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INDUCED INNOVATIONS AND FOREIGN WORKERS IN U.S. AGRICULTURE

By

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INDUCED INNOVATIONS AND FOREIGN WORKERS IN U.S. AGRICULTURE

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Abstract

A cost function approach of induced innovation is used to measure the biases in U.S. agricultural technology between 1948-1994. The results show significant labor-saving, capital-using technical change. Focusing on the impact of migration policy on labor-saving technology, a simulation of different rates of labor-saving technical change is conducted. The simulation shows decreases in elasticity of labor demand and demand quantity, and an increase in wage rate as technology becomes more labor-saving.

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Introduction

Throughout much of U.S. agricultural history, labor has been the relatively scarce factor of production. Hayami and Ruttan's theory of induced innovation suggests that an increase in relative factor prices will induce technical development to save the factor that becomes relatively more expensive. A change in relative demand for factors, however, is a result of both changes in factor prices and changes in technology. As labor becomes relatively more scarce, the wage rate also becomes relatively higher, thus inducing the development of labor-saving technology. This paper addresses the relation between immigration regimes and the structure of technology in U.S. agriculture.

Several studies have shown that U.S. technology is biased toward labor-saving, as the induced innovation theory would suggest. Binswanger (1974) showed that technology was labor-neutral from 1912 to 1944, but it was biased toward strong labor-saving technical change between 1944 and 1968. He estimated that two-thirds of the decrease in labor share was explained by biased technical change, and only one-third by the price substitution effect. From 1948 to 1968, both labor and machinery prices have accelerated, but the technology was machinery-using, suggesting machinery-using technical change. Antle (1984) also showed technical biases against land and toward machinery between 1910 and 1946. However, he found that technical change was labor-saving, capital-using, and chemical-using from 1947 to 1978. A study by Shumway and Alexander (1988) also suggested non-neutral technical change in most regions of the United States.

Empirical evidence of machine-using, labor-saving technical change in agriculture follows from the many developments in farm mechanization. During the past century several machines have been invented to substitute for human labor such as tractors, threshers, and reapers. There have also been significant labor-saving technologies in dairy, poultry and swine production. More recently, the development of farm mechanization has focused on mechanical harvesters for perishable crops. Even though the U.S. has become more advanced in mechanical technology, there remain a number of potential mechanical technologies that have not been fully developed or adopted such as mechanical citrus harvesting in Florida. With the most difficult applications remaining, the technological challenges are both difficult and expensive. Moreover, the development of new technology is relatively more expensive when an inexpensive foreign labor supply remains readily available.

The labor market experience for the past two to three decades has been an increasing flow of illegal labor into the U.S. with significant unauthorized employment in agriculture. The National Agricultural Workers Survey (NAWS) during 1997-1998 shows that 81 percent of farm workers are foreign born, and 52 percent of total farm workers are unauthorized (USDL). Given a downward sloping demand and upward sloping supply for agricultural labor, the augmentation of labor supply through unauthorized foreign workers results in a rightward shift in the supply of labor at a wage rate lower than would occur in the absence of supply augmentation. From the perspective of induced innovation models, the incentive for new labor-saving technologies is reduced from what it would be in the absence of international labor mobility.

The first objective of this study is to estimate the biases in technical change in U.S. agriculture over the period 1948 to 1994. During this period, there are two major changes in migration policy pertaining to agricultural labor. The early part of the period includes the Bracero program established in 1942 and ending in 1964. This was a bilateral agreement between the U.S. and Mexico that allowed Mexican workers to enter the U.S. for agricultural work. The termination of the Bracero program was followed by the rapid adoption of the mechanical tomato harvester (Martin; Sarig, et al.). The second legislative change was the Immigration Reform and Control Act (IRCA) of 1986. The legislative intent of IRCA was to reduce the flow of illegal immigrants. One component of IRCA was the Special Agricultural Worker (SAW) program legalizing 1.2 million unauthorized workers in 1987-88 who claimed to have done at least 90 days of farm work in 1985-86. There is little evidence, however, that IRCA reduced the flow of illegal workers; as noted above, the 1997-98 NAWS data indicate that 52 percent of the farm workers are unauthorized.

