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Abstract

Using unique panel data on the *temporary* movement of Chinese workers to 186 economies during 1992−2012, I investigate the patterns and determinants of labor mobility in the services trade. I estimate a gravity model of labor mobility in two categories, namely, overseas labor services and overseas contracted projects. I find that distance (proxy for migration costs) and income are not the most important determinants of the latter. For overseas contracted projects, the dispatch of workers is not driven by their pure economic aims but by the Chinese government's policies and strategies such as its overseas project promotion policy. Furthermore, I employ propensity score matching with the difference-in-difference estimation method to investigate the impact of this policy upon labor mobility. The results show that the policy of promoting overseas contracted projects has causal and strong positive effects on labor mobility in construction-related sectors.

Keywords: Labor mobility, Services trade, Gravity model
JEL classification: F22, J15

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1. Introduction

During the past three decades, China's economic transformation and progressive trade liberalization has led to increasingly free movement of goods, capital, and labor. China's growing role in the world economy as a result of these policies has generated a significant amount of concern among policy-makers and scholars both home and abroad.[1] However, compared with the cross-border movement of goods and capital, labor mobility is often overlooked in recent literature. There are two reasons behind this oversight. First, the liberalization of labor mobility falls behind that of goods and capital due to trade liberalization both in China and beyond. Few countries, developed or developing, are openly receptive to free movement of labor. Second, international statistics confined to labor movements are currently very limited. The data are often incomplete and fail to capture the extent of labor movement (Stephenson and Hufbauer, 2010). According to World Bank's calculations based on the annual flow of immigrants, in 2010, China ranked fourth (approximately 1.88 million people) after India, Bangladesh, and Pakistan as a source of workers going overseas. Though China is a major global source of overseas workers, few studies have investigated the associated patterns, determinants, and related issues. This study tries to fill this gap. Using unique panel data on the *temporary* movement of Chinese workers to 186 economies during 1992−2012, this study provides evidence and explains the patterns and determinants of labor mobility from China. Here, labor mobility implies movement of workers for employment in another country for a limited period. Therefore, this study does not cover Chinese emigrants and international students working abroad.

This study is closely related to the literature on international trade in services and migration. In the international trade in services, labor mobility is defined as the *temporary* movement of natural persons to provide services, or Mode 4, in the General Agreement on Trade in Services (GATS) of the World Trade Organization (WTO).[2] Mode 4 refers to a process through which individuals temporarily move to the consumers' country to provide a service, while temporary is not defined under the GATS. Winters (2008) argues that the temporary movement of natural persons can be considered using two existing analytical frameworks. First, it can be viewed as cross-border services

[1] Feenstra and Wei (2010), Yueh (2013) are two impressive collections of papers on China's growing role in international trade and investment.

[2] GATS classifies service trade into four modes: direct cross-border trade in services (Mode 1), movement of the customer to the country of the provider (Mode 2), sales of services through an offshore affiliate or legal person (Mode 3), and movement of natural persons (Mode 4).

trade (Model 1). Second, Mode 4 has much in common with traditional long-term migration, wherein workers move to a new country permanently. This is particularly true where periods of stay are long or where a particular job in the destination country is filled by a circulating flow of temporary workers from a source country, each being replaced by another when worker contracts expire.[3]

In the literature on international trade in services, Kimura and Lee (2006) estimate the standard gravity model and find that the variables of economic size, geographical proximity, regional trade arrangements (RTAs) are significant factors in services trade between 10 member countries of the Organization for Economic Co-operation and Development (OECD) and 47 partners covering the years 1999 and 2000.[4] Recently, Head et al. (2009) developed a formal model of the determinants of bilateral services trade and estimated it for a large sample of countries and different categories of services trade. They find that disaggregated services trade categories, such as financial services and computers and information (IT), are all subject to strong "distance effects" (refers to a negative coefficient on distance). Tang et al. (2013) estimated a modified gravity model with bilateral data on the services trade between China and OECD countries during the period 2000–2006. They find that differences in both GDP per capita and human capital between China and its partners are important determinants of China's trade in services. All these studies use bilateral services trade volumes (exports, imports, or totals) as the dependent variable; therefore, they do not explicitly consider labor mobility in the services trade.

On the other hand, the simple model of labor mobility in standard labor economics has two important implications: (1) labor flows from regions with lower wages to regions with higher wages, so the larger the difference in wages, the higher likelihood that the workers will move; and (2) the lower the migration cost (including transportation costs and psychological costs), the higher the probability that workers will move.[5] Card (2001) and Borjas (2003) studied immigrant workers' responses to wage differences between countries. For international temporary migration, Djajic and

[3] Winters (2008) also points out that neither the models of international trade nor the models of migration can capture the full character of temporary labor mobility.
[4] Ceglowski (2006) runs similar estimations for bilateral services trade in 28 OECD countries in 1999 and 2000. The results are consistent with those of Kimura and Lee (2006).
[5] See Borjas (2013), which is a standard textbook of labor economics.

Milbourne (1988) and Dustmann and Weiss (2007) assume exogenous preference for consumption in home country, so that people will return home after working abroad for a while. In empirical studies, Clark et al. (2007) estimated a migration model using panel data for immigration to the United States from 1971 to 1998. In addition to the significance of relative income and migration costs, they find that many other factors influence labor mobility such as the stock of previous immigrants and the destination country's immigration policy. Furthermore, Lewer and Van den Berg (2008) offered a gravity model of immigration to test several hypothesized influences on immigration. They used immigration data across OECD countries and find that international immigration can be explained well by distance between source and destination countries, their population, relative wages, common languages, and other factors. The term "immigration" in previous empirical studies implies a population whose country of birth and country of residence are different. It includes foreigners with permanent residency, temporary migrant workers, foreign spouses and family members, and refugees, etc. Therefore, these studies' coverage of labor is wider than the target of this study.

