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# UPDATE

## Agricultural and Resource Economics

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### Immigration Reform: Implications for Agriculture

by

*Philip Martin*

*About half of U.S. farm workers are not authorized to work in the United States. Pending immigration reforms aim to prevent the entry and employment of more unauthorized foreigners, but differ on what to do about unauthorized workers already in the United States.*

About 95,000 foreigners a day arrive in the United States. About 90,000 are nonimmigrant tourists, business people, and foreign students and workers welcomed at airports and border crossings. About 3,000 are immigrants who have been invited to become permanent residents of the United States, and almost 2,000 are unauthorized foreigners, usually Mexicans, who evade border controls, enter the United States, and settle.

Is the arrival of 30 million nonimmigrants, a million immigrants, and 500,000 to 700,000 unauthorized foreigners a year something to be welcomed or feared?

Opinion polls consistently find that most Americans want the U.S. government to take additional steps to prevent illegal migration. A December 2005 *Washington Post-ABC News* poll reported that 80 percent of Americans think the federal government should do more to reduce illegal immigration, and 56 percent agree that unauthorized migrants hurt the United States more than they help it.

In December 2005, the House approved the Border Protection, Antiterrorism, and Illegal Immigration Control Act (H.R. 4437) on a 239 to 182 vote. President Bush commended the bill, saying: "I applaud the House for passing a strong immigration reform bill... I urge the Senate to take action on immigration reform so that I can sign a good bill into law."

If eventually enacted into law, H.R. 4437 would require U.S. employers within two years to submit Social Security and other data on newly hired workers to government agencies by telephone or computer. If the data do not match that in government records, employers are to notify workers to correct the problem within 30 days, or the worker could no longer be employed. Employers would have six years to verify the legal status of their current employees. H.R. 4437 also cracks down on unauthorized foreigners in the United States by making "illegal presence" in the United States a felony, which may make it hard for such persons to eventually become legal immigrants, and introduces penalties on those who support or shield illegal migrants, which could affect churches and other migrant support groups.

Perhaps the most controversial item in H.R. 4437 is a provision that calls for 700 miles of additional fencing along the Mexico-U.S. border. Adding to the 106 miles already in place, this would extend the fencing to over a third of the 2,000 mile border. Even though President Bush has been calling for a guest-worker program since his election in 2000, H.R. 4437 does not include such a program.

In March 2006, the Senate began to take up immigration reform. Unlike the House, the leading proposals in the Senate would legalize unauthorized foreigners

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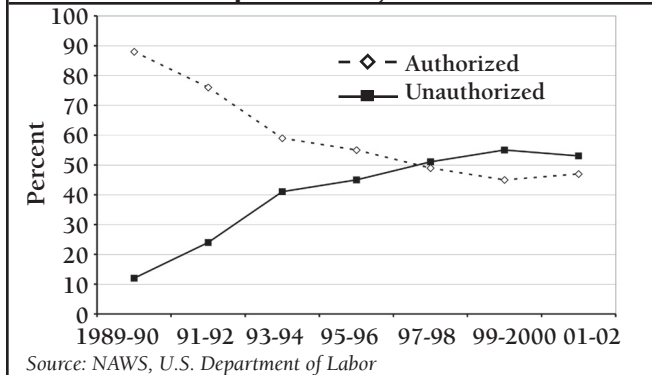
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**Figure 1. Authorized and Unauthorized U.S. Crop Workers, 1989-2002**



employed in the U.S., but they differ in what happens to newly legalized workers at the end of six years of legal U.S. work.

Under the Secure America and Orderly Immigration Act of 2005 (S. 1033), introduced by Senators John McCain (R-AZ) and Edward Kennedy (D-MA), unauthorized foreigners in the United States could apply for guest worker visas by showing a U.S. work history and passing background checks. If they continued working in the United States for six years, passed additional security and background checks, and paid a fee/fine of at least \$2,000, they could qualify for immigrant visas. Legal guest workers under McCain-Kennedy could change U.S. employers, an effort to protect them from unscrupulous employers, and more visas would be made available so that foreigners who earn immigrant visas by working could have their families join them in the United States. Like the House bill, the McCain-Kennedy bill would create a new electronic work-authorization system that would ultimately replace the current paper-based system.

Senators John Cornyn (R-TX) and Jon Kyl (R-AZ) also aim to make currently unauthorized foreign workers in the United States legal. Their Comprehensive Enforcement and Immigration Reform Act of 2005 would require unauthorized foreigners in the United States to register, return to their countries of origin, and then re-enter with renewable three-year work permits. At the end of six years, these legal guest workers would be expected to leave the United States for good. Like the House bill, Cornyn-Kyl would dramatically increase funding for border and interior enforcement and introduce machine-readable, tamper-resistant Social Security cards to help employers determine the legal status of newly hired workers.

There are several other proposals that share the goals of reducing the influx of unauthorized foreigners and

ensuring that workers employed in the United States are legal. However, the differences are clear: should the U.S. government try an enforcement-first and guest workers-later strategy, as in the House bill, or launch new enforcement and guest-worker programs simultaneously, as in the Senate bills? Another issue is what happens to guest workers when their work visas expire: can they become legal immigrants or must they leave the United States? Finally, an issue of special importance to agriculture is how easy it will be to obtain additional legal guest workers.