The end of the Bracero program and the passage of IRCA during the study period were intended to reduce the supply of foreign farm workers. Had the program changes truly had their intended effects, the induced innovations model would suggest that the changes should induce the development of additional farm mechanization and other technologies that could substitute for the potentially more expensive labor. At about the same time, however, public institutions, particularly the U.S. Department of Agriculture and Land Grant universities, in the early 1980s were reducing their emphasis on mechanization research under the presumption that it favored large-scale agriculture and displaced labor.

A second objective in this paper is to provide implications for migration policies from alternative technological biases. Assuming that technical change biases are a result of induced innovations, simulations of different technical change scenarios provide a basis to evaluate alternative labor supply scenarios. Previous research has shown agricultural labor supply to be highly elastic (Emerson and Roka), and the implication of Gisser and Davila is the same. Farm labor supply is assumed to be perfectly elastic for the purposes of this paper.

There is a number of studies of technical change in agriculture have been done (Antle; Binswanger; Shumway and Alexander; Weaver; Griliches; Hayami and Ruttan; Kislev and Peterson; Huffman and Evenson). One difference is that the present paper builds on the previous work using the quality-adjusted data published by USDA (Ball, et al., 1997, 1999). A second difference is that the present paper is focused on the relation between labor migration and technological change in agriculture for the 1948-1994 period.

Methodology

We adopt the dual cost function model of biased technological change by using a time variable to represent technology in the translog cost function. Although a time variable may leave much to be desired as an *explanation* of technological change, that is not our objective. As Chambers argues, time is a very economical variable for representing technological change (p. 204). The estimates from parameters of the translog cost function provide the estimates for elasticities of factor demand and elasticities of factor substitution. In addition, the time variable provides estimates of bias in technological change.

Deviations from the estimated technology bias in both direction and magnitude form the basis for simulations of alternative technology biases. One simulation provides estimates for changes in labor demand when factor prices are assumed to remain constant. The second simulation with alternative technology biases provides estimates of equivalent wage rate changes while factor shares and other factor prices are assumed to remain constant. The wage rate changes are assumed to follow from alternative immigration policies raising or lowering the wage rate that agricultural employers face. The counter-factual is again based on the induced innovations theory: the observed technology biases result from the relative factor prices. Coincident with the implied wage change is a new equilibrium quantity of labor calculated from the elasticity of demand for labor, given a perfectly elastic labor supply.

Model

We adopt the basic structure of Binswanger's translog cost function model; this section draws heavily from his paper. The model assumes a single aggregate agricultural output. Constant returns to scale is assumed: the level of output does not affect the relative use of inputs. The production of the aggregate agricultural product (Y) requires n variable inputs $X = (X_1, X_2, \ldots, X_n)$. The vector of input prices is $W = (W_1, W_2, \ldots, W_n)$. A state of technology influences a cost of production. Using time as a representative for technological knowledge, production cost is a function of input prices and the technology level. The translog cost function $C = f(Y, W_1, \ldots, W_n, t)$ can be written as

$$\ln C = \nu_0 + \ln y + \sum_i \nu_i \ln W_i + \frac{1}{2}\sum_i \sum_j \gamma_{ij} \ln W_i \ln W_j + \nu_t \ln t + \omega_t (\ln t)^2 + \sum_i \omega_i \ln W_i \ln t \quad (1)$$

Since a cost function must be homogeneous of degree one in prices, , this implies for a translog cost function that

$$\sum_{i} \nu_i = 1; \qquad \sum_{i} \gamma_{ij} = 0; \qquad \sum_{j} \gamma_{ij} = 0.$$

In addition, a symmetry restriction is also assumed to hold.

$$\gamma_{ij} = \gamma_{ji} \qquad \text{for all i, j; } i \neq j$$

Utilizing Shephard's Lemma, $\partial C/\partial W_i = X_i$, the first derivative of a translog cost function generates a share equation.

$$\frac{\partial \ln C}{\partial \ln W_i} = \frac{X_i W_i}{C} = S_i \qquad i = 1,\ldots,n \qquad (2)$$

$$S_i = \frac{\partial \ln C}{\partial \ln W_i} = \nu_i + \sum_{j} \gamma_{ij} \ln W_j + \omega_i \ln t \qquad i = 1,\ldots,n \qquad (3)$$

$$\Delta S_i = \sum_{j} \gamma_{ij} \Delta \ln W_j + \omega_i \Delta \ln t \qquad i = 1,\ldots,n \qquad (4)$$

