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POLITICAL ECONOMY, SECTORAL SHOCKS, AND BORDER ENFORCEMENT

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ABSTRACT

In this paper, we examine the correlation between sectoral shocks and border enforcement in the United States. Enforcement of national borders is the main policy instrument the U.S. government uses to combat illegal immigration. The motivation for the exercise is to see whether border enforcement falls following positive shocks to sectors that are intensive in the use of undocumented labor, as would be consistent with political economy models of how enforcement policy against illegal immigration is determined. The main finding is that border enforcement is negatively correlated with lagged relative price changes in the apparel, fruits and vegetables, and slaughtered livestock industries and with housing starts in the western United States. This suggests that authorities relax border enforcement when the demand for undocumented workers is high.

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I. Introduction

The official position of the United States and other industrialized countries is that controlling national borders against illegal entry is a central goal of immigration policy. Recent economic instability in emerging economies, from which many illegal immigrants originate, has heightened the concern over secure borders. Over the last two decades, the U.S. government has increased expenditures to combat illegal immigration, raising the enforcement budget of the U.S. Border Patrol from $290 million in 1980 to $1.7 billion in 1998 (in 1998 dollars). In spite of the public commitment to border enforcement, approximately 300,000 new illegal immigrants enter the United States each year; in 1996 there were approximately five million illegal immigrants in the country (Warren, 1995; INS, 1997). Undocumented workers are an important part of the U.S. agriculture, apparel, construction, food processing, lodging, restaurant, and domestic help industries (Chiswick, 1984; U.S. Department of Labor, 1991). Whether by accident or design, U.S. borders are porous. One common explanation for why the U.S. Immigration and Naturalization Service (INS), which oversees the Border Patrol, fails to prevent illegal entry is that it operates under conflicting mandates: while groups opposed to immigration demand strict enforcement, industries intensive in manual labor demand that enforcement not undermine their economic viability.

In this paper, we examine whether sectoral shocks influence U.S. enforcement of national borders against illegal immigration. The aim is to see whether border enforcement is correlated with the fortunes of industries that use illegal immigrants most intensively. Political lobbying is one mechanism which could create such a correlation. Open lobbying *in favor* of illegal immigration is unlikely, which by necessity makes the analysis indirect. Our approach is to look for factors which affect the economic return to lobbying on border enforcement.

To give a simple version of our story, suppose the apparel industry, among other activities, is a

major employer of illegal immigrants. To guarantee a supply of undocumented workers, apparel firms privately lobby the government to maintain lax border enforcement. Labor unions and other groups pressure the government to keep illegal immigrants from entering the country. Out of this situation emerges an equilibrium level of enforcement. Now suppose there is an exogenous increase in the demand for apparel. The positive demand shock raises the apparel industry's demand for illegal labor, as well as the return to lobbying for lower enforcement. The result is likely to be a lower equilibrium level of border enforcement.

We estimate the sensitivity of border enforcement to relative price changes in industries that use undocumented workers intensively. To measure border enforcement, we use the number of hours U.S. Border Patrol officers spend in different lines of activity. Naturally, labor-market conditions in the United States and Mexico may influence illegal immigration and thus the intensity of border enforcement. We control for these and other issues in the estimation.

Our work contributes to a small but growing literature on illegal immigration. Ethier (1986) models the determination of border enforcement and illegal immigration for a small open economy. Bond and Chen (1987), Djajic (1987, 1997), and Bucci and Tenorio (1996) extend this framework. In terms of empirical work, Moehring (1988) examines the evolution of INS budgetary appropriations over time, Bratsberg (1995) examines the correlation between sending-country characteristics and the stock of illegal immigrants in the United States, and Hanson and Spilimbergo (1999) find that attempted illegal immigration, as proxied by apprehensions of those attempting to cross the U.S.-Mexico border illegally, is very sensitive to changes in Mexican and U.S. wages. On border enforcement, Hanson, Robertson, and Spilimbergo (1999) find that changes in enforcement are not followed by changes in wages in U.S. border regions, suggesting that enforcement-induced changes in illegal immigration have little impact on U.S. wages. To our knowledge, there is little systematic analysis of the factors that

influence the intensity of enforcement efforts. This gap in the literature is unfortunate, given the importance of border enforcement in U.S. attempts to control illegal immigration.

A further motivation for examining border enforcement is the likely attempt to include international labor standards in the next round of World Trade Organization (WTO) negotiations. Labor unions and other political interest groups may demand the adoption of labor standards as a precondition for their support of any future WTO agreement. If labor standards were to be incorporated into the WTO, there are at least two ways countries could circumvent them: by expanding guest-worker programs, which permit laborers from foreign countries to work temporarily in a host country often in conditions far inferior to those for native host-country workers; or by allowing greater illegal immigration, which could be achieved by reducing border enforcement. In the United States, guest-worker programs and lax border enforcement have been alternative policies, each used with varying intensity over time, for increasing the supply of low-wage foreign workers in the economy (Hanson and Spilimbergo, 1998). As noted, undocumented labor is common in many U.S. industries. The employment of foreign guest workers is increasingly common in Germany, the Netherlands, and other European countries (Groenendijk and Hampsink, 1994). To the extent employers can hire foreign workers on terms that violate international labor standards, such standards might have only a small effect on employment conditions in industrialized countries. Understanding the determinants of border enforcement is important for predicting the impact of labor standards on U.S. labor-market outcomes.

In the second section of the paper we discuss political lobbying activities in the United States related to border enforcement and illegal immigration. In the third section we discuss theoretical literature which is relevant for our analysis and present the empirical specification. In the fourth section we describe the data and discuss estimation issues. In the fifth section we present the empirical results. And in a final section we offer concluding remarks.

II. Politics, Border Enforcement, and Illegal Immigration in the United States

There are a host of government policies that affect the flow of illegal immigrants into the United States. These include policies that impact the level of immigration directly, such as quotas for the admission of legal immigrants and for the admission of individuals to work in the United States on a temporary basis, and policies that impact immigration indirectly, such enforcement of U.S. borders, sanctions against employers that hire illegal immigrants, and the availability of government assistance to immigrants. In this paper, we focus on border enforcement, since this policy is relatively easy for authorities to change and can be measured at high frequencies and over long time periods. Because our empirical work is indirect – we examine the correlation between border enforcement and factors which theory suggests affect the return to lobbying on enforcement – we provide context for the analysis by discussing instances of political activity related to illegal immigration. Our goal is not to explain the complex political economy of U.S. immigration policy, but merely to cite examples which substantiate the plausibility of our hypothesis that the intensity of border enforcement is subject to influence by industry political interest groups.