### Unauthorized Farm Workers

An estimated 10.3 million unauthorized foreigners were in the United States in March 2004. Their number has been increasing by over 700,000 a year in the past decade, so that in recent years the inflow of illegal migrants has exceeded that of legal immigrants. The fact that almost 30 percent of the 36 million foreign-born U.S. residents are unauthorized, as are 55 percent of the 11 million Mexican-born U.S. residents, is a major reason why Congress is considering immigration reform.

Most unauthorized foreigners in the United States are not employed in agriculture. Almost two million are children under 18, and others are housewives or are retired, so that seven to eight million unauthorized are in the U.S. labor force of 150 million. Most are between the ages of 18 and 40, and half arrived since 1995.

There are no reliable data on the number of unauthorized farm workers and their importance to U.S. agriculture. The U.S. Department of Labor (DOL) has been surveying workers employed on crop farms for the past 15 years, and found that the percentage of unauthorized workers has been above 50 percent since the late 1990s. However, more recent surveys suggest that the unauthorized share of the crop work force has fallen slightly, perhaps because tougher border enforcement is slowing new entries while the boom in construction and other nonfarm labor markets has drawn newly arrived unauthorized seasonal workers into nonfarm jobs.

There are no government estimates of unauthorized workers in livestock, but livestock workers are more likely to be legal because a higher share have year-round jobs and benefits such as housing.

When USDA relied on the Current Population Survey to estimate the number of farm workers, they estimated there were 2.5 million farm workers, defined as persons employed for wages on farms sometime during a typical year, including 1.8 million in crops and 700,000 in livestock. If 45 percent of the crop workers and 25 percent

of the livestock workers are unauthorized, there would be almost one million unauthorized U.S. farm workers. If the unauthorized percentage is higher, say two-thirds of the crop workers and a third of the livestock workers, there would be about 1.4 million unauthorized farm workers.

The number and share of unauthorized workers varies by well-known factors, including size of employer and commodity, with large labor contractors providing workers to harvest less-perishable crops such as citrus having the highest shares of unauthorized workers. However, differences between less-perishable citrus and more-perishable strawberries have been disappearing as unauthorized workers spread. Indeed, areas in which foreign-born workers are a recent development, including many Midwestern and southeastern states, may have higher shares of unauthorized workers than states that have long relied on foreign workers, such as California.

Even though almost half of crop workers may be unauthorized, few farm employers are fined for employing such workers. There are several reasons. First, there is little enforcement of laws against hiring unauthorized workers. In FY04, the Immigration and Customs Enforcement agency issued only three notices of intent to fine (NIF) employers for violations of employer sanctions laws, down from 1,000 to 2,000 NIFs a year in the 1990s. Second, most employers protect themselves from fines by copying the documents presented by newly hired workers.

### **Agriculture's Stake**

Agriculture's three major interests in pending immigration reform proposals deal with currently unauthorized workers, future guest workers, and enforcement. Although some farmers fear that hundreds of thousands of currently unauthorized workers will disappear overnight, this is a highly unlikely scenario.

The House bill does not include a guest-worker program that legalizes currently unauthorized workers, but it does include a two-year phase-in of the Internet-based system to verify the legal status of new hires and a six-year phase-in of the requirement to verify current employees. Thus, even under a worse-case scenario for farmers worried about "losing" unauthorized employees, there would likely be attrition rather than a sudden

disappearance of workers. The Senate bills, of course, allow currently unauthorized workers to become legal guest workers.

The seasonal farm labor market resembles a revolving door, in the sense the newcomers arrive, are employed for about a decade, and then return to their countries of origin or, more often, find nonfarm jobs and settle in the United States. If there is 10 percent annual turnover, 250,000 farm workers exit each year, and must be replaced to keep the farm work force at current levels.

Since virtually all new entrants to the farm labor force are born outside the United States, farm employers are very interested in government rules that regulate their access to foreign workers. If increased border and interior enforcement slows the influx of unauthorized workers and turnover remains at current levels, farm employers would be interested in at least 250,000 new guest workers a year, far more than the 40,000 a year requested under the current H-2A program.

*“Since virtually all new entrants to the farm labor force are born outside the United States, farm employers are very interested in government rules that regulate their access to foreign workers.”*

The H-2A program presumes that U.S. farmers will normally find sufficient U.S. workers. Farmers anticipating too few U.S. workers must file a job order at their local employment service (ES) office and ask the DOL to certify their need for foreign H-2A workers. Before certification, the ES and the farmer seek U.S. workers but, since farmers do not request certification to employ H-2A workers until they have found them abroad, most do not really want U.S. workers, and recruitment usually finds few.

Making the request for H-2A workers alerts unions and advocates, who sometimes sue employers who do not hire the U.S. workers who respond to the farmer's ads. In addition, farm employers requesting H-2A workers must offer approved housing, which means that DOL inspectors arrive to check housing. Applying to the government for H-2A workers in areas that often have double-digit unemployment rates tends to bring unwelcome attention to farm employers who may have been operating out of the limelight with unauthorized workers, explaining why many farmers say the H-2A program is "unworkable." Proposals to make the H-2A program more employer-friendly include the AgJOBS proposal described below.