This study makes several contributions to the literature. First, I use a unique dataset to define two categories to examine the determinants of temporary labor mobility from China. This allows me to separate workers whose departure is related to overseas contracted projects (mainly undertaken by large state-owned enterprises (SOEs) engaged in sectors such as building, energy, and transportation) from those that are not such as workers in manufacturing, computers and software, education. Second, I find that distance (proxy for migration costs) is not always a decisive barrier to international labor mobility. It is subject to factors such as type of job and the area of work, policies, and other factors. Third, I employ propensity score matching (PSM) with the difference-in-difference (DD) estimation method to investigate the effect of the overseas project promotion policy that the Chinese government announced in 2008. I find that this policy has a positive and causal impact on labor mobility linked to overseas contracted projects.

The remainder of this paper is organized as follows. Section 2 presents a short review of China's overseas labor policy. Section 3 describes the data on labor mobility. In Section 4, I report the estimation results of a gravity model and discuss the determinants of labor mobility. In Section 5, I conduct a policy evaluation by PSM and DD methods. I conclude in Section 6.

2. Short review of overseas labor policy

Before China's open door policy in 1979, workers were mainly dispatched overseas in relation to government's political intention to provide economic and technological assistance to "Southern" countries. By the end of 1979, China had sent about 180 thousand of specialists and workers, and conducted more than 1000 projects across 70 countries, covering many sectors such as mining, agriculture, transportation. However, in January 1976, an order for an agriculture-related project in Nigeria, that would be worth RMB12 million, was accepted. The following year, the Chinese central government decided to undertake more projects if "Southern" countries could afford to pay for a project. Consequently, acceptances of project orders and the dispatch of workers both increased rapidly.

In 1993, the Japanese government set up the technical intern training program (TITP). TITP aims to accept young workers from various countries, who then obtain Japanese industrial and vocational skills in Japan, thereby contributing to the improvement of their occupational lives after their return home. Accordingly, this program also fosters the development of industries and business enterprises in their countries. TITP covers three main sectors (manufacturing, wholesale and retail, hotel and catering) and other service sectors. This program has accepted a large number of workers from China since the late 1990s. According to the *Situation of Notified Foreign National Employment Status* of Japan's Ministry of Health, Labor and Welfare, the number of foreign workers engaged in "technical intern training" was approximately 136,000 people as of 2013, of whom trainees from China accounted for 70%.

China gradually reformed its trade regime during the 1990s, and a growing number of companies were authorized to conduct international trade (Branstetter and Lardy, 2008). After China's entry into the World Trade Organization (WTO) in 2001, the Chinese government proclaimed a "go overseas" policy in 2002, which covered outward foreign direct investment (FDI), the export of Chinese employment or labor services, and the undertaking of foreign construction and engineering projects. To support "go overseas," funds were established to support Chinese firms in bidding for foreign construction or engineering projects in the form of subsidies for project finances and insurance. To further promote contracts for overseas projects, at the end of 2008, the Ministry of Commerce (MOFCOM) published the *Catalogue for the Guidance of Overseas Contracted Projects by Country*

(OCPC) for six sectors, including transportation infrastructure, energy and power, and telecommunications, in 13 developing countries.[6] It is also worth noting that China has concluded free trade agreements (FTAs) with many countries since 2003. Most of these FTAs cover not only trade in goods but also trade in services.[7] These policies are likely to have direct and indirect impacts on China's overseas labor mobility to destination countries, and I will examine their economic effects in the following Sections.

3. Data and basic patterns

The main data used in this study, annual data on labor mobility, are obtained from *China External Economic Statistical Yearbook* (1994–2005), and *China Trade and External Economic Statistical Yearbook* (2006–2013), published by the National Bureau of Statistics of China (NBS). The data include workers staying overseas, less than one year and more than one year. Workers sent from China can be classified, in principle, into the following two categories: *overseas labor services* (LS hereafter) and *overseas contracted projects* (CP hereafter).[8] LS implies the provision of labor by dispatching Chinese workers based on agreements concluded between domestic corporations and overseas corporations, intermediary agencies, and private employers that are allowed to recruit or hire foreign labor forces. Workers are employed in a specific sector and, according to the job description and the period set forth in the agreement, receive a predetermined payment and return to China after fulfilling the agreement.[9] The covered sectors include agriculture, manufacturing, transportation services (for example, sailors), computers and software, hotels, education, etc. In CP, domestic corporations or other Chinese economic organizations provide labor that accompanies a contract for construction projects (such as building, transportation, and petroleum extraction) in foreign countries, Hong Kong, Macau, and Taiwan, or alternatives that accompany the export of equipment and technology. Contracts for construction work include reconnaissance, design,

[6] These countries are Algeria, Egypt, Ethiopia, Indonesia, Kazakstan, Nigeria, Pakistan, Philippines, Sri Lanka, Sudan, Tajikistan, Uzbekistan, and Viet Nam.

[7] The countries include Cambodia (2007), Chile (2010), Costa Rica (2011), Hong Kong (2003), Indonesia (2007), Lao People's Democratic Republic (2007), Macau (2003), Malaysia (2007), New Zealand (2008), Pakistan (2009), Peru (2010), Philippines (2007), Singapore (2007), Thailand (2007), and Viet Nam (2007). The years in parentheses are date of entry into force. Source: World Trade Organization (WTO).

[8] Before 2009, another small category existed, named "overseas design and consulting." After 2009, data on overseas design and consulting are included in CP. To keep consistency, I combined these two categories into one during the sample period.

[9] Chinese workers who arrived in Japan though the TITP are included in this category.

construction, supervision, purchasing equipment and materials, installation and testing, engineering consulting, and project management. These overseas projects are mainly undertaken by a handful of large state-owned enterprises (SOEs). According to Engman (2010), in 2007, the top 225 international contractors generated US$827 billion in revenue, of which US$310 billion represented exports. Of these 225 companies, 51 were Chinese.