Border Enforcement. The level of border enforcement in the United States is the result of several governmental decisions. First, the U.S. Congress appropriates funds for the U.S. Border Patrol, as part of the overall appropriation to the INS. The appropriation specifies how the funds are to be spent, including the portion of the budget that is to be dedicated to enforcement activities. Second, given the overall enforcement budget, the INS decides how to divide resources between enforcement of U.S. borders, which consists of policing land borders and ports of entry, or so-called "linewatch" duty, and internal enforcement, which consists of traffic checkpoints, raids on worksites, and other interior patrols. Figure 1 shows the monthly number of hours Border Patrol officers spent on linewatch duty

and on internal enforcement for the period 1970-1997. During this period 57.1% of total Border Patrol officer hours were devoted to linewatch duty and 91.3% of linewatch officer hours occurred at the U.S.-Mexico border. Figure 2 shows monthly apprehensions by Border Patrol officers on linewatch duty and on internal enforcement duty for 1970-1997. During this period 93.4% of apprehensions occurred in the U.S.-Mexico border region and 60.1% occurred as individuals were attempting to cross the border itself.

Among the main opponents of border enforcement are agricultural growers in California and Texas, who tend to specialize in perishable crops that are intensive in the use of manual labor. These growers frequently declare that without low-wage foreign labor they would be forced to cut back production or shutdown their operations altogether. In defense of hiring undocumented labor, a California grower replied, "The reality is that if the government was able to stop everybody at the border, there would be no agriculture. You wouldn't be eating asparagus."[1]

Indirect indications abound of growers' political influence.[2] Calavita (1992) documents that in the 1940s and 1950s the district commissioner of the U.S. Border Patrol in El Paso would routinely issue orders to stop apprehending illegal immigrants during the agricultural harvest season. During periods when the Border Patrol did increase apprehensions, Texas farmers complained to their congressional representatives, who then pressured the INS to reduce its enforcement intensity. Following one such a period, a Texas grower protested to his U.S. senator,

> For a number of years citizens of Mexico entered the United States both legally and illegally, engaging in agricultural work. While from time to time they have been picked up by the Border Patrol, there has been a tendency on the part of the Border Patrol to concentrate their efforts on

[1] Denny Walsh, "Valley Grower Guilty: Admits Farm Used Illegal Workers," *The Sacramento Bee*, April 30, 1999.

[2] This influence has infuriated politicians sympathetic to organized labor. In 1952, Senator Hubert Humphrey of Minnesota lamented, "Because of the economic interests that are involved in the wetback problem, no real, sincere effort has been made to solve it. As long as it is possible to hire the wetbacks at 10 cents an hour, they will be coming across the border until kingdom come" (Calavita, 1992: 37).

> deporting only those who were bad citizens. This arrangement, although it did not have the stamp of legislative approval, has worked out very nicely for our farmers down here. But during the past few weeks the Border Patrol has picked up and deported hundreds of wetbacks... (Calavita, 1992: 35)

Recent legislative reforms of U.S. immigration policy, including the Immigration Reform and Control Act of 1986 and the Immigration Control and Financial Responsibility Act of 1996, have mandated increases in government expenditure on border enforcement. Though they were ultimately unsuccessful, agricultural interests lobbied against these provisions of the new immigration laws (Gimpel and Edwards, 1999). As the INS has increased border enforcement, it has done so unevenly by raising enforcement drastically in some locales, such as El Paso during "Operation Hold the Line" in 1993 and San Diego during "Operation Gatekeeper" in 1995, but not in other locales. This has had the impact of shifting attempted illegal immigration and apprehensions from one border site to another, without necessarily reducing the overall level of illegal entry (Hanson, Robertson, and Spilimbergo, 1999). The strategy of targeting regional enforcement may serve to appease groups opposed to illegal immigration, which were particularly vocal in El Paso and San Diego,[3] without reducing overall illegal immigration.

Border versus Interior Enforcement. The division of Border Patrol activities between border and interior policing is further evidence of how political factors shape enforcement. As noted, the INS devotes most of its enforcement efforts to apprehending illegal immigrants when they first enter the country and relatively little time to monitoring employers that are likely to hire illegal immigrants. In 1990, for instance, less than eight percent of INS enforcement manpower was devoted to worksite inspections (Juffras, 1991). Of the 1.56 million apprehensions the Border Patrol made in 1996, only

[3] See Marcus Stern, "La Raza Blasts Move in State to Crack Down on Illegal Immigration," *The San Diego Union-Tribune*, July 20, 1994, p. A8; Daniel B. Wood, "Can Crackdown Halt Border Crossings?" *The Los Angeles Times*, May 8, 1996, p. 4; and statement of Raul Yzaguirre, National Council of La Raza, Subcommittee on Immigration, U.S. House of Representatives, June 29, 1995.

12,100 occurred at U.S. farms or other worksites. The inefficiency of this enforcement strategy in terms of deterring illegal immigration has long been recognized. It is relatively difficult to detain illegal immigrants as they cross the 2,000 mile U.S.-Mexico border, but it is relatively easy to do so at their places of work, especially during peak production periods, such as agricultural fields at harvest time or apparel factories prior to the annual fall sales boom. One common interpretation of the enforcement pattern is that the INS is pressured to avoid enforcement activities that directly injure specific parties, such as agricultural growers or factory owners.

Periodic attempts by the INS to increase interior enforcement are often met with stern political opposition. Following INS raids of onion fields in the state of Georgia during the 1998 harvest, the U.S. Attorney General, both Georgia senators, and three Georgia congressional representatives publicly criticized the INS for injuring Georgia farmers.[4] Similar raids of farms in California, Florida, or Texas, which are home to the largest concentrations of undocumented workers in the United States (Warren, 1995), are virtually unheard of. This may be due to the political strength of agriculture in these states. Similarly, the INS recently investigated the meat-packing industry in Nebraska and Iowa, which is reputed to use undocumented labor intensively, but made no raids on any plants. In defense of the inaction an INS official stated, "We don't want to have a negative impact on the production capabilities of these companies."[5]

A further constraint on interior enforcement efforts by the INS has been that until recently employers faced few penalties for hiring illegal immigrants. Prior to IRCA in 1986 it was not explicitly illegal to hire undocumented workers. Though it was illegal to "harbor" illegal immigrants, under the so-called Texas Proviso of 1951 employment was not interpreted as harboring. Agricultural political

[4] See Mark Krikorian, "Lured by Jobs, Illegal Immigrants Risk Death at Border Crossings," *Santa Barbara News-Press*, April 25, 1999.

interests appear to have been instrumental in getting the Texas Proviso adopted (Calavita, 1992). While IRCA finally instituted penalties for employers that hire undocumented workers, these sanctions seem to have relatively little bite. In 1989, for instance, the average fine the INS levied against employers for hiring illegal immigrants was less than $10,000. Fewer than 400 fines were levied in that year (Juffras, 1991).

The Bracero Program and Guest Farm Workers. A final example of how political factors influence illegal immigration are guest-farm-worker programs, which allow foreign laborers, most of whom are from Mexico, to work in U.S. agriculture on a temporary basis. The stated justification of allowing guest farm workers into the United States has been to prevent labor shortages on U.S. farms. The most well-know guest farm worker arrangement was the Bracero Program of 1942-1965, which at its peak in the 1950s brought 200,000-400,000 Mexican laborers into the United States annually (Calavita, 1992). The Bracero Program owed its existence to lobbying by agricultural interests in California and Texas. The INS was one agency responsible for determining how many Mexican workers could be admitted as "braceros." Agency reports from the 1950s indicate that U.S. agricultural labor demand was a major factor in deciding how many braceros to admit annually.[6] When the Border Patrol increased border enforcement and apprehensions as part of Operation Wetback in the early 1950s, growers were allowed to more than double the number of bracero workers they brought into the country, largely nullifying the impact of increased enforcement on the supply of manual labor to agriculture (Calavita, 1992).

