

Submitted Article

The End of Farm Labor Abundance

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Abstract *An analysis of nationally representative panel data from rural Mexico, with observations in years 2002, 2007, and 2010, suggests that the same shift out of farm work that characterized U.S. labor history is well underway in Mexico. Meanwhile, the demand for agricultural labor in Mexico is rising. In the future, U.S. agriculture will compete with Mexican farms for a dwindling supply of farm labor. Since U.S. domestic workers are unwilling to do farm work and the United States can feasibly import farm workers from only a few countries in close geographic proximity, the agricultural industry will eventually need to adjust production to use less labor. The decline in foreign labor supply to farms in the United States ultimately will need to be accompanied by farm labor conservation, switching to less labor intensive crops and technologies, and labor management practices that match fewer workers with more farm jobs.*

Key words: Farm labor, immigration, agricultural employment, Mexico.

JEL codes: J43, J61, O13, J38, J11, Q12.

Introduction

Fruit, vegetable, and horticultural (FVH) farms in the United States have enjoyed an extended period of farm labor abundance with stable or decreasing real wages, thanks to an elastic supply of labor from rural Mexico (Taylor 2010; Martin 2009). However, findings from panel data from rural Mexico point to a declining long-term trend in the farm labor supply there (see Boucher et al. 2007, and below). At the same time, an increasing demand for farm workers in Mexico may be creating unprecedented labor competition for U.S. farmers. The combination of a declining farm labor supply and rising demand for labor on Mexican farms raises

the reservation U.S. farm wage—that is, the minimum wage needed to induce new workers to migrate northward to farm jobs. Tighter border enforcement and drug-related violence along the border may deter migration, but our analysis suggests that their effect is largely secondary, reinforcing a negative trend in the immigrant farm labor supply. If this analysis is correct, the obvious policy implication is that immigration reform is not the answer to securing an abundant supply of low-cost farm labor from Mexico in the medium to long term, if not sooner.

This implication has important ramifications for U.S. agriculture as well as for rural communities. A reduced supply of Mexican farm workers implies that U.S. growers must look for labor substitutes. One option is to shift out of labor-intensive FVH production. That is unlikely, given the demand for high-quality U.S. fresh produce. Another option is to seek migrant workers from other countries with lower reservation wages. However, there is a limited supply of Central American workers willing and able to migrate (through Mexico) to work on U.S. farms, and due to logistical and administrative costs, importing labor from more distant countries does not appear to be feasible on a large scale.

Another solution would be to invest in labor-saving agricultural production and labor management technologies. Under this option, capital improvements in farm production would increase the marginal product of farm labor; U.S. farms would hire fewer workers and pay higher wages. From 2007 to 2009, 23% of U.S. farm worker families had an income below the poverty line (Martin 2012). Changes in production technology are necessary to increase farm wages, and better labor management is needed to match fewer workers with more jobs—the two key ingredients to reducing farm worker poverty. Rising farm wages create an incentive for both to happen.

Equilibrium in the Farm Labor Market

The received wisdom in development economics is that the domestic supply of agricultural labor starts out being relatively elastic, as illustrated in the domestic supply curve LS_{us} in figure 1 (Lewis 1954).

Nevertheless, the domestic farm labor supply shifts inward and becomes less elastic as countries' per-capita incomes increase, and people shift from farm to non-farm jobs. Figure 2 illustrates this shift for the United States, Mexico, and China. The origin of each ray in the figure depicts per-capita income and the share of agricultural labor in 1990, and the tip shows the same in 2010. Both the positions of these rays and their slopes reveal that the farm labor share drops precipitously as economies develop and off-farm employment expands. The same is true for nearly every other country in the world (Taylor and Lybbert 2012). In order to induce domestic workers to supply their labor to farm jobs, agricultural wages must rise apace with non-agricultural wages. This is all the more true if non-farm jobs bring non-pecuniary benefits compared to farm jobs and/or workers associate farm jobs with drudgery.

Figure 1 illustrates a diminishing supply of domestic farm labor by a shift from LS_{us} to LS'_{us} and a rise in the equilibrium domestic farm wage from w_{us} to w'_{us} . At this higher wage, agriculture would produce with a domestic labor force comprised of L'_{us} workers.

