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Cynthia Kinnan
Shing-Yi Wang
Yongxiang Wang

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ABSTRACT

This paper exploits two unique features of China's history to study the effects of access to internal migration: reforms to the household registration (hukou) system, and historical migration flows. We show that temporary migration due to a government policy called the "sent-down youth" (SDY) program created lasting inter-province links, so that decades later, hukou reforms in cities which sent SDY increased migration in provinces where those SDY temporarily resided. Using this variation, we find that improved access to migration leads to higher consumption levels and lower consumption volatility for rural households. Furthermore, household production shifts into high-risk, high-return activities.

Cynthia Kinnan
Department of Economics
Northwestern University
2001 Sheridan Road
Evanston, IL 60208
and NBER
c-kinnan@northwestern.edu

Shing-Yi Wang
The Wharton School
University of Pennsylvania
3620 Locust Walk
Philadelphia, PA 19104
and NBER
was@wharton.upenn.edu

Yongxiang Wang
Marshall School of Business
University of Southern California
Los Angeles, CA 90089
Yongxiang.Wang@marshall.usc.edu

1 Introduction

Migration offers a key form of arbitrage: especially for the poor, human capital may represent a large share of wealth, and migration allows this human capital to receive a higher return.[1] While much of the focus of the economic literature on migration has been on the impact of migration on migrants and on workers in receiving communities, the impact of migration opportunities on sending households and communities is less understood but extremely important for policy-makers in developing countries who are interested in reducing rural poverty and regional inequality. Using a novel identification strategy, our paper addresses the question of how the relaxation of constraints on internal migration affects the economic choices and outcomes of agricultural households in communities sending the migrants.

We exploit two unique features of China's economic environment to understand how opportunities for internal migration affect agricultural households: China's *hukou* (household registration) system and historical patterns of urban-to-rural migration during the "sent-down youth" (SDY) campaign. A key feature of the Chinese context that we leverage is recent variation in the ease of migration generated by province-level reforms in the *hukou* system that allowed some migrants to register and receive social services in urban areas.[2] As discussed in Section 3.1, several other papers have also used variation in the *hukou* system to study migration; to our knowledge ours is the first to use its interaction with ties created by the SDY program. This allows us to use cross-province variation while relaxing the assumption that timing of *hukou* reforms in a province is orthogonal to economic conditions in that province.

The second feature of the Chinese context that we use is the SDY program, wherein the government mandated the temporary resettlement of roughly 18 million urban youth to rural areas.[3] Our strategy builds on previous papers that use historical flows to instrument for migration (Munshi 2003, Hanson and Woodruff 2003, Hildebrandt and McKenzie 2005, Mckenzie and Rapoport 2007), but there are two key advantages to our analysis in the Chinese context. First, the decision to migrate and the locations associated with the SDY were not choices of the migrating individuals; instead, the routes of this involuntary migration were chosen by government planners. In previous papers that use historical flows, it may be more difficult to separate out persistent correlations in preferences or characteristics that draw people from one place to another. In our setting, we exploit a natural experiment where the government determined the migration paths of urban youth. Moreover, the fact that we interact

[1] Indeed, the potential income gains from rural-to-urban migration are substantial; the rural-urban wage gap is estimated to be 10% in China and as high as 45% in India (Munshi and Rosenzweig 2013).

[2] See Section 3.1 and Chan and Zhang (1999) for details on the *hukou* system.

[3] See Section 3.2 and Bernstein et al. (1977) for details on the SDY program.

historical SDY flows with time-varying *hukou* reforms allows us to absorb time-invariant correlations between sending and destination areas and recover causal estimates of the impact of access to migration.[4] To our knowledge, we are the first to demonstrate that the large-scale movements associated with the SDY program created lasting linkages between provinces that sent and received SDY.[5]

Using detailed panel data on production activities of rural households from the Chinese Ministry of Agriculture, our paper is among the first that analyzes the effect of access to migration on outcomes related to agricultural production decisions of rural households. There are several reasons that we might expect production decisions to change when households have better access to migration opportunities. One mechanism is a wealth effect, where migrants' earnings increase relative to what they would have earned in the absence of migration and this income is shared with households via remittances. On one hand, the wealth effect may lead to an increase in leisure and a corresponding decline in total production. Alternatively, a negative wealth effect is possible, due to the cost of migration itself or the loss of a productive household member (if that member's wages are not fully shared with the nonmigrating household members). A second possible mechanism is an insurance effect: the migrants are exposed to different shocks than the agricultural households that they left, and this insurance allows households to shift into riskier activities (Rosenzweig and Binswanger 1993). Alternatively, migration itself may be risky (Bryan et al. 2014), so rural households' portfolios could shift *away* from risky activities.

Our results indicate that increased access to migration leads to an increase in the level of rural households' consumption and a decrease in the variability of consumption. Agricultural production decisions also change, with a shift towards riskier activities including animal husbandry and fruit farming. These results are consistent with a positive wealth effect or with insurance derived from having a migrant working outside of the household. We also see a substantial fall in assets without a corresponding fall in income or labor. Similar to the findings of Kabowski and Townsend (2011) where an expansion of credit in Thailand corresponds with a fall in assets, the results on assets in our setting are consistent with the interpretation that households decrease their buffer stock savings in response to improved access to insurance via migration.

The results are consistent with prior research suggesting an insurance mechanism related to migrants. Rosenzweig and Stark (1989) show that in rural India, internal migration for the purpose

[4] Other previous work on migration has attempted to overcome the associated selection problems using various strategies: controlling for observable differences (Adams 1998), propensity score matching (e.g., Acosta 2011), natural experiments (e.g., Clemens 2010, McKenzie et al 2010), randomized experiments (e.g. Bryan et al 2014), or using instrumental variable strategies based on exogenous factors such as shocks at the migration destination (e.g., Yang 2008).

[5] Our findings are related to Burchardi and Hassan (2013), who show that interpersonal relationships persist over time and can be an important driver of economic growth.

of marriage facilitates consumption smoothing by spreading family networks over locations with less covariate weather shocks. Using Tanzanian panel data, de Weerdt and Hirvonen (2012) find that migrants insure non-migrants, but not the other way around. Giles and Yoo (2007) use long lags of rainfall to instrument for the size of the migrant network, and show that households with a larger migrant network engage in less precautionary savings. More recently, Morten (2013) uses a structural model to examine the interaction between internal migration and insurance in rural India. Our setting is novel, however, in that we have detailed data on the productive decisions of rural households, and can examine how these decisions change due to improved access to migration.

In addition to the production outcomes that we examine, we are able to offer a new perspective on the impact of migration on the well-being of remaining households. Our panel data set spans eight years, and the relatively long time frame allows us to look at measures of wellbeing, such as consumption smoothing, which are difficult to study in shorter panels. Prior research has demonstrated that remittances received from migrants correspond with an increase in remaining household members' income, asset ownership and consumption of normal goods including education and health.[6] However, other research suggests that migration may generate negative impacts on sending families stemming from the loss of a family member and household laborer.[7] Prior papers also find ambiguous effects on children's education (Antman 2012, Cox-Edwards and Ureta 2003, Yang 2008, McKenzie and Rapoport 2007) and adult employment of remaining members (Funkhouser 1992, Yang 2008, Amuedo-Dorantes and Pozo 2006). Relatedly, Gibson, McKenzie and Stillman (2011) find that in the short-run, in Tongan households in which a member won a lottery to migrate to New Zealand, income falls as does asset ownership and access to finance, suggesting that migration is costly to remaining households in the short run.

Finally, we contribute to the growing literature on internal migration (E.g., Beegle, de Weerdt and Dercon 2011, Bryan et al. 2014, Bazzi et al. 2014). While there exists a larger literature on international migration, there are many reasons to believe that impacts for international migration cannot be simply extrapolated to internal migration. Internal migration is more often short-term and over smaller physical distances, so the ease of and incentives for remitting may be greater, potentially yielding greater benefits for non-migrating household members. On the other hand, income differentials are likely smaller for internal than international migration, and the correlation between earnings of migrants and their sending households may be higher.[8] Questions related to internal migration are

[6] See Rapoport and Docquier (2006) for a good review on this literature.

[7] There are also other potential difficulties associated with split families including problems with hidden income (Joseph, Nyarko and Wang 2015).

[8] The extent of potential negative effects on non-migrants, such as divorce, isolation between parents and children, and

highly relevant: of an estimated 1 billion migrants worldwide, almost 75% are internal migrants (UNDP 2009). Moreover, the form of internal migration we study, inter-provincial migration, is highly relevant in China: according to 2010 Census data, 50% of internal migrants were inter-provincial migrants (Liang 2012).

2 Conceptual framework

There are several channels through which the improved access to migration might affect rural households. This paper focuses on two possible channels: wealth effects and insurance effects.

If migrants provide remittances to household members who remain in the origin, this increase in wealth can lead to more consumption by the rural households. If households were not credit constrained prior to migration, because leisure is a normal good, income earned by rural household members and their corresponding investment in agricultural production may fall. If households were credit constrained prior to migration, the hours worked and earnings of rural household members may rise as the migrant may be able to finance higher investment; if, moreover, investment exhibits fixed costs or nonconvexities, nondurable consumption may fall.[9] If households exhibit decreasing absolute risk aversion, such as in the commonly-used constant relative risk aversion (CRRA) utility function, an increase in wealth will be associated with increased investment in high-risk, high-return assets. On the other hand, if the remittances sent by the migrant are less than the amount that the migrant contributed to household earnings before migration, migration may cause a *negative* wealth effect for households and a corresponding decline in their consumption and risk-taking.

In addition to a wealth effect, there may be an insurance effect from migration given that migrants' income will typically be uncorrelated or less correlated with the income of the remaining household members; in other words, the overall portfolio of household activities becomes more diversified when a member migrates.[10] If migrants can provide state-contingent remittances, gifts or loans (de Weerdt and Hirvonen 2012), this increases the household's ability to insure risk associated with their income. The insurance from having a migrant, in turn, may lead to increased investment in high-return, risky activities, if the household was not previously able to insure income risk fully (see Binswanger and Rosenzweig 1993 and Karlan et al. 2014). On the other hand, insurance provided

negative spillovers on villages due to the loss of prime-aged workers, may also differ between international and internal migration.

[9] Banerjee, Karlan and Zinman (2105) show how access to credit may cause consumption to fall if nondivisible investment increases; the effect of remittances is similar.

[10] Giles (2006) shows that expanding access to off-farm labor markets lowers consumption variability for rural Chinese households.

by migrants may reduce households' investment due to a reduction in buffer-stock savings (Giles and Yoo 2007, Kaboski and Townsend 2011). Moreover, migrants' income may itself be risky (Bryan et al. 2014). Rural households may be exposed to the risk faced by migrants either directly, because they provide transfers to migrants, or indirectly, because they receive reduced remittances from migrants when migrants' income is low. If households are exposed to risks faced by migrants in a way that increases the total risk they face, they may reduce the riskiness of their own production activities, potentially at the cost of accepting lower average returns.