IRCA revived the guest farm worker program by permitting undocumented agricultural workers in the United States to qualify as special agricultural workers (SAWs), which gave them legal resident

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[5] Barbara Hagenbaugh, "US, Meatpackers Make Deal on Immigration Crackdown," Reuters, May 7, 1999.

[6] One such report stated, "Braceros continue to arrive in sufficient numbers to keep the labor supply slightly ahead

status, and by allowing farmers to bring in additional undocumented laborers as replenishment agricultural workers (RAWs), subject to government approval. The addition of provisions for SAWs and RAWs appeared to be necessary to convince agricultural interests to support passage of IRCA. They were initially opposed to the legislation due to its provisions for raising sanctions on employers that hired undocumented workers (Martin, 1990). There have been recent attempts led by U.S. congressional representatives from agricultural states to pass legislation that would expand the guest farm worker program, but these have so far been unable to surmount strong opposition from labor unions such as the AFL-CIO.[7]

III. Theory and Empirical Specification

To help understand patterns of border enforcement, we sketch a simple model of political lobbying and illegal immigration in a labor-intensive industry. We refer to recent literature in political economy as a guide for how the story we describe generalizes to a general-equilibrium setting. We then use theory to motivate the empirical specification.

A. Theoretical Issues

Consider an economy that takes world commodity prices as given. For illustrative purposes we focus on a single industry in the economy. Suppose the industry produces apparel using two factors, capital, which is specific to the apparel sector, and labor, the supply of which is influenced by illegal immigration from a foreign country. Let output be given by the constant returns to scale production

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of demand for those farmers eligible to use bracero labor" (Calavita, 1992: 82).

[7] See Sam Loewenberg, "Unions Block Guestworker Bill," *Legal Times*, October 26, 1998, p. 16; and William Branigin, "Republicans Back Measure to Import More Farm Workers; Visa Expansion Proposed Despite Critical Hill Reports on Use of Foreign Workers," *The Washington Post*, March 11, 1998, p. A4.

function, *F(K,L)*, where *K* is sector-specific capital and *L* is labor. The price of apparel in the home economy is *p*, which is set on the world market.

Following Ethier (1986), the wage at which apparel firms hire labor depends on illegal immigration from a foreign country, which in turn depends on border enforcement by the home government. For simplicity we initially ignore legal immigration and other sectors of the home economy. The government chooses an enforcement level *E*, which determines the probability *g* that a foreigner attempting illegal immigration is apprehended and returned to the foreign country. We imagine that in making the enforcement decision the government weighs expected welfare for different groups in society and expected campaign contributions, or other benefits, from special interest groups. The apprehensions probability has the following properties: $g(0)=0$, $g'(E)>0$, $g''(E)\leq 0$, and $g(E)<1$ for all values of *E*. Apprehension imposes costs on the migrant, associated with distress or lost labor time, of *k*. If a foreign worker chooses to remain in his country he earns wage w^*, which is exogenous to events in the home economy. Illegal immigration will ensure that the following arbitrage condition holds:

$$(1) \quad (w^* - k)g(E) + w(1 - g(E)) = w^*$$

where *w* is the home-economy wage in the apparel sector. The expression on the left is the expected wage if the foreign worker attempts illegal immigration; the expression on the right is the expected wage in the foreign economy. Equation (1) can be rewritten as,

$$(2) \quad w = w^* + \frac{g(E)}{1 - g(E)} k = w(E)$$

It follows from the assumptions on *g()* that *w* is increasing in *E*. While the simple situation we consider is static, it would straightforward to extend this logic to an intertemporal setting.

Suppose the apparel industry has organized a political lobby, which, following Grossman and Helpman (1994), makes campaign contributions of B in order to influence the government choice of border enforcement. Since higher levels of enforcement raise the wage apparel firms must pay their workers, apparel capitalists prefer lower levels of enforcement. The apparel industry promises the government higher levels of campaign contributions in return for lower levels of enforcement. Other groups in the economy may oppose illegal immigration. These groups, which are left in the background, promise higher levels of contributions D in return for higher enforcement levels.[8] Enforcement can then be written as $E(B,D)$, where $E_B<0$ and $E_D>0$. By (2), raising campaign contributions from the apparel sector lowers the wage in the apparel sector. The function $E()$ summarizes the political economy of enforcement in the home country, which, following Grossman and Helpman (1994), involves different groups lobbying the government non-cooperatively. We leave the details of the policy determination process unspecified, but discuss their relation to fully-developed theories of political economy below.

The restricted profit function for the representative apparel firm can be written as,

$$(3) \quad pF(K,L) - w(E(B, D))L - B$$

where K is assumed fixed in the short run. The representative firm chooses L to maximize profits and the apparel lobby chooses B to maximize profits on behalf of the representative firm. In doing so, the lobby internalizes the impact of B on the apparel wage. Consider how changes in the external environment, in the form of an increase in the world relative price of apparel, affect the intensity of lobbying activity and border enforcement. Totally differentiating the first order conditions to the maximization of profits in equation (3) with respect to L and B, we find that,

$$(4) \quad \frac{dB}{dp} = w_b \frac{F_L - dw^*/dp}{pF_{LL} w_{BB} L + w_B}$$

[8] We suppose that D is determined by long-run factors which influence the political standing of domestic workers in the economy (and so is driven primarily by factors other than sectoral shocks).

where f_x indicates the partial derivative of the function $f()$ with respect to x.[9] By equation (2) and our assumptions on $g(E)$ and $E(B,D)$, w_B is negative and w_{BB} is positive. Thus, if dw^*/dp is not large and positive, then dB/dp is positive and an increase in the apparel price raises the equilibrium level of apparel campaign contributions and lowers the equilibrium level of border enforcement. The logic of this result is that a higher apparel price raises the value of hiring an additional apparel worker, which translates into a higher economic return on lobbying against border enforcement. For dw^*/dp to be small requires that any direct impact of the price change on foreign wages (or, more generally, on wages in other sectors of the home economy) be small. In other words, for dB/dp to be positive Stolper-Samuelson (1948) wage effects from the change in relative apparel prices cannot be too important.[10]

In general equilibrium, the impact of the apparel price rise will be more complicated. There may be feedback effects between border enforcement, illegal immigration, and economic conditions in the home and foreign countries. An increase in demand for labor from the apparel sector may put upward pressure on wages at home. Higher wages in the home economy may induce more illegal immigration, which may lead to greater political pressure from anti-immigrant groups to raise border enforcement. Given the possibility of rising political pressures both for and against border enforcement, how enforcement responds to external shocks is an empirical question.[11] Our goal here is merely to suggest

[9] Using the same framework, it is possible to obtain an expression for the impact of an apparel price change on apprehensions of those attempting illegal immigration (which corresponds to one of the dependent variables in the empirical analysis). A change in the apparel price has two opposing effects on the number of apprehensions, which leaves the total effect ambiguous. On one hand, a higher apparel price increases the demand for immigrant labor, which leads to more attempted illegal immigration and more apprehensions; on the other hand, higher demand for immigrant labor leads to an increase in lobbying activity to decrease border enforcement, which results in fewer apprehensions.