The limitation of this data set is that the numbers of workers by disaggregated sector are not currently disclosed by NBS. According to MOFCOM, at the end of 2007, approximately 36.3% of overseas workers were engaged in construction, 32.4% in manufacturing, 10.6% in agriculture, and 7.3% in transportation. Workers in computers, software, and consulting sectors only account for 0.7%.[10]

Figure 1 shows changes in the dispatch of workers from 1984 to 2012. The values for the flow represent the number of workers dispatched each year while those of stock represent the number of workers living overseas at the end of each year (the same applies below). The dispatch of workers based on LS increased sharply in the 1990s. Although the rate of increase slowed temporarily in the 2000s, it reached approximately 510,000 people at the end of 2012. Meanwhile, the number of workers dispatched based on CP increased sharply after China's WTO accession and announcement of the "go overseas" policy in 2002, with approximately 230,000 people being dispatched in 2012.

[Figure 1 here]

Table 1 shows that the geographical distribution of workers is considerably biased. The values represent the share of workers at the end of each year. For LS, approximately 64% of workers were in Asia in 1992, rising to more than 80% in 2012. Geographically, workers tend to concentrate in Asia, most likely due to China's increasingly strong economic ties in Asia, including Hong Kong, Japan, South Korea, and Southeast Asia since the 1990s that were developed through foreign trade and direct investment. In contrast, labor mobility based on CP shows a different pattern from that under LS. Although approximately 40%, 30%, and 20% of workers moved to Asia, Africa, and Europe, respectively, in 1992, this share rose to approximately 45% in Asia and Africa, but declined

[10] See MOFCOM's homepage at http://tradeinservices.mofcom.gov.cn/c/2009-11-09/78191.shtml

to 3% in Europe. The table indicates that the acceptance of workers increased very noticeably in Africa, which is located far from China. It appears that, in recent years, the dispatch of workers has increased due to China's efforts to secure natural resources and export infrastructure and systems in Africa.

[Table 1 here]

4. Determinants of labor mobility

In this section, I estimate a gravity equation using panel data for the movement of workers from China to 186 economies between 1992 and 2012.[11] I report the main results to show that the determinants of labor mobility are heterogeneous by category. Compared to LS, labor mobility under CP is driven by the Chinese government's policy rather than workers' pure economic aims. I then conduct a robustness check using flow data and alternative measures of explanatory variables. Furthermore, I examine alternative explanations for the main results.

4.1 Gravity equation

The gravity model show that bilateral trade in services increases when the scales of the two trading economies are large and decreases with the geographical distance between them increases (Kimura and Lee, 2006; Head et al., 2009). Furthermore, the gravity equation is capable of explaining immigration (Lewer and Van den Berg, 2008). The labor market model of labor mobility suggests that the attractive force between immigrant source and destination countries depends on both the difference in labor incomes and mobility costs. Population size is also important, other things being equal, i.e., the larger the population in the destination country, the larger its labor market for workers. Following Lewer and Van den Berg (2008), I use distance between China and worker destination, together with the destination country's population, and income per capita as the gravity equation's main explanatory variables.[12] The basic gravity equation for the regression analysis takes the

[11] Though the original data on oversea workers covers 186 economies at most during the sample period, I include all 190 economies with available basic data on distance, population, and GDP per capita in the gravity model's estimation. Not doing so may raise potential concerns of sample selection bias. Economies with constant zero observations during the sample period are Aruba, Bermuda, Faroe Islands, and Luxembourg. Since this study covers almost all economies in the world, I do not report the country list to save space.

[12] Zhang (2014) examines the effects of other variables often used in gravity models such as common borders, a common language (Chinese), and the Chinese immigration stock in destination countries. Since

following form:

$$L_{ijt} = \alpha_0 + \alpha_1 dist_j + \alpha_2 pop_{jt} + \alpha_3 gdppc_{jt} + \gamma_t + \varepsilon_{ijt} \quad (1)$$

where L_{ijt} is the number of overseas workers (in log or real numbers varying by specification) under category i (LS or CP) in destination country j at the end of year t; $dist_j$ is the log of the distance between Beijing (China's capital) and the capital of country j; pop_{jt} is the log of population in destination country j; and $gdppc_{jt}$ is the log of per capita gross domestic product (GDP) in the destination country; γ_t is a year fixed effect; and ε_{ijt} is an error term. The expected signs of coefficients are $\alpha_1 < 0, \alpha_2 > 0, \text{and } \alpha_3 > 0.$[13]

In addition, I consider the effects of two important policies related to worker movements. I include two dummy variables, FTA_{jt} and $OCPC_{jt}$, in the estimation equation. FTA_{jt} is assigned the value of 1 if the destination country has a signed FTA with China in force in year t, and is otherwise 0. Kimura and Lee (2006) and Ceglowski (2006) find that RTAs have a significant impact on the services trade between OECD member countries and other countries. Because the treatment of services trade differs considerably from that of goods trade, I use information on FTAs covering the services trade between China and destination countries. $OCPC_{jt}$ is assigned the value of 1 if the destination country j is a target for China's overseas project promotion policy according to the *Catalogue for the Guidance of Overseas Contracted Projects by Country* (OCPC) for the years 2009 and afterwards, and otherwise is 0. I use this dummy to investigate the effects that the overseas

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the coefficients and significance of these control variables are not the major concerns, I do not include them here.

[13] I do not control for the fixed effects of destination countries here since estimates of distance will be dropped automatically in that case.

project promotion policy may have on labor mobility.[14] Thus, the augmented gravity equation is as follows:

$$L_{ijt} = \alpha_0 + \alpha_1 dist_j + \alpha_2 pop_{jt} + \alpha_3 gdppc_{jt} + FTA_{jt} + OCPC_{jt} + \gamma_t + \varepsilon_{ijt}. \quad (2)$$

I estimate Equations (1) and (2) by two methods, ordinary least squares (OLS) and Poisson pseudo maximum likelihood (PPML). In OLS estimates, I use $\ln(1+L_{ijt})$ as the dependent variable to deal with zero labor flow observations. However, it is known that the OLS leads to biased estimates of the true elasticities if the errors are heteroskedastic. To address this problem, Santos Silva and Tenreyro (2006) propose the PPML method because it yields consistent parameter estimates and is robust to the presence of heteroskedasticity. The PPML method has another advantage of incorporating zeros in a natural manner, which the OLS regressions exclude. Thus, in PPML estimates, the dependent variables in levels are used.[15] Beine et al. (2015) reported that PPML is a useful method for estimating gravity models of international migration. In addition, I cluster the standard errors at the destination level to address potential problems of serial correlation and heteroskedasticity. The descriptive statistics are reported in Table A1 in Appendix.