For a discrete time period, a change in factor share is a result of changes in factor prices and a change in technology. The direction of biased technical change is measured by a change in factor share, keeping relative factor prices constant. In a many-factor case, technical change is biased toward factor i-saving, neutral, or i-using if the share of factor i in total cost decreases, stays constant, or increases.

$$B|_{relative\ factor\ price} = \frac{\partial S_i}{\partial t}\frac{1}{S_i} \begin{matrix} < \\ = \\ > \end{matrix} 0 \quad \begin{cases} i - saving \\ neutral \\ i - u\sin g \end{cases} \qquad (5)$$

Thus, changes in factor shares as a result of only changes in technology, ΔS_i^* can be estimated from

$$\Delta S_i^* = \omega_i \Delta \ln t \qquad i = 1,\ldots,n \qquad (6)$$

The sign of ω_i determines the bias in technical change, and ω_i, can be interpreted as a constant rate of the bias of factor i over the estimation period.

The parameter estimates of share equations allow us to calculate Allen partial elasticities of factor substitution (σ_{ij}) and price elasticities of factor demand (η_{ij}).

$$\sigma_{ij} = \frac{1}{S_i S_j}\gamma_{ij} + 1 \qquad \text{for all i, j; } i \neq j \qquad (7)$$

$$\sigma_{ii} = \frac{1}{S_i^{\,2}}(\gamma_{ii} + S_i^{\,2} - S_i) \qquad \text{for all i} \qquad (8)$$

$$\eta_{ij} = \frac{\gamma_{ij}}{S_i} + S_j \qquad \text{for all i, j; } i \neq j \qquad (9)$$

$$\eta_{ii} = \frac{\gamma_{ii}}{S_i} + S_i - 1 \qquad \text{for all i} \qquad (10)$$

Estimation

The estimates of biased technical change for each factor are obtained from the share equations. We assume that there are four variable inputs: capital, labor, land, and intermediate inputs. Since there are two major changes in migration policy during the study period, the time variable is separated into three periods to capture the potentially different structure of technical change within each period. The first period is from 1948 to 1964 (Bracero period), the second period is from 1964 to 1986, and the last period is from 1986 to 1994 (post-IRCA).

Since the covariance matrix of the disturbances of all four share equations is singular, a system of three share equations is estimated using iterated seemingly unrelated regression (SUR). In this estimation, the share equation for real estate is dropped, and independent variables include relative prices of factor inputs to price of land, and a time variable.

$$S_K = \nu_K + \gamma_{KK} \ln \frac{W_K}{W_A} + \gamma_{KL} \ln \frac{W_L}{W_A} + \gamma_{KI} \ln \frac{W_I}{W_A} + \omega_K \mathrm{lnt} + \omega_{K2} \mathrm{T}_2 \mathrm{lnt} + \omega_{\mathrm{K3}} \mathrm{T}_3 \mathrm{lnt} + \varepsilon_{\mathrm{K}} \quad (11)$$

$$S_L = \nu_L + \gamma_{LK} \ln \frac{W_K}{W_A} + \gamma_{LL} \ln \frac{W_L}{W_A} + \gamma_{LI} \ln \frac{W_I}{W_A} + \omega_{L1} \mathrm{lnt} + \omega_{L2} \mathrm{T}_2 \mathrm{lnt} + \omega_{\mathrm{L3}} \mathrm{T}_3 \mathrm{lnt} + \varepsilon_L \quad (12)$$

$$S_I = \nu_I + \gamma_{IK} \ln \frac{W_K}{W_A} + \gamma_{IL} \ln \frac{W_L}{W_A} + \gamma_{II} \ln \frac{W_I}{W_A} + \omega_{I1} \mathrm{lnt} + \omega_{\mathrm{I2}} \mathrm{T}_2 \mathrm{lnt} + \omega_{\mathrm{I3}} \mathrm{T}_3 \mathrm{lnt} + \varepsilon_{\mathrm{I}} \quad (13)$$

The variables K, L, I, and A represent capital, labor, intermediate inputs, and land, respectively. T_2 and T_3 represent dummy variables for period 1964-1986 and period 1986 to 1994, respectively. The ε_i's are the stochastic disturbances having zero expectation and nonzero contemporaneous covariances. A system of share equations requires that the summation of the four factor shares equals to one. As a result, in addition to homogeneity and symmetry constraints, the following additional constraint, $\sum_{i=1}^{4} \omega_{ij} = 0$, is assumed for j = 1,2,3.