[10] In unreported empirical results, we find that the impact of relative commodity prices on wages in labor-intensive sectors is small, which is consistent with this requirement.

[11] In Sapir (1983), capitalists in the labor-intensive sector use increased immigration as a way of restoring rents following increased competition from low-wage countries. The difference in Sapir's predictions from ours comes not from the setup of the model -- in his model also a relative price increase for labor-intensive goods would raise the return to lobbying for less border enforcement -- but from differing assumptions about how the political process operates. This reinforces the notion that the relationship between sectoral shocks and border enforcement is an

that it is plausible that favorable relative price shocks in labor-intensive sectors can create pressures for lower levels of border enforcement.

The setup we describe is similar to the Grossman and Helpman (1994) model of endogenous tariffs. Instead of the government choosing tariffs to trade off the welfare of import-competing sectors versus the welfare of consumers, as in Grossman and Helpman, we imagine that the government chooses border enforcement to trade off the welfare of shareholders in labor-intensive sectors versus the welfare of laborers and other anti-immigrant groups. Using the Grossman-Helpman framework, Krishna and Mitra (1999) show that changes in relative prices can change the incentive of different groups to become politically organized. In their model, sectors choose endogenously whether to incur the fixed costs of forming a lobby. Beginning from an equilibrium with a lobby in the import-competing sector (which in our case would be anti-immigrant groups) but no lobby in the export-competing sector (which in our case would be the apparel sector), they consider the impact of an increase in the relative price of the export good. The relative price change raises the economic value to the export (apparel) sector of lobbying against tariffs (enforcement) and may induce firms in the sector to form a lobby, in which case the economy moves towards free trade (more immigration). The logic behind this result, which they work out in a general-equilibrium context, closely parallels the result we outline for the impact of an apparel price increase on border enforcement.

B. Empirical Specification

In the simple model outlined above, shocks to sectors that are intensive in the use of undocumented workers influence the level of border enforcement. The policy-making process, in particular lobbying by special interest groups, is the mechanism through which sector-specific shocks

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empirical question.

are transmitted to enforcement. The level of enforcement and the demand for undocumented workers are also likely to impact illegal attempts to enter the home country, which in our case is the United States. Changes in attempted illegal immigration may in turn prompt authorities to alter border enforcement. To address feedback effects between border enforcement attempted illegal immigration, and sectoral shocks, we model the joint dynamic behavior of these variables using a vector autoregression (VAR) approach. Since we do not observe attempted illegal immigration directly, we instead use data on apprehensions of those attempting illegal entry.

One issue for our empirical strategy is to identify factors which influence the demand for less-skilled immigrant workers and hence the demand for border enforcement. Equation (3) suggests that increases in the relative price of final goods in nonskill-intensive industries will increase the demand for undocumented workers and decrease demand for border enforcement. We use relative commodity prices for non-skill intensive goods to measure shocks to the demand for undocumented workers. The industries we select are agriculture (fruits and vegetables), meatpacking (slaughter livestock), apparel, and construction. For durable goods, like those that construction produces, relative final good prices may be a poor indicator of labor demand, as final good prices also depend on the stock of durable goods in the economy. We instead use new housing starts as an indicator of labor demand in the construction industry. Unfortunately, high-frequency indicators of labor demand are unavailable for several nontraded sectors that are also relatively intensive in undocumented labor – domestic help, restaurant, and lodging services. In our story, a positive shock to a labor-intensive sector increases the demand for undocumented workers which then leads to greater lobbying against border enforcement. The transmission from price shock to lobbying to changes in enforcement is unlikely to be instantaneous. We allow for an delayed lag structure, in which price shocks today do not begin to influence enforcement until several periods in the future.

Other variables are also likely to influence enforcement and apprehensions. Attempted illegal immigration will depend in part on labor-market conditions in the United States and source countries for illegal immigration, which is mainly Mexico. We include real wages in the United States and Mexico and the U.S. unemployment rate as additional regressors (Hanson and Spilimbergo, 1999). These variables may influence enforcement indirectly, through their impact on attempts at illegal entry, and directly, through how they influence INS expectations as to how many Border Patrol officers will be needed to control illegal immigration.

There remains an issue of whether relative price changes for nonskill-intensive industries capture demand shocks, as we suppose, or domestic supply shocks. Since fruits, vegetables, livestock, and apparel are all traded goods, international market conditions will influence price movements in these industries, in which case domestic supply shocks may have little scope to affect prices. Since we estimate the correlation between enforcement and relative prices holding wages in the United States and Mexico constant, we effectively control for supply shocks related to wage changes. As a check on whether industry relative prices are reasonable measures of industry labor demand, in some specifications we replace relative prices with capacity utilization. The advantage of using capacity utilization is that it is likely to be highly correlated with industry labor demand; the disadvantages are that data are unavailable for some industries and that simultaneity problems are likely to be more severe for capacity utilization than for relative prices.

Formally, the specification we estimate is,

$$h_t = \alpha_1 + \beta_1(L)h_{t-1} + \gamma_1(L)a_{t-1} + \delta_1(L)p_{t-s} + \theta_1(L)x_t + \rho_1 t + \varepsilon_{1t}$$

(5)

$$a_t = \alpha_2 + \beta_2(L)h_{t-1} + \gamma_2(L)a_{t-1} + \delta_2(L)p_{t-s} + \theta_2(L)x_t + \rho_2 t + \varepsilon_{2t}$$

where h_t is log U.S. border enforcement (person hours the U.S. Border Patrol spends policing the

border); a_t is log apprehensions by the U.S. Border Patrol, which we use to proxy for attempted illegal immigration; p_t is a row vector of log housing starts and log relative prices (or, in some specifications, capacity utilization rates) in the fruit and vegetables, slaughtered livestock, and apparel industries; x_t is a row vector consisting of log real wages in the United States and Mexico and the U.S. unemployment rate; L is the lag operator; α_i, β_i, γ_i, δ_i, θ_i, and ρ_i (i=1,2) are vectors or matrices of parameters to be estimated; and ε_{1t} and ε_{2t} are i.i.d. error terms. If border enforcement falls following positive shocks to nonskill-intensive industries, then it would appear that the U.S. government sets border enforcement in response to economic conditions in these industries.

IV. Data and Estimation Issues

A. Data

For data on apprehensions and enforcement, we use INS records of linewatch activity by the U.S. Border Patrol. These data show the number of hours Border Patrol officers spend policing U.S. borders and the number of apprehensions officers make at U.S. borders. As mentioned, the vast majority of linewatch activity occurs at the U.S.-Mexico border. Measures of linewatch activity, which are shown in Figures 1 and 2, are preferable to broader measures of enforcement, since they identify the precise time (and place) where individuals attempt to enter the United States illegally (Hanson and Spilimbergo, 1999).

