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ECONOMIC EFFECTS OF INTERCOUNTY TRANSFER OF FLUE-CURED TOBACCO QUOTA

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ABSTRACT

Regression analysis was used to estimate the relationship between quantities of quota and rental rates and between labor use, wages and quota for North Carolina for the years 1966 through 1969 and for each of the other flue-cured tobacco producing states for the years 1966 through 1968. The impact of probable changes in aggregate quota and the wage rate of hired labor on rental rates within counties was estimated using regression coefficients. The estimated reservation demand curves for county quota markets were used to project transfers of quota between counties which might occur if wider transferability was allowed. The rental rate which might prevail within the state under various transfer rules was also estimated. In no case did the estimates vary greatly from average observed rental rates. Large quantities of quota were projected to move from the Old and Middle Belts to the Eastern and Border Belts. Estimates of the transfers across state boundaries under various program rules were also made.

The impact of the hypothetical transfers across county lines on the efficiency of production and the distribution of income was also estimated. While aggregate gains within North Carolina could be substantial, producers in high-rent counties and owners in low-rent counties would gain while producers in low-rent counties and owners in high-rent counties would lose from the initiation of a statewide quota transfer program.

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ECONOMIC EFFECTS OF INTERCOUNTY TRANSFER OF FLUE-CURED TOBACCO QUOTA

INTRODUCTION

Before the acreage allotment programs were developed, flue-cured tobacco was in competition for farmland and labor with other crops in the southeastern region of the United States unrestrained by Federal programs. The distribution of tobacco among farms and geographic regions was the result of the joint interplay of biologic and economic factors. With the development of the acreage allotment programs, the returns to flue-cured tobacco were substantially increased but the production pattern was firmly fixed. As a consequence, the distribution of the crop has been virtually unaltered in the past 30 years. Yet, the development of new varieties, new production techniques, greater mechanization of production, the lower relative price of fertilizer and the differential impact of higher wage rates and disease problems would have led to some shift in the geographical distribution of the crop. In the absence of allotment constraints, the crop would also have been consolidated among fewer farmers in response to the economics of operating larger production units.

Because the production of flue-cured tobacco is not currently organized in response to competitive forces, the total quantity of resources used to produce the crop is now greater than would otherwise be required. The pressures to reorganize the geographic and interfirm distribution of the crop are most readily visible in the renting of allotments.

Before 1962, the major markets for flue-cured tobacco allotment consisted of the purchase and rental of land to which allotment was attached. If the farmer could not produce his quota, then the right to produce would be unused unless the land was rented to a tobacco producer. Not all farmers producing tobacco had the same returns per pound. The ones with higher returns per acre had a strong incentive to produce more and were willing to rent land to which the allotment was attached. But producing tobacco on another farm involved transportation costs of machinery and labor. The pressure for a more efficient rental market brought the Lease and Transfer Program into existence in 1962. As this program has developed under acreage-poundage, a producer may increase his production by leasing marketing quota from other allotment holders in his home county subject to the restriction that not more than 50 percent of his cropland may be planted to tobacco.

A large number of people participate in the Lease and Transfer Program every year. Hoover (1967) found that the number of owners that transfer allotment increased by an average of 7700 per year during the period of 1962-1966. In North Carolina, quota transferred among farmers grew from 13.1 percent of the total in 1967 to 23.9 percent in 1971 (N. C. ASCS, 1967, 1971).

Problem

Allowing transferability of allotment within a county has produced benefits for farmers since allotment was generally transferred from low-yield land to high-yield land. In 1967 the lessors had an expected mean yield of 92 percent of the mean yield of the lessees. As a result, the same amount of tobacco can be produced with relative smaller amounts of resources and lower cost to the whole economy. Transfer of allotment among producers within a county benefits both the lessees and the lessors. It allows the lessees to expand their operations without incurring travel costs associated with farming small, scattered plots and to expand production of tobacco where there was a comparative advantage. It allows the lessors to seek full-time employment off-farm and obtain some rental return on the right to produce tobacco.

Returns to tobacco production vary among counties and within counties due to factors such as land productivity, labor availability and off-farm job opportunities. A current policy issue regarding flue-cured tobacco transferability is whether to allow quota to cross county boundaries. Various proposals to allow intercounty transfer have been considered by the Congress in the past three sessions.

If transferability of quota is allowed among counties, there will be a tendency to equalize rental rates, and for quota to transfer from low-rent counties to high-rent counties. Renters in low-rent counties would be worse off after removing the boundaries as would allotment owners in the high-rent counties. On the other hand, renters in the high-rent counties would be better off as would owners in the low-rent counties. Moreover, people involved in supplying production inputs and the marketing of tobacco such as warehousemen, hired farm laborers, and farm supply and machinery dealers will be affected by transferability. Benefits and/or losses would be a function of the amount of transfer that would take place.

Another important consideration in the tobacco industry is the increasing pressure on it produced by anti-smoking advertising that results from the smoking-health controversy. If the advertising campaign is successful and consumption is reduced, there will be an effect on rental rates which could be analyzed.

The relationship between rental rates and changes in the amount of quota within counties is of major importance whether those changes result from changes in the total amount of quota or from a redistribution of quota among counties under the lease and transfer programs. The effects of quota and other economic factors on rental rates could be studied in the framework of demand and supply of an input. In this case, quota is the input which jointly with other inputs determines the maximum amount of production and marketing of flue-cured tobacco. The value of this input is determined as a residual rent, an amount left over after all other factors of production have been satisfied including returns to the operator's labor and management.

$$\text{Residual rent} = Y.P_y - \Sigma X_i P_i \ , \qquad (1)$$

where $Y \leq$ quota,

P_y = price of flue-cured tobacco, and

$\Sigma X_i P_i$ = factor costs (quantities times prices).

Based on equation (1), it can be said that the rental rate depends on the price of tobacco, the production function and factor prices. Analyzing these factors and determining their effect on the rental rates will be the main problem of this study.

Objectives

The general objective of this study is to measure the welfare effects associated with permitting transferability of quota among counties and to project short-run and long-run effects of changes in the quota which arise from different forces.

This will be accomplished by achieving the following specific objectives:

(1) Identification of the structure of the quota market by determining variables that affect the demand and supply of leased and transferred quota.

(2) Analysis of the labor market considering both the demand and supply of labor for tobacco production.

(3) Estimation of elasticities of demand and supply of quota so that rental rate can be predicted under changed conditions.

(4) Estimation of the equilibrium rental rate for various free-trade areas under hypothetical intercounty transfer programs.

(5) Measurement of the net benefits which might arise from allotment transfer among counties.

Procedure

One of the objectives mentioned above was to predict the changes in the distributional pattern of the flue-cured tobacco quota that would occur if that rental rate were to become equal in all counties. There are two basic approaches to the analysis and prediction of production allocation among competing areas. Linear programming, one of the techniques, has been used widely to project estimates of production under alternative policy situations (Egbert and Heady, 1961). The alternative technique, used in this study, is an equilibrium price-quantity model which requires the estimation of prices and quantities for the major economic variables. It rests upon regression analysis which uses economic observations drawn from recent production periods.

Choice between the two approaches is determined by the expected degree of change in economic variables between the period of observation and projection, the accuracy with which future input-output relationships and quantities of limiting factors can be estimated, as well as the amount of research resources available to the researcher.

The primary interacting factor markets in the case of flue-cured tobacco are the labor market and the quota market. To apply regression analysis to the quota and labor markets, data on the returns to quota, quota quantities, wage rates and quantities of labor are needed.

These data are not available for farm units but they exist for counties. The only measure of returns on quota available was the rental rate for the lease and transferred quota. Under the assumption that a pound of quota is the same whether it was transferred or not and that lease and transfer is a perfect substitute for other forms of leasing, the rent paid for a pound of quota transferred could be used as a dependent variable in the quota demand equations.

Although for each transaction under the Lease and Transfer Program a contract is recorded in the ASCS county offices, the farmers are not obliged to report the rent paid. Information on rent paid is obtained as farmers search the market and try to identify a potential lessor or lessee. The ASCS county office managers obtain information of this kind, too, and are aware of the prices and tendencies in the market under the program.

A letter was sent by the Agricultural Stabilization and Conservation Service of the U. S. Department of Agriculture to each of their county managers asking each to report the average rent paid for a pound transferred as well as the lowest and the highest reported price in the county for the same period. The requested rental rate was to represent the return to leased and transferred quota and to exclude rental contract observations which included returns to buildings and land. Thus, the reported rental rate is assumed to represent the real return to a pound of quota.

The six states with flue-cured tobacco production--Virginia, North Carolina, South Carolina, Georgia, Florida and Alabama--were included in the study. All counties in which at least ten contracts had been completed during the transaction period were selected for study.

The sample consisted of 26 counties in Virginia, 63 in North Carolina, 22 in South Carolina, 20 in Florida, 50 in Georgia and 4 in Alabama (Figure 1). Data on rental rates for the period of 1966-1969 were obtained for North Carolina and 1966-1968 for the other states.

Independent variables representing economic factors affecting the demand and supply functions of both allotment and labor market were obtained from secondary sources on a county basis.

Linear regression analysis was used as a statistical procedure. Two basic models were developed, the reservation demand model and the lease and transfer model. The labor market was studied with both allotment market models.

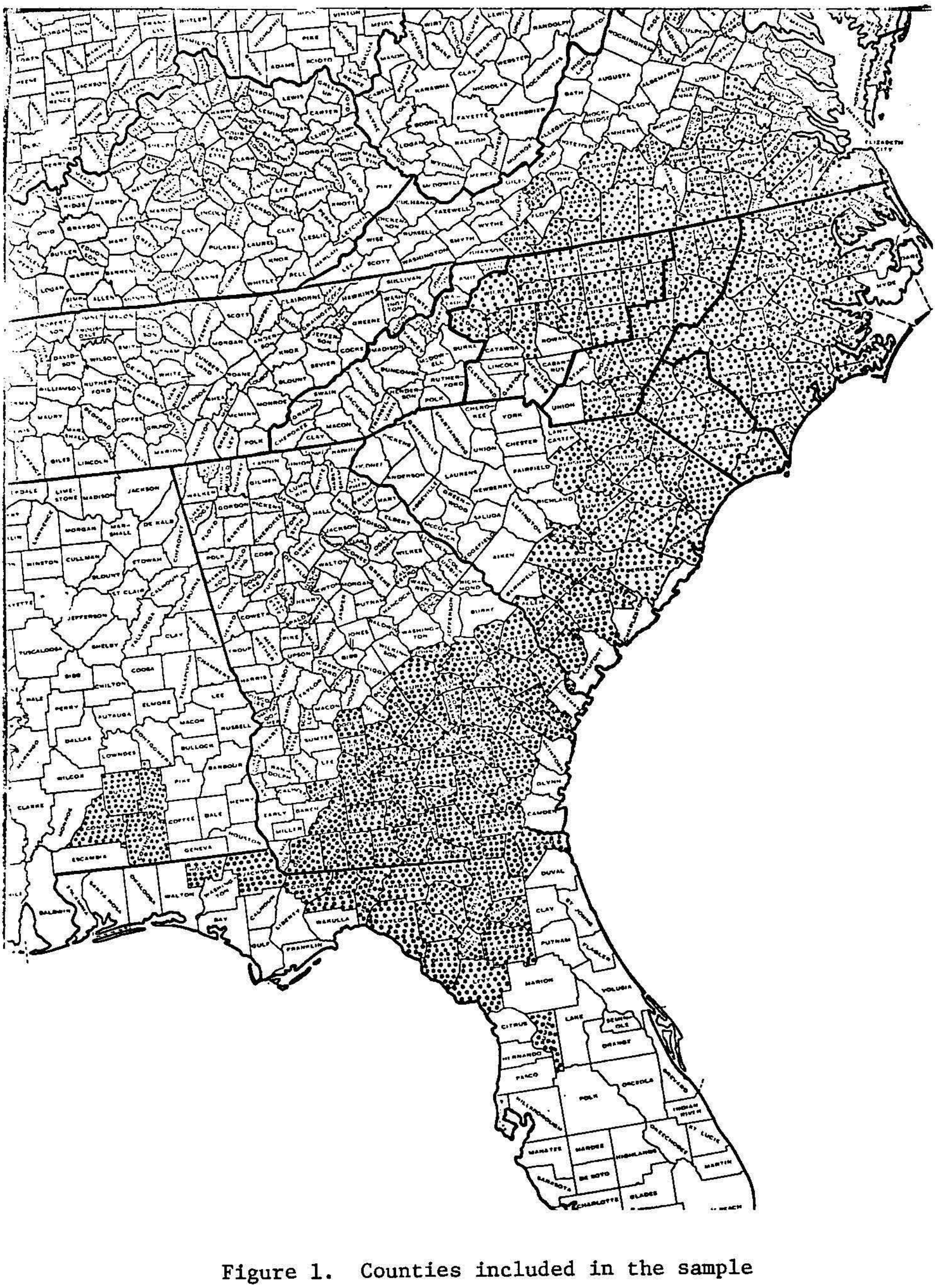

Figure 1. Counties included in the sample

ECONOMIC MODEL

The demand for an input is a derived demand, derived from the demand for the product, the production function and the supply conditions of the other factors. Each of these factors will be discussed with respect to flue-cured tobacco quota and the necessary assumptions will be developed.

Under the assumption of profit maximization and no constraints, a farmer uses variable inputs to the point that the value of marginal product of each factor is equal to its price. Income remaining after all variable factors have been paid is used to compensate the fixed factors including the labor and management of the operator. At equilibrium there is no tendency for factors to enter or leave the industry because each factor is earning its opportunity cost.

This model must be modified for a situation in which some constraint is placed on the production process. In the case of flue-cured tobacco, the amount of quota limits the desired production of each producer. In a sense, the use of each factor is constrained so that the value marginal product of each factor exceeds its price, and by the same proportion for each factor when production is organized efficiently. The excess of returns over costs is assigned to the factor which limits production: quota in this case. Seen from a different point of view, the cost of production per pound (excluding the cost of quota) is minimized by efficient resource use. The resulting difference between the price of tobacco and the cost of production is assigned to quota as residual rent. The market price of quota is then determined by the demanders and suppliers of quota. Efficient producers are able to bid enough to obtain some quota in the market while those with high costs per pound benefit by receiving more by leasing quota to others than by producing it.[1]

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[1]See Efstratoglou (1972, pp. 10-13) for a more complete exposition of these points.

The principles which govern the derived demand of a residual claimant such as the created factor, quota, are essentially the same as those which govern any other factor. These factors and the assumptions concerning them are discussed next.

The Production Function

Lack of farm data did not permit us to estimate the production function for flue-cured tobacco. The inputs entering the production of tobacco, though, are labor (owner-operator and hired labor), land, machinery, fertilizer, and management. A general form of the production function will be assumed which allows for some degree of substitution among the factors of production. Moreover, dealing with county data, it is assumed that this production function represents the average production function in the county.