Data

Data used in this study are obtained from the production accounts constructed by Economic Research Service, USDA (Ball, et al., 1997, 1999, 2001). The aggregate U.S. data report quantity and implicit price indices of aggregate inputs and output during 1948-1994. We select four variable input categories for this study: durable equipment, hired labor, real estate, and other intermediate inputs. Hired labor is representative for the labor variable in the model. Self-employed labor and unpaid family labor are assumed to be a fixed input. Intermediate inputs include agricultural chemicals, fuels and electricity, feed, seed, and livestock purchases, and other purchased inputs which also include contract labor services. Since contract labor quantity is not significant at the aggregate U.S. level, excluding it from hired labor should not have a significant impact on the estimates. Durable equipment includes autos, trucks, tractors, and machines, and represents the capital variable in the model. Real estate represents the land variable in the model, including both land and buildings.

Quantity indices in the production account are constructed based on the Tornqvist index number specification. Implicit price indices are constructed as the ratio of the value of the input aggregate to the corresponding quantity indices, and can be interpreted as unit values (expressed in millions of dollars) of the aggregates. A detailed discussion of data construction can be found in Ball, et al. (1999, 1997). The data obtained from this series are adjusted for changes in quality or characteristics of the inputs over time. As a result, quantity and price indices can be viewed as constant quality indices. It is important to use quality-adjusted data when analyzing induced technological change because using unadjusted quality indices will result in a biased estimation of parameters in the induced innovation model.

Figure 1 illustrates real implicit price indices of inputs between 1948 and 1994. Prices of labor and capital steadily increased over time. Price of intermediate inputs decreased throughout the period, except during the early 1970s when it rose with the oil embargo. Real estate price volatility increased over time, with the real estate price increasing dramatically during the mid 1970s to mid 1980s, and decreasing thereafter.

Figure 2 illustrates the expenditure share of each input during the same period. The expenditure share of labor decreased until the mid 1980s, and increased afterward.

The expenditure share of capital was stable throughout the period. The expenditure share of real estate increased from 1948 to 1980 with some exceptions during 1970 to 1975, and decreased after 1984 until 1993. The intermediate input share decreased substantially from 1948 to 1984, but increased during the remainder of the period.

Results

The parameter estimates of share equations are summarized in table 1. Since only three equations are estimated, the estimates of γ_{AK}, γ_{AL}, γ_{AI}, $\gamma_{AA,}$ and ω_A are derived from the other estimates based on homogeneity, symmetry, and ω restrictions. The signs of the time parameter estimates in each share equation show the direction of technical change. The coefficients of time are significant and negative in the labor equation, suggesting that technology was biased toward labor-saving in all three periods, but became increasingly more labor-saving following the Bracero program and implementation of IRCA. The coefficient of time is positive in the capital equation for the first period, but becomes smaller in the last two periods. Somewhat surprisingly, the technology was biased toward capital-using through the Bracero program. However, there were important changes elsewhere in U.S. agriculture at the time, in particular the adoption of the mechanical cotton picker in the southern U.S. This period also experienced significant mechanization in mid-western grain farming as well as developments in animal agriculture. The technology remained strongly biased toward capital-using until IRCA, although at a slower rate. The mechanical tomato harvester was the major change in farm mechanization after the end of the Bracero period; however, its impact shows a slightly lower rate of machine-using technical change than the prior period. After IRCA, technology became less capital-using, perhaps due to the increasing flow of foreign workers into the U.S. for farm work.

Throughout the whole period, technical change was biased toward intermediate inputs-using. The change in technology implies an increasing use of intermediate inputs that include chemicals, fuel, electricity, contract labor, feed and seeds, and others. This result is also consistent with Binswanger's and Antle's findings. Huffman also shows that there is an increasing amount of contract labor after IRCA, particularly in California and Florida. The technology was biased toward land-saving in all three periods in differing degrees.

The estimates from table 1 are converted to the elasticity estimates evaluated at the means in table 2. All own price elasticities of demand have the right sign. Except for real estate, all own elasticities of substitution are significant. The elasticity of substitution between capital and labor is inelastic and positive, but not significant. The aggregate U.S. data during the study period suggest that there are limitations for substituting capital for labor. Since the mechanization during the past fifty years has been focused on developing mechanical harvesters, the difficulties of replacing labor may result from uneven ripening, and physical damage during mechanical harvesting process. The elasticities of substitution between intermediate inputs and capital, intermediate inputs and labor, and real estate and capital are positive and inelastic. This suggests that they are weak substitutes. The elasticity of substitution between labor and real estate, however, is not significant.

