

# Eighty Years of Research on Rural Economic Development, Agglomeration, Migration, Commuting, Income, Innovation, and Entrepreneurship: The Iowa State Human Capital Tradition

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Wallace Huffman continued the tradition of research on Midwest rural labor markets at Iowa State University that was begun in the 1930s by his advisers T.W. Schultz and D. Gale Johnson. We review the lessons learned from this research about the wisdom of policies aimed at retaining population in rural areas in the face of market forces and technological changes that create incentives to migrate to urban areas. Professor Huffman's teaching and lessons learned from the Iowa State Human Resources Workshop continues to shape recent research on the roles of agglomeration economies, information technologies, and returns to human capital on the strength of rural labor markets and policies regarding rural economic development.

**Key words:** agglomeration economics, information technology, human capital, rural economic development.

T.W. Schultz and D. Gale Johnson began their analysis of "the farm problem" during the Great Depression, first at Iowa State and then at the University of Chicago. Data compiled by Schultz's (1945, 1950) research on relative farm and nonfarm per-capita incomes and Johnson's (1948, 1951) research on relative agricultural and manufacturing wages revealed large income advantages for urban residence. As shown in Figure 1, rural incomes averaged only 20-40% of urban incomes between 1900 and 1940 even though the rural population had grown an average of 18% per decade since 1790 (Figure 2). While the rural population growth slowed after 1890 once the free land made available by the 1862 Homestead Act was exhausted, both Schultz and Johnson agreed that there still needed to be a large relocation of labor and population out of rural labor markets to reduce rural poverty. Schultz (1950, p. 28) wrote that "it is necessary to reduce the excess supply of labor in agriculture to a point where rates of return for human effort would be equal to that in other occupations." Johnson (1948, p. 152) observed that "American agriculture is still subject to serious excess supplies of labor," such that "one must accept the overwhelming importance of migration and mobility in seeking a solution to the resource and income problems in agriculture."

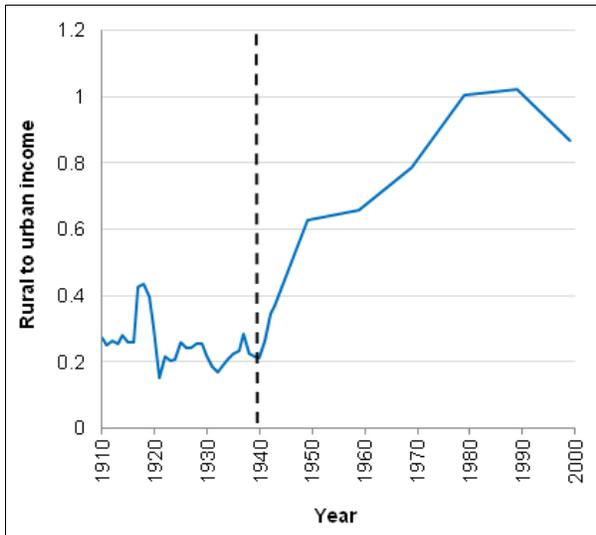
Both Schultz and Johnson advised that instead of trying to strengthen rural incomes through agricultural price-support programs or income transfers, it was bet-

ter to create policies that would ease the outmigration of labor from rural to urban markets. This could be accomplished by improving the education level of rural residents, which would raise their value relative to urban markets by providing aid to rural residents facing large moving expenses if they left their rural homes or by improving their knowledge of urban employment opportunities. In contrast, efforts to strengthen rural incomes would simply delay the inevitable out-migration from agriculture while perpetuating an over-allocation of labor to poor paying jobs in rural markets.<sup>1</sup>

Farm households had limited availability of labor; the median household size was roughly 5 (Reid, 1934). Traditional manual farming methods would not allow a typical farm household to fully exploit the large Homestead Act tracts of farmland, inducing a move toward labor-saving technologies (Ruttan & Hayami, 1984). Coupled with other technological advances in cropping practices, animal husbandry, and plant and livestock breeding, agricultural productivity increased. Given low income and price elasticities of agricultural commodi-

