously affected crop yields in the century between 1525 and 1625.

Permanent (canal) irrigation was extremely important in restricted areas of the Valley, such as the Río Teotihuacan alluvium. However, the Teotihuacan Valley appears to have been unusual in its great potential for highly productive cultivation based on large-scale networks of irrigation canals. Other areas suitable for canal irrigation were, in contrast, on a fairly modest scale, such as along the alluvial plains of the Río Papalotla and Río Cuauhtitlan (J. Parsons 1971:220; Sanders, Parsons, and Santley 1979:253). Other major canal systems reported for the Texcoco region appear to have been utilized in prehispanic times primarily to support the pleasure gardens and rural retreats of the Texcocan rulers rather than agricultural fields (J. Parsons 1971:151; cf. Palerm and Wolf 1961a, 1961b).

J. Parsons (1971; Sanders, Parsons, and Santley 1979:273-275) proposed another major type of intensive agriculture -- that of draining the lakeshore plain by means of large ditches -- and suggests that the canalized barrancas extending across the width of the Texcoco lakeshore plain may well have been constructed in Aztec times as a means of flood control and drainage of low-lying agricultural land. With adequate drainage, the productivity of this zone could potentially rival that of the chinampas. However, J. Parsons (1971:223-224) concludes that we lack any archaeological or documentary data to confirm the thesis of artificial drainage of the lakeshore plain during Aztec times (cf. Sanders, Parsons, and Santley 1979:275-276). For example, the pattern of dispersed rural settlement (so characteristic of agricultural intensification within the piedmont) is missing on large expanses of the alluvial zone; however, massive erosion in the postconquest era could have easily obliterated small sites here. Alternatively, labor could have been drawn from the string of urban settlements (including Texcoco, Huexotla, and Coatlinchan) situated between the alluvium and the lower piedmont.
This pattern of dispersed rural settlement, however, corresponds closely to settlement patterns within the traditional rural *tlaxilacalli*, as reported by Williams (1991). Williams argues that the ethnohistoric data suggest an alternative interpretation of archaeological remains of dispersed, rural settlements with largely domestic architecture: “Instead of communities of renters directed by the state (Sanders, Parsons, and Santley 1979:178-179), such sites could represent remains of rural *tlaxilacalli* subdivisions occupied by macehualtin who independently cultivated the land of their *común* but fell under the jurisdiction of larger entities” (Williams 1991:206).


Due to differences in soil texture and drainage, the *chinampas* and piedmont terraces may well have supported different crops, and thus provided complementary niches for growing a broader range of foodstuffs.

According to the Santa Cruz map (Linné 1948), a major canal runs west from Ayotzinco directly linking the Tenango area to Tenochtitlan-Tlatelolco, while by-passing the major settlements and markets within the lakebed (Blanton 1994). Blanton argues that this direct canal configuration was partly a strategy to prohibit competing markets from monopolizing (and hence gaining power from) the important flow of foodstuffs into the city.

The focus on maize yields alone may substantially underestimate the productivity of this area by ignoring caloric contributions of xeric crops, such as maguey and nopal (Évans 1992; J. Parsons and Darling 1993). For example, J. Parsons and M. Parsons (1990:342-345) argue that the common practice of inter-cropping maize and maguey may significantly increase the total productivity of lands at higher elevation, while adding an important reserve crop that is relatively impervious to the effects of drought, frost, and hail. While important, the contribution of maguey may not have been sufficient to relieve local food stress, since historic reports indicate that food was generally not available in great abundance. In general, Williams' assessment is more in agreement with statements concerning the overall poverty of Indians, such as that of Motolinía in the early postconquest period:

> “These Indians have almost no hinderance that might keep them from earning entrance to Heaven...for in life they are satisfied with very little, so little that they scarcely have the wherewithal to clothe and feed themselves. They eat most poorly indeed and clothe themselves in equal poverty” (cited in and translated by Cook and Borah 1979:162).

By this date, however, it is possible that pulque production for urban consumption had converted maguey from a locally consumed food resource to a cash crop (J. Parsons, personal communication). In either case, the role of maguey clearly merits further investigation.