Demand for Flue-Cured Tobacco

The demand for flue-cured tobacco is assumed to be perfectly elastic for each county. It seems reasonable to assume a perfectly elastic demand for two reasons. First, each county supplies a small portion of the total tobacco output; second, the industry demand curve becomes perfectly elastic for any year at the price support level because of government policy even if consumption shifts abruptly. Because of this product price characteristic, the demand for quota in a county essentially takes on the inverse shape of the cost curve as is indicated in Figure 2. The level of the demand curve for quota is directly affected by the price of the product.

Factor Markets

The slope of the supply curve of flue-cured tobacco is determined by the slopes of the supply curves of homogeneous factors, the production function and the quantities of factors whose quality is not homogeneous such as land and management. Assumptions concerning the supply of fertilizer, capital, labor and land follow.

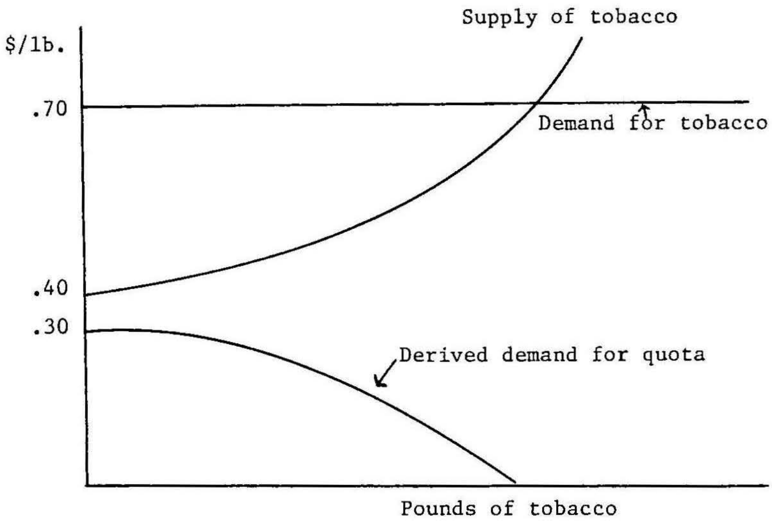

Figure 2. Derived demand for quota under a perfectly elastic demand and upward sloping supply curve for tobacco

Fertilizer

The supply of fertilizer is assumed to be perfectly elastic (constant price). Since cross-sectional data are utilized and the price of fertilizer is constant and the same for each county, this input is not considered as a factor contributing to the rental rate variation and accordingly it is excluded from the model. Also in the three-year period studies, no significant change in the price of the fertilizer took place. Fertilizer price has not been an active factor recently in determining differences in quota demand among counties.

Capital

The supply of capital is assumed to be perfectly elastic for two reasons. First, it is assumed that there is no differential capital rationing between counties: the average farmer can borrow money and acquire capital at the same interest rate. And, second, the prices of capital equipment are constant cross-sectionally. Because of these factors, no variation in capital value or rental rates would be observed. Hence, capital is not considered in the model.

Labor

If farmers in a county try to expand production of tobacco with no changes in technology, the demand for labor will increase and it is logical to assume that given some labor mobility limitations, the wage rate will go up too. This implies a positive sloped supply of labor. Higher wages affect the residual rent for quota. So, an exogenous shift in quota affects the demand for labor and hence the level of wage which in turn influences the level of rent and the amount of quota demanded. Then, in turn, the quantity of quota exerts an influence on wages as noted before. It seems quite reasonable that the structure of labor markets should be identified along with the quota market and that the rental rate and wages should be simultaneously determined.

County labor supplies might differ in slope or in the intercept. Variables should be included to account for those differences. Off-farm opportunities and size of rural population were thought to be good variables to standardize for factor supply differences.

Land

A basic assumption in production function studies is the homogeneity of units of resources. But it is quite possible that as production of tobacco expands, lower yield land enters production. It is reasonable to assume that the farmer first utilizes the land with the higher yield and as he produces more and more, he uses lower fertility land. Each time he employs a number of acres with lower inherent productivity than before, he is farming land for which the production function is different. Assuming technology known and constant, the constant term of the production function changes because less productive land is employed.

Increasing production by expanding acreage in such a case is analogous to a movement across a production surface which is a collection of the relevant points of a group of production functions. As lower quality land is used, the residual rent or offer price for quota falls, giving a downward slope to the demand for quota. The quantity of non-land factors needed in combination with land to produce a unit of tobacco has increased. Ideally, the distribution of land with regard to its ability to produce tobacco should be known for each county and used in conjunction with shifts in quota to estimate the demand for quota. Such a variable is not available. The alternative is to assume that the distribution of land follows the same form in all counties and can be accounted for by using the quantity of quota or a similar variable to catch the influence of shifting average quality of land on quota rental rates.

MARKET MODELS

Based on the economic model developed earlier and the assumptions about the factor markets, the functional demand for allotment could be conceptualized and estimated by utilizing two different quota market models and a labor market model, all discussed in this section.

In a conventional market model both the demand and supply of quota would be analyzed. Rental rate would represent price and quota transferred would represent quantity. The slope and shifters of both curves could be estimated. In such a model the quota not leased and transferred is implicitly assumed to be in a separate market which is outside of the analysis. Attempts to use this model by simultaneously estimating supply and demand equations were generally unsuccessful, resulting in perverse signs on important variables. Further details are reported by Efstratoglou (1972).

Reservation Demand Model

The alternative quota market model is the reservation demand model in which each quota owner must decide each season whether he will produce the quota himself ("reserve it"), or rent it to some other producer under some form of contract. Each farmer starts with a fixed quantity of quota, for example Q_o in Figure 3. At every rental rate he is willing to possess a quantity of quota that might be larger or smaller than his initial quantity. This amount is represented by the demand curve drawn in Figure 3. This curve describes the net earnings the farmer gets from various amounts of quota. If the rental rate is P_o, the farmer demands the amount of quota he has. He neither rents in nor rents out. At a rental rate above P_o, the farmer will reserve less of his quota for himself. He will rent some of it to other producers. At a rental rate below P_o, he has an excess demand for quota: he produces his own quota and rents in additional quota.

Summing the individual reservation curves of all farmers horizontally, the reservation demand for the whole county is obtained. This

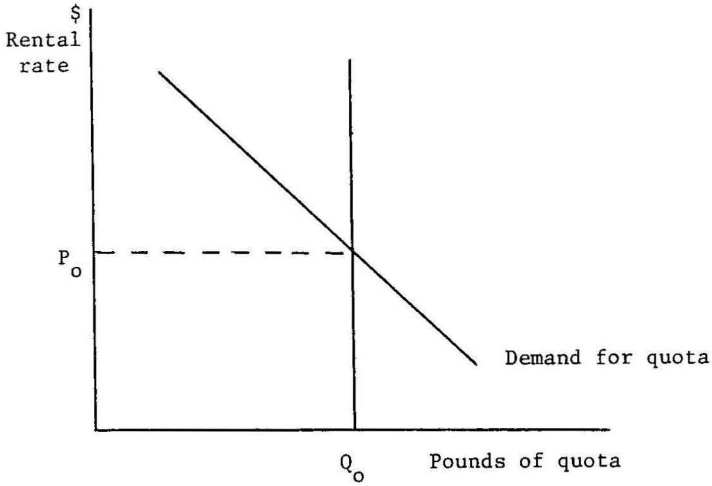

Figure 3. Reservation demand for quota

"reservation demand" is the total demand curve for quota in the county as defined by Braff (1969, p. 110). This model is frequently used for the stock market and other markets in which it is not feasible to divide the demanders and suppliers into separate populations. At a given market price, a person may be a supplier and at a lower one, the same person becomes a demander.

Under the reservation demand model, the supply of quota in a county is perfectly inelastic and fixed. The returns to quota are not observed unless the quota is transferred under the lease and transfer program. By assuming that leased and transferred quota is a perfect substitute to the farmer for either producing tobacco by himself or renting quota out, the rental rate can be assumed to be the return to quota transferred or produced by an owner.

The task of the reservation demand model is to explain the differences observed in rent paid per pound among the counties and years. The relationship of rental rate to quota is of primary interest. But since production functions in counties are not the same, variables must be added in the demand function so that the marginal relationships between rent and quota can be established.

Factors determining the reservation demand for allotment were thought to be the following: quantity of quota, price of tobacco, farm wages, off-farm opportunities and land heterogeneity.

In the rest of this section we will examine each variable separately, its source, and the way it is related to the rental rate.

Quota

The rental rate in the county is determined subject to the quantity of quota in the county. A negative sign was hypothesized as in every demand curve. The lower the rental rate in the county, the more quota will be demanded in the county other things equal.

Finding a negative relationship between quota and rent is complicated by the fact that quota was originally distributed according to the productivity and comparative advantages of various counties. Consequently, rental rates are frequently high where quota is large. The most feasible alternative at hand is to use quota in the study years relative to the quota in 1965. These changes in quota are expressed in terms independent of initial quota distribution and productivity factors. Data on effective quota were obtained from compilations of the tobacco policy staff of the ASCS, USDA.

Price of Tobacco

As was explained earlier, the demand for tobacco for each county is perfectly elastic and the price given for any period. The higher the price of tobacco, the higher the residual rent for allotment is expected to be, *ceteris paribus*. So a positive relationship was hypothesized. The prices for tobacco lagged by one year were used as the expected price variable in the model. It is reasonable to assume that farmers are influenced in their decision about tobacco production by the prices paid for tobacco some months before. Lease and transfer starts in November for the next production period shortly after the close of the marketing season for tobacco. Tobacco prices used were reported for specific markets by the Crop Reporting Service. It was assumed that all tobacco in a given county was marketed at the closest flue-cured tobacco market. The average price reported at this market was assigned to the county.

Farm Wages

Wages affect the cost of producing tobacco and hence the residual rent for allotment. The higher the wages are, the higher the cost of producing the tobacco and the smaller the rent expected. A negative relationship was hypothesized. The mean wage rate for the July and October reporting periods was used as a variable in the regressions. Wages were obtained for each crop reporting district from the Crop Reporting Service. Counties are grouped into ten or fewer districts per state. All counties in a district were assigned the same wage rate. Wages were used as a lagged and non-lagged variable in different models. Where they were used lagged, it is assumed that the wage of the previous production season affects the current year's rent. The farmer in this case decides how much of his quota he will produce and how much he will rent out based on last season's wages. In this formulation the market for labor becomes independent of the allotment market. The lagged wages are considered as an exogenous variable and the labor market equations are estimated separately. Where wages were used non-lagged, it is assumed that the demand for allotment is simultaneously determined with the wage rate and quantity of labor. This assumption requires that farmers have perfect foresight concerning labor market variables because the rental rate is determined six months or more before harvest labor is paid.

Off-Farm Labor Opportunities

Supplies of labor differ among counties in slope and intercept. Off-farm opportunities was used as a variable to standardize for the difference in labor supply conditions. Off-farm opportunities affect the decision of the farmer to demand additional quota or to supply part of what he has. It is expected that the better the opportunities outside of the farm, the higher the incentive for the farmer to work off the farm and to supply his quota to the market or demand less for himself. This variable works as a shifter to the demand for quota. The larger its size, the more it shifts the demand curve for quota to the left and given the quantity of quota and other things equal, a lower level of rental rate results. It was hypothesized that rent and off-farm opportunities were negatively related. Unskilled wages in each county would be a more appropriate variable for off-farm opportunities, but such data were not available.

The variable that was used as an index of off-farm opportunities in all regressions in this study was the ratio of total employment in the county over the agricultural employment in the county as both are reported by the Employment Security Commission in the Work Force Estimates Publications for 1965, 1966, 1967, 1968. Some states had data reported by quarters and some by the annual average. Therefore, this variable is not homogeneous for all states.

The Work Estimates publication defines total employment as "all persons who worked either in farm or nonfarm positions for pay or profit during the period." It is the sum of the nonagricultural wage and salary workers, agricultural workers, the nonfarm self-employed unpaid family workers and domestics (N. C. Employment Security Commission, 1966, p. 3).

An alternative variable that could be used as an approximate indicator of the off-farm opportunities was the proportion of farmers working off the farm more than 100 days in 1964. The disadvantage of this variable is that it repeats itself for the period 1966-69 since its source is the 1964 Census of Agriculture (U. S. Bureau of the Census, 1965).

Land Productivity

Because data from many counties must be analyzed in a single regression, some account of mean productivity differences was needed. Mean county yield was used in one of the major regressions. Because yield and quantity of quota are highly correlated, an alternative to yield as a measure of productivity was sought. It seemed likely that the greater the variance in yield from township to township the more likely the reservation demand curve would be fairly steep. Other things equal, this would mean a county with high variance would have a low level of rent. Average yield per township within N. C. counties was available in county ASCS offices for 1959-63. The variance within a year was calculated and was averaged over those five years for each county. Unfortunately, these data were not available in the other states.

The Model

The mathematical model for the reservation demand function in linear form is:

$$R_{ti} = a + b_1Q_{ti} + b_2WF_{ti} + b_3WNF_{lag,\ ti} + b_4P_{lag,\ i} + b_5V_i + e_{ti} \quad (2)$$

See Table 1 for definitions of symbols. The farm wage variable (WF) is used as a lagged variable in statistical model I and as a non-lagged variable in statistical model II which is developed in the next chapter.

Labor Market Model

One of the objectives of this study was to analyze the labor market along with the quota market. Flue-cured tobacco is one of the most labor-intensive crops among the U. S. field crops. According to Davis and Chappell (1969) labor requirements for tobacco average about 200 hours per acre, compared to 40 hours for cotton, 6 hours for corn and 5 hours for soybeans.

Because of the importance of labor costs in the total cost of producing tobacco, a large number of studies have been conducted concerned primarily with the labor requirements under differing harvesting, curing and marketing systems. Little work has been done on the structure of the labor market. An exception is the work done by Manning (1965) in which he estimated a simultaneous model of allotment and the labor market for flue-cured tobacco by assuming a fixed labor requirement coefficient.

A different approach was chosen for this study. An attempt was made to estimate the agricultural sector labor demand and supply functions rather than the tobacco enterprise demand and supply. It would be ideal if data for tobacco production were available from farmers' records. That is, if quantities of labor employed and corresponding wages for tobacco production were available. But such data do not exist.

The best available data were farm wages reported by crop districts and obtained by personal correspondence with the Crop Reporting Service. The wage rate reported for a district was assumed to be the wage rate in each county of that district. Since it was not possible to isolate the quantity of labor going into tobacco production from other agricultural employment in the county, labor market analysis was concerned with the average agricultural wage and total agricultural employment. Agricultural employment is defined to include "all operators, managers, unpaid family workers and other hired workers on farm establishments including domestic workers in farm house" (N. C. Employment Security Commission, 1966, p. 3).

The mathematical model used for the labor market was the following:

$$\text{Demand:} \quad LA_{ti} = a + b_1 WF_{ti} + b_2 TC_i + b_3 Q_{ti} \qquad (3)$$

$$\text{Supply:} \quad WF_{ti} = a' + b_1' \, LA_{ti} + b_2' \, WNF_{ti} + b_3' \, RP_i \qquad (4)$$

See Table 1 for fuller definitions of the symbols.