The preceding discussion was framed in terms of the effect of migration; however, anticipation of the ability to send a migrant in the future may cause rural households to change their behavior even before sending a migrant. If migration is a valuable *ex post* smoothing strategy (Morten 2013), households can increase investment in risky assets and/or liquidate buffer stocks even before sending a migrant. On the other hand, if households need to save up for migration, they may reduce consumption and/or increase labor supply prior to sending a migrant. For these reasons, our empirical analysis will focus on the effect of *access* to migration rather than the effect of migration *per se*.

Given the theoretically ambiguous effects of access to migration on investment, consumption, and welfare of rural households, empirical evidence is needed. The remainder of the paper will attempt to shed light on the mechanisms that are relevant in the context of agricultural households in China.

3 Institutional background

3.1 *Hukou* system

China's *hukou*, or household registration system, was set up in 1950s as a system of monitoring population flows (Chan and Zhang 1999). After the implementation of the Communist Party's economic plan called the Great Leap Forward (1958-60), the *hukou* system was repurposed to control rural-to-urban migration given the government's desire to keep food prices low and provide welfare benefits for urban residents. While the first constitution of the People's Republic of China (PRC), issued in 1954, guaranteed citizens the freedom to migrate and settle in the area of their choice, the subsequent issuance of "*Hukou* Registration rules of the PRC," issued in January 1958, began the dual-*hukou* system which divided people into those holding a rural *hukou* and those with an urban *hukou*. This essentially voided the "freedom to migrate" specified by the first constitution.[11]

Individuals' *hukou* determines their eligibility for jobs, schooling, housing, and other rationed goods in a specific city or county. In particular, an individual with a rural *hukou* cannot legally work

[11] To justify this system, the first constitution was revised in 1975 and the "freedom to migrate" clause was deleted.

for a state-owned enterprise or the government or receive state services in an urban area. Thus, most rural *hukou* holders can only work in the city as "temporary workers" (*linshi gong*), and do not get insurance, retirement benefits, housing subsidies or other allowances and are not subject to the same labor protections as urban *hukou* holders.

Initially, it was impossible for the holder of a rural *hukou* to convert to an urban *hukou*. However, in July 1985, the Ministry of Public Safety issued the "temporary regulation on the town and city *hukou* registration system," which allowed conversions of rural to urban *hukou* (*nongzhuanfei*); however, the circumstances were very limited.[12] The annual quota (*zhibiao*) for *nongzhuanfei* was miniscule at 0.02%.[13] In other words, a city with 10,000 city *hukou* holders could allow 2 rural people to get a *hukou* in their city. However, starting in the early nineties, provinces began to open the conversion process to more people. The nature and timing of these relaxed conditions varied across provinces and across time, providing a key source of variation that we exploit.

Several previous papers have inferred the effects of the *hukou* system on labor mobility using aggregate data (Bosker et al. 2012, Whalley and Zhang 2007) but have not used cross-province variation to address potentially confounding aggregate trends. An exception is Sun, Bai and Xie (2011) who code and use variation across provinces and time in reforms of the system, as we do; they find that *hukou* reforms adopted by a province correspond to an increase in intra-provincial migration within that province. Unlike Sun, Bai and Xie (2011), the identification strategy in our paper does not rely on the exogeneity of within-province *hukou* reforms.[14] Rather, we show and exploit the idea that *hukou* reforms in a province which historically sent SDY to another (recipient) province correspond to subsequent increases in migration rates between the provinces in the reverse direction of the SDY flow. In a paper building on an earlier national *hukou* reform, de Brauw and Giles (2012) exploit differences in the timing of access to national identification cards; they argue that these cards make it easier for rural residents to temporarily work in urban areas. Their strategy relies on the assumption of that the timing of access to identification cards is exogenous to other economic conditions within provinces that affect migration. We compare our findings to theirs in Section 8.

[12] Furthermore, a worker who successfully obtains an urban *hukou* cannot necessarily get the same for their spouse or dependents.

[13] See http://www.mps.gov.cn/n16/n1252/n1657/n2107/96328.html (Accessed February 2015).

[14] Indeed, we demonstrate that the timing of a province's *hukou* reforms is correlated with other characteristics of the province.

3.2 The sent-down youth policy

Between 1962 and 1978, nearly 18 million urban youth, mainly aged 16 to 20, were sent to rural areas to live and work. These youth were referred to as "sent-down youth" (*zhiqing*). The policy's official goal was to promote rural development and to have urban bourgeois youth learn from living in rural poverty; an underlying objective appears to have been to address high urban unemployment (Bernstein et al. 1977, Gu 1997). Some sent-down youth were sent to rural areas near their home city, but others, especially those from large cities, were sent to other provinces. In total, 1.5 million sent-down youth were sent outside their home provinces. Some sent-down youth stayed only a year or two, while others stayed for more than a decade before the policy was discontinued in 1979. On average, they stayed 3 to 4 years and performed manual, agricultural labor (Bernstein et al. 1977). While some of the sent-down youth stayed in the rural areas that they were sent to, the vast majority (over 90%) returned to the urban areas from which they came (Zhou and Hou 1999).

We investigate the possibility that receiving sent-down youth (SDY) from a large city may create personal connections and knowledge about that city which may persist over time and increase the desirability/salience of that city as a possible migration destination. For instance, Yunnan received 56,600 SDY from Shanghai, which may have created connections and reduced barriers (other than the *hukou* system) for Yunnanese people to migrate to Shanghai. Marriage rates between local residents of the rural areas and SDY from urban areas provide some suggestive evidence that the SDY formed strong bonds with locals during their stay; data from a government conference report on the SDY in 1978 suggests that about 7% of the sent-down youth remaining in rural areas in 1978 were married to local individuals in the rural areas (Gu 2009). In addition, there is anecdotal evidence that ties due to SDY flows persisted over time. For example, *Nie Zhai*, a novel written by a former SDY, Xin Ye, and later adapted into a television series, depicts the persistence of sent-down youth ties. The novel and show focus on children of SDY who remained in rural areas, and who later went to Shanghai to look for their relatives.

While previous economic research has examined parental choices over which child to send-down (Li, Rosenzweig and Zhang 2010) and the impact on being sent down on the outcomes of the individuals directly experiencing the migration (Fan 2015, Meng and Gregory 2002, Zhou 2014), to our knowledge, we are the first to explore the extent to which migration patterns associated with the sent-down movement generated lasting connections between rural and urban regions.

4 Data

4.1 National Fixed Point Survey

Our primary data source is the National Fixed Point (NFP) Survey, a panel survey collected by the Research Center of Rural Economy (RCRE) of the Chinese Ministry of Agriculture, beginning in 1986. We use annual waves of data between 1995 to 2002 for data comparability as the questions and the structure of the survey changed substantially in 1995 and again in 2003. The data set used in our analysis covers over 14,000 households from 234 villages in 19 provinces.[15]

NFP villages were selected for representativeness based on region, income, cropping pattern, population, and non-farm activities. The NFP contains detailed information on household agricultural production, consumption, asset accumulation, employment, and income. Benjamin et al. (2005) provide a detailed description of the data and show evidence that the data are of good quality. Its particular advantages for our purposes are its long panel structure and detailed data on household production decisions.

Over the period 1995 to 2002, the data only include household-level information. In other words, with the exception of a few characteristics of the household head (e.g., age and education), the data do not include individual-level characteristics. For example, we do not know the gender and education of each member of the household, but we know the number of household members, the number that are male and the number in each bin of education. Thus, if a household has four members, two of which are male and two that completed primary school, we do not know if the males were the ones to complete primary schooling. One major implication of this lack of individual-level information is that we do not know the individual identity of the household member who migrates. While we do not know the characteristics of the migrant, we do know whether or not any household members have migrated. We also do not know where exactly migrants go, or what kind of work they are engaged in.[16] Finally, we do not have a good measure of remittances that the household receives.

The summary statistics for the NFP data are presented in Table 1, where there is one observation per household, corresponding to the first year that the household appears in the data. We present levels in the summary statistics for ease of understanding the magnitudes but the regressions use log measures.[17] We drop the top and bottom 1% of values to deal with outliers; however, the results

[15]The provinces are Chongqing, Gansu, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Liaoning, Ningxia, Qinghai, Shandong, Shanghai, Shanxi, Sichuan, Tianjin, Xinjiang, Yunnan, Xizang (Tibet) and Zhejiang.

[16]To address the limitation that we do not know the destination of the migrant in the main NFP data, we supplement our analysis of the 1995 to 2002 NFP data with two data sets in which migrants report both their origin and destination provinces: the China Household Income Project (CHIP) in 2002 and the NFP from 2010 to 2012.

[17]Given that some values of assets, consumption and income may be zero, the log measures are all measured as the

in the paper are very similar if we do not address outliers. To address the issue that household size changes mechanically with migration, we examine most outcomes in per capita terms.

Our key measure of migration is a binary indicator of whether a household member spent time working in a different county. While our identification strategy focuses on cross-province migration, we do not observe the exact location of migrants' work in our primary data set so we cannot distinguish migration within the province from migration across provinces or international migration.[18] While this adds noise to our measure of migration, it does not invalidate our identification strategy. It is important to note that the rate of inter-provincial migration is fairly high. According to the 2010 Census data, inter-provincial migrants constitute 50% of internal migrants in China (Liang 2012).[19]

The base rate of migration in this population is not trivial: in the first year that they appear in the 1995 to 2002 data, about 16% of households have a migrant working away from home. Households experience on average 30 days of a migrant working away from home. This includes the 84% of households who reported zero days of migration. Conditional on reporting positive days of migration, the mean is 184 days.[20]

Over the course of the year, households are required to keep daily diaries of their consumption and the measures represent annual aggregate consumption of the household. Total consumption is 508 RMB (or USD$64 at market exchange rates) per person in the base year.[21] We have several measures of household consumption in RMB and we divide these measures by household size to get per capita values. One sub-category of total consumption is food consumption. Food consumption represents about 50% of total consumption. If households consume their own animal products or agricultural output, this is included using procurement (quota) prices. Food consumption is broken down into staple and non-staple, where staple food includes corn, wheat, rice and beans and non-staple food includes vegetables, meat, seafood, oil, sugar, wine and condiments. About 56% of the value of food consumption is on these non-staple items.

Agricultural income includes products that the household consumes; they are asked to estimate the value of based on the quota price of the products. The average per capita agricultural income in the sample (in the base year) is 2847 RMB per year. This is about USD$356 at market exchange

log of the variable plus one. The results are all very similar if we use the inverse hyperbolic sine instead of the log.

[18] Section 4.2 uses two other Chinese data sets that provide information on the origin and destination provinces of migrants to demonstrate the validity of the identification strategy.

[19] The corresponding figure for the 2010-2012 waves of the NFP is 45%.

[20] While partial-household migration is relatively common, total-household migration, as measured by attrition from our dataset, is very rare at 0.81% per year. If an entire family migrates in this period, they risk losing their land in the village, which may explain why this is a rare event.

[21] This figure is likely to be a significant underestimate of true consumption because the survey used quota prices (which are much lower than market prices) to value agricultural products that are both produced and consumed by the household. See Benjamin et al. (2005) for a discussion of this issue.

rates. Agricultural income makes up about 46% of the total income earned by these households.[22] Non-agricultural income averages 3346 RMB per year.

