

**Does Human Capital Spillover Persist? Evidence from the Forced Migration by
China's Send-down Policy**

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Abstract

This paper tries to estimate the long-term effects of a temporary human capital shock, induced by a forced migration policy in Chinese history. From 1962 to 1979, the Chinese government forcefully relocated 17.92 million high school graduates from cities to rural villages, which was known as the Send-down policy. The immigration of educated youths increased the human capital stock in rural areas. However, this human capital shock retreated in the early 1980s, when most educated youths returned to cities after the policy ended. With a new county-level dataset of the educated youth migration, we estimate the effects of the Send-down policy on the rural areas' human capital formation in the long-term. To account for the non-random placement of educated youths, we control for some pre-existing conditions for rural counties in our OLS estimation. Also, we exploit the variation within the pairs of contiguous counties. The benchmark estimates suggest that by 2010, one additional percentage of educated youths in the rural population increased the rural county's junior high school attainment rate by 0.33 percentage point. It also raised the senior high school attainment rate by 0.44 percentage point and college attainment rate by 0.35 percentage point. Our findings imply that a temporary human capital gain can have spillover effects in the long-term.

1. Introduction

Economists agree that human capital can benefit economic growth (Lucas, 1988; Glaeser, Scheinkman, and Shleifer, 1995; Shapiro, 2006; Iranzo and Peri, 2009). Moreover, a growing literature focuses on the spillover or externality of human capital, which can be via knowledge transfer, peer interactions, or other mechanisms (Marshall, 1890; Lucas, 1988; Acemoglu, 1996; Acemoglu 1998).

Marshall (1890) firstly pointed out that social interactions among workers in the same industry or location can create learning opportunities and enhance productivity. Incorporated to the economic growth model, the average level of human capital can contribute to the productivity of all factors (Lucas, 1988). The human capital externality can also come from the complementarity between physical and human capital (Acemoglu, 1996). As a group of workers increase education, rational firms would invest more physical capital, which will increase the productivity of all workers. The other discussions of the human capital externalities are about crime reduction or political involvement (Witte and Tauchen, 1994; Lochner and Moretti, 2002; Milligan et al., 2002;).

This paper will estimate the persistent spillover of a temporary human capital gain, induced by a forced migration policy in China. Throughout the 1950s, the Chinese government took aggressive policies to develop industrial sectors and urban economy.² The policies that favoured city economic growth boosted a massive rural-urban migration and increased the city population quickly. By the early 1960s, increasing unemployment and food shortage in cities became significant challenges facing the Chinese authority. The unemployment rate among the young generation just entering labour market was highest because the state-owned factories had no more quota to recruit new workers. So, to reduce the excess urban population, beginning in 1962, the government forcefully moved some unemployed high-school graduates from cities to rural areas. Since the rural areas were inferior to cities in living standard, this policy was then called the Send-down policy. The Send-down policy ended in 1980 when the new political leaders decided to reform the economic system and restore market. From 1963 to 1980, the government relocated 17.92 million youths from cities to rural areas. Shortly after 1980, most of the educated youths left the rural villages and returned to cities permanently.

The Send-down policy is a good natural experiment to test the human capital spillover and its persistence in the long-term. First, the policy explicitly targeted the high-school graduates in cities. Given that most rural residents were still illiterate by the early 1960s, the immigration of educated youths significantly increased the human capital stock of the rural destinations. Second, as the migrants had a limited choice of the destination, the policy distributed people without self-selection and independent of their economic motivation. Conditional on some pre-existing conditions relevant to the

² Such policies include the Five-year Plan and Great Leap Movement, which were all aimed at developing the heavy industries and catching up the developed countries. See background section for detail.

assignment rule, the remaining variation of immigration is more idiosyncratic and could serve the causal analysis. Third, the policy-driven human capital gain for rural areas was temporary because most educated youths returned to cities shortly after the policy ended. With the reversed shock, we can distinguish the persistence of human capital spillover and the spillover of a persistent shock. Very scarce studies try to isolate these two effects.

To measure the share of educated young immigrants in native rural population, we collect a new county-level dataset. With the populational education outcomes in 1990, 2000, and 2010, we estimate the effects of the Send-down policy on the rural areas' human capital formation in the long-term. As the government distributed the educated youths non-randomly, we control for a set of pre-existing heterogeneities that were relevant to the placement rule. Also, we control for the fixed effects of any pair of contiguous counties in our benchmark results to eliminate some endogenous unobservable. Counties located to each other tended to be similar geographically and economically. Moreover, they are more likely to integrate into a commodity and factor market. So, controlling for the contiguous county pair fixed effect should significantly increase the consistency of our estimates.