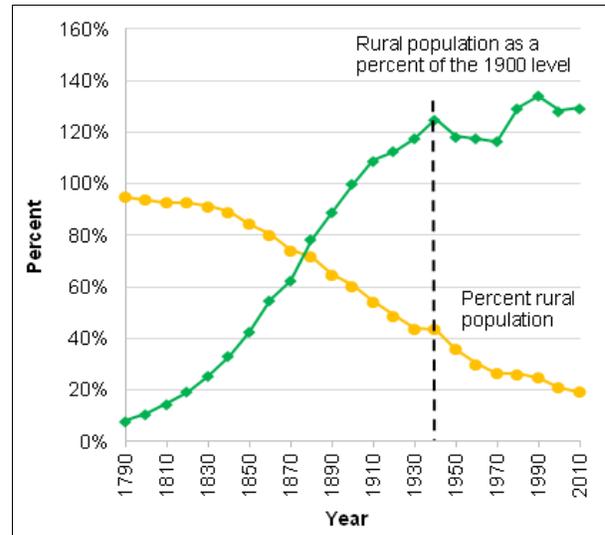
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1. *It was undoubtedly easier to advance these arguments from urban Chicago than rural Iowa, a factor contributing to the incentives of so many famous economists to leave Iowa State at this time. However, both Schultz and Johnson did not shy from advancing these arguments in Iowa as well, inviting the wrath of various political and business groups and, ultimately, the Iowa State administration.*



**Figure 1. Relative farm and nonfarm income in the United States, 1910-1999.**

Source: 1910-1943 is from Schultz (1945); 1949-1999 is from various years of the US Census.



**Figure 2. US rural population: Total and as a percentage of the total, 1790-2010.**

Source: 1910-1943 is from Schultz (1945); 1949-1999 is from various years of the US Census.

ties, increased supply of agricultural commodities put downward pressure on agricultural prices. The lower food prices raise real wages in urban markets and create the incentive for rural workers to shift to urban markets. In this way, agricultural revolutions have consistently predated industrial revolutions as countries develop (Hayami & Ruttan, 1970; Huffman & Orazem, 2007).

Before the United States imposed restrictive immigration policies in 1921, population growth was strong enough to prevent the downward pressure on agriculture prices. Before 1920, the US population grew at 2.5% and agricultural productivity grew fast enough to keep food prices stable over the 1790-1920 period (Huffman & Evenson, 2008). Since 1920, the US population has grown 1.1% per year and food prices have declined 73%.

This was the historical context for the analysis advanced by Schultz and Johnson. At prevailing agricultural prices and productivities in 1940, there were too many workers in agriculture, depressing their wages relative to urban wages. Technological advances had lowered agricultural prices and labor-saving technologies had further reduced the demand for rural labor. At the same time, technical advances in the nonfarm sector created added worker productivity in cities, which raised demand for urban workers. Under those circumstances, Schultz and Johnson expected rural workers to shift to urban areas seeking higher real wages. This rural-to-urban migration would reduce rural labor supply and

increase wages for those rural workers who remained in rural areas. The outward labor supply shift in urban areas did not depress urban wages because labor-using technologies were shifting demand for urban labor outward.

Schultz's and Johnson's conclusion that the rural population must decline based solely on their assessments of relative wages is a remarkable call in the face of 150 years of continuous rural population growth, an early success of the empirical applications of neoclassical labor theory started by Paul Douglass (1934). To appreciate their faith in the power of neoclassical economics over trend analysis, block off the right-hand side of Figures 1 and 2 at 1940 and convince yourself that you would have confidently predicted outmigration from rural areas accompanied by an increase in relative incomes for rural residents.<sup>2</sup> By now, we know what happened. Starting in 1940, there was a sharp reversal of the century and half of rural population growth and an equalization of incomes between rural and urban markets. Since 1940, the urban population grew at 17.4% per decade while the rural population has stagnated. In fact, the rural population grew faster during the Dust

2. A similar call would be to reject income transfers and progressive taxation as a solution to rising income inequality and choosing instead to reduce visa restrictions on highly educated noncitizens.