Figure 1 Shifting domestic farm labor supply

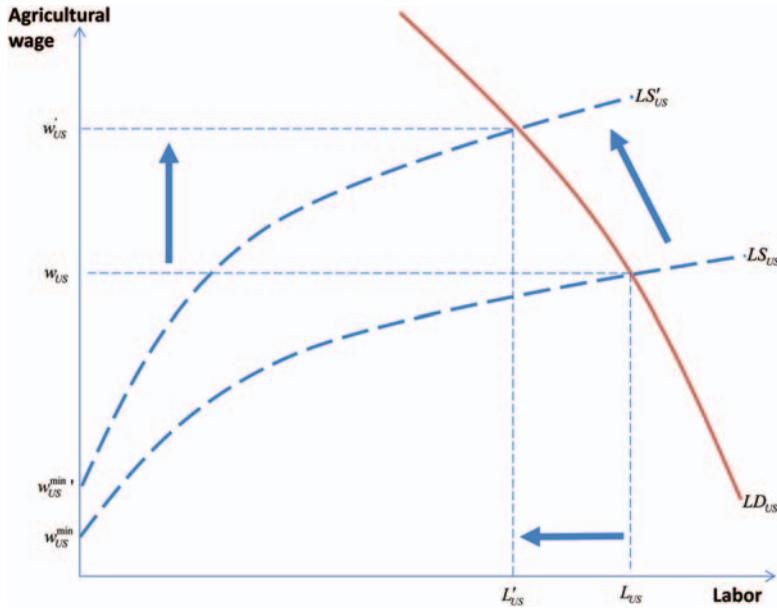
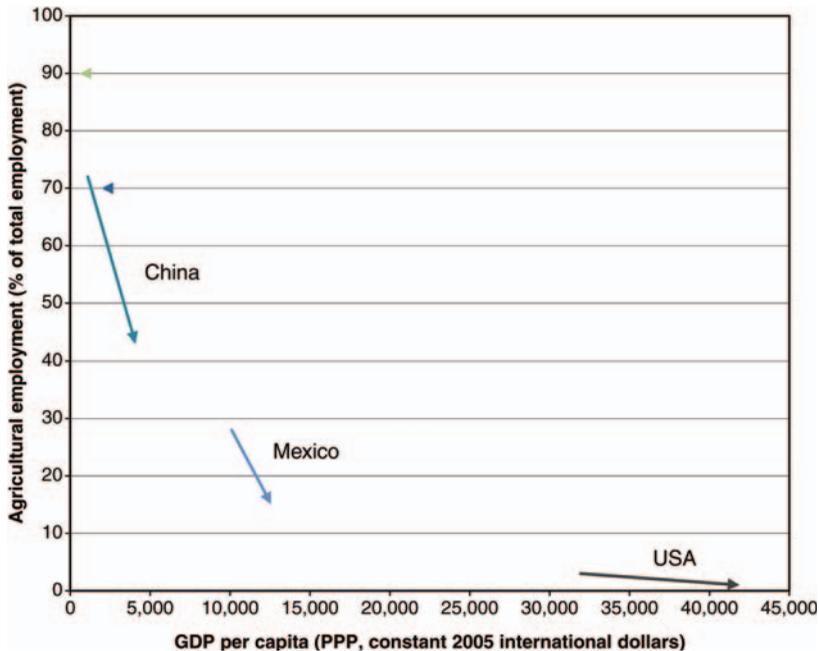
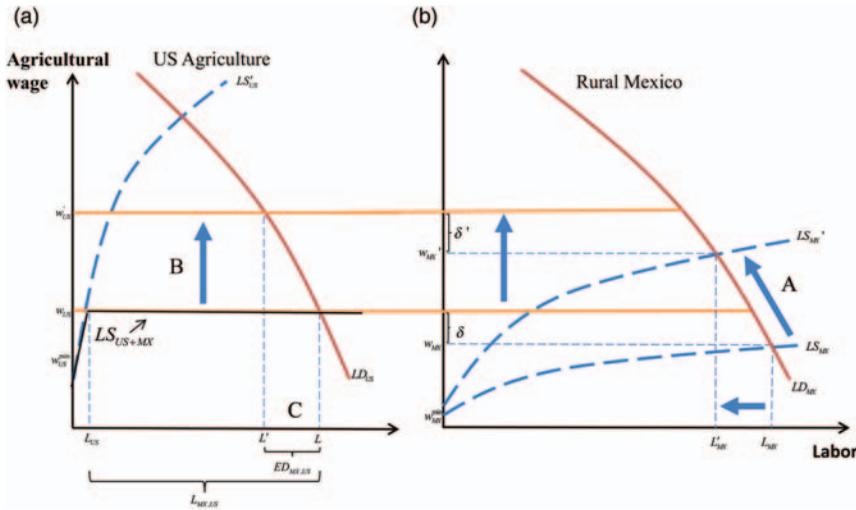