Agricultural labor input is measured as the number of days that all of the members of the household and hired labor work in agricultural production divided by the number of workers in the household. The average for the sample is 167 person-days. The number of household laborers averages 2.4 workers in the family. This measure does not include the migrant if the household has a migrant who is away from home at the time of the survey.

Non-productive assets are durable goods that are not primarily used for production, including bicycles, furniture and electronics.[23] Non-productive assets do not include the value of real estate. The average household owns about 1080 RMB of non-productive assets per worker. Productive assets refer to durable goods that are used primarily for production. Productive assets are divided into agricultural assets and industrial assets. Agricultural assets includes the value of agricultural animals and medium and large farm equipment. The average household owns 470 RMB of agricultural assets per worker. Industrial assets are assets that are used for industrial production; an example of this is a cotton gin. On average, households have 98 RMB of industrial assets per worker.

We denote by "fruits" a bundle of items, including orchard fruits, pods and tea.[24] About 22% of households spent positive labor days on orchard fruits, pods and tea in the base year. Conditional on participating in these production activities, the number of days per worker that are spent on fruits is 29 days per year. Unconditional on participation, this number drops to 5.6 days per worker per year: at baseline, investment in this activity is low. Income from fruits includes earned income as well as the estimated procurement value of fruit products consumed by the household. Households earn an average of 120 RMB per worker per year in this category.

Households spend more days working in animal husbandry than in fruits. A majority (71%) of households worked in animal husbandry in their first year in the survey. Conditional on participation in these activities, households spend an average of 56 days per worker in this category. Unconditional on participation, the corresponding average is 42 days. Again, the procurement value of any products consumed by the household are included in the measure of income. Corresponding to the patterns in labor, households earn substantially more on average from animal husbandry than from fruits, pods and tea; they earned 699 RMB per worker from animal husbandry. Nonetheless, in an absolute sense investment in this activity–which, like fruits, is risky–is low in the base period.

Finally, education in an indicator variable for whether the head of household has a middle

[22] This includes income from crops and plantation as well as from animal husbandry and fruits, pods and tea.
[23] To be included, a durable asset must have at least two years of life and be valued above 50 RMB, or about USD$6.
[24] As we show in Table 12, this activity as well as animal husbandry are relatively risky.

school education or higher. Approximately half (47.5%) of household heads have at least this level of education.

4.2 Sent-down youth flows

For data on inter-province sent-down flows, we use data in the publication, "Statistics on sent-down youth in China," compiled by the Sent-down Youth Office of the State Council of China in 1983. We collect inter-province sent-down information for all of the provinces in our sample. We use the total number of people sent from one province to another across time: in other words, our measure of SDY flows is time-invariant. Appendix Table A.2 shows the total sent-down youth flows to the provinces in the NFP dataset aggregated over the sent-down youth period.

Our identification strategy relies on the idea that historical migration flows associated with the temporary relocation of urban youth to rural areas created lasting linkages across provinces. These lasting linkages can occur for several reasons, including the maintenance of networks created during the sent-down period and the transmission of information or attitudes about particular provinces. In this section, we use aggregated data to examine whether the sent-down flows between provinces predict interprovincial migration several decades later.

We analyze this using two separate data sets. One is the 2002 China Household Income Project (CHIP). The advantage of this wave of the CHIP data is that it deliberately targets rural-to-urban migrants. Of the 5327 households surveyed, 1674 have individuals who have moved across provinces. The survey was conducted in 12 provinces, and interprovincial migrants are from 29 different origin provinces. The second data set we use is the NFP over the waves 2010 to 2012.[25] Unlike the main NFP data set used in this analysis that spans 1995 to 2002, the three years from 2010 to 2012 include information on the destination province of the migrant.[26]

We estimate the following equation:

$$Y_{ps} = \beta_0 + \beta_1 X_{sp} + \delta_s + \gamma_p + \epsilon_{sp} \tag{1}$$

where each observation is a province s-province p pair such that $s \neq p$.[27] The dependent variable, Y_{ps},

[25] We were able to use a representative sub-sample of 45,960 person-year observations to calculate aggregate migration flows. We see 4192 cross-province migrants (and their corresponding origins and destinations) and 4993 intra-province migrants.

[26] The NFP survey is quite different in the 2010-2012 waves as compared to 1995-2002. The later waves do not include all of the variables used in the main analysis and for topics that do overlap, the phrasing of the question can be quite different. Moreover, the full microdata are not readily available to outside researchers yet. For these reasons, we do not use these waves in our main analysis.

[27] Within province analyses are not possible because the aggregate data on sent-down flows do not include data on

is a measure of the migration flows from province p to province s; this is aggregated to the province-pair level from the household data sets as the logarithm of one plus the total number of migrants from p to s. The key regressor is X_{sp}, a measure of the historical aggregate flows of sent-down youth from province s to province p based on data published by the Sent-down Youth Office of the State Council of China (1983). X_{sp} is the logarithm of the total number of youths sent from s to p (plus one). The regressions also include fixed effects for origin and destination provinces, which control for the general attractiveness of a destination or the general migration propensity of individuals from an origin. The standard errors are clustered two-ways at both the origin province and at the destination province to allow for arbitrary correlations of the error term within both origin and destination provinces.

The results are displayed in Table 2. Column 1 suggests that each additional 10,000 people that the government sent down from s to p in the 1960s and 1970s increases migration flows in the reverse direction by 11% in 2002 as measured in the CHIP data. The corresponding estimate in the NFP 2010-2012 data shown in column 2 is a 5.7% increase. Both estimates are significant at the 5% level or higher. These results are supportive of the idea that the program of sent-down youth created lasting inter-province linkages.

4.3 *Hukou* reforms

For our main analysis, we focus on *hukou* reforms that occur in the provinces from which the sent-down youth originated. To compile data on the timing of each province's *hukou* reforms, we used an algorithm with specific combinations of keywords to methodically search through several databases that cover local laws and regulations in China. We focused on city-level reforms that would affect migrants from rural areas.[28] See Appendix A for more details on our algorithm for coding these reforms. Chinalawinfo, maintained by the Law School of Peking University, provides the most comprehensive coverage of local laws and regulations, covering about half a million local laws and regulations in China since 1949. We cross-checked two other main data sources for local laws and regulation rules in China, Law-lib and Law-star, for completeness. Table A.1 details the reforms.

To check the quality of our *hukou* coding strategy, we cross-check our coding of the reforms by comparing the results of our algorithm with reforms identified in Sun, Bai and Xie (2011). They code the *hukou* reforms using *Baidu* (a Chinese search engine similar to Google), and one of the databases that we use, Chinalawinfo. Over the period of our main analysis, 1995 to 2002, and for the provinces that overlap between their coding and ours, our algorithm yields 100% of the provincial reforms that

intra-province relocations.

[28] Thus reforms that targeted a very narrow population, such as individuals with PhDs, were omitted.

they identify. We find eight additional reforms; in other words, their algorithm for coding the reforms yields 74% of the ones that we identify.

Our identification strategy relies on the assumption that the *hukou* reforms facilitated the migration of individuals into the reforming provinces. We exploit the NFP 2010-2012 data to examine whether a *hukou* reform in province s corresponds to an increase in migrants whose destination is province s.[29] More specifically, we estimate:

$$flows_{st} = \beta_0 + \beta_1 ReformTally_{st} + \delta_{sp} + \delta_t + \epsilon_{sp} \tag{2}$$

where $flows_{st}$ is the logarithm of the total number of migrants arriving in province s in year t. The variable $ReformTally_{st}$ is the accumulated number of reforms in province s by year t. For example, if a province has a *hukou* reform in 2010 and another in 2011, for that province, $ReformTally_{st}$ equals 1 in 2010, and 2 in 2011 and 2012. We also include fixed effects for each origin-destination province pair and year fixed effects. We cluster the standard errors at the origin-destination province pair level.

The results are presented in Table 3 where the dependent variable is the logarithm of the number of migrants arriving from other provinces in column 1, and the total number of migrants including intra-provincial migration in column 2. For both outcomes, each additional reform increases migration flows into a province by about 32%, implying that *hukou* reforms are an important determinant of migration into and within provinces. These estimates are significant at the 10% level or better.

4.3.1 Excludability of the *Hukou* Reforms

We examine whether the timing of the *hukou* reforms may be capturing other characteristics of the provinces linked through the SDY program rather than the relaxation of requirements for migration in Panel A of Table 4. The estimates show that characteristics of province p are not related to the timing of *hukou* reforms in provinces, denoted by s, that are linked to p via SDY flows. More specifically, Panel A shows that having a reform in the preceding year in province s is not significantly related in the level or growth rate of GDP per capita in province p.

An alternative strategy would be to use *hukou* reforms in a household's own province to examine intra-province, rural-to-urban migration patterns. However, Panel B of Table 4 suggests that the decision of when to pass a reform in a province moves significantly with GDP per capita in that province. This is perhaps not surprising; areas with more economic activity may have a greater demand for labor in urban areas and this motivates the passing of *hukou* reforms within the province.

[29] We cannot use the 1995-2002 NFP data to do this because we do not observe the destination of migrants.

5 Identification and estimation

Our identification isolates exogenous variation in access to migration from province p using *hukou* reforms in provinces s which had previously sent SDY to province p. We define f_{sp} to be the historical level of SDY flows from urban areas in province s to rural areas in province p. Note that we are focusing on *hukou* reforms that occur in province s. We define h_{st} as an indicator for a *hukou* reform at time t in province s. The variable Z represents an interaction between the historical SDY flows from s to p and the contemporaneous *hukou* reforms in provinces s. In other words, the main source identifying variation is defined as:

$$Z_{pt} = \sum_{s} f_{sp} h_{st}. \tag{3}$$

Thus Z_{pt} is a cumulative weighted sum of all the *hukou* reforms that have occurred in provinces linked to p via SDY flows up until t, where the weights are the historical SDY flows from the reforming province to p. Consider the simplest case, when there is only one reform in year $n \leq 2002$ (where 2002 is the last year in our main dataset) among the provinces s that are linked by historical flows to p. Then the variable is equal to the quantity of SDY flows from s to p for the period from n to 2002 and 0 for the periods $t < n$. Now consider that case where in period $m > n$, there is a reform in another province s' that is also linked by SDY flows to p. In this scenario, in periods m and thereafter, the value of Z is the sum of the SDY flows from provinces s and s'. The key idea is that a reform in province s has a larger effect on the decision of households in province p to migrate to s if there were greater flows of SDYs, and hence stronger historical ties, between s and p.

Because our identification exploits the interaction of time variation resulting from *hukou* reforms in SDY-sending provinces and cross-sectional variation resulting from the fact that SDY-recipient provinces received SDY in different magnitudes and from different destinations, we are able to include both province- and year-fixed effects in our estimates. These allow us to flexibly control for many potential confounds. For instance, time-invariant ties between an SDY recipient province and its sending province(s) will be absorbed into the fixed effect for the recipient province.[30] If a *hukou* reform in a particular province makes migration generally more attractive to migrants from all destinations, this will be be absorbed by year-fixed effects.

[30] Thus, our identification strategy does not rely on random assignment of SDY to destinations. While we do not need this assumption, the destinations of SDY were determined by which locations were prepared to accept SDY at different points in time and are likely to have been orthogonal to ties between sending and destination province.