The following hypotheses were developed concerning the correlation of the dependent and independent variables.

<u>Farm Wages (WF)</u>

A negative sign was hypothesized in the demand function. The higher the wage rate, the lower the quantity of labor demanded. Farmers try to produce at a least cost combination of resources and will substitute machinery for the relatively more expensive labor. In the supply function, a positive correlation is expected. The higher the wage rate, the more people willing to work at that rate.

Table 1. Definitions of symbols used in the market models and in regressions

Symbol	Definition
R	Average rental rate in cents per pound of quota
R/R_{1966}	The rental rate of the year over the rental rate of 1966
Q	Total poundage quota reported in thousand pounds
$\frac{Q}{Q_{base}}$	Total poundage quota of the year over the quota of 1965--if R/R_{1966} is used as a dependent variable in the regression, then the denominator becomes quota of 1966
WF_{lag}	Average farm wages lagged by one year
WF	Average farm wages reported in dollars
WNF	Index of off-farm opportunities derived by dividing total employment by agricultural employment
WNF_{lag}	Index of off-farm opportunities lagged by a year
P_{lag}	Price of tobacco lagged by one year reported in cents
V	Variance in yield, 1959-1963
Y	County yield, mean of 1964-65
TR	Total pounds transferred
LA	Total agricultural labor reported in man units
TC	Total acres of harvested cropland in the county
RP	Total rural population in the county
$\hat{LA}$	Predicted total agricultural labor from reduced equation
$\hat{WF}$	Predicted farm wages resulted from reduced equation
$\hat{TR}$	Predicted total pounds transferred resulted from reduced equation
$\hat{R}$	Predicted rental rate resulted from reduced equation
e	Residual error term
i	Subscript which refers to county i = -1, 2 ... n counties in sample
t	Subscript which refers to year t = 1966, 1967, 1968, 1969

Total Cropland (TC)

This variable was used to adjust for differences in the size of the county. Proportionally, the larger the cropland in the county, the more labor will be demanded ceteris paribus. Source of this variable was the 1964 Census of Agriculture (U. S. Bureau of the Census, 1965). The data for 1964 were used for all the years considered in the study because no intercensal estimates were available.

Quota (Q)

Quota was considered as a variable that will shift the demand function for labor. If the amount of quota is increased by transferring some from another county, it can be argued that more labor will be demanded for the tobacco production in the county gaining quota. Thus, a positive relationship between those two variables is expected.

Off-Farm Opportunities (WNF)

A positive correlation was hypothesized between farm wages and off-farm opportunities as measured in nonfarm wage rate. Off-farm opportunities are considered to be a shifter of the supply function. In counties where off-farm opportunities exist, farmers can find employment outside of the agricultural sector more easily. This leads to a shift in the supply of farm labor to the left increasing the wage rate.

Rural Population (RP)

Rural population affects the supply of labor. The larger the population, the larger the quantity which can be supplied for use as farm labor. Thus, a negative correlation was assumed between wages and rural population. The data for this variable were obtained from the 1960 Census of Population (U. S. Bureau of the Census, 1962). Data for 1960 were utilized for all study years because intercensal data were not available.

STATISTICAL ANALYSIS

The time period over which rental rates in all major producing countries have been observed is so short that analysis and generation of predictions would not be practical if it were not possible to pool cross-section and time-series data. A number of statistical problems may be created by the pooling of these two types of data, but these are regarded as relatively unimportant given the possible use of a greater number of independent variables with continuous values and discrete variables to reflect geographic mean differentials (Efstratoglou, 1972, pp. 38-42).

Model I: Reservation Demand Independent of Labor Market

Model I consisted of three structural equations, the reservation demand for quota, the demand for labor and the supply of labor:

Reservation demand: $R = f(Q, WF_{lag}, WNF_{lag}, P_{lag}, V)$ (2)

Demand for labor: $LA = f(WF, TC, Q)$ (3)

Supply of labor: $WF = f(LA, RP, WNF)$ (4)

Definitions for the symbols are found in Table 1.

In the reservation demand function, lagged wages were used. This made the quota market independent of the labor market. The labor market equations specify the simultaneous determination of LA (quantity of labor in agriculture) and WF (farm wages). Both equations in the labor market were over-identified, requiring the use of two-stage, least squares regression.

Results of structural equation regressions for quota appear in Table 2 and in Appendix A Table 1. Results for the labor market appear in Tables 3 and 4.

Regressions for the reservation demand function were estimated for each of the states of Virginia, South Carolina and for the Georgia-Alabama-Florida region based on three years of observations (1966-68), and for North Carolina based on four years of observations (1966-69). The Georgia-Alabama-Florida region is treated throughout as if it were a single state. It is referred to as Belt 14 in reporting regression

Table 2. Regression equations for the reservation demand model for quota determined independently of the labor market (Model I) and simultaneously with the labor market (Model II)

Equation	Area	Dep. var.[a]	Constant	Independent variables[b]		
				Q/Q_{base}	WF_{lag}	WNF_{lag}
Model I						
$R_{1,1}$	N. C.	R	14.78	-.959#d (-1.36)f	-8.324#**e (-5.46)	-.074#** (-4.38)
$R_{1,2}$	N. C.	R/R_{1966}	1.49	-.293#** (-3.60)	-.486#** (-5.38)	-.0015#* (-2.05)
$R_{1,3}$	Va.	R	33.76	-13.09#* (-2.32)	-1.9080#** (-3.89)	-.049#* (-2.14)
$R_{1,4}$	S. C.	R	63.68	-7.35# (-1.84)	-31.47#** (3.51)	.235 (.95)
$R_{1,5}$	Belt 14[c]	R	-33.32	-5.27#** (-2.98)	10.39 (2.43)	-.065#* (-2.43)
Model II						
$R_{2,1}$	N. C.	R	2.14	-2.568#** (-4.30)	-5.326#** (-3.20)	-.062#** (-4.37)
$R_{2,2}$	N. C.	R/R_{1966}	1.39	-.374#** (-4.55)	-.509#**g (-3.43)	-.0013# (-1.53)

Table 2 (continued)

Equation	P_{lag}	V	D_2	D_3	D_4	R^2
	Independent variable[b]					
Model I						
$R_{1,1}$	.127# (1.62)	-.00005#** (-4.75)	1.44** (2.53)	1.33** (1.98)	2.58** (3.09)	.46
$R_{1,2}$	.0023# (.523)	.0000009 (1.538)	.1081** (3.67)	-.066 (-1.74)	-.066 (-1.48)	.38
$R_{1,3}$	-.087 (-.386)					.17
$R_{1,4}$	-.317 (-.61)					.32
$R_{1,5}$	.683#** (4.69)		-6.876** (-5.04)	-5.30** (-3.93)		.31
Model II						
$R_{2,1}$	-.030 (-.520)	.000027#** (-2.85)				.63[h]
$R_{2,2}$	.0053# (1.14)	.0000013* (2.23)	.1008 (3.29)	-.079 (-1.14)	-.077 (-1.51)	.32

[a]Dependent variable.

[b]Definitions of independent variables can be found in Table 1.

[c]Georgia, Florida and Alabama counties were pooled for regression analysis.

[d]The # symbol denotes that the coefficient had the hypothesized sign.

[e]The 5 percent level of significance is denoted by * and the 1 percent level by ** (one tail test).

[f]The value in parentheses is the t value.

[g]The predicted current wage from the first stage regression ($\hat{WF}$) was used in place of WF_{lag}.

[h]The mean yield per county (Y) was used as an additional independent variable in this regression. Its coefficient was .0127 #** with a t-ratio of 12.42.

Table 3. Structural coefficients for the labor demand equations, by belts and areas

Regression	Area	Dep. var.[a]	Independent variables[b]				
			Constant	$\hat{WF}$	TC	Q	R^2
$R_{3,1}$[c]	N. C.	LA	7997.08	-7278.39[#**ef] (8.866)[g]	.03578[#**] (154.26)	.09689[#**] (134.20)	.91
$R_{3,2}$	N. C.: Old Belt	LA	6714.21	-5922.70[#**] (10.74)	.02835[#**] (33.918)	.105307[#**] (80.197)	.91
$R_{3,3}$	N. C.: Middle Belt	LA	12049	-10348.36[#**] (7.92)	.00051[#] (.00069)	.1437[#**] (19.19)	.74
$R_{3,4}$	N. C.: Eastern Belt	LA	4028.67	-4750.85[#*] (7.1131)	.03089[#**] (78.108)	.08941[#**] (74.14)	.92
$R_{3,5}$	N. C.: Border Belt	LA	1180.10	-2337.09[#] (.6584)	.045036[#**] (31.379)	.1250[#**] (16.95)	.97
$R_{3,6}$	Va.	LA	4794.64	-4258.21[#] (-1.337)	.0217[#**] (7.003)	.1144[#**] (24.20)	.97
$R_{3,7}$	S. C.	LA	39805.75	-45593.65[#**] (-4.75)	.01997[#**] (7.563)	-.14085 (-3.3019)	.75
$R_{3,8}$[d]	Belt 14	LA	11221.95	-12377.12[#**] (-4.078)	.01008[#**] (5.256)	.0597[#**] (3.411)	.52

Table 3 (continued)

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[a]Dependent variable.

[b]Definitions of independent variables can be found in Table 1.

[c]The coefficients and standard errors for dummy variables for belts omitted from the table were: D_2: 92.85 (.269); D_3: -2234.36 (13.95); D_4: -1599.98 (6.6117).

[d]The coefficients and standard errors for dummy variables for belts omitted from the table were: D_2: 3134.7 (4.60); D_3: -781.6 (-2.81).

[e]The # symbol denotes that the coefficient had the hypothesized sign.

[f]The 5 percent level of significance is denoted by * and the 1 percent level by ** (one tail test).

[g]The value in parentheses is the t^2 value for equations $R_{5,1}$ to $R_{5,5}$, and the t value for the rest of regressions.

Table 4. Structural coefficients for the labor supply equation, by belts and areas

Regres- sion	Area	Dep. var.[a]	Independent variables[b]				
			Constant	$\hat{LA}$	WNF	RP	R^2
$R_{4,1}$[c]	N. C.	WF	1.059	.0000119[#f] (3.1402)[h]	.00289[#**g] (8.508)	-.0000013[#] (2.178)	.68
$R_{4,2}$	N. C.: Old Belt	WF	1.143	-.0000129 (-.5190)	.0012035[#] (.7044)	-.0000013[#] (.5829)	.22
$R_{4,3}$	N. C.: Middle Belt	WF	1.027	.0000135[#] (.2034)	.00307[#] (2.539)	-.000008[#] (.07009)	.29
$R_{4,4}$	N. C.: Eastern Belt	WF	.7678	.000027[#*] (5.2069)	.0167[#**] (13.43)	-.0000027[#] (3.1904)	.35
$R_{4,5}$	N. C.: Border Belt	WF	.7878	.000042[#*] (3.728)	.0256[#**] (5.272)	.000007[#*] (3.983)	.42
$R_{4,6}$	Va.	WF	1.099	-.00011 (-.467)	.00071[#] (.5085)	-.0000002[#] (.0973)	.04
$R_{4,7}$	S. C.	WF	1.032	-.00019 (-2.071)	-.0263 (-1.63)	.0000013 (1.755)	.12
$R_{4,8}$[d]	Belt 14[e]	WF	.9008	.000011[#] (.3661)	.000666[#] (.61074)	-.000003[#] (-1.17)	.41

Table 4 (continued)

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[a]Dependent variable.

[b]Definitions of independent variables can be found in Table 1.

[c]The coefficients and standard errors for dummy variables for belts omitted from the table were: D_2: -.013 (2.19); D_3: -.22 (95.90); D_4: -.22 (52.53).

[d]The coefficients and standard errors for dummy variables for belts omitted from the table were: D_2: .2323 (11.52); D_3: -.0644 (-1.55).

[e]Georgia, Florida and Alabama counties were pooled for regression analysis.

[f]The # symbol denotes that the coefficient had the hypothesized sign.

[g]The 5 percent level of significance is denoted by * and the 1 percent level by ** (one tail test).

[h]The value in parentheses is the t^2 value for equations $R_{5,9}$ to $R_{5,13}$, and the t value for the rest of the regressions.

analysis. Regressions were run with two different dependent variables, the rental rate (R) and the rental rate over the 1966 rental rate (R/R_{1966}).

The quota coefficient was negative in all of the N. C. regressions in which belts were pooled. The coefficient was significant at the 1 percent level of significance for $R_{1,2}$. This produces a negatively sloped reservation demand for North Carolina which can be used to make predictions when changes in the size of quota occur. The coefficient for the lagged farm wages in the three regressions was negative as hypothesized and significant at the 1 percent level. It can be argued from these results that wages exert a strong influence in determining the level of the rental rate. The off-farm opportunities coefficient was negative as hypothesized and significant in all three regressions.

The coefficient of the price of tobacco variable, which was always lagged one year, had the expected sign but was not significant in most of the regressions. In every case its coefficient was much smaller than had been expected. The variance-in-yield variable was negatively correlated with the dependent variable as expected in regression $R_{1,1}$ and its coefficient was significant at the 1 percent level of significance. North Carolina counties were divided into the four belts (Old, Middle, Eastern and Border), and in regression $R_{1,1}$ and $R_{1,2}$ dummy variables were used to allow for differences among those belts. D_2 represents the dummy variables for Middle Belt, D_3 for the Eastern Belt and D_4 for the Border Belt. When the dependent variable used was R/R_{1966} (proportional change in rental rate), the coefficient of determination was .38, compared to .46 of $R_{1,1}$.

Regressions $R_{1,3}$ - $R_{1,5}$ concerned the states of Virginia, South Carolina, and Belt 14. The coefficient of quota had the expected sign in all regressions and was significant for Virginia and in Belt 14 when the dependent variable was the absolute rental rate. The values of the coefficients of the quota variable were -13.09 for Virginia, -7.35 for South Carolina and -5.27 for Belt 14; much less elastic than suggested by similar formulation for N. C., $R_{1,1}$. The farm wages and the off-farm opportunities variables had the hypothesized coefficients in half of the regressions and farm wages were significantly different from zero at the 1 percent level in the regressions for Virginia and South Carolina. The absolute size of the wage coefficient varied greatly: -1.91 for Virginia and -31.47 for South Carolina. This variation is surprising considering the basic similarity in the way tobacco production is organized in the two states.

The coefficient of the price of tobacco variable for those states did not have the expected sign in two regressions out of the three areas outside N. C., but the coefficients were not significantly different from zero. The variance in yield was not a variable entering the regressions on Virginia, South Carolina and Belt 14 because data on the yields per township in the counties were not available. The R^2 ranged from .17 to .32 for the regressions of those states.

Model II. Reservation Demand Simultaneously Determined with Labor Market

Model II employed the basic equations used in Model I. The only change from Model I was that current rather than lagged wages in the reservation demand model were used. The three equations compose a simultaneous equation system because the farm wage, the labor used and the rental rate are simultaneously determined. Endogenous variables were rental rate, quantity of labor, and the wage rate. The exogenous variables were off-farm opportunities lagged, price of tobacco lagged, variance in yield, total cropland, rural population and the size of quota. All three equations were over-identified and two-stage least squares were applied. The structural coefficients obtained from the quota market are reported in Table 2.