Bowl years of the 1930s (6.2%) than it did over the next 70 years (3.5%). As the rural-to-urban migration progressed, rural income rose relative to urban incomes from about 20% of urban income in 1940 to 80% of urban income by 1960, a gap roughly consistent with cost of living differences (Johnson, 1951).

By the time Wallace Huffman arrived at the University of Chicago in 1966, the “farm problem”—the gap between farm and non-farm per capita income—had largely disappeared.<sup>3</sup> Huffman’s research focused on a related issue—examining which farmers were faring best and which ones were being left behind in the improving market for rural workers. His early work focused on two questions: 1) what role did schooling play in raising rural income? and 2) what was the linkage between off-farm opportunities and farm income? Our work builds on Huffman’s in addressing four aspects of rural and urban labor markets: the role of agglomeration economies, the returns to observed and unobservable skills, the role of commuting in small-town survival, and the incentives to invest in rural and urban ventures.

### The Role of Agglomeration in Urban and Rural Labor Markets

The Schultz/Johnson/Huffman analysis argued that technical changes in agriculture were substituting physical capital for rural labor, thus pushing rural workers to seek urban job opportunities. An influx of labor to urban markets, all else equal, would shift supply outward and wages would fall. However, the very large relative shift of labor supply toward urban markets has not depressed urban wages. That suggests that there have also been persistent outward shifts in urban labor demand accompanying the outward shifts in urban labor supply. The most plausible source for the rising urban labor demand is higher urban labor productivity associated with agglomeration.

Agglomeration economies are commonly cited as a reason for the growth of cities (Glaeser, Kallal, Scheinkman, & Shleifer, 1992). These productive externalities are associated with high concentrations of skilled workers or local clusters of firms producing similar products or using similar production processes. The idea was first advanced by Marshall (1890), who suggested that firms

in urban markets gain a cost or productivity advantage by pooling skilled workers, specialized information, or access to key inputs or customers. Jacobs (1969) argued that cities also provide a concentration of heterogeneous firms that allow firms to adapt methods or innovations designed for completely different products. Endogenous growth theory has reawakened interest in identifying the sources and impacts of agglomeration economics on growth. We now have a wealth of empirical support for these ideas. Cities foster more rapid innovation (Acs, 2003; Feldman & Audretsch, 1999), benefit from proximity to concentrations of upstream suppliers and downstream customers (Ellison, Glaeser, & Kerr, 2010), and gain productivity from clusters of similar firms (Porter, 2003) and concentrations of educated workers (Moretti, 2004). These productivity gains translate to higher wages, particularly for the most skilled workers whose skills are complementary with agglomeration economies (Glaeser & Resseger, 2010).

Both firms and workers will benefit by being located in cities. However, space in cities is limited so land prices are bid up by the rising density of workers and firms. In equilibrium, as derived by Roback (1982) and Moretti (2004), city workers are paid more but pay higher prices for housing, and city firms’ productivity advantages are countered by higher wages and building rents. Meanwhile, rural firms are less productive but pay lower wages and rents, and their employees are compensated for low wages by lower living costs.