Table 1. Restricted Estimates of the Coefficients of the Translog Cost Function and t-Ratios[1]

	Input Price							
Factor Share	Capital	Labor	Intermediate Input	Real Estate	ln(t)	T2*ln(t)	T3*ln(t)	Intercept
Capital	0.0644 (7.7074)	-0.0044 (-1.0761)	-0.0476 (-6.8211)	-0.0124 (-2.7804)	0.0152 (5.2055)	-0.0030 (-2.2027)	-0.0100 (-7.6116)	0.1669 (8.9304)
Labor		0.0441 (10.4013)	-0.0168 (-3.8409)	-0.0228 (-9.4105)	-0.0116 (-6.8936)	-0.0038 (-4.7570)	-0.0041 (-4.6864)	0.1977 (14.8628)
Intermediate Inputs			0.1818 (17.0298)	-0.1175 (-15.4536)	0.0411 (5.8221)	0.0042 (1.4991)	0.0106 (3.5687)	0.1730 (4.9404)
Real Estate				0.1526 (21.8633)	-0.0446 (-7.1608)	-0.0343 (-4.7132)	0.0035 (1.3360)	0.4680 (19.3337)

[1] Restrictions imposed: $\sum \nu_i = 1; \sum \gamma_{ij} = 0; \sum \gamma_{ij} = 0, \sum \omega_{ij} = 0.$

Table2. Estimates of Allen Partial Elasticities of Substitution and of Own Price Elasticities of Factor Demand and t-Ratios

	Capital	Labor	Intermediate Inputs	Real Estate
Elasticities of Substitution				
Capital	-2.8149	0.5672	0.2979	0.4574
	(-4.3620)	(1.4104)	(2.8945)	(2.3439)
Labor		-4.6732	0.6852	-0.2616
		(-8.9039)	(8.3611)	(-1.9514)
Intermediate Inputs			-0.1667	0.0188
			(-5.5304)	(0.2958)
Real Estate				-0.1975
				(-1.1438)
Elasticities of Demand	-0.3203	-0.4198	-0.0992	-0.0397
	(-4.3621)	(-8.9039)	(-5.5304)	(-1.1438)

Simulation of biased technical change

During 1948-1994, there were significant changes in farm mechanization, notably the cotton picker and tomato harvester. Although the results show that the technology is biased toward labor-saving and machine-using, the availability of foreign labor supply may have slowed the development of labor-saving machine-using technology; for instance, the development of fruits and vegetable mechanical harvesters for fresh markets. The simulations conducted here assume alternative rates of technical bias.

Our first simulation provides estimates of the elasticity of labor demand if the technology had been at alternative rates of labor-saving. The simulation assumes fixed input prices, but allows factor shares to change. Table 3 summarizes the results from this simulation.

Table 3. Estimates of Labor Share and Elasticity of Labor Demand and t-Ratios at different Level of Labor-Saving Technical Change

	Rate of Labor-Saving Technical Change					
	0.00	0.005	0.01	0.015	0.02	0.025
Labor Share	0.1323	0.1178	0.1032	0.0887	0.0741	0.0596
	(25.1249)	(23.3619)	(19.5988)	(16.8357)	(14.0727)	(11.3096)
Elasticity of Labor Demand	-0.5348	-0.5082	-0.4700	-0.4146	-0.3316	-0.2010
	(-18.0561)	(-15.4326)	(-12.5748)	(-9.4759)	(-6.1685)	(-2.8016)
% Change in Labor Demand	40.83	24.63	8.42	-2.92	-23.98	-40.18

The simulation shows that as technical change becomes more labor-saving, the demand for labor decreases. As a result, labor's share decreases, given constant factor prices. Demand also becomes more inelastic as technical change becomes more labor-saving. This suggests that non-neutral technical change for labor could rotate the labor demand schedule. A change in labor's share due to a change in the rate of labor-saving technology can also be converted to a change in labor demand given constant factor prices, providing an estimate of the extent to which the demand curve shifts in or out. A labor demand is calculated at the mean of the data, and compared to labor demand at the actual rate of labor saving technical change[1]. Assuming a constant rate of technical change for each input, it is found from the data that the average rate of labor-saving technical change is 0.014. Thus, the simulation of a percentage change in labor demand is compared with the labor-saving change at the rate of 0.014.