4.2 Main results

Table 2 presents the OLS estimates for labor mobility under the two specified categories, namely LS and CP. The estimation results for LS are reported in columns (1)–(3), and those for CP are reported in columns (4)–(6). First, the distance variables are negatively and significantly related to labor mobility, which indicates that the dispatch of workers declines as the distance is between the host country and China increases. Given the log scale, the OLS estimates imply that a 10% increase in distance will lead LS workers to decrease by about 12–14%. However, compared with LS, the distance effect as a deterrent of labor mobility is quite weak under CP: a 10% increase in distance decreases CP workers by about 6–9%. Second, the coefficients on population in all columns are positive and highly significant, i.e., the larger the labor market in the host country, the greater the dispatch of workers to that country. The magnitude of coefficients is very close between LS and CP;

[14] The FTA and OCPC dummy variables are not highly correlated in my samples. The correlation is 0.24.
[15] These methods were also employed by Head et al. (2009).

a 10% increase in the destination's population increases the number of dispatched workers by about 1.9–4.3%. Third, the effect of income per capita in host countries is not clear. In columns (1)–(3), the higher the host country's per capita GDP, the greater the movement of workers under LS. I refer to the positive coefficient on GDPPC as the "income effect." In fact, the aim of workers temporarily emigrating for work, particularly for most workers from developing countries such as China moving to developed countries, is to receive higher wages. However, under CP, this relationship is the opposite, which is puzzling and contradictory to the gravity model's predictions. I will further discuss this point later. Finally, regarding the sign and coefficients of policy variables, the dispatch of workers is positively correlated to the economies that have concluded FTAs with China. The target countries of China's overseas project promotion policy accept many Chinese workers under CP.

[Table 2 here]

Table 3 reports the PPML estimates, and the results are similar to those reported in Table 2. I concentrate on two points. First, the heterogeneous distance effects by category are much clearer in PPML specifications. The estimated elasticity of LS is −1.627 (s.e. = 0.227, significant at the 1% level) in column (1), whereas the estimate of CP is only −0.412 (s.e. = 0.219, significant at the 10% level) in column (4).[16] And after controlling for the policy variables, the distance effect turns statistically insignificant in columns (5)−(6). This confirms that the effect of migration costs in the determination of labor mobility is weak under CP. Second, the same as in OLS estimates, compared with LS, it appears that a higher host country per capita GDP does not attract more workers under CP.

To sum up, the patterns and determinants of labor mobility are quite different by category. Labor mobility under LS is mainly driven by workers' economic motivations as discussed above: (*i*) labor flows from China to countries with higher wages; (*ii*) the lower the migration costs (proxy by distance), the higher the probability that Chinese workers will move. However, distance effects and income effects are weak under CP. Labor mobility under CP is driven by China's overseas projects

[16] Heterogeneous distance effects can also be observed on year-by-year basis. See Figure A1 in Appendix.

promotion policy and other factors rather than workers' economic aims. Migration costs are likely to be mitigated, and worker incomes are likely to be compensated by support provided through Chinese governmental policies. In fact, a majority of overseas contracted projects are undertaken by stated-owned enterprises. They enjoy numerous advantages and favorable treatments. These include access to generous export credits for financing operational costs, government guarantees for bank loans, and lines of credit for capital goods and machinery.

[Table 3 here]

4.3 Robustness checks

I conduct two robustness checks on my main results. First, instead of the number of workers living abroad at the end of each year, I use cross-sectional flow data regarding the number of workers dispatched in 2012. Flow data by destination is only available for 1992–1994, 2006, and 2011–2012. I focus on 2012 for several reasons: (*i*) there are very long intervals in flow data, (*ii*) 2012 is the most recent year in the panel data set, and (*iii*) it allows me to compare the coefficients and determinants between LS and CP in the cross-section of destinations. Therefore, it allows me to focus on the static effects of the determinants, without having to deal with the related concerns on labor mobility dynamics. In Table 4, Panel A reports the OLS estimates and Panel B reports the PPML estimates. The results confirm that compared with LS, distance and income effects are weak under CP while the destination's population size is a more important determinant of labor mobility.

[Table 4 here]

A further robustness check is conducted using alternative measures of the explanatory variables. For distance, instead of the simple distance between capitals, I follow Head et al. (2009) and use a population-weighted average of the great-circle distances between the 20 largest cities in China and destination countries. For per capita GDP, I use purchasing power parity adjusted per capita GDP in destination countries. This measure is popular in immigration literature; Clark et al. (2007) use this measure to capture relative incomes in source countries vis a vis the United States. Samples with missing values of population-weighted distance (for example, Macao) and PPP-adjusted per capita GDP are dropped. The results in Table 5 are similar to those in Tables 3 and 4, and the main results

remain robust.

[Table 5 here]

4.4 Alternative explanations

In this subsection, I examine alternative explanations for the determinants of labor mobility: (*i*) TITP of Japan, (*ii*) age and education of Chinese workers, (*iii*) exports and outward FDI, (*iv*) official development assistance (ODA), (*v*) natural resources of destination countries, and (*vi*) infrastructure of destination countries. Results by PPML estimation method are displayed in Table 6. Because there are considerable variations of observations by variable, I examine these concerns in turn.

TITP of Japan – As discussed in Section 2, the Japanese government program for temporary workers (TITP) accepts many Chinese workers. I consider the effect of this special case. In columns (1)-(2), I add a TITP dummy indicating the post-TITP period of Japan, i.e., $TITP_{Japan}Post1994_t = 1$ if $t \geq 1994$ and 0 if $t < 1994$. The results in columns (1)-(2) show that Japan's TITP program accepts many Chinese workers under LS but very few under CP. These results support the discussion on this policy in Section 2. Meanwhile, the effects of distance, income, and other policies remain robust. These results confirm the heterogeneous effects of this policy by area of work and job.