Given this convincing theoretical argument and its empirical support, are rural areas doomed to low productivity firms and low-skilled workers? Perhaps not if firms with locations in rural areas are those that do not benefit from agglomeration. Firms that do not receive a productivity benefit from a city location would have no reason to pay the higher wages and rents. Artz, Kim, and Orazem (2014) investigated this possibility by examining whether the measures of agglomeration commonly shown to have productivity effects in cities matter to firm location decisions in rural markets. The surprising answer is that agglomeration measures are as important for rural firm entry decisions as for urban firms. The clear implication is that firms choosing to locate in rural markets will tend to locate close to one another. These relatively few rural locations will become job centers surrounded by a rural fringe of small towns that will no longer be able to compete for new firms. Government efforts to encourage firms to locate in remote towns that have been losing firms will not work; this is either because firms will not locate there or because the firms

3. Huffman was surrounded by former Iowa State faculty while at the University of Chicago. In addition to Johnson and Schultz, his faculty included C. Arnold Anderson, Mary Jean Bowman, Lester Telser, and Margaret Reid.

will locate and then suffer from the lack of agglomeration benefits.

The Internet was expected to lower the importance of agglomeration because proximity was no longer necessary for interactions between firms, between workers, or between firms and customers. It does seem that towns that had early access to high-speed Internet have grown faster (Atasoy, 2013; Kolko, 2012). However, these studies are subject to concerns about endogenous placement of broadband service since IT providers will target the most profitable areas for entry. Unobserved firm productive attributes are likely to be correlated with early access to high-speed Internet. Kim and Orazem (2012) analyzed whether broadband access affected new firm entry decisions using a methodology that holds fixed unobserved firm attributes. Even in remote areas, access to broadband service increases probability of firm entry. However, the effect of broadband on new firm entry increases with the degree of agglomeration. Further evidence that Internet deployment and agglomeration are complements was reported by Watson, Nwoha, Kennedy, and Rea (2005), who found that firm willingness to pay for e-commerce information increased with city size, even though one might have thought e-commerce would be most important for firms in remote markets.<sup>4</sup>

Some have argued that because broadband encourages firm entry, the government should make it available universally. The presumption is that, by subsidizing its installation in markets that private providers have avoided, firms will start locating in remote towns. However, none of these studies imply that taking broadband to new rural locations will increase the total number of firms across all rural markets. Instead, universal broadband may lead the same number of firms to locate across more rural markets, thus limiting the benefits they could gain from agglomeration if they located in fewer rural markets. More plausibly, the importance of agglomeration to rural firms will imply that they would not change their location decisions even if broadband were extended to more rural markets.

Rural skilled workers also tend to concentrate in relatively few rural markets. "Brain drain," or increased migration of human capital from rural to urban markets, is not the inevitable fate of rural America. Between

1970 and 2000, rural counties as a whole experienced a faster-than-average increase in college-educated population share. However, Artz (2003) found that rural areas that gained college-educated workers were disproportionately the rural counties closest to urban markets. Meanwhile, it is the most remote rural areas that are experiencing brain drain, a result that discourages broadband deployment in those areas.

There is one area where IT is likely to affect rural productivity. Satellite technology allows high-speed downloading of information, even if uplinking information is still slow. The most educated farmers are the early adopters of new technologies (Foster & Rosenzweig, 1996; Huffman, 1977; Huffman & Mercier, 1991; Rahm & Huffman, 1984; Wozniak, 1987, 1993). The most educated farmers also allocate resources most efficiently in response to external price, weather shocks, or advice from extension specialists (Huffman, 1977; Wozniak, 1993). Abdulai and Huffman (2005, 2014) and Foster and Rosenzweig (1995) show that shared information from nearby adopters increases the likelihood that farmers adopt. Information dissemination on prices, technologies, and production methods can spread quickly via satellite. Even as farms get larger and proximity to neighbors diminishes, farmers will still be able to access information through satellite downlinks.