Regressions for this model were estimated only for North Carolina because of the generally unsatisfactory labor market regressions for areas outside of N. C. which will be reported below. Dummy variables were used to account for mean belt differentials. Two different dependent variables were used: R and R/R_{1966}. In the structural equations all the coefficients had the hypothesized signs. The coefficient of the quota variable was significant at the 1 percent level in equations $R_{2,1}$ and $R_{2,2}$.

The values of the coefficient of the quota variable in the structural equation of Model II were generally larger and had smaller standard errors than their counterparts in Model I (Table 2). The farm wage coefficient was significant at the 1 percent level as it was in Model I formulations. The coefficients of the other variables, that is off-farm opportunities, price of tobacco, and variance in yield, had approximately the same values as in Model I regressions. The R^2's in Model II structural equations correspond roughly to those obtained for Model I except for $R_{2,1}$ which had the highest R^2 obtained: .63. This is due to the inclusion of mean county yield as an independent variable.

Labor Model

The structural equations used for the labor market which were listed above were:

Demand: LA = f(WF, TC, Q) (3)

Supply: WF = f(LA, WNF, RP) (4)

The endogenous variables were LA (quantity of labor in agriculture) and WF (farm wages) and the exogenous were TC (total cropland), Q (quota), WNF (off-farm opportunities), and RP (rural population). Both equations were over-identified and two-stage least squares were applied. The reduced form equations were:

LA = f(WNF, TC, RP, Q) (5)

WF = f(WNF, TC, RP, Q) (6)

Regressions of the structural equations were estimated for North Carolina (all belts), each N. C. belt separately, Virginia, South Carolina and Belt 14. Coefficients of the structural equations appear in Tables 3 and 4. First stage regression results are reported in Appendix A Tables 2 and 3.

The structural equations for demand produced a negatively sloped demand curve for labor for all regressions and the coefficient was significant at the 1 percent level for North Carolina (combined), the Old Belt, the Middle Belt, South Carolina and Belt 14. It was significant at the .05 level for the Eastern Belt.

The coefficient for total cropland had the expected sign in all regressions $R_{3,1}$ through $R_{3,8}$ and was significant at the 1 percent level for seven regressions out of the total eight. The structural coefficient for quota was consistent with the hypothesis and significant at the 1 percent level for all regressions except the one for South Carolina. The R^2 was quite satisfactory and reached the level of .97. The lowest obtained was .52, which was significant.

Generally the performance of the labor supply function was not as good as for the demand function. Only five out of eight regressions resulted in a positively sloped labor supply curve. Rural population as an explanatory variable performed well giving the hypothesized sign in seven out of eight regressions. The R^2 was as high as .68 for North Carolina and as low as .04 for Virginia.

Labor market elasticities computed for a 10 percent increase in wage rates are reported in Table 5. The 1968 wage and quantity of labor in each area were used in the computations leading to an estimation that is conceptually between a point and arc elasticity. The computed labor demand elasticities were greater than one in all areas except for the Border Belt where it was equal to -.51. In areas in which tobacco is an important crop, such as Eastern and Border Belts for North Carolina, the demand elasticities were as low as -1.22 and -.51 compared to -3.09 and -4.81 of Old Belt and Middle Belt, respectively. An increase in farm wages would cause a reduction in the quantity of labor demanded in the Eastern and Border Belts relatively smaller than in the Old and Middle Belts. Differences in the returns to tobacco production and sale could explain the phenomenon. Increase in farm wages in the Eastern and Border Belts would squeeze profits of the farmers, but since production is still profitable they would continue to produce and consequently to employ laborers. On the contrary in the Old and Middle Belts where returns of tobacco production are relatively lower, marginal producers would stop farming and seek off-farm employment.

There is some consistency in the labor supply elasticities also. In areas such as the Eastern and Border Belts where agriculture is the major activity and there are not large amounts of nonfarm employment, even a significant increase in farm wages cannot be expected to induce a large increase in the supply of labor. But in those areas where off-farm opportunities are available nearby, a small increase in farm wages apparently can induce a large movement of labor into farm activities. Conversely, a decline in farm wage could lead to a substantial movement of labor into nonfarm activities.

Table 5. Labor demand and supply elasticities for the different geographical areas

Area	Demand elasticity	Supply elasticity
N. C. (all belts)	-2.45	26.60
N. C. Old Belt	-3.09	_[a]
N. C. Middle Belt	-4.81	33.40
N. C. Eastern Belt	-1.22	9.60
N. C. Border Belt	- .51	5.10
Virginia	-3.56	_[a]
South Carolina	-20.07	_[a]
Belt 14	-13.10	97.90

[a]These regressions gave negative slope so a positive elasticity could not be estimated.

PREDICTIONS OF QUOTA TRANSFERS AND RENTAL RATES

Statistical analysis is directed to the making of predictions. In this section a number of the reservation demand models are used to generate predictions about future events. Predictions reported are directed to two questions: (1) What rental rates would be expected to prevail under a substantial change in total quota or with higher wages with no transfer among counties? (2) What shifts in the location of quota might occur if intercounty and interstate shifts in quota were allowed? These two types of projections can be classified as (1) economic change within the present institutional structure and (2) change in the structure of the quota market.

Rental Rates with a Reduction in Quota

Farmers are permitted to transfer quota from one farm to another but, under the present program, transfer can take place only within the county to which it is assigned. Based on this institutional framework, the economic behavior of farmers is reflected in the different regressions estimated for the reservation demand model, for models both simultaneous with and independent of the labor market.

Let us suppose that the government reduces the quantity of quota by 25 percent by 1975 as a result of the smoking and health controversy which may affect the demand for cigarettes. Using the regression models, 25 percent reduction in quota *ceteris paribus* is predicted to increase the rental rate for North Carolina (all belts pooled) by .2541 cents (Table 6). Considering that the 1968 rental rate for North Carolina was 12.81 cents, the .2541 cent increase corresponds to a 2 percent change in rental rates under the assumption of given 1968 price-cost relationship. This estimate was based on regression $R_{1,1}$, Model I of Table 2. The elasticity of demand for quota generated by the model is -12.5. Using the 1968 average rental rate for each belt and the regression coefficient for quota of -.959 from equation $R_{1,1}$, elasticities of demand for quota were computed for each belt. The range of elasticities lies between -10.0 (Old Belt) and -15.6 (Border Belt).

Table 6. Change in rental rates assuming a 25 percent decline in quota and 1968 price-cost relationships[a]

Regression on which estimate is based	Region	1968 average rental rate	Percentage change in rental rate	Arc elasticity of demand
$R_{1,1}$	North Carolina	12.81	2.0	-12.5
$R_{1,2}$	North Carolina	12.81	8.0	- 3.1
$R_{1,3}$	Virginia	12.84	25.9	- 1.0
$R_{1,4}$	South Carolina	11.73	16.2	- 1.5
$R_{1,5}$	Belt 14	13.84	10.0	- 2.5
$R_{2,1}$	North Carolina	12.81	4.6	- 5.4
$R_{2,2}$	North Carolina	12.81	9.2	- 2.7

[a]The estimates in this table are based on regressions of Model I.

By utilizing regressions coefficients of Q/Q_{base} for the various regression equations reported in Table 2, elasticities for the rest of the areas were obtained and are reported in Table 6.

The differences among elasticity estimates for a given region using different regression equation coefficients were disappointing. Little geographic pattern is discernible in Table 6. There is a slight tendency for elasticities of demand to increase moving from west to east and north to south across North Carolina with the highest elasticity appearing in the Border Belt. On this basis, higher elasticities than estimated would have been expected for South Carolina and the Belt 14 production region, other things equal.

The predictions obtained in Table 6 were the result of the direct effect of changes in the exogenous variable quota on rental rates. When quota changes in the t^{th} period, ceteris paribus, it affects directly the t^{th} period rental rate. There is another effect, though indirect. Following the logic of Model I, change in quota affects quantity of labor demanded in the t^{th} period and causes changes in the t^{th} period farm wage rate. Assuming nothing else changes between the t^{th} and $t + 1^{st}$ period, wages of the t^{th} period will affect the $t + 1^{st}$ period rental rates. The indirect effect of quota through wages accentuates the change in rental rate.

An example will illustrate the point. Assume a 25 percent reduction in quota occurs relative to the 1968 base. Ceteris paribus, it produces the direct effect on rental rates as follows: $\Delta R_{1968} = -.959\ (\Delta Q_{1968}) = .2133$ based on $R_{1,1}$ (Table 2). Wages change too because of the change in quota. Based on the reduced form corresponding to equation $R_{4,1}$ (Appendix B) $\Delta WF_{1968} = .000001\ (\Delta Q_{1968}) = .003$ where ΔQ is a negative number since quota was assumed to decrease. The change in rent resulting from a change in wages operating through the wage coefficient would be: $\Delta R_{1969} = -8.324\ (-.003) = .0250$ based on equation $R_{1,1}$. The total change in the rental rate is equal to $.2133 + .0250 = .2383$.

Buse (1958) has shown the relevance of the reduced form coefficients in the estimation of what he calls "total elasticities." The reduced form coefficient is suggestive of the response of an endogenous variable to exogenous changes given that all other endogenous variables have adjusted fully to the changes. Consequently in making use of Model II to estimate the changes which would be forthcoming, the reduced form reservation demand equation developed in Appendix B had to be used to estimate the full effect of quota reduction on rental rates. These values are also reported in Table 6. Using $R_{2,1}$ the predicted change in rental rate for a 25 percent decrease in quota is equal to .586 cents per pound. For equation $R_{2,2}$ the change would be 1.18 cents per pound.

Rental Rates with Increased Wages

The effect of wages, used as a lagged exogenous variable in Model I, on future rental rates was estimated also. Assuming that farm wage rate increased by 10 percent, other things being equal, the rental rates in each geographical area would fall. Roughly a 10 percent change in wages from the 1968 level would amount to 10 cents an hour. This could cause something close to a 1 cent change in rent in that the ratio of the change in wages and rent should be approximately equal to the ratio of hours per acre and pounds per acre: 200 hours labor per acre and 2,000 pounds per acre (Davis and Chappell, 1969). The level of predicted change is reported in Table 7 by geographical area and regression. The results for $R_{1,1}$ and $R_{2,2}$ are probably the most plausible of all the regressions. Results for $R_{1,2}$ are lower than expected and for $R_{1,4}$ it is about double the expected level.

Rental Rates with Transferability of Quota

Currently flue-cured allotment can be transferred among farmers within a given county. If transferability were allowed between counties, there would be a substantial flow from low-rent to high-rent counties. Rented rates would rise in counties losing (exporting) quota and fall in counties gaining (importing) quota until the rental rate was approximately equal in all counties.

Predictions of the rental rates and pounds of quota transferred can be generated from the estimated quota market and labor market equations. First the procedure used in estimating transfer for various regression formulations will be presented and then predictions for several alternative trading areas and circumstances will be presented. Implications for the labor market and for efficiency will also be discussed.

Table 7. Change in rental rates assuming a 10 percent increase in farm wage rate and 1968 price-cost relationships

Regression on which estimate was based	Geographic area	Change in rental rates reported in cents	1968 average rental rate in cents	Percentage change
$R_{1,1}$	North Carolina	- .80	12.81	- 6.25
$R_{1,2}$	North Carolina	- .68	12.81	- 5.35
$R_{1,3}$	Virginia	- .20	12.84	- 1.56
$R_{1,4}$	South Carolina	-2.45	11.73	-20.89
$R_{1,5}$	Belt 14	No evidence[a]	13.84	--
$R_{2,1}$	North Carolina	- .51	12.81	- 4.24
$R_{2,2}$	North Carolina	- .71	12.81	5.56

[a]The labor coefficient has a positive (implausible) sign in this regression (Table 2).

The Transfer Equilibrium Mechanism

A programming procedure was developed for regression equation $R_{1,1}$ and similar equations in which rent is a function of present quota divided by quota in the base year: $R = f(Q/Qb, \text{-------})$. The basic programming model is as follows:

$$R_e - R_c = b_1 \frac{(Q_e - Q_c)}{Q_b} \qquad (7)$$

where R_e = equilibrium rental rate

R_c = average rental rate of the county

b_1 = coefficient of the quota variable in the reservation demand function

Q_e = equilibrium quantity of quota in the county

Q_c = quota assigned to the county, 1969 for North Carolina and 1968 for other states

Q_b = quota in the county for the base year, 1965 for North Carolina and 1966 for other states

Equation (7) should be solved for R_e subject to the following constraints.

(a) $\sum_{c=1}^{N} (Q_e - Q_c) = 0$: The sum of imports should equal the sum of exports in the trading area.

(b) $|(Q_e - Q_c)| \leq ZQ_c$: The absolute value of the change in quota in a county should be less than or equal to the size of the existing quota in the county multiplied by the factor Z. In this study Z was arbitrarily set at 0.25 and 1.00 for most projections. Under this restraint no county can export more than the quota that is allotted to it for the year and no county can produce more than twice the initial amount of its poundage quota when Z is set at 1.0.

An initial rent is arbitrarily specified for all counties. The reservation demand equation is used to establish the level of quota demanded in each county. Exports and imports are summed across counties. If total exports exceed total imports, a lower rent is specified, and the process is repeated. The process ends when net rents are nearly zero in accordance with constraint (a).

Implicitly this mechanism assumes that the estimated slope of the reservation demand curve holds far outside of the range observed in the study period. Straight line demand curves, such as the ones assumed in the regression equations, imply that equal amounts of production capacity exist at succeeding levels of cost. Experiments with curvilinear demand curves and their implications for transferability may be found in Appendix C.

When equation (7) is applied to Model 1 regressions, all other variables are assumed to be unchanged. Any impact the transfer would have on the labor market would presumably take place in the next period. The interaction could be estimated by accounting for the effect of quota on wages and then wages on rent. When the transfer mechanism is used with Model 2 regressions, a factor is added to b_1 before it is multiplied by $\frac{(Q_e - Q_c)}{Q_b}$.

The factor added to b_1 accounts for the indirect impact of quota on wages, and wages on rent. The computation of this factor is presented in Appendix B. The resulting transfer equation is:

$$R_e - R_c = (b_1 + b_2 Q_b) \frac{(Q_e - Q_c)}{Q_b} \qquad (8)$$

where b_2 = the reduced form reservation demand equation coefficient which is derived from the reduced form wage equation implied by the structural equations for the labor market.

One further adjustment is needed to accommodate regression equations of the form of $R_{1,2}$ in which $R/R_b = f(Q/Q_b \ . \ . \ .)$. The equation used for the programming procedure is:

$$R_e - R_c = b_1 \frac{Q_e - Q_c}{Q_b} R_b \qquad (9)$$

where R_b is the rented rate in the base period.