The third uncertainty for agriculture is enforcement. Fines on employers who knowingly hire unauthorized

workers were introduced by the Immigration Reform and Control Act of 1986 to “demagnetize the U.S. labor market.” The theory was that foreigners would quickly discover that even if they eluded the Border Patrol, they could not get U.S. jobs, but this theory failed to deter illegal migration because of the availability of false documents and little enforcement.

A mandatory Internet-based verification system could make enforcement easier. For example, if employers learn that the data on a newly hired worker was suspect, but continue to employ the worker after 30 days, there could be a presumption that they knew the worker was unauthorized. Similarly, by having all employers submit data on newly hired workers, it will be easy for enforcers to spot problem industries, areas, and employers.

### AgJOBS

One of the immigration reform proposals, the Agricultural Job Opportunity, Benefits, and Security Act (AgJOBS), would deal only with unauthorized farm workers. As the number of unauthorized farm workers rose in the 1990s, farmers asked Congress to approve a new guest-worker program for agriculture that did not require DOL certification or housing. President Clinton opposed these proposals, and threatened to veto any that reached his desk, and Congress did not approve a new guest-worker program. However, the Senate approved a version of what became AgJOBS as an amendment to an appropriations bill in 1998, as farmers gained support of their effort to win a new guest-worker program.

After the 2000 election of Vicente Fox in Mexico and George W. Bush in the United States, farm employers and worker advocates reached a compromise to deal with unauthorized farm workers. Farm employers wanted a new guest-worker program with two major features, no certification and no housing, while worker advocates wanted a system under which currently unauthorized workers could become immigrants. The compromise that became AgJOBS satisfied farmers by allowing them to self-certify their need for guest workers and to pay housing allowances to out-of-area workers rather than provide housing. Worker advocates won the promise of a temporary legal status for unauthorized farm workers and a path to immigrant status for such workers and their families. This “amnesty” provision prompted opposition from law-and-order members of Congress, and the December 2000 compromise was not enacted.

The bipartisan version of AgJOBS pending in the Senate would offer currently unauthorized farm workers

a path to immigrant status for themselves and their children and offer farmers easier access to legal guest workers. Supported by a coalition of over 400 employer, union, and advocate groups, AgJOBS got 53 votes when it was attached to an emergency military-spending bill in the Senate on April 19, 2005 but, since 60 votes were needed, it was not approved. A competing bill offered by Senator Saxby Chambliss (R-GA), that would have simply made the current H-2A program more employer-friendly was defeated 77-21.

### Conclusions

As Congress debates immigration reform, there could be comprehensive reform, dealing with all unauthorized workers in the United States, or piecemeal reform, such as enacting only AgJOBS. If there is comprehensive reform, Congress could mandate enforcement first and guest workers or legalization later, as in the House bill, or have new enforcement measures introduced together with guest workers and legalization, as in the Senate bills. In 1986, IRCA had legalization first and enforcement second, an approach absent from the 2006 discussion.

Agriculture has a higher stake in the 2006 debate than it did in the 1986 debate. First, labor-intensive agriculture is far larger than it was two decades ago. Second, there are more unauthorized workers, and they are far more widely dispersed, so that more farmers would likely be affected.

However, the major change between 1986 and 2006 is that experience has taught what does not work. A generous legalization program and weak enforcement, as in the late 1980s, increased illegal migration and spread unauthorized workers throughout the United States. Two decades later, there may be much tougher enforcement and fewer opportunities for currently unauthorized workers to become legal immigrants.

Agriculture is cooperating with worker advocates to preserve the labor status quo under AgJOBS, which would legalize currently unauthorized workers and provide easier access to additional guest workers. These guest workers could become a point of contention between advocates and farm employers.

#### For additional information:

Martin, Philip and Bert Mason. 2004. Hired Workers on California Farms. in Jerry Siebert, ed. *California Agriculture*. UC Div. of Agricultural and Natural Resources.

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# Democracy and Environmental Quality

by

*Y. Hossein Farzin and Craig A. Bond*

*The relationship between several local and global air pollutants and economic development is evaluated. We find empirical support for our hypothesis that democracy provides the best conduit to environmental quality, relative to other governmental structures, thus leading to decreased concentrations or emissions of pollution. The results have policy implications for the developing world, as well as the United States.*

The relationship between national income and environmental quality is of great interest to economists, policy-makers, and the public at large. This interest is reflected by growing conflicts between global environmental concerns and global economic development policy, as seen by frequent uprisings at WTO meetings. Previous literature on this relationship has focused on the so-called Environmental Kuznets Curve (EKC), which hypothesizes an inverted-U shape when pollution indicators are plotted against income per capita, as shown in Figure 1. Explanations for this hypothesis generally focus on several primary factors that interact to produce the shape. Among these are: (1) changes in the composition of aggregate output as economies evolve from agricultural to industrial to service-based goods and services, (2) technological progress, and (3) increases in demand for environmental quality as income grows.