### How Large is the Rural Urban Wage Difference for Equal Skills?

Johnson (1951) estimated that living costs were 25% lower in rural than urban areas, meaning that real incomes would be equalized if rural wages averaged 80% of urban wages. By 1970, it appears that rural wages had reached that level, but that does not mean that wages have truly equalized, as differences in skill levels, hours of work, or workers per household render the comparison invalid. Our recent research on the rural/urban income gap controlling for these various factors suggests that real incomes have equalized between urban and rural markets. Artz, Kimle, and Orazem (2014) investigated wage differences between urban and rural markets for Iowa State alumni in the same major, holding constant sector of employment, college academic performance, and family background. For agriculture majors, the urban wage premium was 24% in the agriculture sector and 12% in non-agriculture jobs. For non-agriculture majors, the urban premium was 32% in the agriculture sector and 20% outside agriculture. The weighted average urban premium at the college level is

4. *Of course, remote towns still have to ship their product. It makes little difference whether you can advertise and take orders over the Internet if you lack a local FedEx or UPS service needed to transport goods to customers.*

19.5%, almost exactly the estimated gap attributable to the lower cost of living in rural markets.

In a related analysis, we use propensity score matching to compare observed earnings between two individuals who differ on urban and rural residence but otherwise have the same or similar probability of selecting a given occupation. We estimated the probability that each individual in our alumni database selected full-time farming, nonfarm rural self-employment, rural wage work, urban self-employment, and urban wage work. We then estimated the wage differential for each occupation group relative to its nearest matched control, using rural wage work as our common control group. Urban wage workers earn a 20% premium and urban self-employed earn a 14% premium relative to rural wage earners. However, full-time farmers earn 36% less than observationally equivalent rural wage earners. Is this evidence that the “farm problem” persists? Perhaps not. Commonly used measures of net farm income do not incorporate changes in the value of farm assets such as land and equipment; so, our measure of farm income may miss an important source of returns. Moreover, farm income can be manipulated for tax purposes in ways that greatly understate the true returns. As a result, the after-tax income gap would be exaggerated by before-tax income comparisons.

Our results are broadly consistent with the view that urban and rural workers earn similar real earnings. It does not appear that rural workers are unable to migrate toward higher urban returns, so wages now tend to equalize across regions more than they did in the 1930s and 1940s.

### How Do Rural Workers Access Urban Wages?

Johnson (1948) argued that the rural wage disadvantage could be eliminated by out-migration or by commuting to and from urban labor markets. In the 1930s, transportation costs were much higher so commuting was not a viable alternative. However, the development of high-speed automobiles and the vast expansion of the highway system—which began in the 1950s—made daily commuting up to 60 miles one-way a plausible alternative for individuals wanting to access jobs in higher-paying markets while enjoying the benefits of lower-cost rural residential markets. Therefore, Orazem’s and Otto’s (2001) model of joint residential and job location choices explained where people live and work in the Des Moines metropolitan area. As distance from home to work increases, workers require a larger wage gain

over prevailing local wages for their skills in order to choose the commuting option.

How far are rural workers willing to commute to access the higher-paying urban markets? Khan, Orazem, and Otto (2001) found that employment growth as far as two counties away increased local county population growth. They concluded that the relevant commuting region (or laborshed) around an urban market incorporates households within a one-hour radius. Taking a different tack, Artz et al. (2014) find that commuters tend to reside in less agglomerated labor markets and commute to work in more agglomerated labor markets. Furthermore, while distance deters the probability of commuting for both rural and urban residents, rural residents value agglomeration at out-of-town job sites at 2-3 times the rate of urban workers. The implication is that rural residents will commute greater distance to access higher agglomeration (and presumably higher wages) than will urban workers.

The ability to commute has been extremely important for farm households. Off-farm income represents 85% of farm income on average and even adds 25% of farmer income for farms earnings \$250,000 or more in annual sale of commodities (Zulauf, 2013). Farm households are most likely to engage in off-farm labor when they face a negative productivity or price shock to their farm enterprise (Huffman, 1980; Huffman & Lange, 1989; Kwon, Orazem, & Otto, 2006; Tokle & Huffman, 1991). That suggests that for farm households, off-farm income serves as a mechanism to smooth income and consumption paths in the face of fluctuating commodity prices or crop yields. Finally, evidence suggests that farm households are sensitive to rising economic opportunities in off-farm labor market. When urban wages rise, one or both farm spouses enter the off-farm market; the response is greatest for educated farmers (Huffman, 1980; Huffman & Lange, 1989).

