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Getting What You Pay For: The Case of Southern Economic Development

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Abstract. For the past fifty years, states of the American South have been competing with one another in order to recruit businesses to locate within their borders. While previous research has focused on assessing the short-term success of a tax-based recruitment plan, this paper addresses an important gap in the literature by looking at the long-term consequences that such a development policy can impose on a state's industrial structure. By incorporating the role of firm mobility, this paper demonstrates that at the state level, the effect of lowering the corporate income tax on the factor intensity of a state's manufacturing industries is theoretically ambiguous because it is dependent on the type of firm that finds it easier to move. Using historical data from 1957-1992 and a dynamic, partial adjustment model, this paper establishes an empirical link between low corporate tax rates and labor-intensive manufacturing industries, thereby suggesting that a low-tax policy is encouraging the immigration of footloose, labor-intensive firms. Moreover, the paper finds that the labor used tends to be of an unskilled (production) nature, even as the national trend is to substitute away from unskilled labor into skilled labor.

1. Introduction

The year 1985 represented a peak in the competition among states for business. That year, General Motors received offers consisting of tax breaks and cash subsidies from 38 different states before choosing to locate in Tennessee; Toyota received solicitations from 34 states before settling on Kentucky.[1] The bidding for particular businesses became so popular and well known that it is often referred to as the "Second War Between the States."[2] This war calmed down (relatively) during the late 1980's, only to reheat in the early 1990's with South Carolina's wooing of BMW and Alabama's successful $200 million bid for a Mercedes-Benz plant.

While the aforementioned firm-specific bidding[3] has received most of the attention, states have also competed along another dimension during this period. This battle has been an interstate competition to attract business within one's borders without targeting a specific firm. Rather than offer packages benefiting a single firm, a state uses different fiscal instruments, primarily taxes, to create an atmosphere in which all firms, including those already located within the state, can benefit. Such a pro-business atmosphere is often used in conjunction with a firm-specific package to entice firms to locate.

The states of the American South[4] have been pioneers in creating new ways to encourage firms to lo-

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[1] See Millward and Newman (1989) for a detailed discussion on the formation of Japan Alley.

[2] Hanson (1993) is one of many who have coined this particular phrase.

[3] Examples of the theoretical work on firm-specific bidding include Black and Hoyt (1989), Taylor (1992), King, McAfee and Welling (1993) and Martin (1999).

[4] The South is defined to include the states of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia.

cate within their boundaries. This paper identifies the ways in which these states used tax instruments, along with other methods, to recruit firms during the period 1957-1992. Counter to the standard finding that at the national level, lowering corporate taxes leads to a more capital-intensive industrial structure, this paper finds states relying on low taxes have manufacturing industries with a more labor-intensive production structure and offers the role played by firm mobility as a possible explanation. To better understand this argument, remember that at the national level, corporate tax changes affect all firms equally, regardless of location. Accordingly, a tax decrease will lower the cost of capital (relative to labor) and lead to a substitution away from labor and into capital by all firms. At the state level, however, only firms located within the state can take advantage of a tax break. While there is an incentive for all firms to relocate, the costs associated with relocation may be prohibitively high for certain types of firms. With labor-intensive firms being more footloose in nature, as suggested by Eisinger (1988), they will, in general, find it cheaper to move. Thus, for low corporate taxation to be associated with a labor-intensive production structure, it must be the case that the tax incentives offered by recruiting states encouraged an inflow of mobile, labor-intensive firms that counteracted the capital upgrading occurring among the firms already there. The strength of this mobility effect ultimately determines a state's factor intensity after a tax change.

The policy implications of such a result are twofold. First, success in industrial recruitment policies is likely biased toward labor-intensive firms, as the higher relocation costs of capital-intensive firms make them stronger candidates to exceed allocated recruitment budgets. Additionally, politicians wanting immediate impacts from their recruitment policies are going to target firms who can relocate quickly. Because these firms are more likely to be labor intensive, longer term goals of capital upgrading and creating agglomeration economies are unlikely to be achieved as labor-intensive firms are not as well equipped to provide such benefits. Thus, the second policy implication is that short-run successes in industrial recruitment have a strong potential to hinder long-run aims.

1.1 Brief Review of the Literature

Theoretical research on tax competition has focused primarily on the taxation of mobile capital. A main theme in the literature is that higher taxes effectively raise the cost of capital, causing capital to flow away from jurisdictions with high rates. Regions will cut rates to prevent this outflow and to encourage an inflow from their neighbors, resulting in an underprovision of public goods within all jurisdictions from the lower tax revenues.[5] This argument assumes that the revenue generated by such a tax funds programs that owners of capital do not care about. But, should they fund programs that owners of capital care about, such as public infrastructure for example, the tax then serves the role of a benefit tax and will not cause an outpouring of capital. The classic tax competition result, therefore, is dependent on mobile capital being taxed in a non-benefit setting.

Empirical research has focused on the influence that a variety of taxes (including, but not limited to, the property tax) have had on industrial location. Early work on this issue (Due, 1961; Oakland, 1978; Carlton 1979, 1983) presented strong evidence against taxes playing any role in generating new business activity or new employment. The results from the mid to late 1980's were not so clear cut, as some (Newman, 1983; Bartik ,1985; Schmenner, Huber and Cook ,1987) found a negative relation between taxation and location, whereas others (Plaut and Pluta, 1983; Deich, 1989) found mixed or no effects. Still others (Helms, 1985; Mofidi and Stone, 1990) found that how the tax revenue was spent, and not the tax itself, was the major determinant, with firms locating in states that spent more on public services relative to transfer payments. More recent work (Bartik, 1989; Papke, 1991) has shown a positive relation between low taxes and increased manufacturing start-ups. As modeling methods have become more developed and tax measures have become better measured, a growing consensus indicates the negative relationship between taxation and industrial location.[6,7]

1.2 Interstate Competition and Industrial Structure

So far, the discussion has focused on the short-run consequences of a tax-based development strategy, showing that low taxes do encourage business location, albeit at a cost of forgone revenues. Lacking in the discussion is a description of the type of firms that are being attracted, as well as any mention of the long-

[5] See Wilson (1999) for an excellent summary of tax competition models.

[6] See Bartik (1991) who surveys over 100 papers on this subject, and Ladd (1998) who surveys a sequence of surveys in reaching this conclusion. A recent exception would be Gabe (2003), who found taxes to have a negligible impact on existing firms in Maine.