5.1 Example: Shanxi

To make the construction of the identifying variation more concrete, we discuss the case of Shanxi, a province in Northwestern China. The SDY flows to Shanxi and *hukou* reforms in the corresponding sending provinces are detailed in Panel A of Table 5.

Shanxi received SDY from Beijing and Tianjin: 41,300 from Beijingi and 7,300 from Tianjin. The reform and SDY interaction for Shanxi, $Z_{Shanxi,t}$ will equal 0 until 1998, when it will take the value 41,300, representing the SDY flows received from the Beijing, which implemented a reform in 1998. No additional reforms are implemented in provinces that sent SDY to Shanxi until 2002, so $Z_{Shanxi,t}$ remains at 41,300 until 2002. In that year Beijing implements another reform, so $Z_{Shanxi,t}$ increases to 82,600 $(41,300 \times 2)$.

Tianjin did not implement any *hukou* reforms over the 1992 to 2002 time period, so the SDY flows from Tianjin to Shanxi do not enter into the construction of our instruments. Any time-invariant effects on Shanxi due to its historical ties with Tianjian will be absorbed into the fixed effect for households in Shanxi.

5.2 Heterogeneity in reforms' impact by requirements

The reforms enacted by provinces vary in the requirements specified to obtain a *hukou* in that province. The characteristics fell into three broad categories: job-based requirements, where the reform stipulated that the worker needed to have a formal urban job, wealth-based requirements, where the reform requires the purchase or rental of property in the urban area, and skill-based requirements, requiring particular skills. A few reforms did not specify particular conditionalities (e.g., the reform simply increased the quota of rural-to-urban conversions without specifying particular groups who were eligible); we code these as "unspecified." The cases where the requirements are unspecified are relatively rare and do not necessarily imply no requirements but that the provincial office may have more discretion in their evaluation of applications. Thus, we can separate the *hukou* reforms that occurred from 1995 to 2002 into three indicator variables, h^j_{st}, where $j \in \{unspecified, job, wealth\}$.[31]

We also make use of household-level characteristics that are likely to affect a household's exposure to the reform. For reforms that have a requirement that the migrant purchases or rents property in the city, we look at whether the household's initial assets in year 1995 were above the median in the data.[32] Households with higher levels of initial assets are more likely to be able to afford the cost of

[31] As we will discuss later, the requirements associated with reforms in the later period are different. Unlike in the 2010-2012 sample, no skill-based reforms occurred in SDY-sending provinces during the period 1995 to 2002.

[32] The assets measure is defined as the value of fixed assets for production, including animals, large-medium sized

renting or purchasing property. For reforms that have a job-related requirement, we look at whether the education of the head of household was above the median in year 1995, since more educated households may be more likely to have a formal job offer. In other words, for $j \in \{job, wealth\}$, we also examine:

$$Z_{ipt}^{j} = m_i^j \times \sum_s f_{sp} h_{st}^j \tag{4}$$

where i denotes the household and m_i is an indicator for whether household i has above the median value of assets or education in the initial period of the data. This exploits the fact that the different types of requirements associated with some reforms creates heterogeneity across households in the likelihood of migration.

6 Reforms' Impact on Migration

We begin by estimating the following equation of the impact of the interaction between *hukou* reforms in province s interacted with SDY links from provinces s to p on migration:

$$migrant_{ipt} = \alpha + \beta Z_{pt} + \gamma_i + \delta_t + \epsilon_{ipt} \tag{5}$$

where $migrant_{ipt}$ is a binary variable for whether the household has a migrant in the past year, γ_i are a household fixed effects, δ_t are year indicators, and ε_{ipt} is the error term, clustered at the province level.[33] This provides the relationship between the reforms interacted with SDY flows and migration. Note that SDY flows are re-scaled by their conditional-on-positive mean so that a one-unit change in the key regressor corresponds to a reform in a sending province that sent the mean amount of SDY to the recipient province.[34]

To test the validity of the variation in Z, we examine the requirements associated with the *hukou* reforms interacted with the corresponding SDY flows:

$$migrant_{ipt} = \alpha + \beta_1 Z_{pt}^{unspecified} + \beta_2 Z_{pt}^{wealth} + \beta_3 Z_{pt}^{job} + \gamma_i + \delta_t + \epsilon_{ipt} \tag{6}$$

wooden and metal farm tools, machinery, industrial equipment, transportation tools, factory sites and other; plus the value of fixed assets for non-productive purposes, including real estate and durable goods.

[33] Using the log transformation or the inverse hyperbolic sine (IHS) of migration days rather than the migration indicator gives very similar first stage results (Appendix Table A.3) as well as second stage results. The inverse hyperbolic sine transformation is $sin^{-1}(x) = ln[x + (x^2 + 1)^{\cdot 5}]$. Its properties are similar to $log(x)$ (Burbidge et al. (1988)), but is defined for all x including zero.

[34] The mean is 9,874, i.e., roughly 10,000 SDY on average were sent to the provinces in our sample.

where the variables are defined by equation 3. Finally, to further test the validity of the identifying variation in Z, we include a triple interaction of the reforms based on wealth and jobs with the baseline assets and education of the household, respectively:

$$migrant_{ipt} = \alpha + \beta_1 Z_{pt}^{unspecified} + \beta_2 m_i^{wealth} \times Z_{ipt}^{wealth} + \beta_3 m_i^{job} \times Z_{ipt}^{job} + \gamma_i + \delta_t + \epsilon_{ipt} \quad (7)$$

where the variables are defined by equation 4.

Table 6 shows the results of these regressions. Column 1 corresponds to equation 5. At a mean level of SDY connections, a reform that relaxed the constraints for an individual to get an urban *hukou* in a place in which a household may have connections from the SDY program increases the probability of migration by 0.6%. This effect is significant at the 1% level.

Column 2 allows the effect of reforms to differ according to the conditions of the reforms. There is no significant effect of a reform with a job-based requirement or no requirement clearly specified on the probability of migration. A reform with a wealth requirement corresponds with a 2.7% increase in the probability of migration, and this estimate is significant at the 5% level.[35]

In column 3, we examine whether households with certain characteristics are more responsive to certain reforms as given by equation 7. If the correlation between migration and reforms is causal, households whose characteristics make them more likely to be eligible for a given reform should be more responsive to that reform. The hypothesis is that households with above-median initial assets should be more responsive to wealth-based reforms, while households with above-median education should be more responsive to job-based reforms. We find that those with high initial assets exhibit a differential migration response of 0.5 percentage points when a wealth-linked reform is implemented (significant at the 1% level). While those with high initial education exhibit a differential and positive migration response when a job-linked reform is implemented, this is not significant at standard levels. Overall, the results of column 3 provide additional support for the idea that the *hukou* reforms are relaxing migration constraints for some households; wealthier households are more likely than others to migrate in response to *hukou* reforms with asset requirements.

[35] As discussed above, in most cases renting an apartment qualifies; i.e. the household need not buy property, and the property may be located in a town peripheral to the city in question. Moreover, we show below that the reforms are associated with significant liquidation of assets, which may in part be used to finance the rental or purchase of peri-urban or urban property.

6.1 Origin-Destination Flows

As discussed before, one limitation of our main dataset is that we do not observe the destination of migrants in that sample. This means that the estimates presented in Table 6 demonstrate that migration from provinces linked by SDY flows increases after reforms in SDP sending provinces, but we cannot test whether migration increases specifically *to* the province where the reform occurred.

Using the 2010-2012 NFP data, which contains information on migrants' origin and destination, we can test whether *hukou* reforms in a given province s are associated with a particular migration response from migrants originating in a province p that received SDY from s in the past. Thus, over a sample where each observation is a origin-destination-year, we estimate:

$$flows_{spt} = \beta_0 + \beta_1 ReformTally_{st} + \beta_2 ReformTally_{st} \times SDY_{sp} + \delta_{sp} + \delta_t + \epsilon_{spt} \tag{8}$$

where $flows_{spt}$ is the logarithm of the total number of migrants arriving in province s from p in year t. $ReformTally_{st}$ is the accumulated number of reforms that occurred between the years 2010 to 2012 in province s by year t. We also include an interaction between $Reform_{st}$ and SDY_{sp}, the historical SDY flows from s to p. The regression also includes origin-destination fixed effects and year fixed effects. We cluster the standard errors at the origin-destination province pair level.

Following equation 6, we also allow the effects of the *hukou* reforms to vary by their requirements. The requirements for the reforms in this later period are somewhat different. Three types of reforms occur over the 2010-2012 period in provinces that sent SDY to NFP provinces: unspecified; skill-based; and those requiring both a job and the purchase or rent of property, which we call "job and wealth."

The results are presented in Table 7 where the dependent variable in is the logarithm of the number of migrants arriving from province p to province s in year t. Column 1 shows that, while *hukou* reforms increase in-migration from provinces without historical SDY ties by about 25%, each additional 10,000 SDY who were sent from s to p increase the response by a further 42%. These estimates are significant at the 10% and the 1% level, respectively. That is, the response to *hukou* reforms is significantly greater for migrants coming from provinces with historical ties to the reforming province. In column 2, we examine whether the effect is differential by reform type. In the absence of SDY flows, none of the reform types is significantly predictive of inter-provincial flows, though this may be an issue of power. All three reform types are associated with differentially higher responses from provinces that received SDY flows from the reforming province (significant at 1%), indicating that all three types of reforms are particularly attractive to migrants from a province with historical ties.

6.2 Robustness Check: Distance and SDY Flows

One concern is that the variation in the sent-down youth flows is correlated with the distance between provinces. If the cost of moving urban youth to the rural countryside was a key determinant of of the rural location to which sent-down youth were assigned, then the greatest flows would also minimize the distances between provinces.[36] To examine the possibility that variation in sent-down flows is simply reflecting distances, we include the interaction between distance and the *hukou* reforms in the first stage regression (equation 5).

We measure the distances between provinces using three measures of the distance between the provincial capitals. One measure is great circle distance (collected from Google Maps), which is essentially a measure of shortest (i.e., "as the crow flies") distance between two points. The second measure is road distance (based Google maps in 2015). The final measure is based on road distance as measured by Poncet (2003). The three measures are highly correlated with correlation coefficients exceeding 97%.

The results are presented in Table 8. Using the NFP data from 1995 to 202, the sample is limited to province-pairs for which there are positive SDY flows.[37] The coefficient on the interaction between the distances between provinces and the *hukou* reforms is positive and significant with all three measures of distance. However, the impact of the interaction between *hukou* reforms and the sent-down flows remains positive and significant with the inclusion of the distance controls. The results provide reassurance that variation in the sent-down youth flows is not simply capturing inter-province distances.

7 Main Results

To examine the impact of access to migration on the consumption, income and investment of non-migrating household members, we estimate specifications of the form:

$$y_{ipt} = \alpha + \beta Z_{pt} + \gamma_i + \delta_t + \epsilon_{ipt} \tag{9}$$

where y_{ipt} is an outcome of interest, as before γ_i and δ_t are household- and year-fixed effects, respectively, and Z_{pt} is the reform tally weighted by SDY flows.[38]

[36] It seems unlikely that transportation costs were a primary determinant of where people were sent. As shown in Figure A.1, the distances that individuals were moved were often quite large.