Kislev and Peterson (1982) showed that rising urban incomes relative to machinery costs explain virtually all of the change in farm size over time. We suspect that a reexamination of that hypothesis will show that the effect of urban incomes on farm size is greatest as distance from an urban center increases. Small farms are still viable close to cities because commuting allows the farm household to supplement their incomes from higher-wage jobs. As distance grows beyond the level for commuting, increasing farm size is the only way to match rising urban incomes. Hence, the cross-sectional pattern of farm size across states may be explained by transportation costs and distance to urban markets even

**Table 1. The five states with the largest percentage of rural population, 1900, 1940, and 2010.**

1900		1940		2010	
<b>Idaho</b>	94%	<b>North Dakota</b>	89%	<b>Maine</b>	61%
<b>North Dakota</b>	93%	<b>Mississippi</b>	89%	<b>Vermont</b>	61%
<b>Oklahoma</b>	93%	<b>Arkansas</b>	87%	<b>West Virginia</b>	51%
<b>Mississippi</b>	92%	<b>South Dakota</b>	87%	<b>Mississippi</b>	51%
<b>Arkansas</b>	92%	<b>New Mexico</b>	86%	<b>Montana</b>	44%

Source: US Census

as the time-series pattern is explained by rising urban wages.<sup>5</sup>

The ability to commute is also important for the survival of small towns. Rural regions in close proximity to urban markets and regional job centers have experienced population growth on average, while populations in the more remote regions of the country have declined. Table 1 lists the most rural states in 1900, 1940, and 2010. In the era where transportation was costly, the most rural states were largely engaged in self-sufficient farming and were located in the rural South or west of the Mississippi. As transportation costs fell, the most rural states became those that allowed workers to live in small towns but to commute to high-wage urban centers. By 2010, the three most rural states were in the east: Maine, Vermont, and West Virginia.

Focusing instead on the growth in rural population, we find states such as New Hampshire and Rhode Island more than doubled their rural populations since 1940, while the states with the largest reduction in rural population are South Dakota, Kansas, Illinois, Nebraska, and North Dakota. The primary job centers in Nebraska and Kansas are concentrated on the east side of the state, so their rural populations in the central and western regions had to migrate to access higher urban wages. In contrast, Iowa’s job centers are scattered around the state, allowing rural residents to stay where they were and commute in order to access higher urban wages.

### Urban and Rural Entrepreneurship

Urban areas are associated with greater innovation and entrepreneurship, whether measured by patent rates, venture capital expenditures, employment in creative or artistic occupations, or firm start-ups (Acs, 2003; Feldman & Audretsch, 1999; Glaeser, Kerr, & Ponzetto, 2010; Glaeser, Rosenthal, & Strange, 2010). The possible advantages to entry in urban areas—higher labor productivity, proximity to more and better inputs, larger

customer base, and knowledge spillovers from other firms—were summarized in the first section. And yet some entrepreneurs still locate in rural markets. An obvious question is why do some entrepreneurs enter rural markets, and how do they differ from urban entrepreneurs?

One plausible hypothesis is that rural entrepreneurs have skills that complement location-specific amenities that increase the returns to rural location. An alternative hypothesis is that rural entrepreneurs have preferences for rural location and enter rural markets for reasons of taste rather than profit. The Yu, Jolly, and Orazem (2011) investigation of firm survival rates in urban and rural markets found that rural firms have greater survival rates, a result that might appear surprising except that it seems to hold broadly across states and countries. One explanation is that at the time of entry, entrepreneurs consider the salvage value of the assets of the firm if the venture fails. As one-third of firm start-ups fail within two years and two-thirds fail within six years (Knaup & Piazza, 2007), it must be that entrepreneurs consider their shut-down options at the time of entry. In dense markets, there may be many entrepreneurs whose skills complement the location, but in thin markets, there may be few potential buyers. As a result, for the same investment cost, the expected salvage value of the firm’s assets in case of failure will be lower in rural markets than in urban markets. As a result, rural entrepreneurs must have a higher expected probability of the venture’s success at the time of entry.