[7] There has also been work looking at other aspects of local economic development with an industrial focus. For example, see Coughlin, Terza and Arromdee (1991), Woodward (1992), and Hines (1996) for work looking at the relation between taxes and foreign direct investment and Holmes (1998) for the effectiveness of right to work laws on manufacturing activity.

term effects such a strategy may impose on a state's industrial structure. Historical accounts provided by Cobb (1993) show that many of the firms that moved to the South during the 1940's and 1950's were involved in textiles and/or apparel—industries that were labor intensive in nature. The trend in the 1980's involved assembly plants, especially those within the automobile industry, moving southward. This historical evidence suggests that the tax-based development plan adopted by Southern states led to an influx of labor-intensive industries, thereby playing a role in Southern industry being more labor intensive than industry located in the other states of the Union.

Why should a state be concerned about its industrial structure? Eisinger (1988) has argued firms that are relatively labor intensive have a tendency to be footloose. Thus, if the South has had the propensity to recruit labor-intensive firms, there is a concern that the firms for which they paid large amounts of money could pack up and move at the sight of a better offer, leaving the region with nothing to show for its efforts. Moreover, a footloose firm eliminates the traditional bargaining power that a state would expect to yield over a more entrenched firm. This in turn will prevent the state from implementing tax holidays in the spirit of Doyle and van Wijnbergen (1994).[8]

It should be mentioned that recruiting labor-intensive firms need not be painted in a negative light. After all, if a state with a large number of unskilled laborers hopes to increase its payroll, then offering subsidies to labor-intensive firms makes good policy, since those firms will hire large numbers of workers at once, thereby creating growth in the state's overall payroll. What needs to be recognized, however, is that an influx of low-skill firms will not create a large incentive for skill upgrading among workers, nor will it encourage major capital investment within the state. Consequently, a state may find itself locked into a situation where in order to satisfy its short-term goal of payroll growth, it needs to continually recruit labor-intensive firms. Thus, recruitment of labor-intensive firms can run counter to the long-term goals of encouraging capital investment and skill upgrading that is often championed by proponents of state recruitment agencies (Cobb, 1993).

Despite the importance of industrial structure, there has been a relative dearth of work examining the role tax policy has played in creating it. Gyourko (1987) looked at 30 cities and found that a reliance on payroll taxes, as opposed to property taxes, led to industries that were more capital intensive. He also found that Southern cities were more capital intensive than other regions, although he placed little weight on his findings since his sample was both small (only six) and biased toward such a finding because the particular Southern cities were dominated by one capital-intensive industry.[9] Schmenner (1991) looked at the difference between Sunbelt manufacturing plants and other plants, and found Sunbelt plants are more likely involved in production than development, leading to his conclusion that the South was better suited to smokestack chasing than other regions of the country.

This paper extends this literature by using a much longer time horizon to determine the long-run effect corporate taxes have had on the production structure of manufacturing industries. It illustrates how low corporate taxation can create a more labor-intensive production structure by encouraging the immigration of footloose, labor-intensive firms which overwhelms the natural capital upgrading that will occur among firms already located within the region. The paper then develops an empirical link showing a strong connection between labor-intensive manufacturing and low corporate taxation; a link that remains strong even after initial conditions are controlled for in a dynamic, partial adjustment framework. Furthermore, the paper shows that a low tax recruitment plan is distorting the labor choice away from skilled labor toward unskilled labor, even as the national trend in manufacturing has been to substitute away from unskilled labor into skilled labor. A policy focused on using tax breaks as the basis of industrial recruitment may therefore have the impact of reinforcing, rather than correcting, pre-existing labor market distortions.

The rest of the paper is organized as follows. Section 2 describes a simple model showing how mobility can affect industrial factor intensity. Section 3 briefly outlines the history of Southern industrial recruitment efforts. Section 4 describes the data used to conduct the analysis. Section 5 describes the estimation procedure, the results of which are discussed in Section 6. Section 7 concludes.

[8] The main point of their paper is that a state would offer low taxes to entice location, and then use the fact that the firm would have to reincur the fixed costs of moving to raise taxes slowly over a period of time. Firms anticipate this and are compensated by a larger up-front subsidy. The problem with footloose firms, however, is their small fixed costs of moving, combined with a willingness of other states to subsidize these costs. Because of this, a state cannot raise taxes for fear of losing the firm in question to another state.

[9] For example, two of the six cities were Shreveport and Baton Rouge, both of which are heavily dependent on oil.

2. Modeling Mobility

In order to illustrate how mobility can impact the factor intensity of a state's manufacturing industry, begin by considering the case of a firm located within state j. The firm uses three factors of production:unskilled labor (u), skilled labor (s), and capital (k). Each firm has a profit function as outlined in Equation 1 (Appendix A) with p representing the producer price of output, r the price of capital, w^s the wage of skilled labor, w^u the wage of unskilled labor, and τ^c the corporate income tax rate. There is a continuum of such firms that differ in their technology parameter $\theta \in [\theta_L, \theta_H]$, thereby indicating the level of capital intensity a firm's technology allows it to attain, with θ_L being the most labor intense. Maximization of the profit function (1) will yield the firm's factor demand for capital[10] as found in equation 2 (Appendix A).

Let $\Omega = \Omega(p, r, w_j^s, w_j^u, \tau_j^c)$ represent the set of all firms that are currently located in state j. Thus, the total amount of capital demanded within the state is given by Equation 3 (Appendix A). Now suppose that state j lowers its corporate income tax. Firms located outside the state would like to locate within state j in order to take advantage of the tax change. The associated cost of moving, however, will be prohibitive for some firms. Thus, a firm outside of state j (denoted by A) will locate within state j should the following hold: $\pi^j(p, r, w_j^s, w_j^u, \tau_j^c; \theta) - c(\theta) \geq \pi^A(p, r, w_A^s, w_A^u, \tau_A^c; \theta)$; where $c(\theta)$ represents the cost of relocation. This cost consists of items such as construction costs of new capital facilities, search costs for labor in state j, and foregone agglomeration economies in state A and depends on the relative factor intensity of the firm.[11] Thus, which firms end up moving depends on the relationship between the costs of locating in state j and θ. To illustrate this point, consider two simple cases:

CASE 1: $c(\theta) = z\theta$, so that the cost of relocation is cheaper for the labor-intensive firms. If this is so, a firm will relocate iff $\pi^j - z\theta \geq \pi^A$, meaning all firms with $\theta \leq \theta^* = (\pi^j - \pi^A)/z$ will relocate to state j.