However, the relationship between environmental quality and economic development is not formed in isolation from political institutions that govern the process of policymaking in a particular country. Thus, for example, Dasgupta and Mäler aptly emphasized in 1995: “The connection between environmental protection and civil and political rights is a close one. As a general rule, political and civil liberties are instrumentally powerful in protecting the environmental resource-base, at least when compared with the absence of such liberties in countries run by authoritarian regimes.” This observation raises several important questions: How does public environmental policy influence the relationship between per capita income and pollution, and how does that public policy represent the citizens’ preferences for environmental quality?

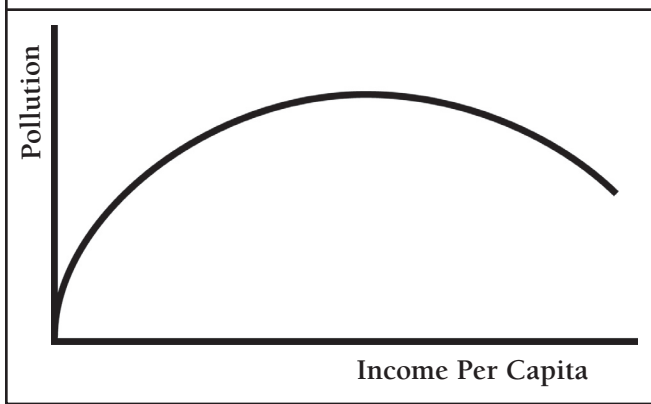
We develop a model that directly incorporates the relationship between societal preferences and provision of public-pollution abatement, utilizing

a measure of quality of governance as a proxy for weights on those preferences. We call this quality of governance variable “polity” and define it to have a low value for authoritarian governments and higher values for governments that are more democratic. We hypothesize that democracy and its associated freedoms provide the conduit through which agents can exercise their preferences for environmental quality more effectively than under an autocratic regime, thus leading to reduced concentrations and/or emissions of pollution. We estimate an econometric model of the relationship between several local and global air pollutants and economic development, measured by national income per capita. The model explicitly accounts for critical aspects of the socio-political-economic regime of a country. Additional variables such as income inequality, age distribution, and urbanization are also included.

## **Relationship between Environmental Policy, Governance, and Preferences**

One of the major determinants of environmental policy is the political regime of a particular country, or “governance.” One study has argued that corruption and rent-seeking behavior can influence the relationship between income and the environment. They show that corruption causes the turning points of an EKC to rise above the socially optimum level. Another study has suggested that well-defined property rights, democratic voting systems, and respect of human rights can create synergies that lead to increased levels and efficacy of environmental policy.

We propose a simple explanation of the role of political structure on the relationship between income and environmental quality, based on the relationship between the demand and supply of environmental quality. Because environmental quality is mostly a public good, and in many cases the capital costs of the required infrastructures to abate pollution are huge,

**Figure 1. Environmental Kuznets Curve**

### Explanation of the Curve

*It is claimed that many environmental health indicators, such as water and air pollution, show the inverted U-shape: in the beginning of economic development, little weight is given to environmental concerns, raising pollution along with industrialization. After a threshold, when basic physical needs are met, interest in a clean environment rises, reversing the trend. Now society has the funds, as well as willingness, to spend to reduce pollution.*

*The extension of the Kuznets Curve to environmental health in general has been doubted. For example, energy, land and resource use (sometimes called the “ecological footprint”) do not fall with rising income. While the ratio of energy per real GDP has fallen, total energy use is still rising in most developed countries. In general, Kuznets curves have been found for some environmental health concerns (such as air pollution) but not for others (such as landfills).*

individuals or groups within a society are unable to effectively provide them. As such, it is usually the State that provides these goods. However, the State’s environmental policy is at least partly influenced by the society’s preferences for environmental quality. In particular, the relationship between the public’s preferred level of environmental quality and the level actually supplied by the State depends on the weights the policymakers place on the various societal preferences.

To illustrate, consider the following simple model. Suppose that the people in a society can be aggregated into two distinct groups based on some distinguishing characteristic. The categorical distinction can be made along any number of characteristics that are likely to

affect environmental preferences; for example, “rich vs. poor,” “educated vs. non-educated,” “urban vs. rural,” or “young vs. old.” The groups’ environmental preferences are assumed to be reflected by their preferred levels of pollution-abatement expenditure to be undertaken by the state.

Our model of public environmental-quality provision highlights the importance of the type of political regime for the relationship between economic development and environmental quality. It suggests that environmental-quality expenditures are partly a function of the citizen groups’ preferences, but these preferences are subject to political distortions, misrepresentation, or neglect by the State. The more open and democratic are the political institutions, however, the more likely it is that the citizens’ preferences will be reflected in actual policy decisions, and environmental quality as a normal public good will increase.

### General Results

We tested the hypothesis of an inverted-U shaped relationship between the direct effects of national income per capita and pollution indicators conditional on the type of government, population density, and technology, as well as the marginal effect of increasing the quality of the public institutions on environmental quality. Results suggest that economic growth alone, as measured by a change in GDP, is insufficient to improve environmental quality. Rather, conscious environmental policy emanating from the existing political institutions, as represented by the polity variable, is necessary. In other words, the type of government in place clearly influences the chances of environmental policies being implemented.