The equilibrium rental rates reported below represent the rates predicted to prevail in exporting and importing counties except for those counties at one of the limits placed on the transfer program. The county in which desired exports are greater than its allowance under the constraint would experience a rental rate below the reported equilibrium rate. The opposite case would occur for a county constrained on the levels of imports. The mean weighted rental rate taken across all counties could be either above or below the reported rental rate. In several of the transfer program situations to be reported below, the weighted rental for all N. C. counties was about 0.5 cents per pound below the equilibrium rental rate derived from the transfer mechanism.

Equilibrium Rents in N. C. Allowing Only Intrastate Transfers, 1969 Quota Base

The predicted equilibrium rental rates reported in Table 8 do not vary much but there is substantial difference in the predicted quota transfers using the different equation coefficients. The single best prediction is probably the one associated with $R_{2,1}$ since that regression equation had the highest R^2 and a small standard error for the coefficient of quota. The coefficient of quota in the two regressions $R_{1,2}$ and $R_{2,2}$ was also highly significant. These two regressions used R/R_{base} as the dependent variable. Their predictions should also be considered seriously. The regressions with inelastic reservation demand curves predicted relatively small amounts of quota transfer and lower equilibrium rental rates. In these two models the slope of the demand curve varied from county to county when the data were plotted in terms of rent per pound and pounds of quota.

The transfer model using regression coefficients from $R_{2,1}$ estimated large transfers relative to the base quota in the various counties and belts. The estimated Old Belt losses and Border Belt gains are over 80 percent of the base quota. Middle Belt losses and Eastern Belt gains are projected at 50 percent of base quota. By contrast under $R_{2,2}$ projection, the transfer rates in the two belts transferring most would be less than 50 percent. The other two belts would transfer less than 25 percent of base.

In principle, Model I and Model II regressions are not directly comparable because the predictions for regressions such as $R_{1,2}$ do not contain an allowance for the impact of added quota on wage rates which in turn would affect quota demand as do the regressions such as $R_{2,1}$. In practice this is not an important factor. In all models wages respond only infinitesimally to quota transfers. Thus, the results in Table 8 represent essentially fully adjusted quota transfer.

Table 8. Equilibrium rental rates, net transfers across county lines by belts in thousands of pounds for a hypothetical free-exchange program of quota within N. C. for 1969 using alternative regression equation results for the transfer program mechanism, transfer constrained to 100 percent of initial quota

Item	$R_{1,1}$	$R_{1,2}$	$R_{2,1}$	$R_{2,2}$
		(cents per lb.)		
Equilibrium rental rate	13.30	12.72	13.09	12.58
		(1,000 lbs. transferred)		
Area				
Old Belt	-153,797	-104,160	-135,189	-87,545
Middle Belt	- 94,038	- 35,750	- 59,469	-27,931
Eastern Belt	176,099	90,658	119,925	76,435
Border Belt	71,775	49,259	74,734	39,038

The second round effect of quota on rent working through wages is small essentially because the elasticity of supply implied by the coefficients of $R_{4,1}$ is so high. It is frequently assumed that the response of quantity of labor to wages is very low in agricultural areas. To simulate an inelastic labor supply situation, transfer program coefficients were developed assuming the coefficient of labor (LA) in $R_{4,1}$ (Table 4) was 10-fold and 100-fold larger than that estimated. Under these assumptions with the transfer constraint set at 100 percent of initial quota, the equilibrium rent was reduced some. More important, the amount of quota transferred was reduced sharply for equations such as $R_{2,1}$ making them more nearly consistent with $R_{1,2}$ and $R_{2,2}$ results. The elasticity of labor supply is potentially an important factor in determining the quantity of quota that would transfer under a free-exchange program. If labor is inelastically supplied to farm work, the amount of transfer is overestimated in Table 8.

The transfer predictions for $R_{1,1}$ are presented as a bridge to some of the analysis of transfer between states which follows. This equation was used in analyses which encompassed interstate transfer. The very large amounts of quota transfer in what follows should not be taken as the best estimate of quota transfer because the slope of the demand curve associated with this regression equation seems in retrospect to be more elastic than is realistic.

Equilibrium Rents Contrasting Intrastate and Interstate Transfer of Quota, 1968 Quota Base

Because data were available for counties outside North Carolina only through 1968 when initial projections were made, rental equilibria for interstate and intrastate trading models were based on the 1968 distribution of quota. The results of free intrastate transfers are reported in Table 9. Absolute quantities of import and export were constrained to the amount of quota in a county in 1968. In terms of the constraint (b) discussed with reference to equation (7), Z = 1.0: an exporting county can lose all of its quota while an importing county is limited to doubling its quota. A summary of transfers between belts within N. C., the only state with more than one belt, is also presented in Table 8.

Table 9. Equilibrium rental rates, exports and imports across county lines in thousands of pounds under a hypothetical free-exchange program within each state for 1968, absolute transfer per county constrained to initial quota[a]

Area	Equilibrium rental rate	Exporting no. of counties	Transfers	Importing no. of counties	Transfers	Net transfers	Percent of base
			(1000 lbs.)		(1000 lbs.)	(1000 lbs.)	
North Carolina							
Old Belt	--	16	100(682)	1	9,936	-90,746	-69
Middle Belt	--	11	49,233	1	17,200	-32,033	-31
Eastern Belt	--	20	102,802	7	162,282	59,480	16
Border Belt	--	3	7,482	4	70,786	63,304	67
State	15.34	50	260,199	13	260,204	5[b]	--
Virginia	14.96	19	3,976	7	3,976	0	--
South Carolina	17.15	16	13,363	6	13,363	0	--
Belt 14	16.87	56	33,896	18	33,944	48[b]	--
Total	--	141	311,434	44	311,487	53[b]	--

[a]The regression equations from which coefficients were taken for the transfer model by states were North Carolina, $R_{1,1}$; Virginia, $R_{1,3}$; South Carolina, $R_{1,4}$; Belt 14, $R_{1,5}$.

[b]The difference between total exports and imports is due to rounding errors and residual left by the computer trying to satisfy the constraint, $\Sigma(Q_e - Q_c) = 0$, discussed in conjunction with equation (7).

The total amount of interfarm transfer cannot be estimated by the model because there is no way to determine how much of the interfarm transfer which occurred within counties in 1968 would have been supressed by intercounty transfer. Nevertheless a comparison of the amount of interfarm transfer to intercounty transfer yields some information on the magnitude of predicted market activity. Data for 1968 intracounty transfer and the predicted intrastate and interstate transfer as a percent of 1968 transfer are presented in Table 10. Since some within-county transfer would continue, the data are understatements rather than overstatements. To avoid double counting in belts in which some counties exported and others imported quota, the larger sum was used to summarize experience by belts within North Carolina. In areas of large amounts of transfer, intracounty trading would be sharply reduced by allowing wider transfer but not so in areas of small amounts of transfer. In areas outside N. C. the percentage figures of Table 10 probably represent added transfer activity fairly well, while within N. C. the percentage figure probably represents the total rather than added market activity relative to 1968 intracounty transfer.

The equilibrium rental rate predicted when quota was hypothetically allowed to move to any of the producing areas in the six southeastern states with maximum transfer per county set at 100 percent of the initial quota (the same level as in Table 9) was 15.48 cents per pound. This rate was intermediate to the rates obtained for the model with four state trading areas reported in Table 9. Only a small difference in total transfer across county lines occurred under the within-state (Table 9) and between-state (Table 11) programs. Each N. C. county was an exporter under both programs or an importer under both. However, the volume of transfer varied somewhat under the two programs. A few importing Virginia counties under the within-state program became exporters under the between-state program. Conversely, a few exporting counties in states south of N. C. became importers with the broadening of the exchange area. On balance, total production was only slightly more concentrated geographically under the between-state program than under the within-state program.

Both transfer programs were also run with constraints set at 0.25 of the initial base. In this situation no county could export or import

Table 10. Cross-county market transfer activity under alternative market arrangements, 1968 base[a]

Area	Quota base in 1968	Quota transferred in 1968	Intrastate transfer[b]: Pounds transferred as a percent of actual 1968 transfer	Interstate transfer[c]: Pounds transferred as a percent of actual 1968 transfer
	(1000 lbs.)		(percent)	(percent)
North Carolina				
Old Belt	131,337	29,889	337	351
Middle Belt	104,148	20,987	235	292
Eastern Belt	374,091	57,186	284	279
Border Belt	94,570	17,022	416	389
State	704,146	125,084	208	251
Virginia	94,463	21,902	18	25
South Carolina	131,842	24,018	56	166
Belt 14	138,165	43,355	78	125
All states	1,068,616	214,359	145	162

[a]For belts in which some counties exported and some counties imported quota, the larger number of imports or exports was used as the measure of transfer.

[b]Basic data are found in Table 9.

[c]Basic data are found in Table 11.

Table 11. Exports and imports across county lines in thousands of pounds under a hypothetical free-exchange program among all producing states for 1968 with absolute transfer constrained to initial quota

Area	Exports		Imports		Net transfers	Percent of base
	No. of counties	Transfers	No. of counties	Transfers		
		(1000 lbs.)		(1000 lbs.)	(1000 lbs.)	
North Carolina						
Old Belt	16	104,952	1	7,842	-97,100	-74
Middle	11	61,211	1	17,200	-44,011	-42
Eastern Belt	20	138,168	7	159,546	21,378	6
Border Belt	3	9,928	4	66,294	56,366	60
State	50	314,259	13	250,882	-63,377	- 9
Virginia	23	5,877	3	1,248	- 4,629	- 5
South Carolina	15	7,525	7	39,931	32,406	25
Belt 14	52	19,070	22	54,372	35,302	26
Total	140	346,731	45	346,433	- 298[a]	

[a]The difference between total exports and imports is due to rounding errors and residual left by the computer trying to satisfy the constraint $\Sigma(Q_e - Q_c) = 0$ discussed in conjunction with equation (7).

more than one-fourth of its 1968 base. The results are presented in Appendix A, Tables 5 and 6. In broad terms, the amount of transfer was reduced to about 35 percent of the level of transfer under the corresponding programs with the constraint factor set at 100 percent of the initial quota. No shifting between exporting and importing occurred for any county.

An additional constraint was used with the between-state program: exports were limited to 100 percent of initial quota but imports were allowed up to the point that total tobacco acreage would be equal to 50 percent of cropland in the county. Under this constraint total trade increased about 40 percent over the initial import constraint of 100 percent of initial base (Table 11). The equilibrium rental rate was 16.16 cents per pound. Under this program, all counties would lose quota in Virginia, Alabama and the Old Belt of North Carolina.

In all of the 1968 interstate and intrastate transfer projections, very elastic quota demand coefficients were used. In surveying the results the emphasis should be on the relative magnitudes rather than the absolutes. The results in Tables 9, 11, 12 and Appendix A Tables 5 and 6 demonstrate the importance of constraints on a county level. Transfer projections responded much more sharply to allowed exports and imports per county than they did to where the quota was transferred. Contrasting Table 9 to 11 and Appendix A Table 5 to 6 showed that N. C. would lose less than 10 percent of its quota with an interstate program. By comparison moving from lower to successively higher restraints from Appendix A Table 6 to Table 11 and then to Table 12 leads to a tripling and quadrupling of total transfer activity within North Carolina. With less elastic demand curve regression results, the pattern among tables would probably remain but the amplitude would be much less.

Table 12. Exports and imports across county lines in thousands of pounds under a hypothetical free-exchange program among all producing states for 1968 with absolute transfer constrained to initial quota for exporters and total tobacco acreage to 50 percent of cropland for importers[a]

Area	Exports		Imports		Net transfers
	No. of counties	Transfers	No. of counties	Transfers	
		(1000 lbs.)		(1000 lbs.)	(1000 lbs.)
North Carolina					
Old Belt[b]	17	120,494	0	0	-120,494
Middle Belt	11	86,948	1	38,558	- 48,390
Eastern Belt	21	210,431	6	298,439	88,008
Border Belt	5	20,392	2	71,641	51,249
State	54	438,265	9	408,638	- 29,627
Virginia	26	9,245	0	0	- 9,245
South Carolina	16	9,878	6	28,979	19,101
Belt 14					
Georgia	34	16,878	16	43,630	26,752
Florida	18	7,923	2	1,631	- 6,292
Alabama	4	877	0	0	- 877
Area	56	25,678	18	45,261	19,583
Total	152	483,066	33	482,878	- 188[c]

[a]Estimated by multiplying tobacco yield times 50 percent of cropland acreage as reported in the U. S. Census of Agriculture (U. S. Bureau of the Census, 1965).

[b]For belts the larger of exports or imports was used as the measure of transfer.

[c]The difference between total exports and imports is due to rounding errors and residuals left by the computer trying to satisfy the constraint $\Sigma(Q_e - Q_c) = 0$ discussed in conjunction with equation (7).

RESOURCE ALLOCATION, EFFICIENCY AND INCOME WITH TRANSFERABILITY

The Impact of Transfer on Labor Utilization

If tobacco quota were made transferable and considerable adjustment occurred in the geographic distribution of production, input suppliers would be affected. All input sales of goods and services would be affected about in proportion to the decline or increase in importance of tobacco production in a local area. The problems of adjustment would not be the same for all inputs, however. For example, the adjustments required in the wholesaling and retailing of fertilizer would be made fairly quickly because warehouses and retail stores have other uses. By contrast, labor adjustments would probably require several years. Tobacco workers would have to find employment in other farm and nonfarm employment in exporting areas, or alternatively, production workers would have to follow the crop to its new location. In some cases, it might be possible for workers to migrate for seasonal tobacco work, but in others the workers and families would need to move to the importing areas.

The labor supply equations discussed above suggest that labor supply is very elastic. That is, adjustments in numbers of workers take place without much change in the wage rate. The coefficients of labor supply were used in conjunction with the transfer models developed in the previous section for transfer within North Carolina using 1969 base to estimate the amount of labor adjustment that might take place. Labor adjustments estimates for three of the transfer models appear in Table 13. Employment was estimated to decline between 19.9 and 27.5 percent in exporting counties in response to transfer programs using coefficient from $R_{1,2}$, $R_{2,2}$ and $R_{2,1}$ (Table 13). The decline projected under the $R_{1,2}$ transfer program was 23.5 percent. Increased employment as a percentage of pre-transfer employment in all importing counties ranged from 17.9 to 36.6 under the three alternative sets of coefficients for the transfer program. While more precision in estimates is desirable, it is clear that major labor adjustments would be entailed for transfer on a relatively unconstrained basis. With transfer constrained to

Table 13. Percentage adjustments in the quantity of labor estimated to result from a hypothetical free-exchange quota transfer program based on alternative regression equation coefficients with 1969 base quota and transfer constrained to not more than 100 percent of initial quota

Regression equation used for transfer program coefficients	Exporting counties		Importing counties	
	No. of counties	Percentage labor adjustment	No. of counties	Percentage labor adjustment
$R_{1,2}$	41	-23.5	22	20.6
$R_{2,1}$	45	-27.5	18	36.6
$R_{2,2}$	41	-19.9	22	17.9

25 percent of initial base, the shift in employment would be reduced to only about 35 percent of the level reported in Table 13. If, in fact, the supply curve of labor is more inelastic, wages and rent would react to quota transfer reducing the level of employment adjustment.