CASE 2: $c(\theta) = z/\theta$ so that the cost of relocation is now cheaper for the capital-intensive firms. If this is so, a firm will relocate iff $\pi^j - (z/\theta) \geq \pi^A$. Thus, all firms with $\theta \geq \theta^* = z/(\pi^j - \pi^A)$ will relocate to state j.

Assume for the moment that case 1 is accurate, so that labor-intensive firms find it cheaper to relocate. Taking mobility into account, the total demand for capital in state j would now be given by Equation 4 (Appendix A) where the first term represents the capital demand for immigrating firms and the second represents capital demand of the state's original firms.

Now suppose that state j is contemplating a further lowering of its corporate tax rate. Taking the derivative of (4) with respect to the corporate tax rate, τ^c yields Equation 5 (Appendix A).

The first two components of (5) represent the standard result (with $dk/d\tau^c < 0$) that lowering the corporate tax rate effectively lowers the cost of capital, thereby leading to a substitution away from labor and into capital. In the case of a tax cut, therefore, the first two components will be positive. The effect of mobility, however, is captured in the final term. While the second term allows all firms to substitute towards capital and away from labor (which we expect), the third term determines the increase in statewide capital demand coming about by the influx of new firms. Only those firms having $\theta \leq \theta^*$ find relocating worthwhile, and since θ^* is negatively related to the corporate tax rate, the third term will also be positive in the case of a tax cut. Statewide demand for capital will increase in the face of a corporate tax cut, which is a straightforward finding.

There will also be similar equations to (5) for aggregate unskilled labor and aggregate skilled labor demand, with two terms representing the substitution away from labor towards capital (which would decrease overall demand) and a third term indicating the increase in labor demand that will come from the new firms. The overall effect on both types of labor demand is therefore ambiguous, although one could imagine an inflow of labor-intensive firms would make for an overall increase in labor demand.

The implication of this model is the following: for the capital intensity to fall in the state after a tax cut, it MUST be the case that the new firms locating in the state are using more labor than capital (therefore making the effect on aggregate labor demand unambiguously positive). This 'mobility effect' will thereby dominate the substitution effect that occurs among the firms already located in the state, leading to the conclusion that lowering a state's corporate income tax results in a more labor-intensive production structure.

[10] The firm and statewide factor demands for skilled and unskilled labor follow similarly.

[11] The model can easily account for firms that are not yet in existence by having a $c(\cdot)$ for each state. When dealing with existing firms, there are no moving costs in its home state, implying $c(\cdot)$ is zero in state A.

3. Historical Overview of Southern Economic Development

Having seen how the combination of taxation and mobility can theoretically impact the industrial structure of a state, we now turn to a brief history of Southern industrial recruitment efforts. Doing so illustrates how the South has been a region of low corporate taxation and high labor intensity for the period of 1957-1992.

3.1 The Bond Era

In 1936, then Mississippi governor Hugh White began the Balance Agriculture With Industry (BAWI) program, the purpose of which was to encourage industry to locate within the state. BAWI was designed to assist Mississippi's municipalities in attracting outside firms to locate within their borders by sanctioning bond issues that would pay for the construction of a new facility for the firm in question. The idea of subsidizing private business with public funds was not new in 1936, for it had been used off and on since the 19th century. What made BAWI stand apart, however, was that it was the first time a state had sanctioned a program to oversee bond issuance.

It took the occurrence of WWII to make BAWI an economically successful program. Until then, the number of firms BAWI attracted had barely broken double digits.[12] But the advent of WWII caused those firms to increase capacity to levels that were maintained after the war. This caused states to take notice, and BAWI was quickly emulated not only across the South, but also across the entire country. By 1962, 21 states had some sort of industrial bonding program in place, a number that grew to 46 by 1968.

It was the federal tax-exempt status of the bond issues that brought about their downfall. The Treasury announced in 1969 that it wanted to limit the exemption to the first million dollars issued.[13] The Southern states had relied on bonding because they were willing, on the whole, to issue higher amounts than other states.[14] Congressional delegations from the North were more than happy to support the Treasury's announcement, since it served as a cap that effectively reined in Southern spending to levels they were willing to match. The Southern states were consequently unable to differentiate themselves along this dimension, which led them to start a new competition—this time over taxes.

3.2 Evidence of Corporate Tax Competition

In models of tax competition, capital will flow across borders while seeking the highest possible after tax rate of return. One way state government can influence this pattern is to lower its statutory tax rate, thereby encouraging greater capital inflow from neighboring states. Faced with a shrinking tax base, neighboring states will respond by lowering their taxes, leading to a battle of undercutting. Although this scenario has the potential to produce a race to the bottom, the fact that most capital has a relocation cost prevents this from occurring, for once tax levels get small enough, the additional tax savings from further tax cuts will not be large enough to offset relocation costs. The end result is an equilibrium in which states have lower, albeit positive, tax rates.

In analyzing Southern recruitment efforts, the notion of tax competition becomes relevant because relocating firms play the role of mobile capital. With corporate taxation susceptible to competitive forces (Buettner, 2001; Rork, 2003), we would expect a decline in Southern corporate taxation to coincide with the 1969 Treasury announcement. Labor-intensive firms, with their lower relocation costs and higher degree of mobility, were the most likely recipients of the tax savings brought about by such competition.

Rork (1999) illustrates the dependence of the Southern states on corporate income tax revenue during 1957-1992, with dependence defined as the percentage of total state revenue coming from corporate income taxation. A disparity of nearly ten percentage points among Southern states existed during the early parts of his sample period (1957, 1962). This gap began to close with Congress's passage of the bond issuance cap, which consequently increased state competition along the corporate tax dimension. By 1992, most of the Southern states were within two percentage points of one another, and all but North Carolina were below the national average in that year. This suggests that the South has been very competitive in using corporate income tax breaks, not only with other regions, but also among itself. The Southern states now have relatively low reliance, whereas before the Treasury's action in 1969, their reliance was relatively high when compared to the nation as a whole.

3.3 Trends in Manufacturing Factor Intensity

We next turn to Table 1 to illustrate how the 11 Southern states compare to the rest of the nation on a

[12] BAWI successfully brought twelve manufacturing facilities, eight of which were apparel based. See Cobb (1993) for more details.
[13] Congress raised the exemption to ten million dollars in 1978.
[14] Between 1956-68, 87% of all bond issues, representing 60% of the dollar value, was issued by six states: Alabama, Arkansas, Georgia, Kentucky, Mississippi, and Tennessee.

percentile basis in terms of manufacturing factor intensity during our period of focus. Each state is ranked according to its overall capital/labor ratio, which, following Gyourko (1987), is defined as labor's share of value added. Each state is listed in the first percentile in which it falls, and percentiles are for that percentile and below. Thus, a state listed in the 25th percentile would fall somewhere between the 10th and 25th percentiles. A state that falls in the 1st percentile is very capital intensive, whereas a state placing in the 99th percentile is very much labor intensive in nature. If two states are listed in the same percentile, the state listed first is at the more capital-intensive end of that particular percentile.