For relative commodity prices, we use the ratio of U.S. commodity price indices for fruits and vegetables, slaughtered livestock, and apparel to the price index for all U.S. commodities. The price series, which are from the U.S. Bureau of Labor Statistics (BLS), are shown in Figure 3. For housing starts, we use housing starts on all residential buildings in the western United States. These data come from the U.S. Bureau of Economic Analysis. In some specifications, we use capacity utilization rates in

the food processing and apparel industries, which are shown in Figure 4. The selected industries are those which the literature has found to employ large numbers of undocumented workers (Chiswick, 1984; Martin, 1990; U.S. Department of Labor, 1991; Warren, 1995). Table 1 shows the fraction of workers that were foreign born in U.S. industries in each of four education groups. These figures confirm that agriculture, apparel, construction, and food processing are important sources of employment for immigrant labor.

For U.S. wages, we use average hourly compensation for production workers in labor-intensive manufacturing industries (food processing, apparel, textiles, furniture, and wood processing), deflated by the U.S. CPI. Data for this series come from the BLS. This wage captures what prospective illegal immigrants might expect to earn upon successfully entering the United States. For Mexican wages, we use average hourly wages for production workers in Mexican manufacturing, deflated by the CPI in Mexico; both series are from the IMF International Financial Statistics. To our knowledge, no other monthly wage series is available for Mexico covering the entire sample period. Hanson and Spilimbergo (1999) discuss these wage data in more detail.

B. Estimation Issues

There are three estimation issues which need to be addressed: the presence of unit roots in the data, the exogeneity of the additional regressors in the estimation, and the lag structure on the regressors. Before proceeding with the empirical analysis, it is important to check whether the variables used in the estimation are stationary. In unreported results, we performed augmented Dickey-Fuller tests on each variable used in the analysis; in all cases we allow a time trend and up to 12 lags on changes in the variable to control for serial correlation. We reject the null hypothesis of a unit root at the 10% significance level in all cases except apprehensions; for apprehensions we reject the null of a unit

root at the 15% level. We interpret these results as evidence of stationarity in the underlying time series and proceed with OLS estimation of (5).[12]

The specification in equation (5) is a bivariate VAR, which imposes the assumption that relative commodity prices and labor-market conditions in the U.S. and Mexico are not influenced (in a Granger causality sense) by border enforcement and apprehensions. To verify that this assumption is warranted, we perform block exogeneity tests on the two equations that compose the VAR. For each specification used in the next section, we reject the null hypothesis that enforcement and apprehensions jointly Granger-cause relative commodity prices or the labor-market variables used in the analysis. These results, which are consistent with Hanson, Robertson, and Spilimbergo (1999), justify use of a bivariate VAR.

Finally, from the preceding discussion on how political economy mechanisms are likely to create delays in the impact of shocks to nonskill-intensive sectors, we expect that relative-price shocks will take several periods before translating into changes in border enforcement. The first lags of relative prices have no effect on enforcement or apprehensions. Relative prices become statistically significant in the enforcement and apprehensions regressions as a six to 10 month delay is introduced. We choose the lag structure which optimizes the Schwarz criterion. This structure has three lags on the relative-price and housing start series beginning with a delay of 10 months for fruits and vegetables, six months for slaughtered livestock, eight months for housing starts, and seven months for apparel. An alternative approach would be to include lags for the past 12 months, inclusive. We have not chosen this alternative because a long lag structure absorbs too many degrees of freedom and introduces multicollinearity into the estimation.

[12] Moreover, in the OLS estimation of equation (5), which we report in the next section, we find no evidence of serial correlation in the error terms.

V. Empirical Results

In this section, we present results for bivariate VARs of border enforcement and border apprehensions. We estimate two specifications of the system. In the first, relative commodity prices and housing starts are used as indicators of sectoral demand; in the second, relative commodity prices are replaced by capacity utilization rates. By analyzing both price and quantity effects, we examine the robustness of the results to alternative methods of identifying sectoral demand shocks. All sectoral variables are entered with a delay of six to 10 months, which is meant to capture the fact that it takes time for shocks to be transmitted through the political process to changes in policy. Delayed sectoral shocks have the additional advantage of not being influenced by future innovations in illegal immigration, border enforcement, or labor-market conditions in the United States or Mexico. The dependent variables are border enforcement and border apprehensions. The additional regressors are the U.S. real wage, the U.S. unemployment rate, the Mexican real wage, a time trend, and monthly dummy variables.[13]

The first set of OLS regressions, reported in Tables 2a and 2b, examine the impact of relative commodity prices on border enforcement and border apprehensions. We find strong evidence that delayed relative price increases in nonskill-intensive sectors are followed by decreases in enforcement but no evidence that they impact apprehensions.

For each regressor, the tables show a Granger causality test and the estimated long-run elasticity of the dependent variable with respect to the regressor. Consider first the results for border

[13] We do not show impulse responses for the estimation results. Given the block exogeneity of the system we estimate, the standard errors for the impulse responses are undefined and must be estimated using bootstrap methods. We experimented with this approach, but were unable to generate plausible standard-error bounds for the impulse responses.

enforcement in Table 2a. We find that livestock prices, apparel prices and housing starts all Granger cause border enforcement. Fruit and vegetable prices are statistically insignificant. The long-run elasticities for all four sectoral variables are negative, which indicates that border enforcement falls following a rise in relative commodity prices or housing starts. The long –run elasticities, which are statistically significant at the 5% level for livestock and housing and at the 10% level for fruit and vegetables, range from -0.210 for apparel to -0.657 for livestock, meaning that a permanent one-percent increase in the relative price of livestock is followed by a 0.657 percent long-run decrease in border enforcement. The impact of sectoral shocks on border enforcement thus appears to be economically significant, as well as statistically significant.

Turning to the other control variables, both U.S. wages and the U.S. unemployment rate Granger cause border enforcement. Border enforcement rises following an increase in U.S. wages or a decrease in U.S. unemployment, which suggests that the INS raises border enforcement when overall U.S. labor-market conditions tighten. This is consistent with the hypothesis that the INS raises border enforcement when it expects attempted illegal immigration to be higher. Border enforcement is unaffected by Mexican wages.

Table 2b presents OLS results for border apprehensions. In contrast to border enforcement, no sectoral variable Granger causes apprehensions. This is not surprising, given that relative-price changes in labor-intensive sectors may have offsetting effects on apprehensions (see note 9). On the one hand, higher relative prices in labor-intensive sectors mean higher labor demand in these sectors, which may increase attempted illegal immigration; on the other hand, higher relative prices may mean lower border enforcement, which could reduce apprehensions. We do find that apprehensions are responsive to changes in labor-market conditions in the United States and Mexico, as consistent with Hanson and Spilimbergo (1999).

Tables 3a and 3b show results for the second specification, which uses capacity utilization rates in place of relative commodity prices. While there is only weak evidence that capacity utilization in apparel and food products Granger cause border enforcement, the long-run elasticities are negative and precisely estimated. One explanation for the weaker results on capacity utilization is that relative prices are a better measure of sectoral shocks. Firms could, for instance, increase capacity when forecasting higher demand in the future so that a lower rate of capacity utilization today could indicate a future increase in labor demand. The labor-market variables have the same sign and significance as in previous regressions. Table 3b confirms the results in Table 2b that labor-market conditions, but not sectoral shocks, influence apprehensions.