Subsequent studies are consistent with this explanation. Artz and Yu (2011) found that when asked about their future expectations, urban entrepreneurs atypically expect to sell their businesses while rural entrepreneurs atypically expect to pass the venture on to relatives. The lower probability of planned sale of the assets of rural firms is consistent with a lower anticipated resale value of the assets.

Another approach presumes that the component of new firm location decisions not explained by observed firm and entrepreneur attributes is a measure of the

5. See Kilkenny (2010) for a good summary of the role of transportation cost on rural development.

unique match capital between the entrepreneur's skills and the location. If this match capital is a measure of taste-based locational preferences, it should be negatively correlated with subsequent firm success. Instead, it is highly positively correlated with firm survival, suggesting that the match reflects entrepreneur-specific knowledge of the location. If these measured match capital components are not easily transferable to another entrepreneur, they will not be capitalized in the sale value of the firm. However, if they are site specific as opposed to entrepreneur specific, they can be valued at time of sale. In urban markets, the majority of the variation in these measured match capital components across start-ups can be explained by a location-specific fixed effect, suggesting that the match capital is specific to the site and could be transferred on sale. In rural markets, the majority of the variation is specific to the entrepreneur.

Artz and Yu (2014) found that unobservable factors influencing the choice to live in a rural area were positively correlated with unobserved factors affecting the probability of becoming an entrepreneur. The implication is that individuals who locate in rural areas are more likely to start a business, perhaps because they expect they could earn more from the entrepreneurial venture where they can take advantage of lower costs of labor as opposed to becoming lower-cost labor themselves. Consistent with that presumption, unobserved factors that increase the likelihood of locating a new venture in a rural market are also correlated with the firm's survival, suggesting that location-specific knowledge is useful to the profitability of the firm.

## Conclusions and Policy Implications

After growing for 150 years since 1790, the rural population in the United States has been virtually stagnant for the last 70 years. The combination of labor-saving technological change in rural markets and rising wages in urban markets has created an incentive for rural-to-urban migration. As the population shifted from rural to urban areas, the substantial wage advantage enjoyed by urban workers was gradually eliminated. But not all rural areas are losing population. There is great heterogeneity in rural population growth across states. Rural population has shrunk least or grown where rural residents can commute to an urban market to access higher wages rather than having to migrate away from the rural areas.

The urban advantage is related to agglomeration economies that have increased labor productivity in

urban areas. However, agglomeration economies are also valuable in rural markets, suggesting that rural employment growth will be concentrated in relatively few job centers that will employ residents of surrounding areas. Improvements in information technologies have not reduced the tendency for economic activity to congregate because agglomeration appears to complement broadband access, skilled labor, and computer technology.

As initially argued by Schultz and Johnson, it is counterproductive to subsidize job creation in remote rural areas in an effort to delay or reverse the population shift from rural to urban markets. As one example, most new start-ups fail, so the salvage value of the investment is an important factor in deciding where to invest. The market for the assets of failed firms in rural areas is much thinner than for failed firms in urban markets, so new firm start-ups in rural markets face an added risk. That requires a higher expected profit to induce entry in rural markets as compared to urban markets. The source of that added profitability in rural areas appears to be unique to the match between the entrepreneur and the location. It is not obvious how government policy would increase the number of these idiosyncratic matches. Rural towns will be better served by efforts to lower the cost of commuting to nearby urban markets that already have the advantages of agglomeration and infrastructure than to try to subsidize firm entry into rural areas that lack the productivity advantages from agglomeration and infrastructure.

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