Resource Efficiency

Many studies have found that removing transfer restrictions on inputs results in a more efficient use of the resources. Gardner and Fullerton (1968) showed that allowing transfer of irrigation water contributed over time to the increase of value of marginal product of the water. Bradford and Toussaint (1962), studying the economic effects of transferability of allotment, estimated that movement of allotment would lower costs and increase total returns to North Carolina farmers. Specifically, they estimated by budget procedures that transferring 9 percent of the poundage of Old and Middle Belts to Eastern and Border Belts would mean an average annual cost saving of $3.6 million for the farmers in the state.

A crude estimate of the resources saved for a particular transfer program can be obtained based on the 1969 average yield of each belt. The Old and Middle Belts had a yield of 1765 pounds per acre; the Eastern Belt, 1895; and the Border Belt, 1840 (N. C. Department of Agriculture, 1970, p. 4). If all the pounds transferred under the hypothetical program reported in Table 8 for $R_{1,1}$ were taken from and transferred to land with yields equal to the respective belt averages, a saving of 8200 acres would result from the transfer of quota. These acres would be released to be utilized for other crops.

Another rough estimate of resource savings could be made in terms of wage costs. Average wages in the Eastern and Border Belts were $1.12 and $1.15, respectively, in contrast to $1.33 and $1.34 for Old and Middle Belts in 1969. Assuming that labor requirement for a pound of tobacco is the same from belt to belt, then the cost for labor would be lower if tobacco was produced in the eastern part of the state. Using farm costs and returns data for a typical coastal plains farm (Davis and Chappell, 1969), estimates of the labor time required for 1000 pounds of quota can be derived. If all hired labor and one-third of operator labor is devoted to tobacco production, about 100 hours are required per 1000 pounds of quota. Approximately 35.35 million hours of labor would be released in the western portion of the state, and about the same amount drawn into production in the east. If labor costs, both hired wages and opportunity costs for the unpaid operator labor, are about $.20 less per hour in the east, the saving in the wage bill would amount to $7.07 millions. This is an overstatement in that wages would probably rise some in the east as a result of transfer. Also, it is likely that eastern operators already have opportunity costs at or above Piedmont wage rates. In such a case, the wage differential should apply only to hired work time. Even though incomplete, this measure suggests sizable increases in farmer net incomes can arise from transferability. A more complete measure will now be considered.

The Theory of Producers' Surplus

A summary measure of resource savings from quota transfer, known as producers' surplus, can be derived if a number of restrictive assumptions fit the production situation. If the demand curve for quota is a function of the schedule of the difference between price and long-run variable cost of production per pound, producers' surplus can be estimated as the net sum of the decreases in rent on quota leaving exporting counties, plus increases in rent on quota entering importing counties. For the simplest measure to be useful, all variable factor supply curves must be perfectly elastic. If some reproducible factors are currently fixed and the rent currently being paid to them does not allow for returns to cover the long-run cost of production, the situation is more complex. In this case, the absolute difference in long-run and short-run costs must be the same in exporting and importing counties for the suggested measure of producers' surplus to be meaningful. Additionally, it is assumed that the distribution of dollars of producers' surplus is unimportant. A dollar of loss is assumed to be offset by a dollar of gain even though the losses are borne by one group of persons and the gains by another.

The change in producers' surplus from allowing transfer of quota is shown in Figure 4 where S_A is the long-run supply curve for county A, a high-cost county, and S_B is the long-run supply curve of county B, a low-cost county.

Let us suppose that county A has quota equal to Q_A. The producers' surplus is the area ABCD. County B has quota equal to Q_B and the producers' surplus is equal to AFEG. Assume that transfer takes place between those two counties and an amount $Q_A'Q_A$ equal to Q_BQ_B' is transferred from county A to county B. County A experiences a loss of producers' surplus equal to the shaded area, and county B experiences a gain in producers' surplus equal to the dotted area. It is obvious that the dotted area is larger than the shaded because the transferred quota is the same in both cases but S_B is at a lower level than S_A. The distance between the equilibrium competitive price and the long-run supply curve is larger in the case of the S_B curve.

Instead of estimating the supply curve of tobacco for each county, as depicted in Figure 4, the slope of the derived demand curve for quota was estimated (Figure 5). It is essentially the mirror image of Figure 4. The shaded area caQ_AQ_A' is the producers' surplus loss for county A, and the area $bc'Q_BQ_B'$ is the producers' gain for county B. An estimate of the shaded area for each county can be derived by multiplying the average price differential between R_e (the equilibrium price) and R_o (the pre-transfer rental rate for county i) by the change in quota in each county. This procedure will give an approximation of the changes in producers' surplus in each county. The summation of gains and losses gives an aggregate measure of the total change in producers' surplus.

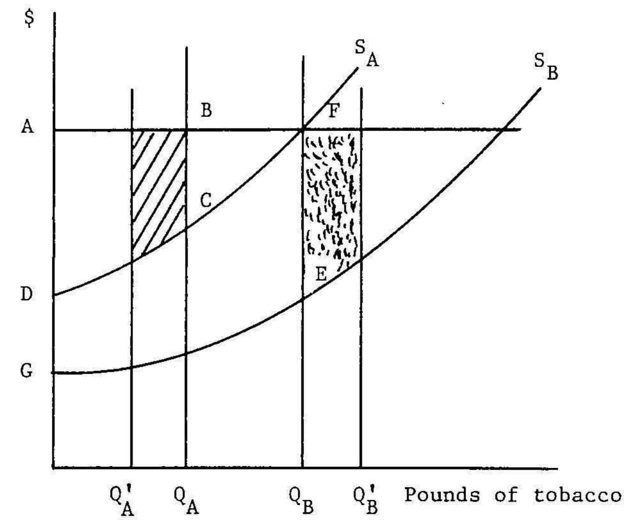

Figure 4. Change in producers' surplus because of redistribution of quota

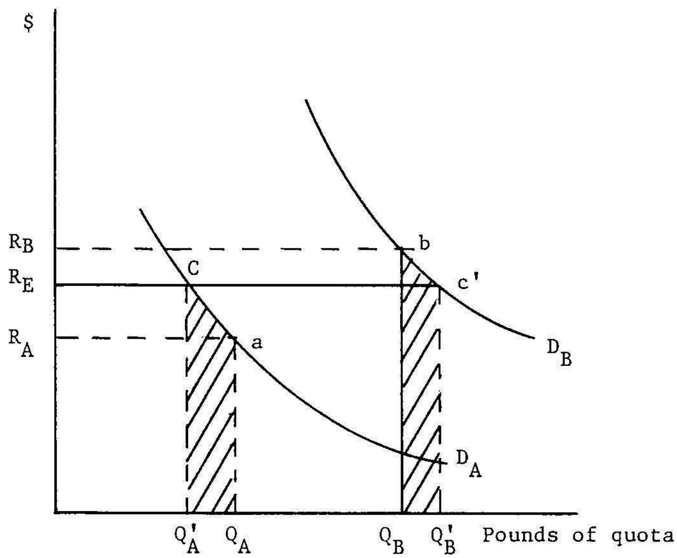

Figure 5. Deriving measurement of producers' surplus from the reservation demand for quota

Measures of Producers' Surplus

Under the assumptions stated above, producers' surplus estimates were made for a number of the hypothetical transfer programs. Results vary directly with the amount of transfer which takes place. Transfer programs based on regressions with large amounts of transfer, such as $R_{1,1}$, had large estimates of producers' surplus. The results for three regressions with more believable levels of transfer appear in Table 14. Using coefficients from $R_{2,1}$ in the transfer program, producers' surplus ran to $9.95 million. This number is slightly less than 2 percent of gross receipts from flue-cured tobacco in 1969, but it represents 1.2 cents per pound of North Carolina production. Transferability represents an opportunity to reduce the cost of production at a time when factor prices are rising. Stated in another way, producers' surplus obtainable by transferability in 1969 was equal to about 9.5 percent of the estimated rental value of all quota. Increases in producers' surplus represent a sizable addition to the net returns of flue-cured producers under the $R_{2,1}$ projections. Restricting transfer to 25 percent of initial base reduces the net gain in producers' surplus to only 3 percent of the rental value of all quota.

Using $R_{1,2}$ and $R_{2,2}$ as the regression base for the transfer model reduces the estimate of producers' surplus substantially.

Producers' surplus estimates were made for 1968 both for intrastate and interstate transfer programs. The levels of producers' surplus were lower on comparable 1968 transfer programs than for 1969 because less quota existed and less would have been transferred in 1968. Producers' surplus in other states was about 25 percent as large as in North Carolina under an intrastate transfer program. Interstate transfer would maximize total producers' surplus, increasing it about 8 percent compared to the sum of the intrastate program producers' surplus.

Income Transfers Arising from Intercounty Quota Transferability

Even though total resource efficiency would be increased by a move to intercounty transferability of quota, there are circumstances in which some persons would be worse off than under the current transfer program. Two cases in which some persons are made worse off will be reviewed, but first a model is developed in which all persons would be better off by

Table 14. Producers' surplus in millions of dollars under three hypothetical free-exchange transfer programs within North Carolina for 1969 and with maximum transfer per county at 100 percent base quota

Regressions source of transfer coefficients	Producers' surplus
	(mil. dols.)
$R_{1,2}$	7.39
$R_{2,1}$	9.95
$R_{2,2}$	5.64

the introduction of an intercounty transfer program. Consider a situation in which quota is produced by the owner of the land to which the quota is attached and that costs of production vary only because land quality varies. Also, assume that quota is attached to the most productive land so that there are no pressures to lease quota within counties.

In these circumstances the difference between the price and the supply curve is a residual return to land used in tobacco production. In Figure 6, with initial quota set at Q_o, net returns to land are equal to the sum of numbered areas 1, 2 and 5 while rent of quota is equal to areas 3 and 4. Should transferability allow an export of quota equal to Q_0 minus Q_1, rental rates would rise from AB to AC. Rental returns on home produced quota would be equal to areas 2 and 3 while returns on exported quota would be 4, 5 and 6. Land returns above any return on associated quota would now be equal to area 1.

What farmers had lost as land owners (areas 2 and 5), they would more than make up as quota owners (areas 2, 5 and 6). This is a net gain of area 6. Such a gain is common to this kind of market transaction in which there is an upward sloping supply curve.

Figure 6 can be used to develop the effects of intercounty transferability on an importing county if Q_1 is taken as the initial quota and AC the initial rent. As quota imports increase the total production to Q_o, rent falls to AB. Inverse to the export situation, producers as land owners gain areas 2 and 5 while losing area 2 as quota

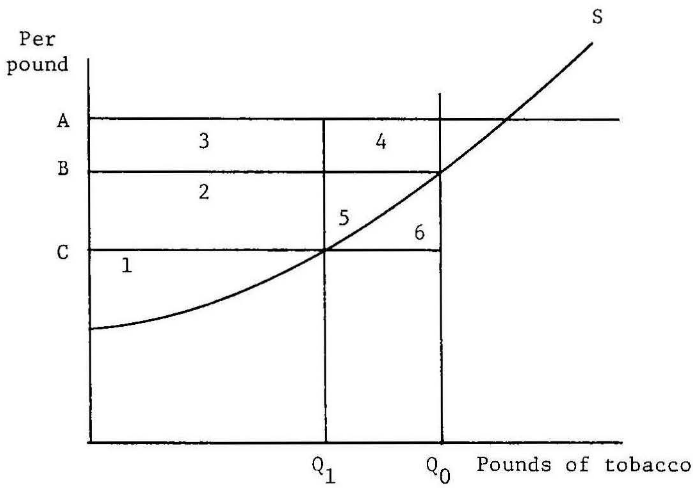

Figure 6. Producer surplus and income transfers under a quota program

owners. In this situation, area 4 is paid out to quota owners in exporting counties, leaving producers in the importing area with an increase in net revenue equal to area 5. Thus, they also gain from the market transaction.

Income Transfers between Quota Owners and Renters

In constructing the analysis of income transfers thus far, users of quota were assumed to also own quota. When this is not the case, quota transfer gives rise to some income transfers among renters and owners. Consider the case of quota renters and owners when lease and transfer is possible only within counties. High-cost quota is transferred to land and managers with low costs through the within-county rental market. Then, if between-county transfer were to be allowed, renters would find rental rates higher, incurring an income loss relative to the previous situation. What renters lose in terms of returns to their specialized tobacco land, quota owners gain. This analysis parallels the discussion of returns to quota ownership and production discussed in the previous section.

A renter in an exporting county loses the amount represented by the lesser of the charge in rent and the difference between his reservation rent and the rental rate prevailing before transfer across county lines was allowed. Thus, to produce an estimate of the income transfer from renters to owners in exporting counties, it is necessary to make an assumption about the distribution of renters along the reservation demand curve. Assuming the renters are proportionally distributed along the curve is probably as defensible as any other assumption.

The sums of these income transfers using the proportional distribution assumption are reported in Table 15 for three regression-based transfer programs. The losses discussed here are completely offset by gains within the county and do not represent a determinant of the distribution of producers' surplus discussed in the first part of this section. Total predicted income transfers, the sum of transfer both directions between quota and land owners, under the transfer program based on $R_{1,2}$ was \$2.217 million, but only \$1.807 under the program based on $R_{2,1}$. The presence of income transfers of these magnitudes would tend to cause losers to

Table 15. Intracounty income transfer implied in going to a N. C. quota transfer program for 1969 with maximum transfer per county at 100 percent of initial quota

Area	$R_{1,2}$		$R_{2,1}$		$R_{2,2}$	
	From renter to owner	From owner to renter	From renter to owner	From owner to renter	From renter to owner	From owner to renter
	(millions of dollars)					
Old Belt	.464	.000	.303	.000	.533	.000
Middle Belt	.170	.060	.183	.041	.189	.067
Eastern Belt	.180	.799	.174	.599	.190	.865
Border Belt	.033	.511	.040	.388	.030	.532
Total	.847	1.370	.779	1.028	.942	1.464

oppose and gainers to support the development of an intercounty quota transfer program.

Income Transfers Among Other Input Owners

Up to this point, the slope of the reservation demand curve arises because of differences in the productivity of land. A second interpretation of the reservation demand curve with implications for income transfers is possible. Perhaps the slope of the demand curve arises because of different opportunity costs among operators for their equipment, curing barns and management time. In such a case, as the rental rate adjusted, there would be windfall gains and losses between managers and land owners much as between quota owners and land returns as discussed above. Operators in exporting counties would find some of their producers' surplus lost while those in importing counties would find theirs augmented. In principle, any factor whose supply curve has an upward slope would participate in the income transfers associated with allotment transfer. This study has used the assumption throughout that the slope of the reservation demand curve reflects land quality differences but such an assumption might be tested by a study concentrating on the input markets and the structure of operating firms.

An additional class of resources might incur gains and losses with transfer of quota: the suppliers of purchased inputs and of marketing services. No information concerning their supply elasticities is at hand as a basis for estimating the possible magnitude of gains and losses. Some transfers would probably occur in the service industries in the short run.