In unreported regressions, we examine the sensitivity of our results to changes in the specification, the set of included industries, measures of sectoral shocks, and the sample period. Extending the lag structure on the regressors produces results very similar to those in Tables 2a-3b, but with a loss of precision in the coefficient estimates. Varying the delay on the lag structure for the sectoral variables tends to reduce the magnitude of the long-run elasticities and increase standard errors – the maximum effect of these variables is that which includes three lags beginning with a six to 10 month delay. We also experimented with using commodity price indices for more disaggregated agricultural goods (fruits, melons, vegetables) and apparel products (apparel by fabric type) and for other labor-intensive industries (textiles, footwear, slaughtered poultry). These results are very similar to those we report, except for footwear, which although it is a labor-intensive industry does not appear to use large quantities of immigrant labor (as shown in Table 1).[14] Finally, we estimated VARs for different subperiods within the sample. The impact of sectoral shocks to apparel on border enforcement is

[14] Also, the U.S. footwear industry is now quite small (after several decades of continual decline), which may mean that shocks to the sector are unimportant for policy outcomes affecting border enforcement.

greater in later subperiods (after 1980), which may reflect the progressive relocation of the industry to California and its apparent increasing reliance on undocumented workers. The impact of housing starts is weaker in later subperiods. Results for other sectors are unaffected by changes in the time period.

VI. Concluding Remarks

In this paper, we examine the correlation between sectoral shocks and border enforcement in the United States. Enforcement of national borders is the main policy instrument the U.S. government uses to combat illegal immigration. The motivation for the exercise is to see whether border enforcement falls following positive shocks to sectors that are intensive in the use of undocumented labor, as would be consistent with a political economy explanation of how enforcement policy against illegal immigration is determined. The main finding is that border enforcement is negatively correlated with relative price changes in the apparel, fruits and vegetables, and slaughtered livestock industries and with housing starts in the western United States. This suggests that authorities relax border enforcement when the demand for undocumented workers is high. We also find that border enforcement rises when overall labor-market conditions in the United States tighten, which suggests that the U.S. government raises enforcement when attempted illegal immigration is expected to be high. Taken together with the results on sectoral shocks, it appears that enforcement softens when the specific sectors that use undocumented workers intensively expand but not when the overall demand for labor is high. This is consistent with free-rider problems in special interest group activity (Olson, 1965), in which sectors that benefit greatly from lower border enforcement, such as apparel and agriculture, lobby heavily on the issue while remaining sectors that benefit modestly or not at all are politically inactive.

Our results are relevant not only for the political economy of border enforcement but for the empirical importance of political economy in general. In recent years, several papers have tested

models of the political economy of trade policy (e.g., Trefler, 1993; Goldberg and Maggi, 1997). While this work is important for understanding the determination of trade policy, it does not necessarily represent the best strategy for testing political economy theories in general, as trade policy is often constrained by international treaties and cannot be changed frequently or easily. Political decisions regarding border enforcement do not have these features. The INS can reallocate resources between different types of enforcement and the U.S. Congress can change appropriations to the INS on an annual basis, if not more often. This makes border enforcement a valuable laboratory for examining the impact of political factors on policy outcomes.

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Table 1: Foreign-Born Share of Employment By Industry and Education Group, 1990

Industry	HS Dropout	HS Graduate	Some College	College Grad.
Agriculture	0.315	0.041	0.029	0.029
Agriculture Services	0.295	0.092	0.064	0.041
Mining	0.058	0.007	0.032	0.081
Construction	0.189	0.047	0.046	0.098
Food Products	0.336	0.091	0.086	0.078
Tobacco	0.000	0.000	0.000	0.000
Textiles	0.133	0.019	0.022	0.064
Apparel	0.419	0.097	0.183	0.251
Lumber	0.098	0.015	0.017	0.040
Furniture	0.244	0.076	0.051	0.051
Paper	0.164	0.033	0.074	0.055
Printing	0.157	0.050	0.056	0.055
Chemicals	0.224	0.040	0.057	0.089
Petroleum Refining	0.000	0.032	0.000	0.000
Rubber	0.282	0.052	0.094	0.066
Leather	0.160	0.132	0.106	0.075
Stone, Clay, Glass	0.110	0.043	0.056	0.084
Primary Metals	0.241	0.032	0.030	0.041
Metal Products	0.267	0.079	0.049	0.104
Machinery	0.195	0.040	0.063	0.142
Elec. Machinery	0.245	0.086	0.097	0.139
Transport Equip.	0.182	0.060	0.049	0.069
Misc. Manufacturing.	0.405	0.097	0.129	0.119
Transport/Utilities	0.117	0.040	0.062	0.083
Wholesale Trade	0.197	0.070	0.060	0.093
Retail Trade	0.153	0.070	0.065	0.116
Finance, Insur., Real Estate	0.150	0.057	0.063	0.086
Investment Finance	0.302	0.103	0.120	0.069
Lodging Services	0.278	0.122	0.135	0.205
Personal Services	0.214	0.092	0.061	0.200
Business Services	0.225	0.072	0.064	0.110
Automobile Services	0.156	0.073	0.128	0.123
Repair Services	0.194	0.019	0.069	0.139
Entertainment	0.121	0.056	0.077	0.054
Health Services	0.127	0.061	0.061	0.130
Legal Services	0.233	0.049	0.070	0.037
Education Services	0.104	0.047	0.062	0.061
Social Services	0.092	0.053	0.055	0.065
Household Services	0.323	0.155	0.145	0.268
Government	0.097	0.027	0.044	0.051

Each cell shows the fraction of workers that were foreign born in a particular education group (high-school dropout, high-school graduate, some college, college graduate) and in a particular industry.
Source: *Public Use MicroSample of the U.S. Census of Population and Housing, 1990.*

Table 2a: OLS Estimation Results for Border Enforcement
(p values are in parentheses)

	Granger Causality Test	Long-Run Elasticity		
Border Enforcement	--	0.885 (0.00)	Breusch-Godfrey	1.030 (0.38)
Border Apprehensions	0.967 (0.81)	-0.052 (0.71)	Adj. R-Sqd.	0.986
Fruit and Veg. Relative Price	3.902 (0.27)	-0.491 (0.07)	Schwarz Criterion	-5.610
Livestock Relative Price	14.248 (0.00)	-0.657 (0.02)		
Apparel Relative Price	8.753 (0.03)	-0.210 (0.61)		
Housing Starts Western U.S.	8.753 (0.03)	-0.283 (0.02)		
U.S. Real Wage	11.947 (0.01)	4.879 (0.01)		
U.S. Unemp. Rate	7.813 (0.05)	-0.389 (0.14)		
Mexico Real Wage	2.844 (0.42)	0.155 (0.46)		

Observations are monthly for January, 1970 to December, 1996. All variables are in logs. Border Enforcement (Apprehensions) is officer hours (apprehensions) by the U.S. Border Patrol on linewatch duty. Prices are commodity PPI/all commodity PPI. The U.S. wage is a weighted average of wages in labor-intensive industries. The Mexican wage is for production workers in manufacturing. Three lags on the independent variables are included. Additional regressors are a time trend and monthly dummy variables. Under the null hypothesis that coefficients on lagged values of a variable are zero, the Granger causality test statistic has a K^2 distribution. The long-run elasticity is the sum of coefficients on lagged values of an independent variable divided by one minus the sum of coefficients on the dependent variable (for the dependent variable it is the sum of the coefficients on lagged values). The Breusch-Godfrey test for serial correlation is an F test on the inclusion of lagged residuals in the regression with the contemporaneous residual as the dependent variable (Godfrey, 1994).