The simulation shows that if the rate of labor-saving technical change is below 0.014, the demand for labor would increase more than it had been. On the contrary, if the rate of labor-saving technical change is greater than 0.014, labor demand would be less

[1] $\frac{\Delta L}{\bar{L}} * 100 = \Delta\omega_L \overline{\ln(t)} \frac{C}{\bar{W}_L \bar{L}} * 100 = \frac{\Delta\omega_L \overline{\ln(t)}}{\bar{S}_L} * 100$

than it had been. A near doubling of the rate of the labor-saving technology (to 0.025) would shift the labor demand curve to the left by 40 percent.

The second simulation assumes constant factor shares and holds all factor prices constant, except the wage rate. This simulation provides deviations in labor price and quantity indices from the sample means at different levels of labor-saving technical change. Table 4 summarizes a percentage change of nominal implicit wage of hired labor, and a percentage change of labor quantity indices at a given rate of technical change.

Table 4. Estimates of Percentage Change in Wage and Labor Quantity and the t-Ratios at different Level of Labor-Saving Technical Change

Percentage Change	Rate of Labor-Saving Technical Change					
	0.00	0.005	0.01	0.015	0.02	0.025
Wage	-11.7046	-7.6974	-3.6903	0.3167	4.3250	8.3312
	(-8.2267)	(-5.7920)	(-2.7468)	(0.2166)	(2.5966)	(4.3298)
Labor Quantity	4.9135	3.2313	1.5491	-0.1330	-1.8152	-3.4973
	(5.1631)	(4.6337)	(2.7696)	(-0.2143)	(-2.1638)	(-3.1058)

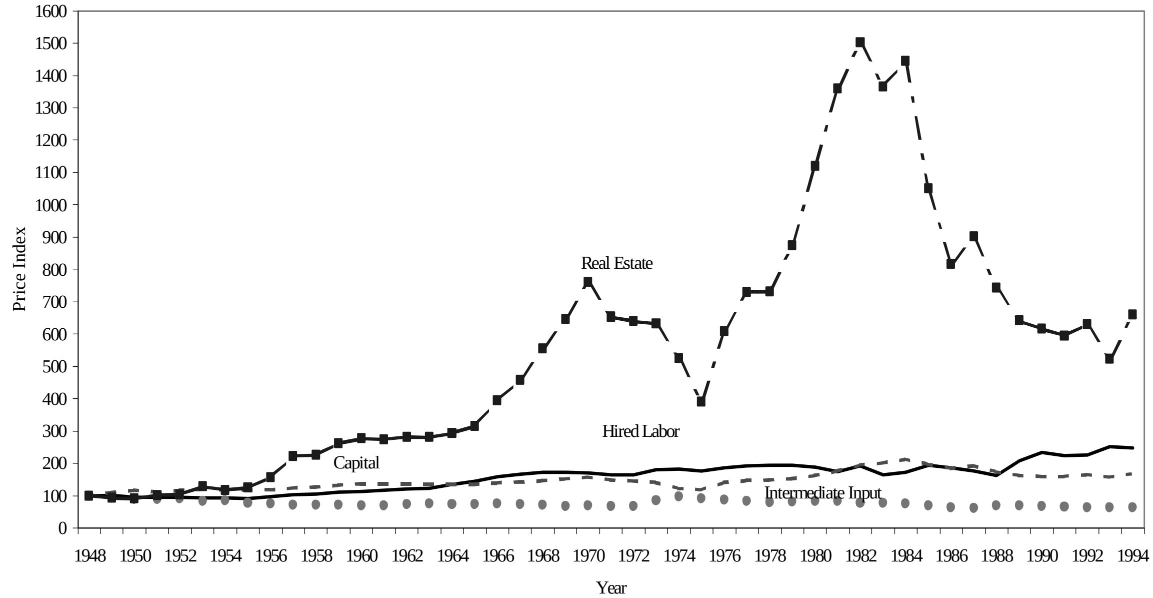
Assuming induced innovations, for technology to have been neutral over the sample period, the wage rate would have to have been about 12 percent lower, and the equilibrium labor quantity would have been by about 5 percent higher. Should the technology become more labor-saving, the wage rate would have to increase, and the labor quantity would have to decrease. Given a perfectly elastic labor supply function, labor-saving technical change would offset an upward shift in the supply curve resulting in a higher wage rate, and a lower equilibrium quantity of labor.