[37] Thus, column 1 of Table 8 is the sub-sample that corresponds to the first column of Table 6.

[38] We trim the bottom and top 1% of outliers of the dependent variables. The results are all very similar without trimming the outliers. These are available upon request from the authors.

We focus on these reduced-form estimates, rather than instrumental variables estimates, because there is the potential for effects stemming from *hukou* reforms that operate through the expectation of migrating in the future. For example, a household anticipating the ability to use migration as an ex-post risk smoothing activity in the future (as in Morten 2013) might begin to reduce precautionary buffer stocks or increase risky, high-return investments in advance of actually sending a migrant. There could also be knowledge spillovers from migrants to other households in their community. There may also may be effects of sending a migrant that persist after the migrant has returned, due, e.g. to changes in wealth or information. Such effects would invalidate using the reforms as instruments for contemporaneous migration as the exclusion restriction would fail. The reduced form effects will capture expectation and spillover effects as well as the direct effects of migration; these reduced form effects capture the effect of reduced migration restrictions and increased access to migration.

7.1 Consumption

We begin by considering the impact of increased access to migration[39] on the level and variability of consumption. Panel A of Table 9 examines effects on the log consumption. Column 1 indicates that total consumption increases by 0.8 percent in response to increased access to migration. However, the effect is not significant. Food consumption also increases by 0.8 percent, and this is statistically significant at the 5% level (column 2). Non-staple food consumption increases by a similar magnitude, however the effect is is not significant (column 3).

For risk-averse households, the level of consumption is not a sufficient statistic to describe the effect on welfare: households also care about the variability of consumption. Panel B of Table 9 shows effects on consumption variability, defined as the absolute change relative to the previous year, $|log(c_{it}) - log(c_{i,t-1})|$. The variability of total log consumption falls, but the effect is not significant. However, when we turn to log food consumption (a category of consumption that households may particularly value smoothing), there is a significant reduction in variability associated with access to migration: year-to-year consumption changes are reduced in absolute magnitude by 0.6 percent, and this estimate is significant at the 1% level. Year-to-year consumption changes for non-staple food are reduced by 0.6 percent, an estimate that is also significant at the 1% level.

The ability to migrate ex post and/or receive remittances from migrants may be especially important in response to significant negative shocks, when marginal utility is particularly high. In Panel C of Table 9, we examine whether access to migration reduces the likelihood of large consumption

[39] Throughout, the coefficient estimates the effect of one additional reform in a s province that sent the mean amount of SDY to province p; however for ease of exposition we refer to this as the effect of "increased access to migration."

drops (greater than 20%). Column 1 shows that large drop in total consumption is 0.4% less likely when households have increased access to migration. Column 2 shows that a large drop in food consumption is 0.9% less likely, and column 3 shows that a large drop in non-staple food is 0.6% less likely. The reductions in large consumption drops are all significant at 1%.

7.2 Income, labor and assets

The positive effects on per-capita consumption levels, and negative effects on consumption variation and risk of large consumption drops are consistent with non-migrants receiving transfers from migrants. However, the effects could also be coming through changes in the level of income earned by non-migrants or changes in household composition. Table 10 examines these outcomes. Column 1 reports the effect of access to migration on log agricultural income: the effect is small in magnitude and not significantly different from zero. Column 2 shows a similar small and insignificant effect on log non-agricultural income. These estimates allow us to rule out a drop in total income of more than 0.5% with 95% confidence, which is informative about the marginal return to household assets, a point we return to below.

Column 3 examines the effect of access to migration on agricultural labor inputs, defined as the number of days that all of the members of the household and hired labor work in agricultural production divided by the number of workers in the household. This is a measure of the intensity of labor inputs, scaled by the worker population of the remaining household. The magnitude of the estimated effect is small (0.1%) and not significant. Finally, column 4 tests whether migration has an effect on the number of household laborers, excluding those working as migrants, in levels. There is a small negative, but insignificant, effect associated with access to migration.

Table 11 examines effects of migration opportunities on assets. We examine non-productive assets (such as televisions and bicycles), agricultural assets (such as animals and farm equipment) and non-agricultural assets (such as a cotton gin). All three categories of assets exhibit significant declines. Non-productive assets fall by 2.2%, agricultural assets fall by 2.4% and non-agricultural assets fall by 1.6%, all significant at the 1% level. The significant drop in productive assets, combined with the fact that we do not observe a corresponding fall in income, suggest that the liquidated assets were earning a low or zero return. We do not see an increase in labor use, which suggests that the fall in assets is not explained by a shift away from capital-intensive activities towards labor-intensive activities. Thus, households may be holding these low-return assets as buffer stocks (Deaton 1991, Anagol, Etang and Karlan 2014), which do not contribute significantly to household productivity but could

be liquidated in response to a negative shock that could not otherwise be smoothed. Households may then optimally liquidate these assets when they gain access to the insurance and/or liquidity provided by access to migration. Alternatively, the fall in assets may be a cause rather than a consequence of migration; migration may be costly and financed by the liquidation of low-yielding assets. We next consider whether some of the proceeds from the liquidated low-return assets may be used to increase investment in high-risk, high-return activities.

7.3 Investment in risky activities

A corollary of households receiving better access to smoothing strategies through insurance or liquidity with increased access to migration opportunities is that the household can move along the risk-return frontier to invest in assets and activities that have a higher expected return, but are riskier. We examine two high-risk activities: growing fruits (orchard fruits, pods and tea), and raising animals. Tea and orchard fruits are typically cash crops (Qian 2008), subject to fluctuations in the market price. Animals can also be expected *a priori* to be risky, as they are frequently sold at variable market prices and are subject to disease risk (Cai et al. forthcoming).

We also directly confirm in our NFP data that these activities are high risk; this implies that they must yield high returns to be held in the household portfolio alongside lower-risk investments.[40] Table 12 shows the coefficient of variation (CV) for total agricultural income, non-agricultural income, fruit income and animal income. Panel A shows unconditional CVs and Panel B shows within-household CVs.[41] Unconditionally, fruit and animal income have CVs of 6.2 and 6.7, respectively, compared to 1.3 for total agricultural income and 3.4 for non-agricultural income. Looking within households, the CVs fall because cross-household variation is removed, but the pattern remains the same: fruit income has a CV of 1.9 and animal income a CV of 1.2, while for total agricultural income the figure is 0.64 and for non-agricultural income it is 0.76. Thus, both measures suggest that there is at least twice at much income volatility in the fruit and the animal production categories as compared with total agricultural production and non-agricultural activities.

Table 13 shows that households increase their investment in these high-risk activities. We observe investment of labor in the form of person-days spent working on each type of activity. Because both the extensive margin (moving into or out of an activity) and the intensive margin (scaling investment up or

[40] We cannot directly estimate returns for these activities because we do not observe capital for animals and fruits separately.

[41] Whether the cross-sectional or the within-household estimates is more informative for the amount of risk households face depends on whether persistent variations across households are ex ante forecastable. If not, these represent risk and the unconditional CV is informative, while if persistent variations are forecastable, the within-household CV is more informative (see Ligon 2011).

down) may be important, we consider each separately, and examine a composite measure combining both margins. Column 1 shows that migration leads to a significant increase of 0.7 percent in the fraction of households reporting positive days worked in animal husbandry, significant at the 1% level.

Column 2 shows that, among the sample with positive days worked in animal husbandry, the log number of days worked increases by 0.013. This implies a 1.3% increase in days worked on the intensive margin (significant at the 1% level). Combining the extensive and intensive margin effects, column 3 shows that $log(days + 1)$ increases significantly, corresponding to a 4.8% increase in days worked in animal husbandry (also significant at the 1% level).

Columns 4 through 6 show the corresponding results for fruits. The probability of working positive days in fruits increases by 0.6 percentage points, and this is significant at the 5% level. The effect on the intensive margin is also positive and significant, corresponding to a 9.9% increase in days worked in fruit cultivation among households already cultivating fruit. When the two margins are combined there is a significant effect on $log(days + 1)$, corresponding to a 2.3% increase in days worked.

Finally, in Table 14, we examine the effect of migration on income from animal husbandry and fruits. We consider $log(income + 1)$ to capture both intensive and extensive margins. Consistent with the positive effects on days worked in animal husbandry, we see a significant increases in income from animal husbandry of 7.1% in column 1. The effect on income from fruits in column 2 is 3.0%, also significant at the 5% level. Thus, both investment in and income from high-risk activities increase due to access to migration, consistent with households reallocating their portfolios toward these activities in response to the insurance provided by the option of sending migrants.

7.4 Labor market frictions as an alternative explanation

Another possible mechanism through which having a migrant affects the production decision of households is through the loss of a laborer. This may be important if rural labor markets are incomplete and households cannot hire labor to fully replace the lost labor supply of the migrant. However, the fact that we do not see a significant drop in labor used in households with a migrant (Table 10, columns 4 and 5) suggests that this mechanism is not first order in our setting. Of course, there is the possibility that the units of labor used (in worker days or in workers) doesn't reflect the fact that the labor that replaces the migrant is different in terms of quality if not quantity. However, the lack of a significant drop in earnings corresponding to migration (Table 10, columns 1 and 2) suggests that the labor quality is not much lower.

7.5 Instrumental variables and OLS estimates

Estimates of the treatment effects of the relaxation of the *hukou* constraints in areas connected through the SDY program for households in which an individual migrates may also be of interest. We present instrumental variables estimates of the form:

$$y_{ipt} = \alpha + \beta migrant_{ipt} + \gamma_i + \delta_t + \epsilon_{ipt} \tag{10}$$

where $migrant_{ipt}$, the indicator for sending a migrant, is instrumented with Z_{pt}. This relies on the assumption that all of the effects of the *hukou* reforms in areas with SDY connections operate through the migration of a household member. As discussed above, this assumption will fail if anticipation or spillover effects are present; as such the IV estimates are likely to be upward-biased to the extent they attribute all effects of migration access to household-year observations when a household sends a migrant. The corresponding estimates are presented in Appendix Tables A.4-A.8. As expected, the coefficients are larger than in magnitude than the reduced form estimates, but the sign and significance are quite similar.

Given that selection on unobservables into migration is often a concern, we also compare our IV estimates of the effect of migration obtained from estimating equation 10 with the corresponding OLS estimates obtained by including migration as an exogenous regressor in the regression. Note that the specifications contain household fixed effects, so any bias will be due to time-varying unobservables. The OLS results are presented in Appendix Tables A.9 through A.13. The OLS effects are broadly of similar sign to the IV estimates, but much smaller in magnitude and in some cases not significant. This pattern of downward bias in the OLS results may suggest that households migrate in response to negative shocks in income and consumption (as in Morten 2013).[42]

8 Discussion and conclusion

Our results suggest that, on net, increased access to internal migration is beneficial for rural households. Consumption increases and becomes less variable. The findings rule out a negative wealth effect from having a migrant and rule out the possibility that the total consumption risk a household faces increases as a a result of having a migrant. Furthermore, the results suggest that low-yielding assets

[42] Another possible explanation is classical measurement error in migrant status. The OLS estimates will also be downward-biased to the extent that positive spillovers or expectation effects are present, since some household-year observations in which the household does not send a migrant will be "indirectly treated" (Angelucci and De Giorgi 2009).

are liquidated. The proceeds of the liquidation of the assets, potentially combined with net positive transfers from migrants, serve to increase households' cash on hand. The increased cash on hand may fund the observed increase in food consumption and the observed increase in investment in high-risk, high-return assets. An alternative interpretation of the liquidation of low-yielding assets is that they were used to finance the costly migration of a household member.