Compensation Possibilities

In principle, a system of compensation could be established so that gainers from intercounty quota transfer would compensate losers. This would enhance the political acceptability of transferability. The ideal compensation system would be to tax gainers in such a way that the volume of transferred quota was unaffected. In practice, it is difficult if not impossible to develop and use such a tax.

There is an alternative which has frequently been followed in other situations in which net social gains are substantial but losers need to be compensated to insure an unambiguous increase in welfare. This is the procedure of compensating losers from general tax funds, even though no special tax is laid on gainers. In the case of highway construction, persons losing property are compensated but persons whose property is increased in value are not taxed. There is a middle class of property owners who are gainers but who do not fit this rule. If a property owner receives both losses and benefits, he is compensated only to the extent that losses exceed benefits. In this sense, his gains are "taxed." In the case of the Kennedy-round of tariff reductions, legal provision was made for the compensation of domestic producers who can show that they suffered losses from tariff reductions. Yet, no provision exists for a special tax on gainers from the tariff reductions.

Traditionally, most tobacco program decisions have been made through producer referenda. The major exceptions are the initiation and extension of the lease-and-transfer rental programs. It seems likely that flue-cured tobacco producers would approve a referendum submitted to them to allow intercounty transferability if provision for compensation of losses is made. As noted above, losses and gains between current quota renters and owners may be important. In addition, owners of other imports may suffer losses. Numerically, the number of losers is probably about as large as the number of gainers. It would be unfortunate if some kind of intercounty transfer were not made possible, given the fact that gains from transfer exceed losses by a substantial magnitude.

In the absence of compensation, it might be politically feasible to allow 10 percent of the base from a county to transfer permanently in any one year. Such a program would spread the losses out over a period of years and perhaps would make the program more acceptable to losers. By the same token, the net gains from transfer would be less in the early years than would be possible from unconstrained quota transfer.

Transfer Market Organization

Under the present system of allowing transferability within a county, ASCS offices handle the contracts. When quota is transferred, the county office acts as a clearinghouse and the parties file the contract jointly. Administering transfer across county boundaries would be a more complicated job requiring extra costs which should be subtracted from the total gains resulting from the new program in determining the net gains from transfer. A copy of the contract should be filed in the counties in which the parties reside. If the size of the trading area is large, adequate information on the location of interested persons and the going rental rate will be difficult to obtain. The ASCS offices could act as agents for facilitating transfer to quota across county, so that interested parties could be identified easier. A weekly or bi-monthly publication of transfers and rental rates, as well as names of persons interested in leasing, exchanged among county offices would facilitate the transfer process.

SUMMARY AND CONCLUSIONS

Since 1962, flue-cured tobacco allotment has been transferred from one farm to another. Transferability of allotment has produced benefits for farmers because allotment was transferred from high-cost to low-cost farms. Transferability is currently allowed only between operators residing in the same county. If transferability among farmers in different counties is allowed, quota will be redistributed to areas of comparative advantage for tobacco production. Some groups of people involved directly with the production of tobacco will gain and some groups will lose. On balance, benefits would result.

The purpose of the study was to develop the economic theory underlying the demand for quota response of farmers in the quota market and labor market to changes in various economic variables. Statistical analysis of the market models resulted in estimates that permitted measurement of the resources saved and the benefits obtained in the form of producers' surplus.

Two basic market models were developed: (a) a model of the reservation demand for quota, which is concerned with all existing quota in the county whether it is transferred or not, and (b) a model of lease-and-transfer quota, which assumes that the quota transferred under the provisions of the lease-and-transfer program is a market separate from the rest of quota. Only the reservation demand model yielded useful results. Factors affecting the reservation demand for quota were considered to be farm wages, off-farm opportunities, the price of tobacco, and variance in yield accounting for differences in land productivity.

The study covered the states of North Carolina, Virginia, South Carolina, Georgia, Florida and Alabama and covered the years 1966 through 1968 for all states except for North Carolina for which 1969 data were also available. Average rental rates per county reported by county ASCS offices were treated as the price of a pound of quota and were used as the dependent variables in the equations.

Two statistical models were developed to the point they could be used for prediction purposes: the reservation demand independent of the labor market (Model I), and the reservation demand model simultaneously determined with the labor market (Model II). Regressions were estimated in linear form. Whenever the structural equations of a model were over-identified, two-stage, least squares regression procedures were applied.

The regressions for the reservation demand model produced estimates of a negative relationship between quota and rental rates as hypothesized in all cases except one. The coefficients were significantly different from zero half the time. The farm wage variable used as a lagged or as a non-lagged variable always produced the expected sign being negatively correlated with rental rates. Its coefficients were significantly different from zero in most regressions.

The coefficient for the off-farm opportunities variable was consistent with the hypothesis in most regressions. The price of tobacco used was lagged and gave the right signs for the majority of regressions but failed to be significant at the 5 percent level.

Variables used to represent production belts had significant coefficients, indicating that there were real differences among regions not being captured by the explicit variables of the models.

Quantitative analysis of the labor market where the endogenous variables, total agricultural labor employed in the county and the farm wage rate, were regressed on other exogenous variables produced satisfactory results. Tnis permitted estimation of elasticities of demand and supply of labor for the different geographical regions. Labor demand elasticities were greater than one in all areas except for the Border Belt. In areas in which tobacco is a very important crop such as in the Eastern and Border Belts of North Carolina, the labor demand elasticities were low: -1.22 and -.51, respectively, compared to -3.09 (Old Belt) and -4.81 (Middle Belt).

An increase in wages in Eastern and Border Belts would have caused a reduction in the quantity of labor demanded by a small amount only. But in areas such as the Old and Middle Belts where production of tobacco is not as profitable, an increase in wages leads to a large decline in the quantity of labor demanded.

In general, supply elasticities of labor were much higher than had been expected. In separate belt regressions, elasticities were lower where tobacco is a major farm activity. But in those areas where off-farm opportunities are available such as in the Old Belt and the Middle Belt, a small increase in wages is estimated to induce a large movement of labor into farm activities. Conversely, a small decrease in wages is estimated to induce a large movement of labor into nonfarm activities.

Utilizing the econometric analysis, predictions on future rental rates were obtained by assuming changes of exogenous variables such as quota and farm wages. A 25 percent decline in quota produced a percentage increase in rental rates varying from 1.3 percent for the Border Belt to 25.0 percent for the Middle Belt. Estimated elasticities of demand for quota did not follow a specific geographic pattern. A 10 percent increase in wage rates would depress rental rates approximately 1 cent per pound in North Carolina. The results for other states varied around this value but did not form a stable pattern.

Predictions of an equilibrium rental rate which would prevail if transfer could be made across county lines were made under a number of hypothetical situations. Relatively unrestricted transfer within North Carolina was predicted to result in substantial transfer. Quota would move from low yield land (Old and Middle Belts) to high yield land (Eastern Belt and Border Belt).

In general, inelastic reservation demand curves reduce the quantity of quota expected to be transferred. But even for the regression models yielding the most inelastic estimates, from 25 to 50 percent of base quota would move across county lines. The labor market had virtually no impact on estimated quota transfer because the estimated supply of labor was so elastic. An inelastic supply of labor would lead to lower predicted amounts of transfer. Even though wages were predicted to change little, the quantity of labor demanded would shift sharply with the transfer of quota. Labor market adjustments resulting from transferability would be very substantial. If transferability is allowed, considerable attention should be given to easing labor market adjustments.

Transfer was predicted for regions outside of North Carolina too. The proportion of base that would move across county lines was generally lower in those regions. The percentage of transfer under a hypothetical intraregional program for Belt 14 (Georgia-Florida-Alabama) would equal 25 percent of the total quota and for intrastate programs 10 percent for South Carolina and 4 percent for Virginia.

Allowing quota to transfer anywhere in the six southeastern states would increase total transfer activity about 10 percent, depending on the constraints laid on volume of transfer imposed at the county level. The major loser in moving from the intrastate to the interstate transfer program would be the Eastern Belt of North Carolina, with major gains going to South Carolina and Georgia. Total transfer activity would increase several fold over the level observed in 1968, the base year of the interstate transfer program predictions.

Resource efficiency and aggregate net income would rise in response to transfer of quota. Estimates of savings in land use and the wage bill were made for North Carolina. A comprehensive measure of all resource savings, producers' surplus, was 1.2 cents per pound of total production in North Carolina under one of the hypothetical transfer programs ($R_{2,1}$). Aggregate savings were estimated in the range of \$5.64 to \$9.95 million in North Carolina. They would be larger if interstate transfer were allowed, smaller if the total quota were smaller and smaller if the absolute differences in rent among counties are smaller at the time transferability across county lines is allowed.

Income transfers in the sense of windfall gains and losses would occur with the adoption of quota transferability. The resulting income gains would accrue to both exporters and importers, increasing the acceptability of quota transfers. Some of the resulting income transfers would leave some participants worse off than they are currently, decreasing the acceptability of quota transfers. These gains and losses would be larger the more separation there is between quota use (rental within counties) and quota ownership under the current lease and transfer program. Owners of all inputs with upward sloping supply curves would be gainers or losers in the process. If some system of compensation were adopted to reimburse losers, the chances that quota owners would vote for a transfer program probably would be increased. Some central organization of the quota transfer market probably would be useful in facilitating transfer. The need for the provision of information on rental rates and the location of would-be renters and owners would be greater the larger the geographic extent of the transfer market.

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APPENDICES

Appendix A
Supplementary Tables

Appendix A Table 1. Additional regression equations for the reservation demand model for quota determined independently of the labor market (Model I) and for the reservation demand determined simultaneously with the labor market (Model II)

Equation	Area	Dep. var.[a]	Constant	Independent variables[b]		
				Q/Q_{base}	QF_{lag}	WNF_{lag}
$R_{1,6}$	N.C.	R	1.478	-1.58#d	-9.56#**e	-.0824#**
				(-1.28)	(-7.79)	(-4.87)
$R_{1,7}$	N.C. Old Belt	R	36.12	(-.69)[f]	-16.52#**	-.070#**
				(-.69)[f]	(-3.06)	(-2.976)
$R_{1,8}$	N.C. Middle Belt	R	-15.25	-11.35#**	-1.099#	-.0759#*
				(2.65)	(-.282)	(-2.196)
$R_{1,9}$	N.C. Eastern Belt	R	20.64	.406	-6.31#**	-.1229#
				(.604)	(-3.04)	(-1.87)
$R_{1,10}$	N.C. Border Belt	R	4.13	-.777#	-8.08#**	.0275
				(-.199)	(-3.77)	(.45)
$R_{1,11}$	Virginia	R/R_{1966}	1.369	-.3412#	.1149	-.007#
				(1.278)	(.496)	(.660)
$R_{1,12}$	South Carolina	R/R_{1966}	.9325	-.1185#	.2624	.0036
				(-.65)	(.6473)	(.32)
$R_{1,13}$	Belt 14[c]	R/R_{1966}	1.718	-.142#	-.441#	.0045
				(-1.515)	(-1.94)	(3.13)
$R_{2,3}$	N.C.	R	19.24	-.885#	-10.01***g	-.073#**
				(-1.20)	(-3.05)	(-3.99)
$R_{2,4}$	N.C.	R/R_{1966}	1.45	-1.073#**	-.444#**	-.002#*
				(-2.56)	(-2.88)	(-2.00)

Appendix A Table 1 (continued)

Equation	Independent variables[b]					R^2
	P_{lag}	V	D_2	D_3	D_4	
$R_{1,6}$	.208#** (3.08)	-.00005#** (-4.55)				.43
$R_{1,7}$	-.026# (-.149)	-.000026# (-.817)				.41
$R_{1,8}$	.666#** (2.86)	-.000021# (.903)				.39
$R_{1,9}$	.0279# (.2548)	-.000089#** (-6.2738)				.36
$R_{1,10}$	.2101# (1.18)	.00017 (4.64)				.69
$R_{1,11}$	-.0025 (-.231)					.07
$R_{1,12}$	-.007 (-.030)					.05
$R_{1,13}$	-.036 (.47)		.277** (3.83)	.146** (2.04)		.25
$R_{2,3}$	.0844# (1.03)	-.00005#** (-4.35)	1.483 (1.51)	1.39 (11.58)	2.70 (2.66)	.42
$R_{2,4}$	.001#** (2.30)	.000002** (2.71)		-.151 (-3.61)	-.149 (-3.10)	.29[g]

[a]Dependent variable.

[b]Definitions of independent variables can be found in Table 1.

[c]Georgia, Florida, and Alabama counties were pooled for regression analysis.

[d]The # symbol denotes that the coefficient had the hypothesized sign.

[e]The 5 percent level of significance is denoted by * and the 1 percent level by ** (one tail test).

Appendix A Table 1 (continued)

[f]The value in parentheses is the t value.

[g]The squared term of the ratio of quota to quota in the base year may also be used in this regression. Its coefficient was .263 and its t-ratio was 150.

Appendix A Table 2. First stage equations for the quantity of labor (demand) by belts and areas

Regression	Area	Dep. var.[a]	Independent variables[b] Q	WNF	TC	RP	Constant	R^2
$R_{5,1}$[c]	N. C.	LA	.0862[#**f,g] (10.06)[h]	- 19.49[#**] (-2.94)	.0331[#**] (10.39)	.0109[#] (1.86)	209.09	.83
$R_{5,2}$	Belt 0	LA	12.301[#**] (12.87)	- 19.55[#**] (-3.39)	.011[#*] (1.96)	.0243[#**] (3.14)	211.64	.83
$R_{5,3}$	Belt 1	LA	.1264[#**] (3.50)	- 45.38[#**] (-2.82)	-.0384 (-1.63)	.0478[#] (1.89)	1585.99	.56
$R_{5,4}$	Belt 2	LA	.0737[#**] (7.11)	- 73.46[#**] (-2.81)	.0268[#**] (6.71)	.0197[#*] (2.29)	245.81	.86
$R_{5,5}$	Belt 3	LA	.1063[#**] (2.48)	- 59.14[#**] (-7.49)	.0453[#**] (4.90)	.0071 (.291)	-456.08	.93
$R_{5,6}$	Va.	LA	.1188[#**] (19.95)	- .764[#] (-.25)	.0254[#**] (11.12)	-.0018 (-.377)	64.38	.97
$R_{5,7}$	S. C.	LA	.02088[#**] (3.50)	-144.45[#**] (-7.53)	.0010[#] (.559)	.0656[#**] (11.42)	862.73	.90
$R_{5,8}$[d]	Belt 14[e]	LA	.0266[#] (1.87)	- 19.63[#**] (-6.01)	.0071[#**] (4.87)	.064[#**] (9.49)	48.33	.63

Appendix A Table 2 (continued)

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[a]Dependent variable.

[b]Definitions of independent variables can be found in Table 1.

[c]The coefficients and standard errors for dummy variables for belts in this regression omitted from the table were: D_2: 190.60 (1.06); D_3: -565-01 (-3.25); D_4: 3.55 (.016).