Conclusion

Our study of biased technical change in U.S. agriculture over the 1948 to 1994 period shows that U.S. technology has become more labor-saving, capital-using, intermediate inputs-using, and land-saving. Following the Bracero program, the technology was biased toward more labor-saving, and after IRCA, it became even more labor-saving. Given some evidence of more change toward mechanization, such as the development of mechanical cotton picker in the 1950s, and of mechanical tomato harvester after the end of the Bracero program, our result suggests technology was less capital-using. Despite the government's attempt to reduce the flow of illegal foreign labor into the U.S, there has still been an increasing flow of illegal foreign farm labor into the U.S. Our study tries to answer whether relatively abundant labor supplies may have forestalled labor-saving technology in the currently labor-intensive areas of U.S. agriculture.

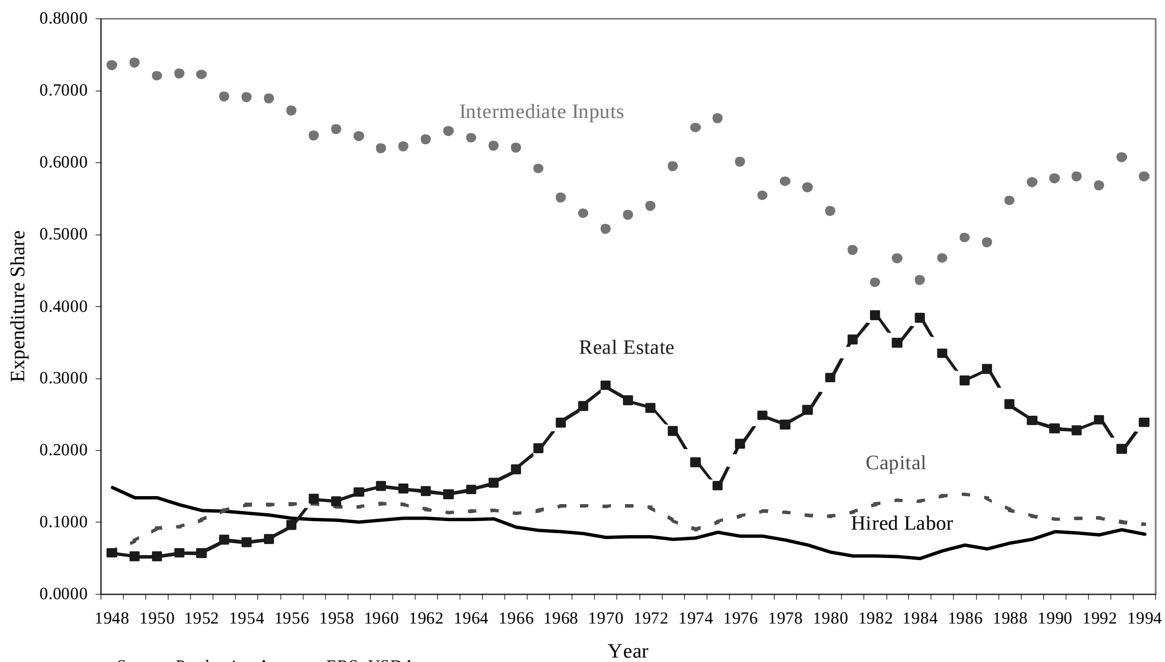
The simulation of different rates of labor-saving technical change suggests two outcomes. First, if all factor prices remain constant, labor-saving technology would result in a reduced expenditure share for labor, a more inelastic labor demand, and a significant reduction in the equilibrium quantity of labor. An alternative scenario is holding all factor shares constant and all factor prices constant except labor, and evaluating the wage increase corresponding to greater labor-saving technology. From the perspective of induced innovation theory, labor-saving technology can be induced by the decrease in supply of labor, and the corresponding increase in wage rate. Given the fact that a large majority of U.S. farm labor is unauthorized foreign workers, this would suggest that an increase in the stringency of migration policy as well as law enforcement would be necessary to induce further labor-saving technical change in U.S. agriculture.

Figure 1. Real Input Price Indices (GDP deflated)



Source: Production Account, ERS, USDA.

Figure2. Expenditure Share



Source: Production Account, ERS, USDA.

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