Age and education – The traditional immigration literature argues that younger people and more educated people are more likely emigrate (Clark et al., 2007; Lewer and Van den Berg, 2008). To address these potential concerns, I add two variables in columns (3)-(4). The variable of age is the share of population aged 15–29, and the variable of education is the gross secondary education enrollment ratio in China. Again, the results markedly differ by category of labor mobility. The coefficients of age indicate that younger people are not likely to work abroad, especially under the category of LS. A possible explanation is that initial mobility costs are high for younger people and thus hinder them from travelling abroad. The positive coefficient on education level implies that under CP, on average, destination countries prefer educated workers over uneducated workers. Overseas workers under CP are likely to have technical skills and knowledge in engineering and construction-related fields. This is consistent with a recent study by the World Bank (2007), which

found that in African construction projects, a majority of professional staff members are Chinese, and a majority of nonprofessional staff members are African.

Exports and FDI – One potential concern is that the dispatch of overseas workers is likely to accompany growing exports of infrastructure systems or outward FDI from China that has occurred in recent years. I control for total exports (both goods and services) and outward FDI from China to host countries in columns (5)-(6). As data on FDI stocks by destination is only available from 2003, for consistency, I use total exports for the same period. Thus, the number of samples is reduced from 3,849 to 1,847. The results suggest that, on average, instead of exports from China, the presence of FDI in destination countries increases the dispatch of workers. [17] Compared to LS, the magnitude of the FDI estimate for CP is large, with higher statistical significance. These results indicate that FDI has stronger effects on labor mobility under CP. In practice, when I control for exports only, the estimate of LS is 0.235 (s.e. = 0.268), whereas the estimate of CP is 0.402 (s.e. = 0.119, significant at the 1% level) which implies that China's exports are positively correlated with labor mobility under CP than LS. On the other hand, when only outward FDI is controlled, the estimates are quite similar to those results in columns (5)-(6).[18]

ODA – The dispatch of workers undertaking projects in developing countries is likely to be related to China's foreign aid. China's foreign aid has grown rapidly since 2004, reaching USD 2,745 million in 2013 (*Finance Yearbook of China*, 2014). Foreign aid includes grants, interest-free loans, and government concessional loans. China's definition of foreign aid is different from the definition of ODA by OECD (2008). Accordingly, the figures used here are those for "ODA-like" flows. Foreign aid data are only available at aggregated level, not by country, for each year during 2001–2012.[19] The results are shown in columns (7)-(8). It is found that foreign aid is positively statistically significantly related to the dispatch of workers through overseas contracted projects.

[17] The effects of exports and FDI differ between countries. According to the World Bank (2007), Chinese multinationals in Angola import almost all materials, staff, and technology from China partly due to the scarcity of local skilled labor and the relatively high prices of local materials. However, in Tanzania, the majority of building materials and other services supplying Chinese firms are produced by local companies.

[18] I do not report these results in Table 7 to save space. However, they are available upon request.

[19] The geographical distribution of China's foreign aid in 2009 is Africa 51.8%, Asia 30.5%, Latin America and the Caribbean 8.4%, Oceania 4.2%, Europe 1.7%, and others 3.4%. Source: China's Foreign Aid (2014).

Other main results remain valid.

Natural resources – In recent years, much argument has centered around China's expanding presence overseas and the desire to secure access to natural resources. Chinese companies are likely to bring large numbers of Chinese staff to their overseas worksites. To address this issue, I add a variable indicating the share of total natural resources rents to GDP in destination countries. The results in columns (9)-(10) show that destinations rich in natural resources accept more Chinese workers under CP, but not under LS. Meanwhile, the results of the overseas project promotion policy remain robust.

Infrastructure – China is the fourth largest exporters of construction services in the world and exported services worth more than US$2,593 million in 2005 (WTO, 2008). Since the annual data on trade in construction services are limited and fragmented, I control for infrastructure conditions in destination countries to examine whether labor mobility can be explained by this factor. Here, I use telephone lines (per 100 people) rather than roads or electric power consumption simply because more observations are available. The results in columns (11)-(12) show that countries with poor infrastructure accept more Chinese workers under both LS and CP, but the effects are big under CP in terms of magnitude. Again, the results of the overseas project promotion policy remain robust.

[Table 6 here]

5. Causal impact of China's overseas project promotion policy

In this section, I econometrically investigate the causal effects of China's overseas project promotion policy on labor mobility. In strict terms, this is not an overseas labor policy but is nevertheless likely to have indirect effects on the expansion of overseas workers accompanying overseas projects.[20] Empirically, I begin with a simple DD analysis and then move to PSM with DD estimation.

5.1 Difference-in-difference method

I use China's overseas project promotion policy to conduct a DD estimation. Specifically, I compare

[20] I focus on China's overseas project promotion policy rather on FTAs and TITP. The effects of FTAs are not confirmed in some specifications. TITP is the case of only Japan, and this policy was devised very early in 1993, at the very beginning of the panel data set.

the dispatch of workers in the treatment group (i.e., destinations where contracted projects became more encouraged) with that in the control group (i.e., destinations where no change occurred in the policy for promoting contracted projects) before and after China announced its overseas project promotion policy at the end of 2008. The baseline DD analysis is as follows:

$$\log L_{jt} = \beta_0 + \beta_1 Treatment_j \times Post2009_t + \beta_2 Treatment_j + \beta_3 Post2009_t + \varepsilon_{jt}, \quad (3)$$

where L_{jt} is the number of workers under CP in destination country j at the end of year t; $Treatment_j$ indicates whether country j belongs to the treatment group; and $Post2009_t$ is a dummy indicating the post-period of the overseas project promotion policy, i.e., $Post2009_t = 1$ if $t \geq 2009$ and 0 if $t < 2009$. ε_{jt} is an error term. β_1 is the key factor of interest that represents the effect of China's overseas project promotion policy on labor mobility. Here, the DD estimates are measured in two ways, OLS and fixed-effects. Fixed-effects regression controls for unobserved and time-invariant characteristics that may influence the outcome variable. In fixed-effects regressions, I include τ_j and γ_t, which are destination and year fixed effects, respectively. The standard errors are clustered by destination to address potential problems of serial correlation and heteroskedasticity.