Of the five models estimated, only one (emissions of non-methane volatile organic compounds [VOC]) supports the EKC hypothesis of an inverted-U shaped relationship. The turning point for the VOC curve is inversely related to the quality of political institutions, but tends to occur at GDP levels at the upper end of the distribution. Our results support the findings of the previous literature; namely, growth in income per capita is not sufficient to explain increases in pollution abatement as nations develop. As emphasized in the statement by Dasgupta and Mäler quoted earlier, conscious choices of environmental policy coming from people exercising their civil rights to express preferences are the key to understanding the relationship between economic development and environmental quality.

Our testing of the effects of the government on the estimated relationship corroborates this hypothesis. In all cases, the marginal effect of the polity variable with respect to the pollutant is negative for the majority of the income range under consideration, suggesting that countries with more democratic institutions have a greater tendency to reduce pollution. For those pollution measures for which the effect is dependent on income levels ( $\text{CO}_2$ , VOC, and  $\text{SO}_2$ ), the marginal effect of democratization is intensified with income. At very low levels of income for four of the five models, however, the estimated marginal effect of democratization of political institutions could be positive. This implies that, in very low-income countries, for most government types, the State and the people assign such a high priority to industrial development that pollution emissions increase. However, this effect is lessened as income per capita rises.

### Specific Results

Thus, environmental policy-making considerations are of paramount importance in describing the relationship between economic development and the environment. We turn now to the results of the model that decomposes the environmental-policy indicator variable. We try to account for both the preferences of the society and the mechanism through which these preferences are translated into realized pollution abatement.

As expected, the relationship between GDP per capita and the various pollution measures is similar to that estimated in the basic model. However, the  $\text{NO}_x$  model now has an EKC relationship with a turning point well outside the sample range of income. Nevertheless, the similarity in conditional results suggests that the decomposition is valid, and that demand considerations based on societal preferences are an important determinant of overall environmental quality. Income growth conditioned on greater polity scores is predicted to have a relatively smaller impact on increased emissions in four out of five cases. Furthermore, the marginal effects of increasing polity on pollution remain negative at the mean sample values. This creates an inverted-U when plotting pollution versus polity, just as in the EKC.

#### *Urbanization*

We now turn to the effects of the individual preference shifters on the pollution indicators, conditional on the type of government in place in a given society. Urbanization has an unambiguous net positive effect

on all pollution indicators, with the exception of  $\text{CO}_2$  emissions, at high levels of democracy and national income. This suggests that the effects of increased fossil-fuel use in urban societies mostly dominate any economies of scale or preference effects.

#### *Income Inequality*

Another abatement demand shifter widely discussed (and disputed) in the literature is income inequality, as it is hypothesized that the distribution of income may play a role in the income/environment relationship. In this application, the proxy for income inequality is found to have a negative relationship with environmental quality in three of the five regressions at the sample mean.

Interestingly, a distinction can be made here between greenhouse gasses (such as  $\text{CO}_2$ ) and the ozone and acid-rain generating chemicals. The latter pollutants most often exhibit an EKC relationship because their consequent damages are primarily local in nature, whereas carbon compounds are global in their environmental impacts. One explanation for this intriguing result may be the relationship between income inequality and differences in environmental preferences of the poor and rich. That is, the poor are the primary victims of local air pollutants because they can neither afford the high local costs associated with environmental amenities, nor can they choose environmental quality over having a job that is overly exposed to pollution. They often have to live and work immediately downstream and downwind, thus bearing a disproportionate burden of local pollution. As such, the environmental preferences of the poor are biased toward reduced local pollution.

In contrast, the rich, who can afford, and gain from, environmental amenities, have a lot of interest in amenity values associated with protection of rain-forest biodiversity, endangered species, and the like, and have little interest in some kinds of local pollution. Thus, assuming that the political behavior of each group (whether rich or poor) is self-interested, environmental quality outcomes depend largely on which group's environmental interests get served by the State. Government action, in turn, depends on politicians' sensitivity to the issue of environmental justice (both within and between generations) and on the effectiveness of each group to influence them.

#### *Age Distribution*

A similar pattern appears in terms of the age distribution of the society, as measured by the percentage of the



population less than fifteen years of age. NO<sub>x</sub> and VOC emissions are negatively correlated with the proxy for youth, independent of the level of national income. A similar result holds for SO<sub>2</sub> emissions, but the relationship reverses with high GDP per capita levels (achieved by only 18 percent of the observations in the sample). This may partly reflect the empirical fact that infants and young children are the main victims of local ground-level, ozone-producing pollutants, and the greater sensitivity of politicians to health hazards of these pollutants among the very young. Again, however, the greenhouse gas CO<sub>2</sub> emissions are predicted to increase with the share of youngsters in the population, and this marginal effect is intensified with increases in GDP per capita.