The benchmark estimates of this paper indicate positive and significant effects of the Send-down policy on the rural areas' human capital formation by 1990, 2000, and 2010. By 2010, one additional percentage of educated youths in the rural population increased the rural county's junior high school attainment rate by 0.33 percentage point. It also raised the senior high school attainment rate by 0.44 percentage point and college attainment rate by 0.35 percentage point.

Our findings can contribute to at least three strands of literature. First, our findings enrich the empirical studies on the human capital externality. The existing literature identifies the human capital externality by testing the causal effect of overall human capital stock on individual worker's wage via a Mincerian wage equation (Rauch, 1993). However, the regional unobservable factors in labour demand and supply can bias the OLS estimates (Moretti, 2004). The recent literature commonly exploits some exogenous variations or instrumental variables for overall human capital (Acemoglu and Angrist, 2000; Moretti, 2004; Cornelissen et al., 2017). Even the identification is valid, Ciccone and Peri (2002) proposed given the imperfect substitutivity between the skilled and unskilled workers, the change of relative supply of skilled workers will change the unskilled workers' wage even without externality. So, they introduced a constant-composition approach, which estimates the effect of average schooling on average wages across cities, holding the relative size of each skill group constant. Other empirical studies test the human capital externality by the firms' productivity change, knowledge transfer or geographic agglomeration of patents (Moretti, 2002; Adams and Jaffe, 1996; Peri, 2002; Jaffe et al., 1993; Zucker et al., 1998).

Instead of exploring the change in school enrollment, our paper exploits the forced migration of educated people as a more exogenous source of human capital gain. Also, the absence of a competitive

labour market in Chinese history helps us to rule out the market-based mechanisms proposed by Acemoglu (1996). One similar work is from Rocha et al. (2017). They look at the human capital gain caused by a state-sponsored settlement policy that attracted educated immigrants to a region in Brazil from the late 19th to early 20th century. They find that one century after the policy, municipalities receiving more educated settlers had higher levels of schooling and higher income. Though their findings suggest the persistence of a human capital shock, they cannot attribute the effects to spillover.

The second literature we can contribute to is the peer effects literature. Increasing empirical studies discuss peer effects on productivity or working effort (Falk and Ichino, 2006; Mas and Moretti, 2009; Lalive and Cattaneo, 2009; Bobonis and Finan, 2009). Peer effects can also be on individuals' school choice. Peer pressure and social norms regularly influence a child's education decision (Bernheim, 1994; Akerlof, 1997; Akerlof and Kranton, 2002; Glaeser and Scheinkman, 2003). Higher education of peers may bring informational externalities to the uneducated people, who observe the benefits of schooling via their peers' achievement (Bikhchandani et al., 1992). Peer interactions also generate complementarities between student learning and teachers' effort (Kremer et al., 2009). The human capital spillover among peers implies that the social multiplier of education spending may be higher than one. As most studies listed above focus on the contemporary peer effects, our paper tries to identify that in the long-term.

Finally, this paper also contributes to the specific literature on the Send-down policy. The existing economic studies on the Send-down policy are insufficient and mostly focus on the sent-down youths and their families. Zhou and Hou (1999) show that the sent-down youths suffered from the delayed marriage and child-bearing. Xie et al. (2008) find that the sent-down youths do not seem to benefit the policy. Li et al. (2010) find that the sent-down youths received more parental transfers in their later life, suggesting that parents behaved altruistically, showed favouritism, and exhibited guilt.

Due to the limited data on the immigration of educated youths, scarce studies evaluate the policy's impacts on the rural destinations. Kinnan et al. (2015) use inter-province migration data to show that the forced migration created lasting inter-province links, which can be an instrumental variable for the contemporary rural-urban migration. They find that improved access to migration leads to higher consumption level and lower consumption volatility for rural households. However, as this paper will show, the inter-province migrants only accounted for 8% of all educated young migrants. Moreover, we show that the inter-province migration was endogenous, indicating that their identification might not be valid. Another study by Honig and Zhao (2015) tells a hostage story. They argue the arrival of educated youths provided the rural areas with access to equipment and technical training from the sending regions. The local officials had more bargaining power to request living and production materials from the sending cities. Though this story seems to be reasonable, they do not provide any quantitative evidence and only base the proposition on anecdotal cases of the educated youths from Shanghai.

To our best knowledge, this paper is the first to systematically evaluate the long-term effects of the Send-down policy on the rural areas. With the county-level immigration dataset, we can provide a more accurate and comprehensive picture of the Send-down migration.