The DD regression results are reported in Table 7. It is observed that my regressor of interest $Treatment_j \times Post2009_t$ has positive and highly significant estimated coefficients in all specifications. These results imply that China's overseas project promotion policy does increase the dispatch of workers under CP, which is consistent with the results in Tables 3 and 4. In terms of magnitude, the results in column (6) show that being a target destination of China's overseas project promotion policy has a 73% positive impact on labor mobility from 2009, which is both big and very significant.

[Table 7 here]

5.2 Propensity score matching with difference-in-difference

Estimating the effects of China's overseas project promotion policy encounters potential endogeneity problems because target countries are not chosen randomly. To correct for biases arising from endogeneity, I employ the PSM method developed by Rosenbaum and Rubin (1983) to control for observable heterogeneity in the conditions. The data, covering as many as 190 economies, provide adequate samples for both control and treatment groups. I use PSM with the baseline data (before China's announcement of its overseas project promotion policy in 2008) to ensure that the control group is observationally similar to the treatment group, and then apply double differences to the matched samples.[21] Specifically, the baseline data are constructed using the mean value of dispatched workers under CP, dispatched workers under LS, population of destination country, and per capita GDP of destination country (all in log) from 2003 to 2007.[22]

I first run a Probit model to estimate how target destinations are chosen under the overseas project promotion policy. Using the propensity score obtained from the Probit estimation, I match treatment group with control group in 2008 and check whether pre-2009 conditions are similar between the two groups. The results show that countries accepted more workers under CP, and countries with large population are more likely to be chosen as a target destination even after controlling for workers under LS and other factors; however, the statistical significance of distance and income estimates are weak. The pseudo R squared is 0.428, which is reasonably high for matching purposes. The results of the Probit estimation are shown in Appendix Table A2.

After the matching, the treatment and the control group should have similar characteristics before the announcement of the overseas project promotion policy. I employ a simple *t* test to check whether the mean of each covariate differs between the treatment and control group after matching. The balancing test results are reported in Appendix Table A3. These results indicate that although the treatment and control groups are systematically different before matching, the two groups share very similar characteristics after matching. The results from the balancing tests indicate that the matching

[21] Another advantage of using the PSM with DD is its ability to eliminate the time-invariant effects on the outcome variables.

[22] I use data from 2003–2007 since the dispatch of workers under CP increased rapidly during this period after the announcement of the "go overseas" policy in 2002.

was performed successfully.

The next step is to implement the DD method as before. The results for the PSM with DD are shown in Table 8. The number of observations drops from 2703~3849 (in Table 7) to 711~745 after the matching procedure. The results show that applying PSM to DD retains the original impact of the overseas projects promotion policy on workers dispatched under CP. In addition, the statistical significance and magnitude of estimates are very close to those reported in Table 7.

[Table 8 here]

6. Conclusion

This study uses panel data on the *temporary* movement of Chinese workers to other countries and explains the pattern and determinants of labor mobility. I estimate a gravity model of labor mobility for two categories, LS and CP. I find that labor mobility under LS is mainly determined by emigrating workers' economic motivation as well as by conditions such as migration costs and per capita income in the destination country. However, workers dispatched under CP display completely different patterns: migration costs and incomes are not the most important determinants; labor mobility is driven by the policies and strategies of the Chinese government, among other factors. These results are robust to different estimation methods, use of flow data, cross-sectional analysis, alternative measures of explanatory variables, and controlling for various other concerns. In addition, I investigate the impact of China's overseas project promotion policy on labor mobility. The results show that this policy has a causal and strong positive effect on the dispatch of workers in construction-related sectors. My empirical study contributes to the literature by providing strong evidence that in addition to traditional factors, such as migration costs and income, overseas labor policies play an important role in determining international labor mobility patterns.

The determinants of labor mobility can vary depending on the type of job and the area of work. The explanatory power of both distance and relative incomes between the two countries are stronger in LS than CP. This finding indicates that workers' motivation of seeking economic benefits is very strong in sectors such as manufacturing, computers and software, hotels and catering. Governments of both origin and host countries should therefore design overseas labor policies according to job

type and area of work.

The coefficients of policy dummies, TITP, FTA, and overseas project promotion policy have high statistical significance and very strong explanatory power. These results suggest that overseas labor policies of source/host countries and the bilateral agreements between them are important. In recent years, many countries have started to conclude RTAs covering labor mobility or bilateral labor agreements (BLAs) (Stephenson and Hufbauer, 2010). If appropriate policies and environment for receiving foreign workers are developed while still considering demand in the domestic labor market and relative wages of both origin and destination countries, these policies are likely to promote and regulate international labor mobility.