Figure 2 Moving off the farm



U.S. farms have avoided significant increases in wages by tapping the farm labor supply of a country at an earlier stage of this farm labor supply transition: Mexico. In figure 3a, an elastic supply of Mexican farm labor transforms the U.S. agricultural labor supply curve by flattening it out once it reaches the reservation wage for migrant workers—that is, the minimum wage required to induce new workers to migrate from rural Mexico to U.S. farm jobs. This reservation wage equals the wage rate

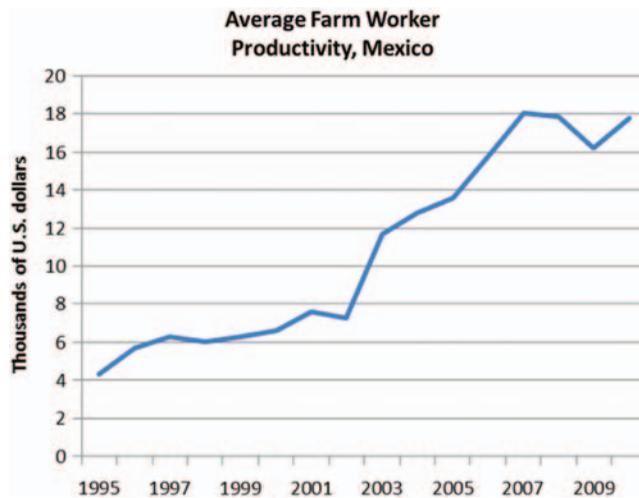
Figures 3a and 3b: Interconnected labor markets



(or marginal value product of labor) in rural Mexico, plus the costs—material or otherwise—associated with migrating to work on U.S. farms (denoted by δ in figure 3b). The transformed U.S. farm labor supply curve is labeled LS_{US+MX} in figure 3a. The new equilibrium quantity of labor is higher than without Mexican workers, but the quantity of domestic labor supplied is only L_{US} ; any labor demand beyond this point is satisfied by foreign workers ($L_{MX,US}$). In the United States, the share of domestic workers in the hired farm workforce has fallen to the point where, by 2006, only 23% of workers (2% in California) were U.S.-born. The rest were immigrants, earning wages that were easily eight times the minimum wage in the rural areas of Mexico from which most come (Martin 2009). As Martin (2009, p. 7) notes, “The farm workers of tomorrow are growing up outside the United States.”

An elastic farm labor supply in Mexico, then, is the key to ensuring an abundant supply of low wage farm labor in the United States. As the rural Mexican labor supply pivots inward, say, from LS_{MX} to LS_{MX}' in figure 3b (see arrow A), the reservation wage increases (arrow B in figure 3a). At the previous U.S. farm wage, w_{US} there is an excess demand for Mexican farm workers, shown as $ED_{MX,US}$.

Rising average labor productivity in Mexican agriculture (figure 4) offers compelling evidence that the marginal product of labor in rural Mexico is increasing. Both emigration and a shift of rural Mexican labor out of agriculture into domestic non-farm jobs cause the rural Mexican farm labor supply curve to shift upward, as from LS_{MX} to LS_{MX}' . Clearly, this cannot continue indefinitely without exerting upward pressure on U.S. farm wages. An inward shift in the demand for farm labor in Mexico would reduce this tension, while an increase in demand for labor on Mexico’s farms would do the opposite. Non-farm job growth in Mexico or the United States would continue to pivot the farm labor supply curve inward as farm workers shift to non-farm jobs. U.S. farmers thus face multiple sources of competition for rural Mexican labor: Mexican agriculture (represented by the labor demand curve in figure 3b); and the Mexican

Figure 4 Mexico's rising farm worker productivity¹

Source: Calculations based on World Bank data; <http://data.worldbank.org/topic/agriculture-and-rural-development> and <http://data.worldbank.org/topic/labor-and-social-protection>.

and U.S. non-farm sectors (represented by a leftward shift in the rural Mexican farm labor supply.)