The first part of Table 1 focuses on the use of unskilled (production) labor. A majority of Southern states (at least 8 of the 11) fall above the median, with at least 5 of those 8 falling above the 75th percentile and at least one state falling at the 95th percentile. This gives an indication that their industries are very labor intensive in nature. Only two Southern states, Kentucky and Louisiana, consistently fall in the more capital-intensive percentiles. This is primarily due to an industry effect: Louisiana was heavily concentrated in petroleum industries (SIC 29), whereas Kentucky was heavily concentrated in tobacco (SIC 21). Of the twenty 2-digit SIC manufacturing classifications, petroleum and tobacco are consistently two of the more capital-intensive industries. A closer examination of Louisiana and Kentucky shows that relative to other states active in these particular industries, these states are labor-intensive. This underlies the importance of accounting for the industrial composition of a state, as this example suggests the labor intensity will not only be across, but also within, manufacturing industries.

The second part of Table 1 repeats the exercise, with the focus on skilled labor as opposed to unskilled (production) labor. Here, the results are the opposite of what was witnessed previously. The majority of Southern states fall in the lower percentiles, with only one state, Florida, consistently falling above the median. This result comes about in part because the manufacturing workforce in Southern states (with the exception of Florida) does not consist of a high percentage of skilled labor when compared to the national average during this time period. Because value added is being held constant, whereas the denominators measuring different labor vary greatly, we witness the contradictory patterns in Table 1.

Thus, anecdotal evidence suggests that despite lowering their reliance on corporate income taxation, the states of the South have remained relatively more labor intensive, both within and across manufacturing industries, than other states within the Union. In decomposing labor into skilled and unskilled, one sees that the South has been predominantly using unskilled labor. The remainder of the paper will determine the role, if any, that the tax policies of the South have played in the development of this situation.

4. Estimation Procedure

To begin, consider the case of a profit-maximizing firm that has located within state j. It has a production function, $F(S_j,U_j,K_j)$, where S_j = skilled labor, U_j = unskilled (production) labor , and K_j = capital used by a firm in state j. In a world without taxes, profits for this particular firm can be written as Equation 6 (Appendix A) where w^S_j, w^U_j is the wage paid for skilled and unskilled labor respectively in state j, p is the price of output and r is the cost of capital. Suppose firms can choose to buy capital from banks in any state, so that the rate is constant at r. Furthermore, suppose firms produce for a national market, so that the demand for the good will not be location specific. This will result in a constant producer price of output, p. Thus, the only differential among states would be the wage rates.[15]

With taxes, the profit function becomes Equation 7 (Appendix A) where τ^C_j is the corporate income tax rate in state j, τ^{UI}_j is the payroll tax on labor in state j, τ^i_j are taxes that affect the wage rate for skilled and unskilled labor (i.e. i = S,U) in state j through general equilibrium effects, X^i_j are other non-tax factors that affect the wage rate for skilled and unskilled labor (i.e. i = S,U) in state j and ψ_j is the percentage of capital expenditures that are deductible from the corporate income tax in state j.

The firm is going to maximize profits by choosing levels of capital, skilled labor and unskilled labor, yielding 3 first order conditions as outlined in Equations 8, 9, and 10 respectively (Appendix A)

The historical discussion in the previous section gave rise to two issues:

(1) What role did taxes play, if any, in determining the South's use of more unskilled labor rather than skilled labor?
(2) If taxes did influence this choice, did this carry over in choosing between capital and unskilled labor?

[15] Implicit in this discussion is an assumption of zero transport costs.

Table 1. National Percentile Rankings of Southern Manufacturing Capital-Labor Ratios

Percentile	1958	1963	1972	1982	1992
Capital-Unskilled Labor Ratio:					
1st (Capital Intensive)					
5th			LA	LA	LA
10th					
25th	KY, LA	LA, KY			
50th		FL	KY	KY	KY, VA
75th	FL		FL	FL, VA	FL, NC, SC
90th	VA, TN, AL, GA, AR, NC	AL, VA, TN, GA, NC, AR	VA, TN, GA, AL, AR	TN, AR, GA, MS, AL	TN, SC
95th		SC, MS	NC, SC	NC	AL
99th (Labor Intensive)	SC, MS		MS	MS	AR, MS
Capital-Skilled Labor Ratio:					
1st (Capital Intensive)				LA	LA
5th	KY	KY	KY		KY
10th			LA	KY	AR, NC
25th	NC, AL, VA, SC, AR, LA	LA, AL, AR, NC, SC, GA	AR, MS, AL	MS, AR, AL	VA, MS, TN
50th	GA, MS, TN	MS, VA, TN	SC, NC, TN, GA, VA	NC, VA, GA, TN, SC	SC, GA, AL
75th					
90th	FL	FL	FL	FL	FL
95th					
99th (Labor Intensive)					

NOTES: capital intensity is constructed as labor's share of value added.
States are listed in their relative ordering within the percentile.
Percentile is for that percentile and below.

The ultimate goal is to be able to construct an estimating equation for the skilled to unskilled labor ratio (S/U), and then another equation for the capital to unskilled labor ratio (K/U). In order to do that, one needs to generate factor demands for S, U, and K from the first order conditions.

In the most generic of cases, each factor demand is going to be a function of the exogenous variables from the profit function: the producer price of output, the rental rate on capital, the wage rates, and the tax rates. One could impose a particular functional form on the production function, thereby placing structure on the first order conditions. The problem with this approach is that many functional forms (such as CES and CRESH) do not allow for the explicit derivation of the factor demands, whereas those that do (such as Cobb-Douglas) place a high degree of structure on the system that could in part influence the results. Rather than impose such structure, a more general log-linear specification for the relative use of inputs was chosen, yielding the estimating Equations 11 and 12 (Appendix A).

As a justification for this particular specification, consider the case of a first order Taylor approximation of input demand functions around the means of S, U, and K expressed in logarithms. Doing so creates a three equation system that is linear in the logarithms of S, U and K. The ratios that can be constructed will be additive in the logarithms of the exogenous variables. Higher order terms of the expansion are incorporated in ε_1 and ε_2.