Table 2b: OLS Estimation Results for Border Apprehensions
(p values are in parentheses)

	Granger Causality Test	Long-Run Elasticity		
Border Enforcement	0.605 (0.90)	0.068 (0.84)	Breusch-Godfrey	1.56 (0.20)
Border Apprehensions	--	0.821 (0.00)	Adj. R-Sqd.	0.98
Fruit and Veg. Relative Price	3.691 (0.30)	0.166 (0.66)	Schwarz Criterion	-3.87
Livestock Relative Price	0.147 (0.99)	0.026 (0.95)		
Apparel Relative Price	4.926 (0.18)	-0.946 (0.10)		
Housing Starts Western U.S.	0.186 (0.98)	-0.056 (0.75)		
U.S. Real Wage	12.896 (0.01)	7.526 (0.00)		
U.S. Unemp. Rate	2.757 (0.43)	0.461 (0.21)		
Mexico Real Wage	0.888 (0.83)	-0.228 (0.44)		

The specification and estimation procedure is identical to that in Table 2a, except for the change in dependent variable.

Table 3a: Additional Results for Border Enforcement
(p values are in parentheses)

	Granger Causality Test	Long-Run Elasticity		
Border Enforcement	--	0.888 (0.00)	Breusch-Godfrey	0.63 (0.59)
Border Apprehensions	3.224 (0.36)	-0.215 (0.11)	Adj. R-Sqd.	0.986
Food Products Capacity Util.	4.619 (0.20)	-3.815 (0.08)	Schwarz Criterion	-5.62
Apparel Capacity Util.	5.291 (0.15)	-1.265 (0.04)		
Housing Starts Western U.S.	2.707 (0.44)	-0.105 (0.43)		
U.S. Real Wage	13.293 (0.00)	6.318 (0.00)		
U.S. Unemp. Rate	5.163 (0.16)	-0.293 (0.27)		
Mexico Real Wage	2.861 (0.41)	0.053 (0.79)		

The specification and estimation procedure is identical to that in Table 2a, except that the relative price variables have been replaced by capacity utilization rates.

Table 3b: Additional Results for Border Apprehensions
(p values are in parentheses)

	Granger Causality Test	Long-Run Elasticity		
Border Enforcement	0.603 (0.90)	-0.084 (0.82)	Breusch-Godfrey	0.63 (0.59)
Border Apprehensions	--	0.832 (0.00)	Adj. R-Sqd.	0.98
Food Products Capacity Util.	0.479 (0.92)	-0.442 (0.89)	Schwarz Criterion	-3.91
Apparel Capacity Util.	4.774 (0.19)	-0.861 (0.33)		
Housing Starts Western U.S.	0.452 (0.93)	0.000 (1.00)		
U.S. Real Wage	15.113 (0.00)	9.498 (0.00)		
U.S. Unemp. Rate	2.885 (0.41)	0.702 (0.07)		
Mexico Real Wage	0.306 (0.96)	-0.229 (0.44)		

The specification and estimation procedure is identical to that in Table 2b, except that the relative price variables have been replaced by capacity utilization rates.