The finding of an increase in consumption following migration, an event that increases the ability of households to smooth their consumption, echoes the results of Kaboski and Townsend (2011) who study the response of Thai households to increased access to formal credit. These findings contrast with de Brauw and Giles (2012), who do not find evidence of liquidation of buffer stock assets.[43] While they find, as we do, increases in consumption associated with migration, they find income effects that are as large or larger than consumption effects. They also do not find robust evidence of effects on productive investment. One possible explanation for the diverging findings lies in the different sources of variation. de Brauw and Giles exploit the timing of access to national identification cards which make it easier for rural residents to temporarily work in urban areas. It is likely that the identification card instrument induces more short-distance migration whereas the variation we use increases access to long-distance, inter-provincial migration. Shorter migration distances reduce the insurance value, as the shocks will be more correlated (Rosenzweig and Stark 1989).

Our finding that access to improved consumption smoothing increases investment in risky activities echoes the literature on income smoothing in developing countries (e.g., Rosenzweig and Binswanger (1993), Karlan et al. (2014), Carter et al. (2015), Cole et al. (2014), and Emerick et al. (2014)). Moreover, the shock to consumption smoothing that we study here, internal migration, is notable in that there appears to be large demand for rural-to-urban migration, whereas other candidate smoothing policies such as crop or weather insurance, formal savings and credit often appear to suffer from low demand (Banerjee et al. (2015), Cole et al. (2013), Dupas et al. (2014)). Nonetheless, previous evidence suggests that temporary, partial-household, internal migration appears to be sub-optimally low (Bryan et al. (2014)). In our particular setting, the sub-optimal level of rural-to-urban migration may reflect government restrictions on mobility in China, including the *hukou* policy. Our results suggest that efforts to promote internal migration are likely to benefit agricultural households.

[43] They examine the impact of migration in the Chinese RCRE data for 1986 to 2002 for 8 provinces: Anhui, Jilin, Jiangsu, Henan, Hunan, Shanxi, Sichuan and Zhejiang.

A *Hukou* Reform Coding

We collect information on *hukou* reforms from several databases, each of which covers local and national laws, rules and regulations in China. We search the following electronic databases that have information about local and national laws, rules and regulations: Xihu Law Library (www.law-lib.com), Peking University Yinghua Technology PKULAW (www.pkulaw.cn), Beijing Zhongtian Nuoshida Technology Company (www.law-star.com) and Zhengbao Online Education Company's database (www.chinalawedu.com).

We use the following algorithm in each of the four databases to compile our data on *hukou* reforms across provinces and time. We used all combinations of the following two keywords for *hukou* and reform or administration in Chinese and searched the whole body (not just the title) of these records. The words for the *hukou* system used are *hukou* and *huji*. The words for reform or administration are: *gaige* and *guanli*

We then examine the written description of the laws and regulations carefully to determine whether the record refers to a *hukou* reform that was issued for the first time. We focus on reforms that apply to a wide group of individuals and are likely to be relevant for the rural households in our sample. Thus, we exclude any policies that only allow a very restricted group of individuals to obtain a new *hukou*. If the document refers to a change that only targets PhDs, PhDs from Western universities or owners of very high asset firms, we exclude these from our coding.[44] In some cases, the local government issued documents that discuss general principles of *hukou* reforms without implementing actual reform measures. These are also excluded from our analyses.[45]

[44]For example, in 2002, the city of Beijing city issued a policy document, titled "A notice on four measures to implement ¡rules on opening further to domestic and further developing Beijing economy", that allows senior managers of large state-owned business groups and firm owners who invested at least 30 million RMB in Beijing to apply for Beijing *hukou*.

[45]For example, Sichuan provincial government issued a document in 1998 called "A note on solving several important problems in the Hukou system." The document indicates that Sichuan provincial government was thinking of doing some *hukou* policy experiment in a few cities. However, the document doesn't specify which places and when these experiments would be implemented.

References

(1983): *Statistics on Sent-down Youths in China*, Sent-down Youth Office of the State Council of China, Beijing.

Amuedo-Dorantes, C. and S. Pozo (2006): "Migration, remittances, and male and female employment patterns," *American Economic Review*, 222–226.

Anagol, S., A. Etang, and D. Karlan (2014): "Continued Existence of Cows Disproves Central Tenets of Capitalism?" Tech. rep., Working paper.

Angelucci, M. and G. De Giorgi (2009): "Indirect Effects of an Aid Program: How Do Cash Transfers Affect Ineligibles' Consumption?" *The American Economic Review*, 486–508.

Antman, F. M. (2012): "Gender, educational attainment, and the impact of parental migration on children left behind," *Journal of Population Economics*, 25, 1187–1214.

Banerjee, A., E. Duflo, R. Glennerster, and C. Kinnan (2010): "The miracle of microfinance? Evidence from a randomized evaluation," Centre for Micro Finance working paper.

Banerjee, A., D. Karlan, and J. Zinman (2015): "Six Randomized Evaluations of Microcredit: Introduction and Further Steps," *American Economic Journal: Applied Economics*, 7, 1–21.

Bazzi, S., A. Gaduh, A. Rothenberg, and M. Wong (2014): "Skill Transferability, Migration, and Development: Evidence from Population Resettlement in Indonesia," .

Beegle, K., J. deWeerdt, and S. Dercon (2011): "Migration and economic mobility in Tanzania: Evidence from a tracking survey," *Review of Economics and Statistics*, 93, 1010–1033.

Beijing Lawstar Tech Limited Company (2011): "China Local Law Library," .

Benjamin, D., L. Brandt, and J. Giles (2005): "The evolution of income inequality in rural China," *Economic Development and Cultural Change*, 53, 769–824.

Bernstein, T. P. (1977): "Up to the mountains and down to the villages: The transfer of youth from urban to rural China." .

Bonnin, M. (2013): *The lost generation: The rustication of Chinese youth (1968-1980)*, Chinese University of Hong Kong.

Bosker, M., S. Brakman, H. Garretsen, and M. Schramm (2012): "Relaxing Hukou: Increased labor mobility and Chinas economic geography," *Journal of Urban Economics*, 72, 252–266.

Bryan, G., S. Chowdhury, and A. M. Mobarak (2014): "Underinvestment in a profitable technology: The case of seasonal migration in Bangladesh," *Econometrica*, 82, 1671–1748.

Burbidge, J. B., L. Magee, and A. L. Robb (1988): "Alternative transformations to handle extreme values of the dependent variable," *Journal of the American Statistical Association*, 83, 123–127.

Burchardi, K. B. and T. A. Hassan (2013): "The Economic Impact of Social Ties: Evidence from German Reunification," *The Quarterly Journal of Economics*, 128, 1219–1271.

Cai, H., Y. Chen, H. Fang, and L.-A. Zhou (forthcoming): "The effect of microinsurance on economic activities: evidence from a randomized field experiment," *Review of Economics and Statistics*.

Carter, M. R., R. Laajaj, and D. Yang (2015): "Raising Returns, Managing Risk: A Randomized Experiment on Combining Input Subsidies with Financial Services Interventions," .

Chan, K. and L. Zhang (1999): "The Hukou system and rural-urban migration in China: Processes and changes," *China Quarterly*, 818–855.

Clemens, M. (2010): "The Roots of Global Wage Gaps: Evidence from Randomized Processing of U.S. Visas," Center for Global Development working paper 212.

Cole, S., X. Giné, J. Tobacman, R. Townsend, P. Topalova, and J. Vickery (2013): "Barriers to household risk management: evidence from India," *American Economic Journal. Applied Economics*, 5, 104.

Cole, S., X. Giné, and J. Vickery (2014): "How does risk management influence production decisions? Evidence from a Field Experiment," HBS WP.

De Brauw, A. and J. Giles (2012): "Migrant labor markets and the welfare of rural households in the developing world: Evidence from China," Working Paper.

Deaton, A. (1991): "Saving and Liquidity Constraints," *Econometrica*, 59, 1221–1248.

deWeerdt, J. and K. Hirvonen (2012): "Risk sharing and migration in Tanzania," .

Dupas, P., S. Green, A. Keats, and J. Robinson (2014): "Challenges in banking the rural poor: Evidence from Kenya's western province," in *African Successes: Modernization and Development*, University of Chicago Press.

Edwards, A. C. and M. Ureta (2003): "International migration, remittances, and schooling: Evidence from El Salvador," *Journal of Development Economics*, 72, 429–461.

Emerick, K., A. de Janvry, E. Sadoulet, and M. H. Dar (2014): "Risk and the modernization of agriculture," Mimeo.

Fan, Y. (2015): "Does Adversity Affect Long-Term Consumption and Financial Behaviour? Evidence from China's Rustication Programme," LSE working paper.

Funkhouser, E. (1992): "Migration from Nicaragua: Some recent evidence," *World Development*, 20, 1209–1218.

Gibson, J., D. McKenzie, and S. Stillman (2011): "The impacts of international migration on remaining household members: Omnibus results from a migration lottery program," *Review of Economics and Statistics*, 93, 1297–1318.

Giles, J. (2006): "Is life more risky in the open? Household risk-coping and the opening of China's labor markets," *Journal of Development Economics*, 81, 25–60.

Giles, J. and K. Yoo (2007): "Precautionary behavior, migrant networks, and household consumption decisions: An empirical analysis using household panel data from rural China," *Review of Economics and Statistics*, 89, 534–551.

Gu, H. (2009): *Chinese Educated City Youth: The Whole Story [Zhongguo Zhishi Qingnian Shang-Shan Xiaxiang Shimo]*, People's Daily Publishing House.

Gu, S., ed. (1997): *The origins and consequences of Sending-down Youths in China*, China Procuratorial Press, Beijing.

Hangzhou Fatu Tech Limited Company (2011): "Legal Star and Regulations Database," .

Hanson, G. H., R. Robertson, and A. Spilimbergo (2002): "Does border enforcement protect US workers from illegal immigration?" *Review of Economics and Statistics*, 84, 73–92.

Hanson, G. H. and C. Woodruff (2003): "Emigration and educational attainment in Mexico," Tech. rep.

Hildebrandt, N., D. J. McKenzie, G. Esquivel, and E. Schargrodsky (2005): "The effects of migration on child health in Mexico [with comments]," *Economia*, 257–289.

Joseph, T., Y. Nyarko, and S.-Y. Wang (2014): "Asymmetric Information and Remittances: Evidence from Matched Administrative Data," *NBER Working paper*.

Kaboski, J. P. and R. M. Townsend (2011): "A Structural Evaluation of a Large-Scale Quasi-Experimental Microfinance Initiative," *Econometrica*, 79, 1357–1406.