#### *Local versus Global Pollutants*

It appears that the nature of the pollutant may affect the policy weights given to preferences and, thus, the rate at which the preferred environmental policy is translated into actual policy. At low-income levels, more weights are seemingly given to abatement policies aiming at local pollutants (such as NO<sub>x</sub>, VOC, and SO<sub>2</sub>). The main victims of these pollutants are the inner-city, low-income groups and their damages become visible in a relatively short period. Conversely, less weight may be given to policies aiming to abate global or regional air pollutants (such as CO<sub>2</sub>). This means policies aiming to improve environmental amenities that benefit, and support the lifestyle of, the rich receive less weight. And this is more likely to be the case the more democratic is the political regime of a society.

#### *Education*

The last preference shifter under consideration is the education of the populace, as proxied by the illiteracy rate for people greater than fourteen years of age. At least one education term is significant in all of the emissions models, though no significant correlation could be determined for ambient SO<sub>2</sub>. The relationships all follow the same pattern, with illiteracy positively correlated with emissions at relatively low levels of income, but the marginal effect reversing sign at higher levels.

### **Conclusions**

This article discusses the link between income per capita and environmental quality. Recognizing that the often-cited “inverted U-shaped” relationship or EKC is not an inevitable result of income growth, a

model was developed that specifically accounted for different environmental-policy regimes, reflecting the demand for environmental quality as a public good.

Results of the exercise support the hypothesis that the qualities of political institutions and several indicators of societal preference interact with each other to create the inverted-U shape, which is frequently cited in the environment-development literature. Estimates of individual effects for each of the included preference shifters support the hypothesis that more democratic governments respond favorably to environmental demands by the populace.

For additional information on this subject, the authors recommend the following sources:

- Dasgupta, P., Mäler, K-G. 1995. Poverty, institutions, and the environmental resource-base, in: Behrman, J., Srinivaan, T.N. (Eds.), *Handbook of Development Economics*, Vol. 3A. Elsevier Science, Amsterdam, Chapter 39.
- Ecological Economics* (1998), Special Issue on the Environmental Kuznets Curve, 25 (2), 143-229.
- Grossman, G.M., Krueger, A.B., 1995. Economic growth and the environment. *Quarterly Journal of Economics* 110 (2), 353-377.
- Lopez, R., Mitra, S., 2000. Corruption, pollution, and the Kuznets environment curve. *Journal of Environmental Economics and Management* 40 (2), 137-150.
- Panayotou, T., 1997. Demystifying the environmental Kuznets curve: turning a black box into a policy tool. *Environment and Development Economics* 2, 465-484.
- Persson, T., Tabellini, G., 2000. *Political Economics: Explaining Economic Policy*. The MIT Press, Cambridge, Massachusetts.
- Rivera-Batiz, F.L., 2002. Democracy, governance, and economic growth: theory and evidence. *Review of Development Economics* 6 (2), 225-247.

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# Are International Beef Prices Converging and, if so, Why?

by

**Lovell S. Jarvis, José E. Bervejillo, and José P. Cancino**

*Beef export prices have converged, implying liberalization of commercial and sanitary policies in many trading nations and a more competitive international beef market.*

During the 1980s and 1990s, the United States received higher average prices for its beef exports than did most of its competitors. However, during this period the average U.S. beef export price was declining relative to the beef export prices of other countries. This trend appears to be part of a process of convergence among beef export prices from different countries, as is shown in figure 1. This paper reports the results of efforts to test whether beef prices did converge from 1980-2002 and, if they did, to determine why. What forces are determining international market prices and are such forces affecting U.S. export prices?

The United States was one of the world's largest beef exporters until a case of BSE was found in the state of Washington nearly two years ago. U.S. beef exports then declined precipitously. The United States is attempting to demonstrate the safety of its beef and hopes to regain an important share of international beef markets. U.S. producers must examine the market within which they will compete in the future. We hypothesize that U.S. beef export prices have been declining relative to the prices of other countries because major export markets for U.S. beef have become increasingly competitive. Several important beef importers that previously gave preference to U.S. beef liberalized their imports, allowing other countries to compete directly with the U.S.

In addition, exports from Brazil and Uruguay expanded. These countries, traditionally excluded from important markets because of endemic Foot and Mouth Disease (FMD), gained access to additional markets. After World War II, countries with FMD were largely unable to export fresh beef to countries that were free of FMD. The international beef market was thus segmented. In one part, trade occurred between exporters and importers that were FMD-free. In another part, trade occurred between importers and exporters that were FMD-compromised, i.e., FMD was endemic, occurred fairly regularly, or was controlled through vaccination. Prices in the FMD-free market, primarily the Pacific Rim countries including the United States, Canada, Japan, Australia, and New Zealand, were generally significantly higher than prices in the FMD-compromised market, which included the rest of the world,

the European Union (EU) and the Southern Cone of South America, as well as the Middle East, Eastern Europe, and parts of Asia. However, in recent years, Brazil and Uruguay have increasingly controlled FMD, while several importers that traditionally excluded beef from exporters with FMD have begun to accept such beef, with specific restrictions.