[d]The coefficients and standard errors for dummy variables for belts in this regression omitted from the table were: D_2: 100.17 (1.38); D_3: -247.27 (-1.79).

[e]Georgia, Florida and Alabama counties were pooled for regression analysis.

[f]The # symbol denotes that the coefficient had the hypothesized sign.

[g]The 5 percent level of significance is denoted by * and the 1 percent level by **.

[h]The value in parentheses is the t value.

Appendix A Table 3. First stage equations for the wage rate of labor (supply) by belts and areas

Regres-sion	Area	Dep. var.[a]	Independent variables[b]					R^2
			Q	WNF	TC	RP	Constant	
$R_{6,1}$[c]	N. C.	WF	.0000013[#f] (1.11)[h]	.0026[#**g] (2.87)[h]	.00000029[#] (.065)	.0000011[*] (-1.39)	1.062	.46
$R_{6,2}$	Belt 0	WF	-.000003 (-1.47)	.00296[#*] (2.17)	.0000029[#*] (2.20)	-.000004[#*] (-2.24)	1.107	.12
$R_{6,3}$	Belt 1	WF	.000001[#] (.274)	.00429[#**] (2.61)	.0000034 (1.43)	-.000004[#] (-1.41)	1.002	.15
$R_{6,4}$	Belt 2	WF	.0000023[#] (1.41)	.0145[#**] (3.48)	.0000006[#] (.925)	-.000002[#] (-1.61)	.779	.12
$R_{6,5}$	Belt 3	WF	.000009[#] (1.47)	.0271[#*] (2.405)	.0000012[#] (.929)	-.000007[#**] (-2.13)	.759	.20
$R_{6,6}$	Va.	WF	-.00000089 (-.304)	.00039[#] (.263)	-.00000078 (-.687)	.00000023 (.099)	1.11	.04
$R_{6,7}$	S. C.	WF	-.0000039[*] (2.06)	.00276[#] (.448)	.0000002[#] (.379)	-.00000059[#] (-.319)	.849	.12
$R_{6,8}$[d]	Belt 14[e]	WF	.0000027[#] (.061)	-.00016[#] (.164)	-.0000004 (-.892)	-.0000014[#] (-.692)	.906	.41

Appendix A Table 3 (continued)

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[a]Dependent variable.

[b]Definitions of independent variables can be found in Table 1.

[c]The coefficients and standard errors for dummy variables for belts in this regression omitted from the table were: D_2: -.01128 (-.45); D_3: -.224 (-9.34); D_4: -.218 (-7.11).

[d]The coefficients and standard errors for dummy variables for belts in this regression omitted from the table were: D_2: .2278 (10.23); D_3: -.067 (-1.58).

[e]Georgia, Florida and Alabama counties were pooled for regression analysis.

[f]The # symbol denotes that the coefficient had the hypothesized sign.

[g]The 5 percent level of significance is denoted by * and the 1 percent level by **.

[h]The value in parentheses is the t value.

Appendix A Table 4. Equilibrium rental rates, net transfers among belts in thousands of pounds for a hypothetical free-exchange program of quota within North Carolina for 1969 using alternative regression equation results for the transfer program mechanism, transfer constrained to 25 percent of initial quota

Item	$R_{1,1}$	$R_{1,2}$	$R_{2,1}$	$R_{2,2}$
		(cents per lb.)		
Equilibrium rental rate	13.20	13.21	13.39	13.17
Area		(1000 pounds transferred)		
Old Belt	-38,445	-38,029	-38,449	-37,116
Middle Belt	-26,277	-22,961	-28,181	-20,312
Eastern Belt	46,788	43,047	45,475	39,296
Border Belt	17,944	17,943	17,943	18,133

Appendix A Table 5. Equilibrium rental rates, exports and imports across county lines in thousands of pounds under a hypothetical free-exchange program within each state for 1968, absolute transfer per county constrained to 25 percent of initial quota

Area	Equilibrium rental rate	Exports		Imports		Net transfer
		Number of counties	Transfer	Number of counties	Transfer	
	(cents/lb.)		(1000 lbs.)		(1000 lbs.)	(1000 lbs.)
N. C.						
Old Belt	-	16	25,672	1	3,314	-22,358
Middle Belt	-	11	13,451	1	4,300	- 9,151
Eastern Belt	-	20	28,809	7	41,996	13,187
Border Belt	-	3	2,051	4	20,391	18,340
State	15.10	50	69,983	13	70,001	18[a]
Va.	14.98	19	3,866	7	3,866	0
S. C.	17.59	16	6,459	6	6,459	0
Belt 14	17.03	15	15,265	59	15,260	- 5[a]
Total	-	100	95,573	85	95,586	13[a]

[a]The difference between total exports and imports is due to rounding errors and the residual left by the computer trying to satisfy the constraint $\Sigma\ (Q_e - Q_c) = 0$ discussed in conjunction with equation (7).

Appendix A Table 6. Exports and imports across county lines in thousands of pounds and equilibrium rental rates under hypothetical free-exchange programs among all producing states for 1968, absolute transfer constrained to 25 percent of initial quota

Area	Exports		Imports		
	Number of counties	Transfers	Number of counties	Transfers	Net transfer
		(1000 lbs.)		(1000 lbs.)	(1000 lbs.)
N. C.					
Old Belt	16	29,514	1	3,314	-26,200
Middle Belt	11	21,733	1	4,300	-17,433
Eastern Belt	20	51,513	7	41,996	- 9,517
Border Belt	3	3,249	4	20,391	17,142
State	50	106,009	13	70,001	-36,008
Va.	23	4,878	3	2,750	- 2,128
S. C.	15	2,663	7	26,783	24,120
Belt 14	52	7,255	22	21,327	14,072
Total	140	120,805	45	120,861	56[a]

[a]The difference between total exports and imports is due to rounding errors and the residual left by the computer trying to satisfy the constraint $\Sigma\ (Q_e - Q_c) = 0$ discussed in conjunction with equation (7).

Appendix B

Reduced Form Equations for the Labor Market and for the Model II Allotment Market Model

When a system of equations is over-identified, the two-stage least squares procedure is required to generate estimates of the structural coefficients. However, the first stage coefficients are not equivalent to the reduced form coefficients obtained by a just-identified set of simultaneous equations. The reduced equations implied by the second stage least squares can be derived by substituting one of the structural equations for the exogenous variable in another of the structural equations. For example, $R_{5,1}$ could be substituted for LA in $R_{5,9}$ to generate a reduced form for WF, farm wages. Writing only the portions of the equations that relate to endogenous variables and quota, Q, the policy variable:

$$WF = .0000119\ \hat{LA} + \ldots\ldots \quad . \quad (R_{4,1})$$

$$LA = .09689\ Q - 7278.39\ \hat{WF} + \ldots\ldots \quad . \quad (R_{3,1})$$

Making the indicated substitutions we obtain:

$$WF = .0000119\ (.09689\ Q - 7278.39\ \hat{WF} + \ldots) + \ldots \quad .$$

$$= .000001153\ Q - .866112841\ \hat{WF} + \ldots\ldots \quad .$$

$$WF = .00000100\ Q + \ldots\ldots \quad . \quad (R_{4,1}')$$

This is the appropriate value for use in Model I equations when the estimated indirect impact of changes in quota on rent is desired. Similarly, the reduced demand equation for labor with respect to quota using $R_{5,1}$ and $R_{5,9}$ is:

$$LA = .09689\ Q - 7278.39\ (.0000119\ \hat{LA}) + \ldots\ldots \quad .$$

$$LA = .089166\ Q + \ldots\ldots \quad . \quad (R_{3,1})'$$

This process can be carried one step further to derive the reduced form coefficient between rent and quota in the Model II format:

$$R = -\ .885\ (Q/Q_{base}) - 10.01\ WF + \ldots\ldots \quad . \quad (R_{2,3})$$

$$= -\ .885\ (Q/Q_{base}) - 10.01\ (.000001/Q) + \ldots\ldots \quad .$$

$$= -\ (.885 + .00001\ Q_{base})\ Q/Q\ base + \ldots\ldots \quad .$$

This is the formulation used in the analysis of quota reductions and transfers when $R_{2,3}$ is the base equation. The coefficient would vary with base in each county. The coefficient between R and Q/Q_{base} in the mean county in North Carolina would be -1.0106. This is 14 percent greater than the coefficient which accounts only for the direct effect of quota on rent (- .885).

Appendix C

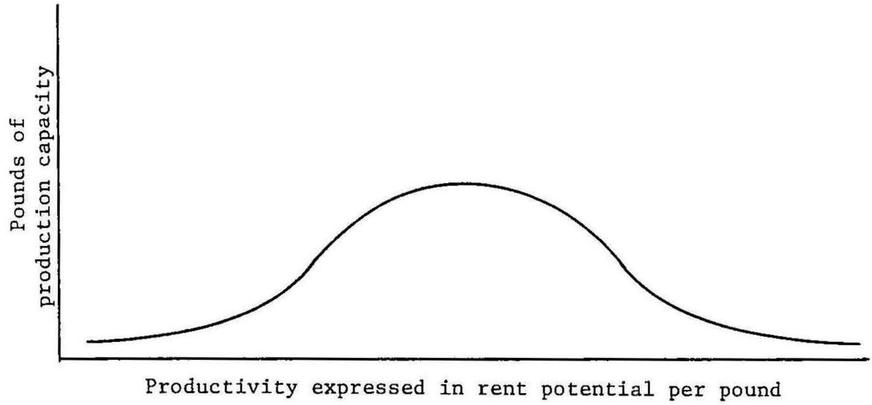
The Effect of the Underlying Frequency Distribution of Production Capacity on Predictions of Quota Transfer and the Equilibrium Rental Rate

All of the transfer predictions appearing in the text are based implicitly on the assumption that there is an equal quantity of production capacity available at every rental rate from the intersection of the demand curve with the quantity axis to twice the base period quota. This distribution is implied in extrapolating the linear reservation demand curve over the entire range of interest for transfer purposes. If the true underlying frequency distribution is of a different shape, the predictions presented in the text will not hold, particularly at the extremes.

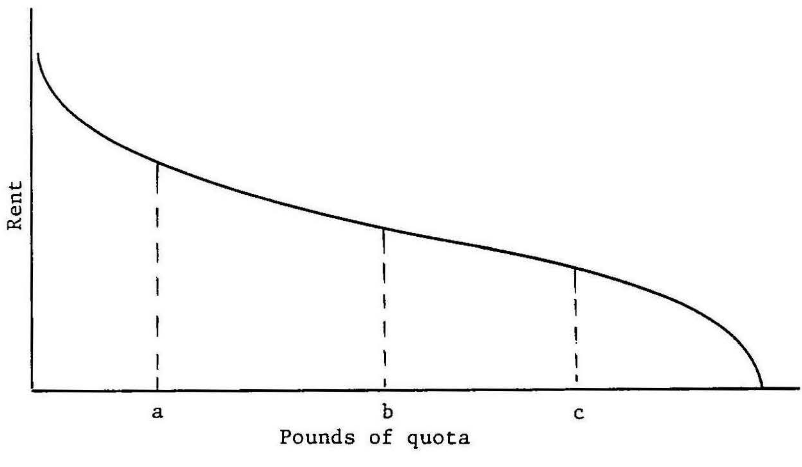
Almost an infinite number of frequency distributions could hold but there is no evidence at hand to select the "true" one. Two procedures are reported in this appendix to demonstrate the impact of a different distribution than the one used to predict quota transfers and the equilibrium rental rate. One procedure employed was to estimate a squared term to see if there was evidence of nonlinearity for the reservation demand curve. The second was to assume that a normal distribution underlay the demand function and then to alter the slope of the demand curve to approximate the "true" but unobserved reservation demand curve located some distance away from the quota quantities observed in the study period. In general, the use of the squared term was unsuccessful. Regression $R_{2,4}$ reported in Appendix A Table 1 was one of the best in the sense of consistent signs and significance. In this equation, however, the coefficient of the quota-ratio term was so large relative to the squared term that the latter had no practical effect. In most of the regressions with squared terms the quota-ratio term was larger than in the earlier work, indicating greater inelasticity of demand, but its significance was much lower than in regressions not including the squared term. Even had the coefficients been significant, there would have been a problem in using the results to predict transfer because the implied reservation demand curve would have either turned up or down at both extremes. Such a result would be incompatible with a normal or near-normal distribution as indicated below.

To examine the possible impact of a normal distribution of production capacity, suppose that pounds of production capacity are plotted on the "y" axis and that productivity in terms of reservation demand rent is plotted on the "x" axis as in Appendix C Figure 1. This normal distribution can be plotted in terms of a reservation demand curve which takes on an "S" shape as in Appendix C Figure 2. For concreteness suppose that the rent at the mean point of the distribution and its standard error are known for each county. If the current quota is equal to about half of the productive capacity of the county, the slope of the estimated reservation demand curve approximates the slope at point "b" in Appendix C Figure 2. For counties potentially losing all of their quota and counties potentially doubling their quota, some greater slope is indicated to represent the slopes beyond points "a" and "c." The rate at which quota is given up by an Old Belt county from such an underlying distribution would be less than that estimated in the text. Likewise, the absorption capacity of high-rent counties would be overestimated in the text if the normal curve describes the distribution of production capacity. Both forces would work to reduce the amount of quota transferred but the equilibrium rent might not be changed much. To use the normal distribution to generate estimates of equilibrium rent and amounts of transfer, it would also be necessary to make assumptions about the variance of the distribution and the quantity of present quota relative to the mean of the distribution. Clearly what one assumes about each of these parameters would affect the results.

One estimate of transfer was made under the assumption that each county's quota was at the mid-point of its productive capacity and that export or import over 70 percent of initial base would be along a demand curve with twice the slope estimated by the regression equation. In addition two other distributions were assumed: one in which export of more than 50 percent of initial base would be along a demand curve with twice the estimated slope but with importation along the estimated slope; and one with the reverse assumptions: export of more than 50 percent of the base would be subject to the steeper demand curve. In all three cases the coefficients from $R_{2,1}$ were used. The results are presented in Appendix C Table 1 and are contrasted to the results using the assumption of a rectangular distribution. Surprisingly, there was only a small change in the amount of estimated transfer. Increased inelasticity 10 or 20 percent away from the current quota would have had a greater impact on the results.



Appendix C Figure 1. A normal distribution of production capacity



Appendix C Figure 2. A reservation demand curve based on a normal distribution of production capacity

Appendix C Table 1. Transfer predictions with different assumed production capacity frequency distributions, using the reservation demand slope from $R_{2,1}$

Item	Rectangular distribution	Normal distribution: Extremes subject to inelastic demand curve: ± 70 percent	Export over 50 percent	Import over 50 percent
		(cents per lb.)		
Equilibrium rental rate	13.09	13.09	13.21	12.93
Area		(1000 pounds transferred)		
Old Belt	-135,189	-132,362	-128,412	-131,968
Middle Belt	- 59,469	- 56,244	-55,983	- 56,458
Eastern Belt	119,925	119,025	112,169	122,045
Border Belt	74,734	69,581	72,226	66,380

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