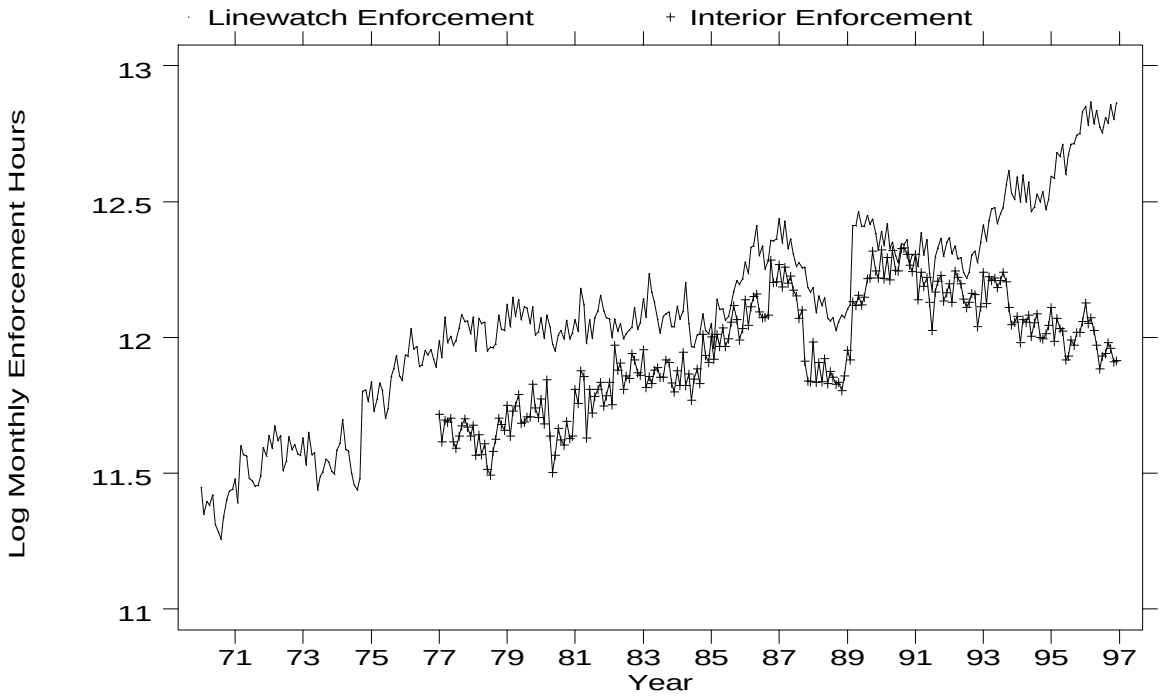

Figure 1: Border Patrol Enforcement

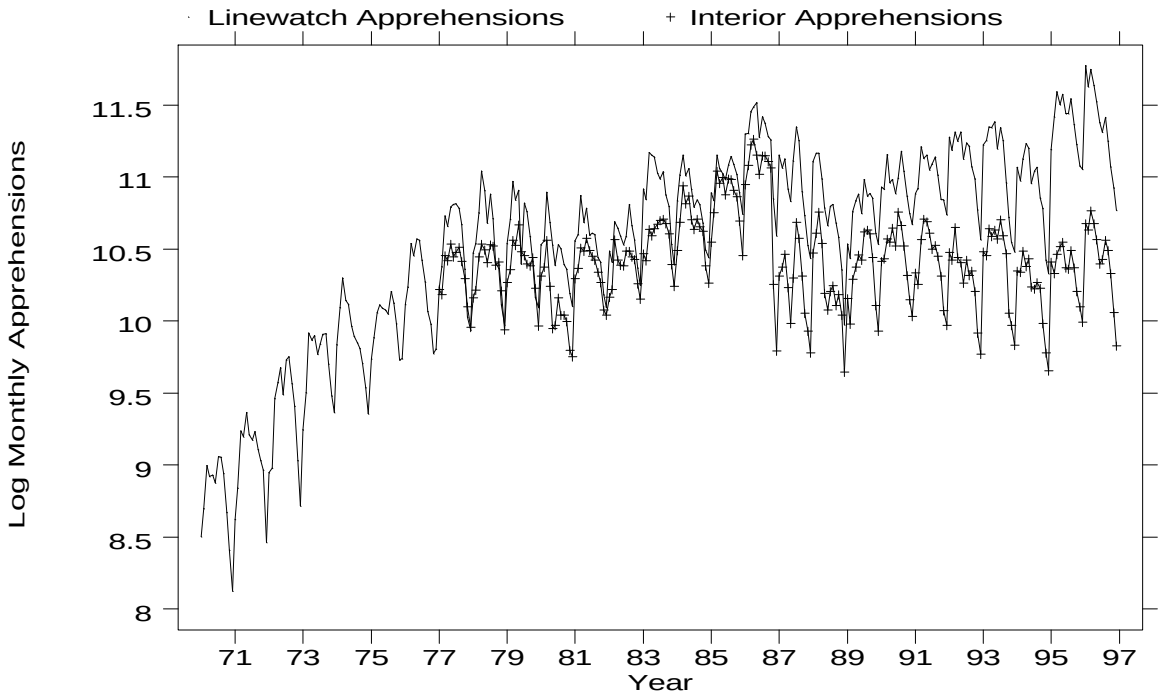

Figure 2: Border Patrol Apprehensions

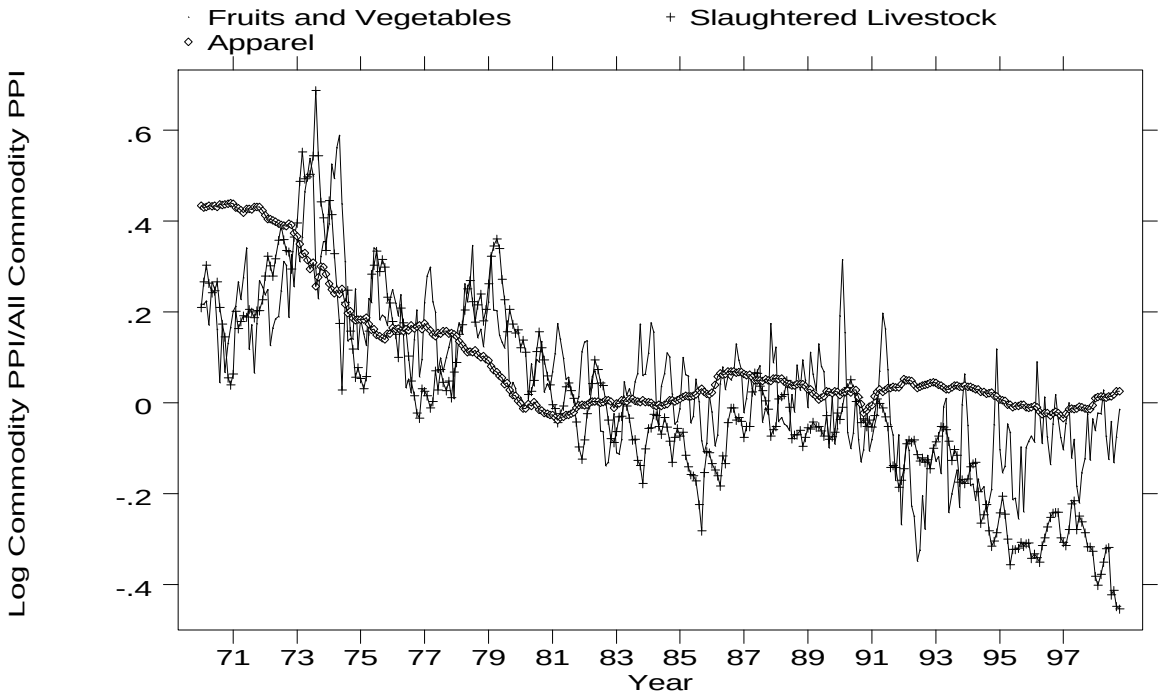

Figure 3: Relative Commodity Prices

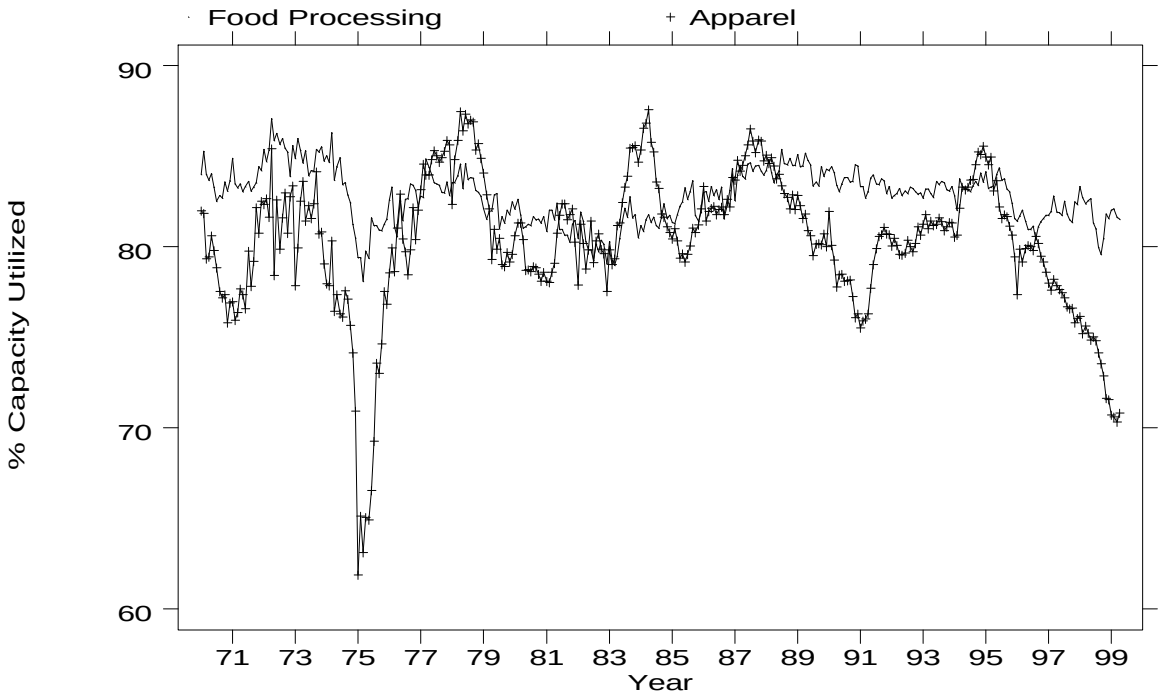

Figure 4: Capacity Utilization