There is anecdotal evidence that the supply of rural Mexican labor to U.S. farms is, indeed, decreasing. According to a recent *San Francisco Chronicle* article titled “Farmers Scrambling to Find Harvest Labor”:

Farmers across California are experiencing the same problem: Seasonal workers who have been coming for decades to help with the harvest, planting and pruning have dropped off in recent years. (Finz 2012)

Moreover, an article from the *Sacramento Bee* (Smith 2012) stated:

Growers throughout the fertile Central Valley are wringing their hands as they struggle to find the manpower they need.

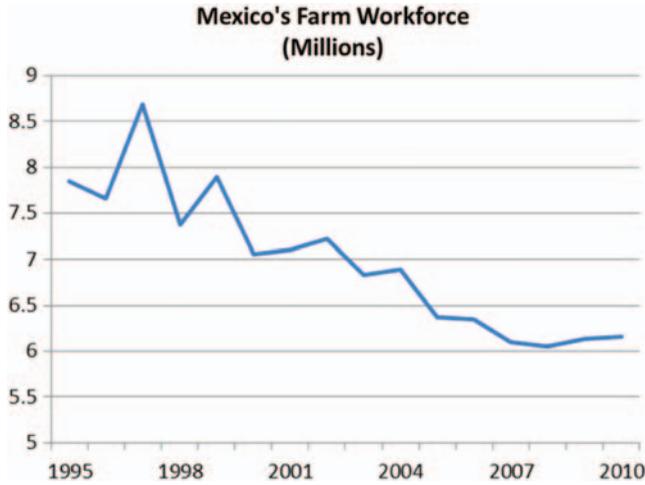
Both articles blame the dwindling farm labor supply in part on U.S. immigration policies and fear of drug cartels (reflected in δ in figure 3b), job growth in Mexico, and the U.S. recession. However, as we show below, a downward trend in the supply of rural Mexican labor to U.S. farms has been underway for some time, independent of these other factors. Mexico-to-U.S. migration indeed decreased during the recession beginning in 2008 (Pew Hispanic Center 2012). In theory, the decrease should have been sharper for migration to non-agricultural than to agricultural jobs, because the recession did not negatively affect U.S. farm production. However, our analysis shows the opposite.¹

Data

We use panel data on individuals from a nationally representative sample of rural Mexican households to study shifts in the migrant labor force over time. The Mexico National Rural Household Survey (Spanish

¹A relatively inelastic demand for food is likely to explain why agricultural production in the United States was not significantly affected by the recession.

Figure 5 Mexico's shrinking farm workforce



acronym *ENHRUM*²) is unique in providing both retrospective and panel data on migration from rural Mexico to both the United States and destinations within Mexico. The panel data come from three survey rounds: 2003, 2008, and 2011. Each round collected detailed information on migration destinations, whether migrants worked in the agricultural or non-agricultural sectors, and employment status (wage-earner or self-employed) for all family members, including the household head, his/her spouse, all others living in the household, and children from the household head and spouse living outside the household in the year prior to each survey. The final two survey rounds make it possible to compare migration patterns before and after the onset of the 2008 recession. This article presents the first findings using all three rounds of the survey.

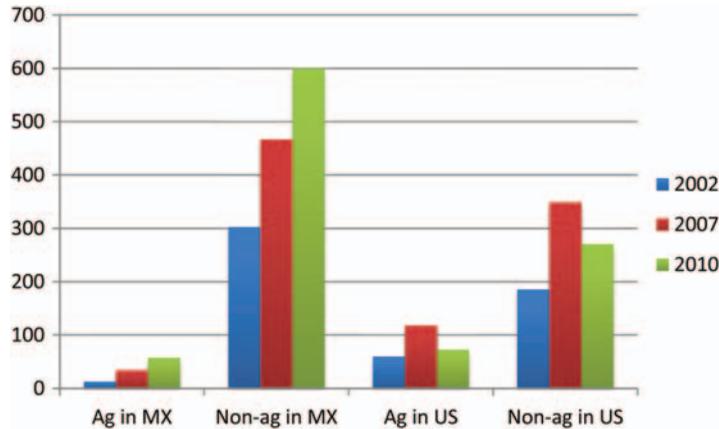
Findings

A previous study documented a downward trend in the supply of rural Mexican labor from west-central Mexico to U.S. farms using retrospective data from the 2003 round of the *ENHRUM* survey (Boucher et al. 2007). This downward trend was mirrored by a sharp decline in agricultural employment in Mexico (see figure 5): between 1995 and 2008 Mexico's farm workforce shrank from 7.85 to 6.06 million (which is still nearly three times the size of the U.S. hired farm work force) before recovering slightly in 2009 and 2010.