In the dataset, the producer price of output, p, is not observed, which necessitates the inclusion of both time and industry fixed effects. The assumption of a national market implies the market clearing producer price should be the same in all states. Different goods will have different prices, so there is a need for industry effects to control for the type of good being produced.[16] Likewise, these prices will change over time, resulting in a need for fixed time effects.

The cost of capital, r, also unobserved, is assumed to be constant across states and industries, but varying over time. This time variation is reflected in fixed time effects. The cost of capital will not vary by state, since firms are free to go to any bank in any state. Likewise, one would not expect the capital market to discriminate by industry.[17] Thus, the only variation in this variable will be that caused by the change of year.

This leads to the final specification of the estimating Equations 13 and 14 (Appendix A) where η_i represents the industry fixed effects and ζ_t represents the year fixed effects.

Since the derivation of equations (13) and (14) used the factor demands of a profit maximizing firm, these equations can be interpreted as a demand-side specification, where the quantities of capital and labor (expressed as a ratio) demanded by the firm are written as a function of their prices (in this case, wages). A supply-side specification would look similar, except that in addition to the prices, state expenditure data, such as per capita education spending, must be included under the premise that lower levels of educational spending may result in a higher pool of unskilled labor. There is no reason to expect the corporate income tax to play a role in labor supply, although it will have a general equilibrium impact on capital supply. The assumption of a national capital market means that capital suppliers receive only one rate of return, regardless of location. Cross-sectional variation in state corporate income taxation in this sample cannot be correlated with general equilibrium effects on interest rates because the entire cross-section is part of the same general equilibrium. Consequently, the inclusion of the corporate income tax measure in equations (13) and (14) allows for proper identification, as it can be omitted in a supply-side framework given this assumption.

Unless labor supply is considered perfectly elastic, the amount of labor demanded is going to play a role in the determination of the market clearing wage for labor. Accordingly, treating the two wages as being exogenously determined is not correct. Thus, the log of property, sales, motor fuel and personal income taxes[18], in conjunction with the state unionization rate and presence of a right to work law as instruments for the two wages were used.[19] While it is true that these other factors may influence a firm's location decision, there is no reason to believe that the presence of a sales tax, for example, would alter a firm's factor demands. Thus, while these factors are correlated with wages through general equilibrium effects, they are uncorre-

[16] Additionally, the fact that factor intensities vary across industries also necessitates the inclusion of industry fixed effects.

[17] It could be the case that certain industries could be perceived as riskier and therefore charged different rates. To the extent that this perception is uniform across states, this effect will be absorbed by the time and industry fixed effects.

[18] Feldstein and Wrobel (1998) found that wages respond rapidly to changes in various taxes.

[19] There may also be concern that the corporate income tax may also be endogenous in the specification. For this to be so, it must be the case that policy makers adjusted the corporate tax rate, which affects all industries in the state, in order to influence the manufacturing capital-labor ratio. The size of manufacturing industry in a state's economy, combined with politicians' goals of increased payroll, makes this seem unlikely. The political process of tax determination is an interesting area for future research, but is beyond the scope of this paper.

lated with the factor demands that form the dependent variable and hence are valid instruments.

The main purpose of this exercise was to derive a sensible set of estimating equations that can be used in the analysis. Thinking about the case of a single firm clarifies which factors influence the firm's input decision. To the extent one expects all firms to be influenced by the same factors, applying aggregate data to equations (13) and (14) should not prove to be problematic.[20]

Because these equations involve looking at the firms that are in a state at the time of the observation, it may not be readily apparent how they relate to the mobility discussion presented earlier. With K/U defined as unskilled labor's share of value added, lower values of K/U imply higher labor intensity for a firm. With such a definition of K/U, a positive value for γ_1 implies that lower corporate taxation results in a production structure that is more labor intensive. As was shown earlier, the only way this can be is if the influx of mobile, labor-intensive firms has overwhelmed the substitution that will occur among the existing firms. Should γ_1 be found to be negative, however, we will not be able to distinguish whether this effect is a result of the upgrading of existing firms or a result of an influx of capital-intensive firms, as both scenarios are consistent with such a finding. Note that if the hypothesis arising from the historical discussion is correct, γ_1 should be found to be positive. Finally, we are not explicitly modeling the mobility effect within the estimation. Rather, the mobility effect is offered as an explanation for why γ_1 could be found to have a positive sign within this specification.

5. Data

The data set used in this analysis is a compilation from a variety of sources. The primary source is the Geographic Area Series from the Census of Manufactures (COM). The COM gives state-level data for employment, value added and wages at the 2-digit SIC level for all manufacturing industries in the United States. This was matched with data from the Census of Governments (COG), which has fiscal information on all state governments. In particular, information is available on numerous tax revenues, as well as expenditures.[21] This information was then combined with demographic data from the Statistical Abstract. Information here includes population breakdowns and general labor statistics, such as unemployment rates, labor force unionization rates, and work stoppages. Data was collected for the period 1957-1992, yielding eight years of data spanning 35 years of history.[22]

Within the dataset, an observation will be a state-year-industry combination. For example, information on all printing and publishing firms (SIC 27) for the year 1958 in Alabama would be considered an observation. Each observation contains information on total wages paid by all firms of a particular classification broken down by worker type. Thus, the average wage of a given class of worker is calculated as the total payroll divided by the total number of workers in that class. It is this measure that will be referred to as "the wage".[23]

The COG does not contain information regarding payroll taxes, however, so a measure for this was created from existing data. The Annual Survey of Manufactures (ASM) is published every year the COM is not published, and contains a category known as supplemental labor costs, which is not published within the COM. This is available at the state level, and represents the total amount paid for social security (both employer and employee), unemployment insurance, and workmen's compensation by manufacturing firms in a given state. Taking this variable, and dividing it by total payroll created a measure that will be referred to as the payroll tax.[24] A regression of the payroll tax on the social security rates and the state average unemployment insurance (UI) rate[25] was run in order to impute the payroll tax for the years observed with the COM.[26]

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[20] Alternatively, assuming the production function exhibits constant returns to scale would also eliminate any aggregation bias and not affect the estimation procedure used in any substantial way.

[21] All dollar values are deflated using the CPI-U for 1992.

[22] This time period was chosen to insure a consistent definition of various industries, as the SIC classification system was revamped prior to 1957. Furthermore, tax competition mentioned in historical discussion did not heat up until the 1960's, so 1958 allows one to control for a state's structure before the tax battle took place.