## Methodology and Data

Studies utilizing beef prices often assume that beef is a homogeneous commodity. This was a more reasonable assumption in the 1960s, when trade was predominantly in carcasses. Today, almost all beef is exported as differentiated cuts, with roughly 85 percent as boneless cuts. To compare price trends, it is important to categorize beef cuts into more homogeneous products. We utilize bone-in beef and boneless beef as the two quality categories. Beef sold as carcasses, half carcasses, and quarters are classified as bone-in beef, as are a number of rather simple bone-in cuts, most of which involve little value-added in processing. Boneless cuts generally imply a higher degree of processing. Using these two categories, we apply two common tests of price convergence to the prices of 17 exporting countries that each accounted for at least one percent of the international beef market in 2002. Collectively, they accounted for 90 percent of world beef trade. Using annual data, we calculate the implicit beef export price for each country's beef products by dividing the value of exports by the quantity of exports. We deflate each price series using the U.S. Producer Price Index (PPI) for all commodities. We tested for price convergence from 1961 to 2002 and, because important changes occurred in markets around 1980, for the period 1980 to 2002. We also tested for price convergence using monthly data for a subset of seven important exporters for 1990-2002.

We defined price convergence as a shrinking divergence over time in the prices obtained by the principal beef-exporting countries. We tested the hypothesis of convergence using two variations of an approach previously published to analyze changes in price dispersion. One test utilized *the mean of the absolute price differentials* and the other utilized *the standard deviation of*

**Table 1. Tests for Convergence of Beef Export Prices**

| A. Annual data  |                   |           |
|---|-------------------|-----------|
| Group 1 (All 17 Exporters)  | 1961-2002         | 1980-2002 |
| Bone-in   | C                 | C         |
| Boneless  | C                 | C         |
| Group 2 (10 European Exporters)   |                   |           |
| Bone-in   | C                 | C         |
| Boneless  | C                 | C         |
| Group 3 (8 Largest exporters, including EU as one exporter)   |                   |           |
| Bone-in   | NS/C              | NS/C      |
| Boneless  | D/NS              | D/NS      |
| Group 4 (2 FMD free and 2 FMD endemic exporters)  |                   |           |
| Bone-in   | C                 | C         |
| Boneless  | C                 | C         |
| B. Monthly data   |                   |           |
| 7-Major Exporters   | Jan 1990-Dec 2002 |           |
| Bone-in   | C                 |           |
| Boneless  | C                 |           |
| Notes: The tests use 1) absolute price differentials (APD) and 2) standard deviations of price differentials (SD). C corresponds to price convergence with $P < 10\%$ , for both tests. NS/C corresponds to no significance for APD test and convergence for SD test; while D/NS correspond to price divergence for APD test and no significance for SD test. |                   |           |

*absolute price differentials.* We fit a linear trend to each of the series of annual observations. The null hypothesis was that the estimated trends would be negative, reflecting a tendency for the mean or the standard deviation of the differentials to decline over time. We applied each test to the prices of a) bone-in beef and b) boneless beef, for each period analyzed. We analyzed convergence for the entire set of countries and for several subsets to determine whether any of the results appeared sensitive to the particular set of countries chosen. The country sets were:

**Group 1:** The 17 principal exporters: Argentina, Australia, Austria, Belgium-Luxembourg, Brazil, Canada, Denmark, France, Germany, Ireland, Italy, Netherlands, New Zealand, Poland, Spain, United States, and Uruguay.

**Group 2:** The European exporters from Group 1: Austria, Belgium-Luxembourg, Denmark, France, Germany, Ireland, Italy, Netherlands, Poland, Spain.

**Group 3:** The eight largest exporters from Group 1, excluding Poland and taking the EU as a single country with intra-bloc trade excluded.

**Group 4:** The four major grass-fed exporters: Australia, New Zealand, Uruguay, and Brazil. The first two countries have always been FMD-free, whereas Uruguay and Brazil have almost always been FMD-endemic. This set probably provides the best test of convergence between the FMD segments.

## Results

Table 1, part A, contains results for the tests applied to the prices of boneless and bone-in beef, using annual data for 1961-2002 and 1980-2002, for the four sets of countries. In almost every case, the results are consistent with price convergence.

The results suggest that price convergence occurred for all exporters taken together (Group 1), for the European exporters (Group 2), and for the matched set of FMD-free and FMD-endemic exporters (Group 4), in each case for bone-in and boneless beef, and in both periods, except for Group 4, which was not significant. The prices of the largest exporters (Group 3) also show convergence for the prices of bone-in beef in both periods when the test uses the standard deviations of price differentials, but not when the test uses the mean of the absolute price differentials. When the same tests are applied to the prices of boneless beef, the results from both tests support divergence in 1961-2002 and indicate a constant trend in 1980-2002. Note particularly that the prices in a matched set of FMD-free and FMD-endemic country prices (Group 4) show convergence for both types of beef and in both periods, except in one case, which is insignificant. Thus, there is evidence that the price differential attributed to FMD has shrunk.