Between 2008 and 2009, employment in non-farm sectors of the U.S. economy in which Mexican immigrant workers are concentrated (particularly housing construction) decreased sharply, while U.S. farm employment remained steady at 2.1 to 2.3 million workers.³ Nevertheless, the number of rural Mexicans migrating to work in the U.S. farm sector decreased substantially. There is no evidence that a significant number of non-farm workers shifted to farm work when the recession hit. Although

²Encuesta Nacional a Hogares Rurales de Mexico.

³Calculations based on World Bank data; <http://data.worldbank.org/topic/agriculture-and-rural-development> and <http://data.worldbank.org/topic/labor-and-social-protection>.

Figure 6 Number of workers that migrate to each sector by survey round

some individual workers shifted from U.S. non-farm to farm work after 2008, more workers shifted from farm to non-farm work. Analysis of the ENHRUM data suggests that the observed decrease in migration to U.S. farm jobs is the consequence of long-term structural changes in the supply of Mexican labor rather than a temporary response to the U.S. recession.

Figure 6 shows the number of internal and international migrants from rural Mexico in the ENHRUM sample who supplied their labor to U.S. and Mexican agricultural and non-agricultural sectors during each survey round. The number of international migrants increased in the years leading up to the recession between 2002 and 2007; however, between 2007 and 2010, with the onset of the recession, there was a sharp decrease in international migration. Internal migration, on the other hand, grew substantially for both the farm and non-farm sectors from 2002-2007, as well as 2007-2010. These data reveal that migration from Mexico to the United States fell dramatically after the 2008 recession, and many former immigrants found work in Mexico.

Figure 7 shows the percentage changes in the number of workers in each sector and country between survey rounds. Migration to Mexican agricultural jobs had the greatest percentage growth, largely because the base (that is, the number of workers migrating to Mexican farm jobs) is small relative to the number of workers in non-agricultural work and workers that do not migrate. It is evident from figures 6 and 7 that the rural labor force is growing in all sectors in Mexico.

U.S. agriculture appears to be doubly adversely affected by the decline in the supply of immigrant labor and the shift in the immigrant labor supply away from farm work. Figure 8 shows the number of internal and international migrants in each sector as a percentage of the total rural Mexican workforce. Although the percentage of the rural Mexican workforce migrating internally to do farm work is growing, it continues to be a small percentage of the total workforce. The combined shares of the workforce migrating to agriculture in either Mexico or the United States decreased between 2007 and 2010. In contrast, the percentage of Mexico's rural workforce migrating to non-farm work within Mexico grew steadily. Non-farm workers in Mexico represented the largest share of the migrant labor force in all three of the survey years. The increase in rural Mexicans

Figure 7 Percentage change in the number of workers in each sector between survey rounds

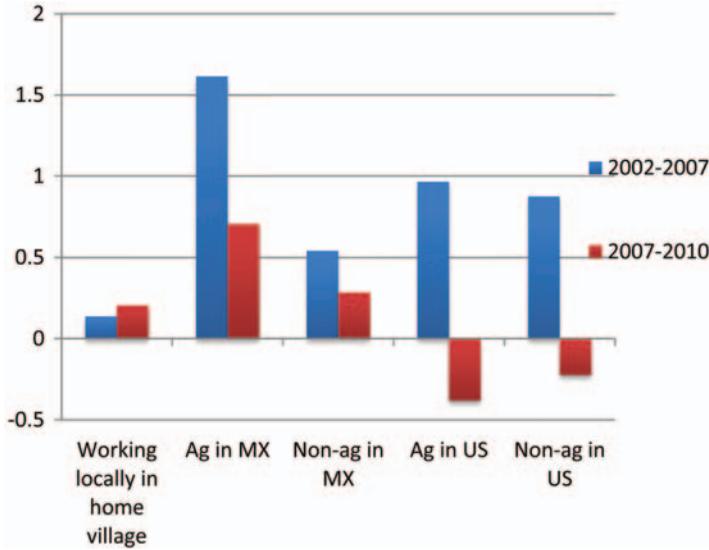
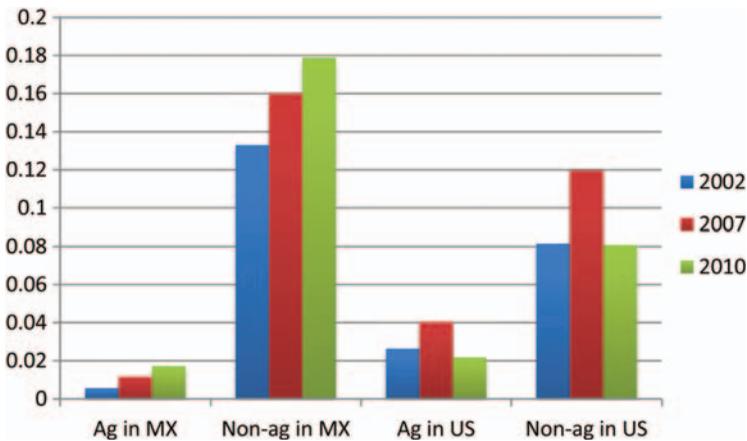