[23] To the extent that one does not expect there to be large variation in the wage that firms within an industry cluster offer, this should serve as more than an adequate measure. This is dependent, however, on the assumption that the number of hours worked does not vary by firm.

[24] The theoretically correct measure of this tax would take into account the fact that there are wage caps on the amount that social security and UI are calculated on. Given the aggregate nature of our data, the best we can do is to use this measure, which is more of an average tax rate.

[25] Since UI is experience rated, one would expect the rate for two industries, such as construction and manufacturing to differ. Because labor turnover will vary within manufacturing industries as well, the ideal scenario would be to have this variable for each manufacturing industry in a state. While data can be gotten by state or by industry, it cannot be obtained by state-industry.

[26] For the years in which the payroll tax was observed in the ASM, the following regression was run:

payroll tax = $\alpha + \beta$ *social security rate + δ* hospital insurance (HI) rate + γ * state average UI rate. The coefficients were then used to predict the payroll tax for the specific years in the dataset.

To generate factor intensities, the paper follows the value added approach used by Gyourko (1987), defining the capital-labor ratio to be the share of labor's cost in value added. Labor's costs are calculated as mentioned above, whereas value added is provided directly by the COM.

Because most states have graduated corporate income tax systems, there is no single measure one can use for the corporate income tax. Our preferred measure is the tax share measure, which is meant to capture all potential changes to the corporate tax base, including changes in brackets, deductions, exemptions, etc. While correlated with corporate tax rates, there is potential for noise being brought into the measure through the denominator. Because of this, we repeat our base analysis with two other 'rate' measures. The first measure is the state's highest statutory tax rate, as listed on the World Tax Database. Because all firms are not subject to the highest marginal tax rate, we also create an average corporate tax rate, in which total corporate tax revenues are divided by adjusted state GSP, which is state GSP with state expenditures and personal income netted out. Ideally one would like a measure of corporate income, but such data is hard to come by at the state level. Given data restrictions, net state GSP is as close a proxy as one can generate. Because estimates of state GSP are provided by the Bureau of Economic Analysis starting with 1972, we use the estimates of Berry and Fording (1997) for 1963 and 1967. Because estimates do not exist for 1958, the average tax rate measure only spans from 1963-1992.

6. Results

6.1 The Labor Choice

Results for the S/U regressions at the national level are presented in Table 2. Column 1 shows the estimates when running ordinary least squares with no fixed effects. While the fixed effects are needed for the reasons mentioned above, this column is included to observe how the inclusion of these fixed effects alters the results. The coefficients on the labor costs (wages and estimated payroll taxes combined) are the expected sign, showing that an increase in the cost of one type of labor leads to substitution toward the other. The coefficient on the corporate tax measure is negative and insignificant.

Table 2. Regression Results Using Logged Ratio of Skilled Labor to Unskilled Labor (S/U)

Independent Variable	[1] OLS	[2] OLS	[3] 2SLS
log (1 + corporate tax)	-0.181	0.604 **	0.359 **
	(0.147)	(0.106)	(0.131)
log (unskilled labor costs)	1.390 **	0.801 **	1.185 **
	(0.031)	(0.027)	(0.110)
log (skilled labor costs)	-0.709 **	-0.507	-0.230
	(0.031)	(0.024)	(0.152)
constant	-2.976 **	-1.899 **	-3.866 **
	(0.092)	(0.088)	(0.288)
Industry Fixed Effects	No	Yes	Yes
Year Fixed Effects	No	Yes	Yes

standard errors reported in parentheses.
** significant at 95% level.
* significant 90% level.

Column 2 includes the necessary industry and year fixed effects. The coefficients on the labor costs remain the same sign, although they have gotten smaller in magnitude. The coefficient on the corporate tax has now become positive and significant, indicating that there is a positive association between corporate tax rates and skilled labor use. This finding is consistent with the finding that the Southern states, who initiated the low-tax strategy, used more unskilled labor than the national average. Moreover, the upward trend in skilled labor use noted in section 3 corresponded to a time when the corporate tax rate was declining nationally. In light of this, the switch in signs should be expected.

Column 3 keeps the fixed effects, but now corrects for the possible endogeneity of labor costs discussed previously. Doing so has no effect on the sign of the corporate income tax, as it still remains positive and significant, although the magnitude has decreased. Whereas before a 10% decrease in the corporate income tax would result in a 6% decrease in the skilled to unskilled ratio, now there is only a 3% decrease. The unskilled labor costs remain significantly positive with an increased magnitude, indicating an elasticity greater than one. The skilled labor costs, while maintaining the proper sign, are now only significant at the 85% level.

This suggests that while the cost of unskilled labor has the largest influence on the choice between skilled and unskilled labor, the corporate tax rate has also played a significant, albeit smaller role in affecting this decision. In light of this, the next question to ask is to what extent does the corporate tax rate affect the use of capital to unskilled labor?

6.2 The Choice of Capital versus Unskilled Labor

Table 3 shows the results of the K/U regressions. Column 1 illustrates the case of running ordinary least squares with no fixed effects. The unskilled labor costs, as expected, are positive and significant, indicating a potential substitution effect between unskilled labor and capital. The corporate tax rate is negative and significant, suggesting the standard result of increasing in capital intensity.

Table 3. Regression Results Using Logged Ratio of Capital to Unskilled Labor (K/U)

Independent Variable	[1] OLS	[2] OLS	[3] 2SLS
log (1 + corporate tax)	-0.464 **	0.157 **	0.304 **
	(0.109)	(0.076)	(0.091)
log (unskilled labor costs)	1.430 **	0.931 **	0.996 **
	(0.019)	(0.019)	(0.077)
log (skilled labor costs)	-0.138 **	-0.169 **	-0.074
	(0.023)	(0.017)	(0.106)
constant	-0.637 **	0.555 **	-3.866 **
	(0.068)	(0.062)	(0.288)
Industry Fixed Effects	No	Yes	Yes
Year Fixed Effects	No	Yes	Yes

standard errors reported in parentheses.
** significant at 95% level.
* significant 90% level.

Column 2 includes the fixed effects. Now the corporate tax rate is positive and significant, indicating that there is a connection between a low corporate rate and a labor-intensive industrial structure. Both wages come in positive and significant, suggesting that there may be some complementarities between skilled and unskilled labor. As was the case with the S/U regressions, however, these wages are endogenous.