Karlan, D., R. Osei, I. Osei-Akoto, and C. Udry (2014): "Agricultural Decisions after Relaxing Credit and Risk Constraints," *The Quarterly Journal of Economics*, 129, 597–652.

Law School of Peking University (2011): "Chinalawinfo - legal retrieval system," .

Li, H., M. Rosenzweig, and J. Zhang (2010): "Altruism, Favoritism, and Guilt in the Allocation of Family Resources: Sophie's Choice in Mao's Mass Send-Down Movement," *Journal of Political Economy*, 1–38.

Liang, Z. (2012): "Recent Migration Trends in China: Geographic and Demographic Aspects and Development Implications," in *UN Expert Group Meeting on New Trends in Migration: Demographic Aspects*.

Ligon, E. (2011): "Measuring Risk by Looking at Changes in Inequality: Vulnerability in Ecuador," Mimeo.

McKenzie, D. and H. Rapoport (2007): "Network effects and the dynamics of migration and inequality: Theory and evidence from Mexico," *Journal of Development Economics*, 84, 1–24.

——— (2011): "Can migration reduce educational attainment? Evidence from Mexico," *Journal of Population Economics*, 24, 1331–1358.

McKenzie, D., S. Stillman, and J. Gibson (2010): "How Important is Selection? Experimental vs. Non-Experimental Measures of the Income Gains from Migration," *Journal of the European Economic Association*, 8, 913–945.

Meng, X. and R. G. Gregory (2002): "The Impact of Interrupted Education on Subsequent Educational Attainment: A Cost of the Chinese Cultural Revolution," *Economic Development and Cultural Change*, 935–959.

Morten, M. (2013): "Temporary Migration and Endogenous Risk Sharing in Village India," Working paper.

Munshi, K. (2003): "Networks in the modern economy: Mexican migrants in the US labor market," *Quarterly Journal of Economics*, 118, 549–599.

Munshi, K. and M. Rosenzweig (2013): "Networks and misallocation: Insurance, migration, and the rural-urban wage gap," *Working paper*.

Poncet, S. (2003): "Measuring Chinese domestic and international integration," *China Economic Review*, 14, 1–21.

Qian, N. (2008): "Missing Women and the Price of Tea in China: The Effect of Sex-Specific Earnings on Sex Imbalance," *The Quarterly Journal of Economics*, 123, 1251–1285.

Rajbanshi, R., M. Huang, and B. Wydick (2012): "Measuring Microfinance: Cognitive and Experimental Bias with New Evidence from Nepal," .

Rapoport, H. and F. Docquier (2006): "The economics of migrants' remittances," *Handbook of the Economics of Giving, Altruism and Reciprocity*, 2, 1135–1198.

RCRE (1993-2002): *National Fixed Point Survey*, Research Center of Rural Economy, Ministry of Agriculture.

Rosenzweig, M. and H. Binswanger (1993): "Wealth, weather risk and the composition and profitability of agricultural investments," *Economic Journal*, 103, 56–78.

Rosenzweig, M. and O. Stark (1989): "Consumption smoothing, migration, and marriage: Evidence from rural India," *Journal of Political Economy*, 905–926.

Sun, W., C. Bai, and P. Xie (2011): "The impact of Hukou reforms on rural labor migration in China," *Economic Research Journal*, 28–41.

Whalley, J. and S. Zhang (2007): "A numerical simulation analysis of (Hukou) labour mobility restrictions in China," *Journal of Development Economics*, 83, 392–410.

Yang, D. (2008): "International migration, remittances and household investment: Evidence from Philippine migrants' exchange rate shocks," *Economic Journal*, 118, 591–630.

Zhou, W. (2014): "How Does A Hard Manual Labor Experience During Youth Affect Education and Income? The Long-term Impact of the Send-down Program during the Chinese Cultural Revolution," Mimeo.

Zhou, X. and L. Hou (1999): "Children of the Cultural Revolution: The state and the life course in the People's Republic of China," *American Sociological Review*, 12–36.

Table 1: Summary Statistics

	Mean	Std Dev	N
Migrant (0/1)	0.162	0.368	14014
Migration (Days)	29.78	79.24	14014
Migration (Days, not including zeros)	184.0	102.1	2268
Year	1995.6	1.691	14016
Total Consumption (per person)	508.4	428.2	13794
Food Consumption (per person)	262.4	150.9	13687
Non-Staple Food Consumption (per person)	145.8	131.4	13704
Agricultural Income (per worker)	2846.5	2328.9	11459
Non-Agricultural Income (per worker)	3345.5	5160.8	11461
Agricultural Labor Inputs (per worker)	166.9	97.91	11441
Household Laborers	2.420	0.978	11322
Non-Productive Assets (per worker)	1079.8	1532.9	11497
Agricultural Assets (per worker)	470.5	689.2	11428
Non-Agricultural Assets (per worker)	98.42	1059.3	11324
Positive Days on Fruits (0/1)	0.220	0.414	14015
Days on Fruits (per worker, not including zeros)	29.09	44.65	2820
Days on Fruits (per worker)	5.579	17.52	11462
Income from Fruits (per worker)	120.1	494.2	11434
Positive Days on Animal Husbandry (0/1)	0.710	0.454	14015
Days on Animal Husbandry (per worker, not including zeros)	55.90	45.08	9051
Days on Animal Husbandry (per worker)	42.08	40.61	11470
Income from Animal Husbandry (per worker)	699.3	970.2	11435
High Education (middle school degree or higher)	0.475	0.499	14012

Notes: The table presents summary statistics of the NFP data where each observation refers to the first period that a household appears in the data.

Table 2: Historical Sent-Down Flows and Subsequent Inter-Province Migration

	CHIP	NFP
	2002	2010-2012
	(1)	(2)
Sent Down Flows	0.111**	0.057***
	(0.027)	(0.007)
N	234	300
LHS Variable Mean	1.292	0.402

Notes: The dependent variable is the log of inter-province migration flows. Regressions also include destination province fixed effects and origin province fixed effects. The dependent variable is the log of inter-province migration flows plus 1. Robust standard errors clustered two ways by origin province and by destination province in parentheses. *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 3: Hukou Reforms and Incoming Migration

	Log Inter-Province Migration Flows (1)	Log Total Migration Flows (2)
Reform Tally	0.323**	0.326*
	[0.162]	[0.186]
N	144	159

Notes: Log total migration flows includes inter-province and intra-province flows. The variable $ReformTally$ for province s in t is the accumulated number of reforms in s by year t; see Section 4.3 for details. Each observation is an origin-destination- year. The data set used is the NFP 2010-2012. The regressions include year indicators and a constant term. The standard errors are clustered at the origin-destination province pair level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table 4: Pre-Reform Differences in the Level and Growth of GDP per Capita

	Log GDP per Capita (1)	Growth Rate (2)
Panel A: Sent Down Flow Provinces		
$I(Reform_{t-1})$	−0.021	0.002
	[0.033]	[0.017]
N	105	92
Panel B: Own Province Reforms		
$I(Reform_{t-1})$	0.056*	−0.011
	[0.022]	[0.012]
N	112	112

Notes: The data for log GDP per capita is from the National Bureau of Statistics. Panel A displays the relationship between a *hukou* reform in the province last period and the level and growth rate of GDP per capita in the current period. Panel B displays the relationship between having a reform in any of provinces that sent SDY last period and the level and growth rate of GDP per capita in the current period.

Table 5: SDY flows and *Hukou* reforms affecting Shanxi

Panel A: Provinces sending SDY to Shanxi and reform dates		
Sending province	SDY to Shanxi	Hukou reform dates
Beijing	41,300	1998, 2002
Tianjin	7,300	None
Panel B: Measure of Access to Migration for Shanxi		
Year	$Z_{Shanxi,t}$	Source
1995	0	-
1996	0	-
1997	0	-
1998	41,300	Beijing
1999	41,300	-
2000	41,300	-
2001	41,300	-
2002	82,600	Beijing

Table 6: The Impact of *Hukou* Reforms Interacted with SDY Flows on Migration

	(1)	(2)	(3)
Reform Tally × SDY Flows	0.006***		
	(0.002)		
Unspecified Reform Tally × SDY Flows		-0.023	-0.023
		(0.016)	(0.015)
Wealth Reform Tally × SDY Flows		0.027**	0.021
		(0.012)	(0.013)
Job Reform Tally × SDY Flows		-0.013	-0.013
		(0.015)	(0.016)
Wealth Reform Tally × SDY Flows × High Assets			0.005***
			(0.001)
Job Reform Tally × SDY Flows × High Education			0.000
			(0.001)
N	91163	91163	91163
F-statistic on instruments	11.64285	6.968441	18.94017
p-value	.0031067	.0026133	1.32e-06

Notes: The dependent variable is a binary measure of whether the household has a migrant. The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table 7: The Impact of *Hukou* Reforms Interacted with SDY Flows on Migration Path Flows

	(1)	(2)
Reform Tally	0.278*	
	[0.155]	
Reform Tally × SDY	0.424***	
	[0.140]	
Unspecified Reform Tally		0.403
		[0.282]
Unspecified Reform Tally × SDY		0.284***
		[0.0527]
Skills Reform Tally		0.327
		[0.242]
Skills Reform Tally × SDY		1.604***
		[0.141]
Job&Wealth Reform Tally		0.0901
		[0.209]
Job&Wealth Reform Tally × SDY		2.055***
		[0.374]
N	144	144

Notes: The dependent variable is the log of inter-province migration flows. Each observation is an origin-destination-year. The data set used is the NFP 2010-2012. The regressions include year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the origin-destination province pair level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table 8: Robustness Check: The Impact of the *Hukou* Reforms Interacted with SDY Flows with Distance Controls

	(1)	(2)	(3)	(4)
Reform Tally × SDY Flows	0.008***	0.006***	0.006***	0.006***
	(0.001)	(0.002)	(0.002)	(0.002)
Reform Tally × Circle Distance		0.004**		
		(0.002)		
Reform Tally × Road Distance			0.004**	
			(0.002)	
Reform Tally × Poncet Distance				0.003**
				(0.001)
N	59993	59993	59993	59993

Notes: The dependent variable is a binary measure of whether the household has a migrant. The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 9: Reduced Form Estimates of Migration on the Level and Change in Consumption

	Log Total Consumption (1)	Log Food Consumption (2)	Log Non-Staple Food (3)
Panel A: Level of Consumption			
Reform Tally × SDY flows	0.008	0.008**	0.008
	(0.005)	(0.004)	(0.006)
N	87468	87506	87488
Panel B: Variability of Consumption (First Differences)			
Reform Tally × SDY flows	-0.003	-0.006***	-0.009***
	(0.003)	(0.002)	(0.002)
N	74244	74244	74233
Panel C: Variability of Consumption (Indicator for Drops > 20%)			
Reform Tally × SDY flows	-0.004***	-0.009***	-0.006***
	(0.001)	(0.001)	(0.001)
N	75929	75929	75929

Notes: The dependent variables are per capita measures of consumption. The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table 10: Reduced Form Estimates of Migration on Income and Labor

	Log Agricultural Income	Log Non-Agricultural Income	Log Agricultural Labor Inputs	Number of HH Laborers
	(1)	(2)	(3)	(4)
Reform Tally × SDY flows	0.007	0.007	0.001	-0.002
	(0.007)	(0.008)	(0.005)	(0.005)
N	72535	72469	72539	72623

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table 11: Reduced Form Estimates of Migration on Assets

	Log Non Productive Assets	Log Agri-cultural Assets	Log Non-Agricultural Assets
	(1)	(2)	(3)
Reform Tally × SDY flows	-0.022***	-0.024***	-0.016***
	(0.004)	(0.009)	(0.005)
N	72581	72747	34408

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table 12: Coefficient of Variation by Income Categories

	Agricultural Income	Non-Agricultural Income	Fruit Income	Animal Income
	(1)	(2)	(3)	(4)
Panel A: Unconditional CV				
Coefficient of Variation	1.335	3.415	6.189	6.723
N	91193	91193	91193	91193
Panel B: Within Household CV				
Coefficient of Variation	0.641	0.758	1.855	1.213
N	12163	12207	5341	11144

Notes: The coefficient of variation is the standard deviation divided by the mean. In Panel A, it is calculated using the unconditional mean and standard deviation across all observations in the data. In Panel B, it is calculated using the mean and standard deviation within households for households that have at least two years of positive income in the category.