Figure 8 Migrants to each sector as percentage of total workforce by survey round



working in non-agriculture began before the recession and persists now, indicating a structural shift of Mexican labor away from agriculture.

A key question for U.S. farmers and policy-makers is whether the decreasing supply of Mexican labor to U.S. farms is a temporary response to the recession, a result of increased border enforcement or fear of drug-related violence along the border, or a permanent supply shift. U.S. immigration policies can affect migration costs (δ in figure 3), but not these other factors that shift the Mexican agricultural labor supply upward (as from LS_{MX} to LS_{MX}' in figure 3). The recession had a large negative impact on housing construction and other non-farm activities, but it had little or no negative effect on the agricultural sector. If unemployed workers in the non-farm sector sought jobs on U.S. farms, one might expect the supply of agricultural labor to increase. If the inward shift in the Mexico-U.S. immigrant labor supply were only a temporary response to the recession, we would expect the rural Mexican labor supply to U.S. non-farm work to decrease more sharply than the supply

to U.S. farm jobs after 2008. If this decrease were a result of increased border enforcement or drug-related violence, we would expect the decrease in farm labor supply to be similar to the decrease in non-farm labor supply.

The ENHRUM data show the opposite: the farm sector in the United States lost a larger percentage of rural Mexican workers between 2007 and 2010 than the non-farm sector did. The number of international migrants working in agriculture dropped by 38% between 2007 and 2010, compared to only 22% in the non-farm sector.

The decrease in farm labor supply evident in the ENHRUM data is echoed by anecdotal evidence. Kristi Boswell, the Farm Bureau's Director of Congressional Relations, stated: "The workforce has been decreasing in the last two to three years, but last year it was drastic" (Finz 2012). Recent articles report unprecedented declines in farm labor availability (Finz 2012; O'Brien 2012; Wells 2012), increases in wages paid to farm workers (Finz 2012; Wells 2012), and strategies to recruit workers from other regions (Finz 2012), through which shortages in one region reverberate into others. Washington governor Chris Gregoire calls her state's farm labor shortage "a crisis" (Hotakainen 2012). Passel, et al. (2012) conclude that the supply of Mexican labor available to work in the United States fell between 2005 and 2010 due to a sharp decrease in Mexico's total fertility rate (from 7 to just above 2 children per woman) and employment growth in Mexico.

Migration networks reinforce a shift away from farm jobs. Migration is largely driven by networks of contacts with those who migrated previously (Massey et al. 2005), and the effects of networks are both destination-specific and sector-specific (Mora and Taylor 2005; Richter and Taylor 2008). As households, communities, and regions become integrated into networks leading to non-farm jobs, either domestic or abroad, their supply of labor to agriculture diminishes. Consequently, an inward shift in labor supply to U.S. farms during the recession erodes agriculture-oriented networks and likely represents a permanent change in the level of immigrant workers, as well as the beginning of a continued downward trend in the number of Mexico-to-U.S. farm migrants in coming years.