Using the same instruments for the wages as discussed for the S/U regressions produces the results presented in column 3. The coefficient on the corporate tax rate remains positive and significant, and has in fact nearly doubled in magnitude. Now, a 10% decrease in the corporate tax rate will cause a 3% decrease in the capital-unskilled labor ratio. The cost of unskilled labor remains positive and significant, as expected. Moreover, the coefficient is effectively one, indicating that a 10% decrease in the wage will cause an equal fall in the K/U ratio. The coefficient on the skilled labor costs is now negative, but insignificant. Note that this coefficient has always been of a smaller magnitude, indicating that while there may be complementarities between skilled and unskilled labor, the driving force in the decision to use unskilled labor is the costs associated with unskilled labor, which is expected.[27]

6.3. Sensitivity Checks

Different Measures of Corporate Taxation

The results presented so far are based on the use of the tax share measure. Because there is the potential for measurement error through the denominator, we repeat the regressions from Table 3 using our two other measures of corporate taxation and report the results in Table 4. For ease of comparison, we reproduce the results of the tax share measure in column 1. Column 2 contains results for the highest statutory rate, whereas column 3 presents results using the 'average' corporate tax rate.

One will quickly notice that the coefficient estimates on the corporate tax measure do not vary greatly between tax measures, as the estimate is approximate 0.3 in all specifications. Moreover, the estimates remain significantly different from zero in all three regressions, although the average rate is only significant at the 10 percent level. The estimated coefficients on the labor costs are also consistent across measures, with unskilled labor hovering around 1 and skilled labor being negative but insignificant.

[27] Equations (13) and (14) were also estimated using 3SLS with limited efficiency gain in the standard errors.

Allowing for Partial Adjustment

So far, our model has assumed an instantaneous adjustment. In reality, however, there may be a cost of adjustment in that a firm may wish to be more capital-intensive, but requires additional time to gather the equipment necessary to do so. Not accounting for such a possibility may cause the results to overstate the mobility effect. In addition, there is a possibility that the witnessed relationship is a result of historical accident and simply spurious. In order to eliminate these possibilities, a partial adjustment model was run in which a lag of the dependent variable was included into the original specification. This lag captures the cost of adjustment described previously while also controlling for initial conditions that have the potential to skew the results.

Column 4 of Table 4 shows the results of including this lagged variable.[28] As can be seen, the patterns that arose previously remain. Once again, the corporate tax and unskilled labor costs are significant and positive, whereas the skilled labor costs are positive, but insignificant. The lagged dependent variable is positive and significant in all three scenarios, indicating that a state's industrial structure is dependent on the firms that were present in the previous period of observation. The size of the coefficients on the corporate tax, while remaining significant, has decreased in magnitude. The long-term elasticity with respect to the corporate tax rate is (0.181/(1-0.356)) or 0.281, which is similar to the short-run elasticities calculated previously. The long-term elasticity with respect to the unskilled labor costs is 0.39, which is lower than the short-run effects. The long-run responsiveness of the K/U ratio to skilled labor costs is effectively zero, with the long-term elasticity being only 0.026.

Thus, there are two findings we can draw from this result. First, a state's factor intensity today is dependent on its factor intensity yesterday. More importantly, a state lowering its corporate income tax will become more labor intensive in nature, regardless of the factor intensity level it started with. This suggests the tax is having a true effect and that there is not a spurious relationship between corporate taxation and factor intensity.

The South by Itself

Up to now, the focus has been on the national level. The results have shown that for the country as a whole, lower corporate taxes have corresponded to a more labor-intensive structure, even after initial condi-

[28] Lagged dependent variables, such as lagged corporate income tax rates and lagged wages, were used as instruments for the lagged capital-labor ratio.

Table 4. Sensitivity Checks with Logged Ratio of Capital to Unskilled Labor (K/U)

Independent Variable	[1]	[2]	[3]	[4]	[5]	[6]
log (1+ corporate tax)	0.304 **	0.312 **	0.310 *	0.181 **	0.671 **	0.502 *
	(0.091)	(0.125)	(0.189)	(0.082)	(0.251)	(0.304)
log (unskilled labor costs)	0.996 **	0.998 **	1.027 **	0.248 **	0.961 **	0.406
	(0.077)	(0.078)	(0.089)	(0.052)	(0.256)	(0.305)
log (skilled labor costs)	-0.074	-0.032	-0.060	0.017	0.632	0.083
	(0.106)	(0.101)	(0.121)	(0.052)	(0.527)	(0.152)
constant	-3.866 **	1.570 **	1.650 **	0.686 **	-0.825	0.582
	(0.288)	(0.201)	(0.241)	(0.019)	(1.284)	(0.354)
log (previous period's K/U)				0.644 **		0.511 **
				(0.056)		(0.207)
measure of corporate tax	Tax Share	Highest Rate	'Average' Rate	Tax Share	Tax Share	Tax Share
sample	Mainland 1958-1992	Mainland 1958-1992	Mainland 1963-1992	Mainland 1963-1992	South 1958-1992	South 1963-1992

standard errors are reported in parentheses.
all regressions utilize 2SLS and include year and industry fixed effects.
states included in South: AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA.
** significant at 95% level.
* significant at 90% level.

tions have been controlled for. To further eliminate the possibility of a spurious relationship, another analysis using only Southern states was conducted. Showing the results hold for a subset of states with similar initial conditions and lower than average corporate tax reliance lends further credence that not only is the relationship between corporate taxation and labor intensity real, but also is not driven by national outliers. The results of this investigation are listed in columns 5 and 6 of Table 4.

Column 5 shows the results for the instantaneous adjustment model. The coefficients are all positive, with the corporate tax rate and the unskilled labor cost being significant. The elasticity with respect to the cost of unskilled labor still remains about one, and the elasticity with respect to the corporate tax is higher (0.67) than in any other specification that has been run. The skilled labor coefficient has switched sign, becoming positive, although it is still not significantly different from zero.

Column 6 includes the lagged capital-labor ratio, which remains significant. Both the skilled and unskilled wages are insignificant. This is not a large surprise because wages have a strong regional component. Given that the focus of the regression is solely on the South, there is not a large variation in wages between states. Consequently, one would expect wages to have little impact, which is what happened once initial conditions are controlled for.

More importantly, the corporate income tax rate is still significant, although now it is at the 90% level as opposed to the 95% level. The sign is still positive, indicating that even within the South, having a lower corporate income tax is associated with being more labor intensive, even controlling for initial conditions. The long run elasticity is very high, however, at 0.982. Thus, even in a region where the differences in corporate income tax reliance have been shrinking over time, the result of low corporate income taxes and high labor intensity remains.