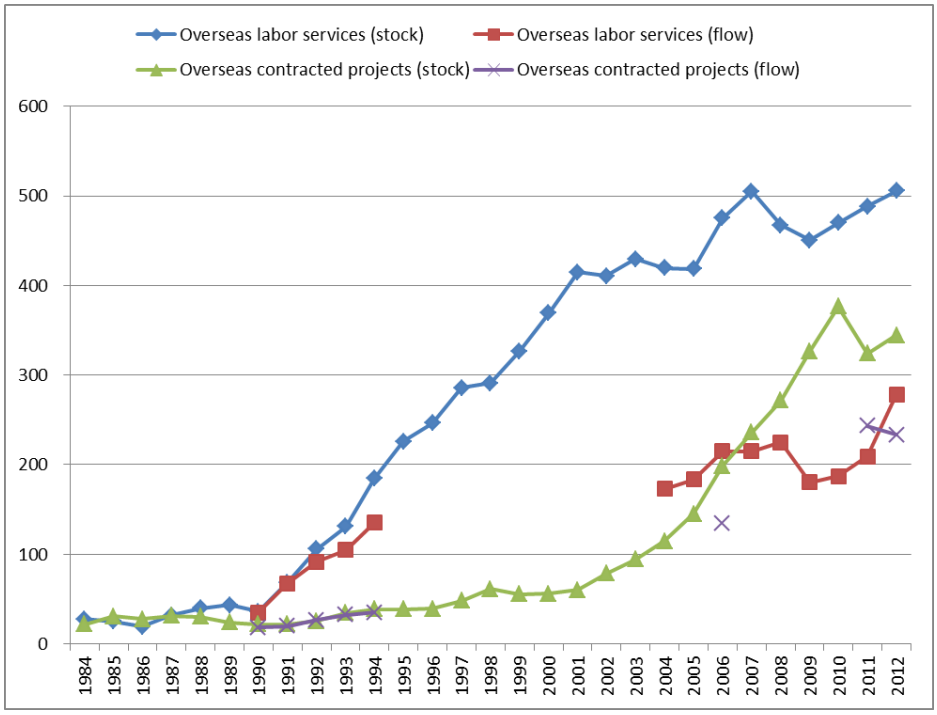
References

1. Beine, M., S. Bertoli and J. F. –H. Moraga (2015), 'A Practitioners' Guide to Gravity Models of International Migration', *The World Economy*, forthcoming.
2. Borjas, G. J. (2003), 'The Labor Demand Curve is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market', *Quarterly Journal of Economics*, 118, 4, 1335－1374.
3. Borjas, G. J. (2013), *Labor Economics* 6rd ed., New York: McGraw－Hill/Irwin.
4. Branstetter, L. and N. R. Lardy (2008), 'China's Embrace of Globalization', in Brandt L. and T. G. Rawski (eds.), *China's Great Economic Transformation*, 633－682, Cambridge University Press.
5. Card, D. (2001), 'Immigration Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration', *Journal of Labor Economics*, 19, 1, 22–64.
6. Clark, X., T. J. Hatton and J. G. Williamson (2007), 'Explaining U.S. Immigration, 1971－1998', *Review of Economics and Statistics*, 89, 2, 359－373.
7. Ceglowski, J. (2006), 'Does Gravity Matter in a Service Economy?', *Review of World Economics*, 142, 2, 307－329.
8. Djajic, S. and R. Milbourne (1988), 'A General Equilibrium Model of Guest-Worker Migration', *Journal of International Economics*, 25, 3-4, 335－351.
9. Dustmann, C. and Y. Weiss (2007), 'Return Migration: Theory and Empirical Evidence from the U.K.', *British Journal of Industrial Relations*, 45, 2, 236－256.
10. Engman, M. (2010), 'Building Empires Overseas: Internationalization in the Construction Services Sector', in Cattaneo O., M. Engman, S. S. Sáez and R. M. Stern (eds.) *International Trade in Services – New Trends and Opportunities for Developing Countries*, Washington, DC: the World Bank.
11. Feenstra, R. C. and S.－J. Wei (2010), *China's Growing Role in World Trade*, The University of Chicago Press.
12. Head, K., T. Mayer and J. Ries (2009), 'How Remote is the Offshoring Threat?', *European Economic Review*, 53, 4, 429－444.
13. Head, K., and T. Mayer (2014), 'Gravity Equations: Workhorse, Toolkit, and Cookbook', in Gopinath, G., E. Helpman, and K. Rogoff (eds.), *Handbook of International Economics* Vol. 4, Elsevier.
14. Information Office of the State Council (2014), 'China's Foreign Aid', The People's Republic of China.
15. Kimura, F. and H.－H. Lee (2006), 'The Gravity Equation in International Trade in Services', *Review of World Economics*, 142, 1, 92－121.
16. Lewer, J. J. and H. Van den Berg (2008), 'A Gravity Model of Immigration', *Economics Letters*,

99, 1, 164－167.

17. Ministry of Health, Labor and Welfare, ‘Situation of Notified Foreign National Employment Status’ http://www.mhlw.go.jp/stf/houdou/0000036114.html (in Japanese).
18. Rosenbaum P.R. and D.B. Rubin (1983), ‘The Central Role of the Propensity Score in Observational Studies for Causal Effects’, *Biometrika*, 70, 41－55.
19. Santos Silva, J. and S. Tenreyro (2006), ‘The Log of Gravity’, *Review of Economics and Statistics*, 88, 4, 641–658.
20. Stephenson, S., and G. Hufbauer (2010), ‘Increasing Labor Mobility: Options for Developing Countries’, in Cattaneo O., M. Engman, S. Sáez and R. M. Stern (eds.) *International Trade in Services – New Trends and Opportunities for Developing Countries*, Washington, DC: the World Bank.
21. Tang, Y., Y. Zhang and C. Findlay (2013), ‘What Explains China’s Rising Trade in Services?’, *The Chinese Economy*, 46, 6, 7－31.
22. Winters, L. A. (2008), ‘The Temporary Movement of Workers to Provide Services (GATS Mode 4)*’, in Matto, A., R. M. Stern and G. Zanini (eds.), *A Handbook of International Trade in Services*, 481－541, Oxford University Press.
23. World Bank (2007), *Africa’s Silk Road: China and India’s New Economic Frontier*, Washington, DC: the World Bank.
24. WTO (World Trade Organization) (2008), *International Trade Statistics 2008*, Geneva: WTO.
25. Yueh L. (2013), *China and Globalization*, Routledge.
26. Zhang, H. (2014), ‘Reconsidering the Determinants of International Labor Mobility’, Research Institute of Economy, Trade and Industry, Column: 293, http://www.rieti.go.jp/en/columns/a01_0401.html.