Table 1, part B, contains the results for the tests carried out using monthly data for 1990-2002 for Group 3 (excluding Argentina, for which monthly data were not available), again for both bone-in and boneless beef. The results provide strong evidence of price convergence for bone-in and boneless beef in 1990-2002. The use of annual data for 1990-2002 produced highly similar results, with and without the inclusion of Argentina. It seems clear that the tendency toward price convergence was strong throughout the 1990s.

## Why Have Prices Converged?

We believe that price convergence has been caused principally by 1) changes in commercial policy following the Uruguay Round, 2) the erosion of the price penalty traditionally faced by beef-producing countries with endemic FMD, and 3) the industry's shift toward the

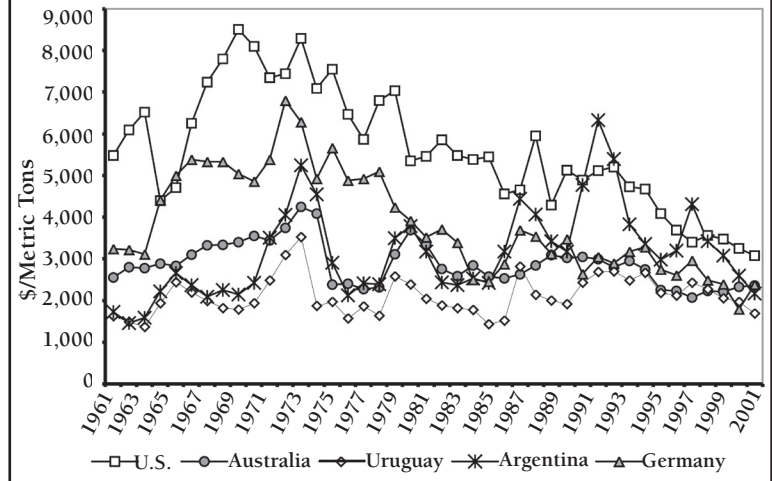
export of cuts instead of carcasses. Historically, beef trade has been strongly influenced by tariffs, quotas, and other forms of commercial policy. The last two decades have witnessed considerable liberalization in import quotas and a reduction of export subsidies by the EU. The liberalization of commercial policy is probably a factor in the observed convergence of beef export prices and, as such, probably implies significant global welfare gains in this important commodity market.

Qualitative analysis indicates that the greatest divergence among market prices at the beginning of the period was the result of several exporting countries having preferential access to several strongly protected markets. For example, the United States emerged as an important beef exporter, largely in response to the preferential access it received in the Japanese and then the South Korean markets. The United States received prices in these protected markets that were higher than it could have received in other markets. However, as Japan and South Korea liberalized their markets, imports from Australia and New Zealand competed more strongly with U.S. imports, gradually driving down prices to more closely approximate prices in less-protected markets (Figure 1). Similarly, the EU's decision to reduce the magnitude of its subsidies on beef exports to the "Atlantic" market, gradually raised the average EU export price.

Although FMD continues to segment the world beef market, its effect appears to be decreasing. Some producing countries have increasingly brought FMD under control. Simultaneously, greater scientific knowledge has shown that properly processed boneless beef from FMD-endemic countries poses little risk of contamination. On the basis of such evidence, the EU altered its sanitary policy from that of "zero tolerance," in which beef from FMD-endemic countries was strictly prohibited, to one of "minimum risk," in which properly processed, deboned beef was accepted. During the Uruguay Round, numerous other countries, including the United States and Canada, agreed to base their sanitary policies on science-based information. As a result, these countries also began to import beef from exporters with FMD, provided that the beef had been properly processed and deboned.

The shift toward the disassembly of the carcass in the exporting country and the associated export of cuts instead of carcasses also allowed exporters to arbitrage

**Figure 1. Export Price of Fresh Beef, Major Exporters, 1961-2002**



beef more effectively across markets, domestically and internationally, particularly within the context of declining trade restrictions. Exporters who were previously restricted to selling carcasses to lower-priced markets can sell lower-quality cuts to these markets, while selling higher-priced cuts to higher-priced markets. Although this process is little studied, we believe it also contributed to price convergence.

Although world beef trade remains impeded by FMD and commercial policies, such barriers have diminished in the last two decades, bringing economic benefit to producers and consumers of beef. In the process, U.S. producers have lost some of the preferential benefits they once enjoyed and face greater competition in the United States and in international markets in the future. Nonetheless, U.S. beef exports continued to rise over the period of price convergence that we have analyzed, at least until many foreign markets were closed following discovery of a case of BSE. We may therefore expect that as foreign markets become persuaded that U.S. beef is safe, U.S. beef will continue to be competitive in international markets.

Adapted from Jarvis, L.S., J.P. Cancino, and J.E. Bervejillo. (2005) "International Beef Prices: Is There Evidence of Convergence?" *Review of Agricultural Economics*, 27(3):1-7.

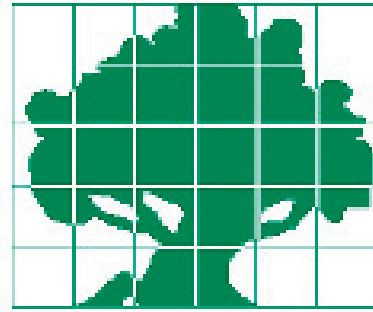
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