7. Summary and Concluding Remarks

This paper started with the simple historical observation that for the past forty years, manufacturing industries in the American South have been, on the whole, more labor intensive in comparison to the rest of the nation. Coinciding with this observation was the fact that these same states have been at the forefront of a competition, both among themselves and with the rest of the country, of lowering corporate taxes in order to recruit industry. This paper argues this is no mere coincidence. Rather, it appears that by instituting a tax-based economic development policy, the South has hindered the maturation of its industrial structure, thereby leading to a persistence of labor-intensive technology in the region.

Although the impacts of low corporate taxation at the state level are theoretically ambiguous, this paper has established an empirical link between low corporate taxation and labor intensity for the period of 1957-1992, thereby indicating the possibility that low taxes encourage the immigration of labor-intensive firms. Furthermore, it demonstrated that a low tax recruitment plan distorts the choice of labor away from skilled labor toward unskilled labor, which is contrary to national trends.

By placing too great an emphasis on the short-run goal of increased employment, Southern leaders accidentally backed themselves into a corner from which escape was next to impossible. As more states entered the recruitment arena, Southern states were forced to offer larger tax breaks in order for a firm to be lured successfully. Moreover, technological advances have increased firm mobility, making the South particularly vulnerable to foreign competition for their existing manufacturing base. These two factors have served to reinforce the mobility effect, which in turn leaves states in an even worse situation in terms of their industrial factor intensity.

The South has responded in part by expanding their recruitment internationally, focusing on the enticement of foreign direct investment (FDI). A recent paper by Ford et al (2004), however, argues that while FDI encourages state growth, the South lacked the proper levels of human capital to take full advantage. This led the authors to conclude that a better policy would have been for Southern states to invest in human capital as opposed to their continual pursuit of industry.

How did the South stack up in terms of education during the 1957-1992 period? Only 3 Southern states consistently placed above the median in per capita education expenditure, whereas high average corporate tax rates during this time were positively correlated with high per capita education expenditures. [29] Moreover, when states were ranked by the percentage of the population that had a high school diploma, nine Southern states could be found among the bottom ten states at any point during this time frame.

Can we therefore conclude that the South erred in following an industrial recruitment policy rather than focusing on an education-based policy? While preliminary evidence suggests the benefits of human capital upgrading appear to be strong, unfortunately

[29] While the correlation coefficient is small at 0.14, it is significant at the 90 percent confidence level.

they are not immediate. The short-term impacts of a successful industrial recruitment push, however, give politicians tangible results necessary for re-election. Thus, as long as politicians have short time horizons, it makes sense that they employ policy that has more immediate effects. The lesson of this paper, therefore, is that tax-based industrial recruitment policies are most effective within short time horizons. Policy goals of capital upgrading and increasing skill levels within local labor markets require a longer time focus, which, as we have learned from the Southern experience, appear to be incompatible with the short-run impacts of a tax-based industrial recruitment policy.

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Appendix A. Equations 1 through 14.

Equation 1: $\pi(p, r, w_j^s, w_j^u, \tau_j^c; \theta)$ Equation 2: $k(p, r, w_j^s, w_j^u, \tau_j^c; \theta)$

Equation 3:

$$K = \int_{\theta \in \Omega} k(p, r, w_j^s, w_j^u, \tau_j^c; \theta) f(\theta) d\theta$$

Equation 4:

$$K = \int_{\theta_L}^{\theta^*} k(p, r, w_j^s, w_j^u, \tau_j^c; \theta) f(\theta) d\theta + \int_{\theta \in \Omega} k(p, r, w_j^s, w_j^u, \tau_j^c; \theta) f(\theta) d\theta$$

Equation 5:

$$\int_{\theta \in \Omega} \frac{dk(p, r, w_j^s, w_j^u, \tau_j^c; \theta)}{d\tau_j^c} f(\theta) d\theta + \int_{\theta_L}^{\theta^*} \frac{dk(p, r, w_j^s, w_j^u, \tau_j^c; \theta)}{d\tau_j^c} f(\theta) d\theta + k(p, r, w_j^s, w_j^u, \tau_j^c; \theta^*) f(\theta^*) \frac{d\theta^*}{d\tau_j^c}$$

Equation 6:

$$\pi_j = pF(S_j, U_j, K_j) - w_j^S S_j - w_j^U U_j - rK_j$$

Equation 7:

$$\pi_j = (1 - \tau_j^C)\{pF(S_j, U_j, K_j) - (1 + \tau_j^{UI})[w_j^S(\tau_j^S, X_j^S) S_j + w_j^U(\tau_j^U, X_j^U) U_j] - rK_j\} + \psi_j \tau_j^C rK_j$$

Equation 8:

$$\frac{\partial F}{\partial S} = \frac{(1 + \tau_j^{UI}) w_j^S(\tau_j^S, X_j^S)}{p}$$

Equation 9:

$$\frac{\partial F}{\partial U} = \frac{(1 + \tau_j^{UI}) w_j^U(\tau_j^U, X_j^U)}{p}$$

Equation 10:

$$\frac{\partial F}{\partial K} = \frac{r(1 - \tau_j^C(1 + \psi_j))}{(1 - \tau_j^C) p}$$

Equation 11:

$$\ln(S/U) = \alpha + \beta_1 \ln(\tau_j^C) + \beta_2 \ln[(1 + \tau_j^{UI}) w_j^S] + \beta_3 \ln[(1 + \tau_j^{UI}) w_j^U] + \beta_4 \ln(r) + \beta_5 \ln(p) + \varepsilon_1$$

Equation 12:

$$\ln(S/U)_{ijt} = \alpha + \beta_1 \ln(\tau_{jt}^C) + \beta_2 \ln[(1 + \tau_{jt}^{UI}) w_{jt}^S] + \beta_3 \ln[(1 + \tau_{jt}^{UI}) w_{jt}^U] + \eta_i + \zeta_t + \varepsilon_1$$

Equation 13:

$$\ln(K/U) = \mu + \gamma_1 \ln(\tau_j^C) + \gamma_2 \ln[(1 + \tau_j^{UI}) w_j^S] + \gamma_3 \ln[(1 + \tau_j^{UI}) w_j^U] + \gamma_4 \ln(r) + \gamma_5 \ln(p) + \varepsilon_2$$

Equation 14:

$$\ln(K/U)_{ijt} = \mu + \gamma_1 \ln(\tau_{jt}^C) + \gamma_2 \ln[(1 + \tau_{jt}^{UI}) w_{jt}^S] + \gamma_3 \ln[(1 + \tau_{jt}^{UI}) w_{jt}^U] + \eta_i + \zeta_t + \varepsilon_2$$