Conclusion

The shift in labor supply from farm to non-farm work in Mexico is consistent with global economic trends. Worldwide, as incomes rise, the share of the labor force working in agriculture is decreasing (Taylor and Lybbert 2012). The movement of labor off the farm has been a central feature of farm labor history in the United States, where less than 2% of the labor force now works in agriculture. Economic growth and rising agricultural productivity in Mexico have increased job opportunities and reservation wages for rural Mexican workers. Slower labor-force growth due to a sharp decline in Mexico's fertility rate reinforces this trend. A long-term decline in the farm labor supply not only has implications for the competitiveness of U.S. farms, but also for rural poverty; it raises the question of how U.S. farmers will adjust to a reduction in the availability of low-wage farm labor from Mexico.

Labor is a human resource. A decrease in the supply relative to the demand of any resource puts upward pressure on the resource price (in this case, farm worker wages). This provokes two kinds of responses, presented below.

The Exploration and Development Response

In the past, U.S. agriculture has sought out new supplies of farm labor to relieve labor shortages and limit increases in farm worker wages. This response is akin to the development response in the case of non-human resources. For oil, it involves exploration. For farm labor, since the days of the Bracero Program, it has involved immigration policy to ease farmers' access to foreign workers, who in the past half-century have overwhelmingly come from rural Mexico. Seeking new supplies of farm labor has also involved passively relying on migrant networks to reach into new farm worker source areas, for example, villages in southern Mexico (Taylor 2010). The justification for utilizing immigration policies to gain access to foreign workers is that domestic workers are unwilling to perform farm work—that is, the domestic farm labor supply is inelastic. As we have seen, the supply of U.S. hired workers' labor devoted to farm work has been vanishing.

The immigration solution is a viable option as long as the supply of labor to farm work in the labor-source area is high. That is why, even though there is free movement of labor across U.S. states, interstate migration does not supply significant numbers of domestic workers to U.S. farms anymore. The current strategy to fill the U.S. hired farm labor demand hinges upon rural Mexican workers' being willing to do farm work and Mexican farmers not competing with U.S. farmers for a limited number of available workers. However, there are limits to the effectiveness of immigration policy in an era when the supply of rural Mexican labor to farm work is declining.

The Conservation Response

In the world of resources, the alternative to exploration and development is conservation. The same is true for farm labor. Resource conservation involves shifting to less energy-demanding production and consumption activities, and developing alternative energy sources and efficiency-enhancing technical change. Farm labor conservation involves shifting to less labor-intensive crops and raising worker productivity via mechanization and improved management. Perceived labor shortages and rising real farm wages create incentives to change both crop choices and production and management methods.

Therein lies an important distinction between farm labor and most other labor groups. Shortages of highly skilled workers increase wages and induce people to invest in human capital. No such option exists to increase the supply of low-skilled farm workers. Facing a decreasing supply of farm workers from rural Mexico, U.S. farms could try to use immigration policy to secure low-wage workers from other countries. The question, though, is in which countries. Mexico currently imports a modest amount of farm labor from Guatemala, the largest and most rural of Central American countries. With a population just a fraction the size of Mexico's (14.4 million, compared with 110.6 million), however, Guatemala is not a

likely candidate to become a major immigrant farm labor supplier. El Salvador, the second-largest Central American country, has a population of 6.2 million, which is already 64% urban. Looking beyond Central America, the logistical and financial costs of importing low-skilled farm workers rise, making the conservation option seem more economically feasible.

A dwindling supply of Mexican workers to U.S. farms has important implications for rural communities as well as farmers. Historically, poverty in rural Mexico is closely linked with farm labor immigration and poverty in the United States. [Martin and Taylor \(2003\)](#) identify a circular relationship between U.S. farm employment and immigration, where each one simultaneously causes the other. These authors find that this relationship increased the level of rural U.S. poverty beginning in 1990, as farm workers began migrating with their families from poor regions of Mexico to rural communities in the United States. That is, increased demand for farm labor induced immigration from Mexico by providing jobs, while increases in the supply of farm labor through immigration stimulated growth in the agricultural sector, thereby increasing the demand for farm labor.

The central hypothesis of Martin and Taylor's analysis is that the relationship between farm employment and migration is simultaneous: since the supply of immigrant farm labor is elastic, farm employment is driven by demand. The ENHRUM data reveal that Mexico's farm labor supply may not be as elastic as it was previously. Raising worker productivity is a prerequisite for increasing farm wages and enabling farm worker's families to rise above the poverty line, while rising farm wages create an incentive for farmers to make the necessary investments to raise farm worker productivity.

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