Table 13: Reduced Form Estimates of Migration on Labor in High-Risk Activities

	Animal Husbandry (Days)			Fruits (Days)		
	Extensive	Intensive	Log(Y+1)	Extensive	Intensive	Log(Y+1)
	(1)	(2)	(3)	(4)	(5)	(6)
Reform Tally × SDY flows	0.007***	0.013***	0.048***	0.006**	0.099*	0.023***
	(0.002)	(0.004)	(0.009)	(0.003)	(0.053)	(0.008)
N	89387	51183	72405	89387	14515	71971

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table 14: Reduced Form Estimates of Migration on Income from High-Risk Activities

	Log Income Animal Husbandry	Log Income Fruits
	(1)	(2)
Reform Tally × SDY flows	0.071***	0.030***
	(0.016)	(0.011)
N	72319	71924

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Figure A.1: Direction of Sent-Down Youth Flows

Source of Map: Bonnin 2013

Table A.1: City-Level *Hukou* Reforms: 1993-2002

Province	Reform Year	Description	Document Name	Issue Date
Beijing	1998	A migrant can get hukou in pilot satellite cities of Beijing if she buys an apartment and has a stable job.	JingZhengBanFa[1997] No.74	December 31, 1997
	2002	A migrant can get hukou in 14 satellite cities and 33 towns if she has* an apartment and a stable job.	JingZhengFa[2002] No.25	September 23, 2002
Zhejiang	1998	A migrant can get hukou in Hangzhou City, the capital of Zhejiang Province, if she buys an apartment and has a stable job Hangzhou.	HangZhengBan[1998] No.31	September 20, 1998
	2000	A migrant can get hukou in most cities in Zhejiang province (entry conditions are not specified in great detail).	ZheZheng[2000] No.7	September 1, 2000
	2002	A migrant should get hukou in most cities if she has* an apartment and also a stable job.	ZheZhengBanFa[2002] No. 12	March 29, 2002
Shanghai	1994	A migrant can get a temporary Shanghai hukou if she has* an apartment and a stable job.	Shanghai LanYin hukou Guanli Zanxing Guiding	February 1, 1994
	1998	A revision of the 1994 law by decreasing the entry bar further.†*	HuFuFa[1998] No.47	October 25, 1998
	2002	A migrant can apply for <Shanghai Resident Permit> if he has special skills, and this Permit allows the holder to enjoy most benefits a Shanghai citizen has.	HuFuFa[2002] No. 122	April 30, 2002
Jiangsu	1995	A migrant can get a temporary city hukou if she has** an apartment in Nanjing City.	NingZhengBanFa[1995] No. 79	June 14, 1995
	2001	A migrant can get a city hukou if she has* an apartment or a stable job.	XuZhengFa[2001] No. 38	April 30, 2001
	2002	A migrant can get a city hukou if she has* an apartment or a stable job in most cities in Jiangsu province.	SuZhengFa[2002] No. 142	November 22, 2002
Shandong	1993	A migrant can get hukou in Yingkou City if she buys an apartment.	Yingkou Lanyin hukou Guanli Zanxing Guiding	December 1993
	2000	A migrant can get a city hukou in Shangdong if she has* an apartment in most small and medium size cities.	LuZhengFa[2000] No.7	January 14, 2000
	2001	A migrant can get a city hukou in Shangdong Province if she has* an apartment and a stable job. This is a further reform with respect to the 2000 reform.	LuZhengFa[2001] No.107	October 10, 2001

*Renting or buying an apartment are allowed.

** Employer-provided dormitories are included.

†In the 1994 reform, if one wants to buy an apartment to obtain a Shanghai hukou, she has to buy at least 100 square meters; in 1998 this number was decreased to 70 square meters for Puxi and 65 square meters for Pudong. Also in 1998 Puxi was redefined to include several more remote areas: Jiading, Minhang, Baoshan, Jinshan, Songjiang, Nanhui, Fengxian, Qingpu and Chongming.

Table A.2: Interprovince Sent-Down Flows

Sent down to:	Heilongjiang	Liaoning	Ningxia	Zhejiang	Hebei	Shanxi	Yunnan	Guizhou	Gansu	Xinjiang	Qinghai
Sent from:											
Beijing	10.4	0.11	0.45	0	1.4	4.13	0.84	0	0	0	0
Tianjin	6.7	0.29	0.2	0	11.87	0.73	0	0	1.19	0.91	0
Hebei	0	0	0	0	0	0	0	0	0	0	0
Shanghai	16.98	0.06	0	3.2	0	0	5.56	1.06	0	10	0
Jiangsu	0	0	0	0	0	0	0	0	0	1.7	0
Zhejiang	5.82	0	0.18	0	0	0	0	0	0	0.49	0
Shandong	0	0	0	0	0	0	0	0	0.72	0	0.74
Hubei	0	0	0	0	0	0	0	0	0	0.8	0
Sichuan	0.4	0	0	0	0	0	4.1	0	0	0	0

Note: The table presents is the total number of educated youth sent down from one province to another. The units are 10,000 people.

Table A.3: Impact of the *Hukou* Reforms Interacted with SDY Flows on Other Measures of Migration

	Log	IHS
	(1)	(2)
Reform Tally × SDY Flows	0.018**	0.022**
	(0.008)	(0.009)
N	91163	91163
F-statistic on instruments	4.996524	5.588313
p-value	.0383093	.0295272

Notes: The dependent variable is the logarithm or inverse hyperbolic sine (see text for details) of the days that a migrant was working away from the remaining household. The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table A.4: IV Estimates of Migration on the Level and Change in Consumption

	Log Total Consumption	Log Food Consumption	Log Non-Staple Food
	(1)	(2)	(3)
Panel A: Level of Consumption			
Migrant	1.362*	1.354**	1.431
	(0.819)	(0.585)	(0.949)
N	87466	87504	87486
Panel B: Variability of Consumption (First Differences)			
Migrant	-0.692	-1.465**	-2.230**
	(0.545)	(0.716)	(0.989)
N	74244	74244	74233
Panel C: Variability of Consumption (Drops > 20%)			
Migrant	-0.977***	-2.376**	-1.540**
	(0.309)	(0.952)	(0.744)
N	75929	75929	75929

Notes: The dependent variables are per capita measures of consumption. The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table A.5: IV Estimates of Migration on Income and Labor

	Log Agricultural Income	Log Non-Agricultural Income	Log Agricultural Labor Inputs	Number of HH Laborers
	(1)	(2)	(3)	(4)
Migrant	1.129	1.124	0.126	-0.300
	(1.087)	(1.361)	(0.778)	(0.831)
N	72534	72468	72538	72622

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table A.6: IV Estimates of Migration on Assets

	Log Non Productive Assets	Log Agri-cultural Assets	Log Non-Agricultural Assets
	(1)	(2)	(3)
Migrant	-3.773***	-3.775**	-2.537***
	(1.377)	(1.825)	(0.915)
N	72580	72746	34408

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table A.7: IV Estimates of Migration on Labor in High-Risk Activities

	Animal Husbandry (Days)			Fruits (Days)		
	Extensive	Intensive	Log(Y+1)	Extensive	Intensive	Log(Y+1)
	(1)	(2)	(3)	(4)	(5)	(6)
Migrant	1.283***	2.010*	7.607***	1.086*	-4.646*	3.800*
	(0.342)	(1.108)	(1.956)	(0.601)	(2.810)	(2.156)
N	89386	51182	72404	89386	14514	71970

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table A.8: IV Estimates of Migration on Income from High-Risk Activities

	Log Income Animal Husbandry	Log Income Fruits
	(1)	(2)
Migrant	11.169***	4.951*
	(3.843)	(2.911)
N	72318	71923

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table A.9: OLS Estimates of Migration on the Level and Change in Consumption

	Log Total Consumption	Log Food Consumption	Log Non-Staple Food
	(1)	(2)	(3)
Panel A: Level of Consumption			
Migrant	0.001	0.038***	0.067***
	(0.011)	(0.012)	(0.025)
N	87466	87504	87486
Panel B: Variabiliity of Consumption			
Migrant	-0.009	-0.001	-0.018
	(0.006)	(0.005)	(0.012)
N	74244	74244	74233

Notes: The dependent variables are per capita measures of consumption. The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table A.10: OLS Estimates of Migration on Income and Labor

	Log Total Income	Log Agricultural Income	Log Agricultural Labor Inputs	Number of HH Laborers
	(1)	(2)	(3)	(4)
Migrant	-0.066**	0.270***	0.037	0.061***
	(0.032)	(0.045)	(0.028)	(0.023)
N	72534	72468	72538	72622

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table A.11: OLS Estimates of Migration on Assets

	Log Non Productive Assets	Log Agricultural Assets	Log Industrial Assets
	(1)	(2)	(3)
Migrant	0.024	0.006	-0.066***
	(0.016)	(0.026)	(0.012)
N	72580	72746	34408

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table A.12: OLS Estimates of Migration on Labor in High-Risk Activities

	Animal Husbandry (Days)			Fruits (Days)		
	Extensive	Intensive	Log(Y+1)	Extensive	Intensive	Log(Y+1)
	(1)	(2)	(3)	(4)	(5)	(6)
Migrant	0.041***	0.043**	0.199***	0.014	-0.036	0.016
	(0.012)	(0.022)	(0.053)	(0.014)	(0.047)	(0.052)
N	89386	51182	72404	89386	14514	71970

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.

Table A.13: OLS Estimates of Migration on Income from High-Risk Activities

	Log Income Animal Husbandry	Log Income Fruits
	(1)	(2)
Migrant	0.353***	0.037
	(0.075)	(0.082)
N	72318	71923

Notes: The regressions include household fixed effects, year indicators and a constant term. The variable $ReformTally$ for s in t is the accumulated number of reforms in provinces that sent SDY to s by year t; see Section 5 for details. The standard errors are clustered at the province level. *, **, *** denotes significance at the 10%, 5% and 1% levels, respectively.