Figure 1: Dispatch of workers (unit: 1,000 people)



Source: *China Statistical Yearbook*, 2013, *China External Economic Statistical Yearbook*, various years, National Bureau of Statistics

Table 1：Distribution of workers (unit: %)

	Overseas labor services			Overseas contracted projects		
Region	1992	2002	2012	1992	2002	2012
Asia	64.6	78.1	82.6	40.3	50.4	45.3
Africa	5.7	7.8	7.5	30.2	36.9	44.8
Europe	10.6	5.1	4.9	22.6	7.2	3.0
Latin America	1.0	2.9	3.2	2.0	2.0	5.3
North America	6.8	4.3	0.4	3.6	1.3	0.1
Oceania	0.9	1.5	1.0	1.2	1.3	1.4
Others	10.5	0.4	0.3	0.0	0.8	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: *China External Economic Statistical Yearbook*, 1994, 2003, *China Trade and External Economic Statistical Yearbook*, 2013, National Bureau of Statistics

Table 2: Determinants of labor mobility: OLS

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Log (number of workers + 1)	LS			CP		
	Full Samples		LS>0	Full Samples		CP>0
Log distance	-1.425***	-1.282***	-1.374***	-0.983***	-0.876***	-0.651***
	[0.321]	[0.307]	[0.250]	[0.276]	[0.269]	[0.188]
Log population	0.430***	0.424***	0.195***	0.394***	0.383***	0.193***
	[0.068]	[0.068]	[0.063]	[0.060]	[0.059]	[0.048]
Log GDPPC	0.287***	0.282***	0.262***	-0.393***	-0.387***	-0.153**
	[0.097]	[0.095]	[0.086]	[0.084]	[0.083]	[0.070]
Free trade agreement		2.742***	1.619***		1.504***	0.651*
		[0.584]	[0.478]		[0.476]	[0.384]
Overseas project promotion policy		0.006	-0.413		1.561***	1.408***
		[0.684]	[0.585]		[0.505]	[0.401]
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,849	3,849	3,065	3,849	3,849	2,703
adj. R-sq	0.230	0.244	0.247	0.284	0.293	0.218

Note: Estimation methods are OLS in all columns. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Robust standard errors clustered by destination are in brackets.

Table 3: Determinants of labor mobility: PPML

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Number of workers	LS			CP		
	Full Samples		LS>0	Full Samples		CP>0
Log distance	-1.627***	-1.567***	-1.516***	-0.412*	-0.341	-0.255
	[0.227]	[0.213]	[0.204]	[0.219]	[0.214]	[0.202]
Log population	0.198	0.241**	0.189*	0.292***	0.260***	0.180***
	[0.125]	[0.112]	[0.113]	[0.065]	[0.058]	[0.056]
Log GDPPC	0.720***	0.707***	0.689***	0.020	0.062	0.114
	[0.118]	[0.115]	[0.118]	[0.086]	[0.089]	[0.085]
Free trade agreement		0.837*	0.646		0.029	0.014
		[0.478]	[0.453]		[0.505]	[0.448]
Overseas project promotion policy		-0.497	-0.470		1.178**	1.226**
		[0.565]	[0.547]		[0.523]	[0.484]
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,849	3,849	3,065	3,849	3,849	2,703
pseudo R-sq	0.638	0.649	0.644	0.284	0.312	0.273

Note: Estimation methods are PPML in all columns. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Robust standard errors clustered by destination are in brackets.

Table 4: Robustness checks: Flow data for 2012

	(1)	(2)	(3)	(4)	(5)	(6)
		LS			CP	
Panel A: OLS	Full Samples		LS>0	Full Samples		CP>0
Log distance	-1.268***	-0.840*	-0.773*	-0.993***	-0.610	-0.482
	[0.450]	[0.494]	[0.401]	[0.368]	[0.407]	[0.365]
Log population	0.296***	0.249**	-0.045	0.587***	0.522***	0.224**
	[0.104]	[0.108]	[0.108]	[0.083]	[0.084]	[0.086]
Log GDPPC	0.148	0.138	0.330***	-0.579***	-0.545***	-0.447***
	[0.133]	[0.131]	[0.121]	[0.110]	[0.111]	[0.112]
Free trade agreement		2.574***	1.500**		1.455**	0.793
		[0.881]	[0.674]		[0.711]	[0.709]
Overseas project promotion policy		0.068	-0.360		1.343**	1.262***
		[0.842]	[0.745]		[0.549]	[0.451]
Observations	180	180	112	180	180	138
adj. R-sq	0.090	0.126	0.154	0.303	0.323	0.224
Panel B: PPML	Full Samples		LS>0	Full Samples		CP>0
Log distance	-1.599***	-1.296***	-1.140***	-0.414	-0.261	-0.205
	[0.349]	[0.327]	[0.325]	[0.276]	[0.328]	[0.314]
Log population	0.051	0.211	0.112	0.299***	0.249***	0.161**
	[0.140]	[0.147]	[0.137]	[0.068]	[0.065]	[0.065]
Log GDPPC	0.781***	0.753***	0.693***	-0.084	-0.035	0.000
	[0.158]	[0.187]	[0.167]	[0.087]	[0.102]	[0.099]
Free trade agreement		1.605***	1.216***		0.210	0.173
		[0.457]	[0.443]		[0.453]	[0.404]
Overseas project promotion policy		-0.694	-0.674		0.731	0.758
		[0.931]	[0.880]		[0.585]	[0.544]
Observations	180	180	112	180	180	138
pseudo R-sq	0.549	0.634	0.632	0.173	0.205	0.145

Note: Dependent variables are log (number of workers + 1) in Panel A and number of workers in Panel B, respectively. Estimation methods are OLS in Panel A and PPML in Panel B, respectively. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors clustered by destination are in brackets.

Table 5: Robustness checks: Alternative measures

	(1)	(2)	(3)	(4)	(5)	(6)
	LS			CP		
Panel A: OLS	Full Samples		LS>0	Full Samples		CP>0
Log distance population-weighted	-1.315***	-1.201***	-1.302***	-1.114***	-1.021***	-0.723***
	[0.332]	[0.331]	[0.273]	[0.283]	[0.282]	[0.206]
Log population	0.401***	0.392***	0.195***	0.425***	0.410***	0.210***
	[0.068]	[0.068]	[0.061]	[0.063]	[0.062]	[0.048]
Log GDPPC PPP adjusted	0.363***	0.359***	0.322***	-0.401***	-0.395***	-0.109
	[0.125]	[0.124]	[0.108]	[0.119]	[0.118]	[0.093]
Free trade agreement		2.192***	1.151**		1.111**	0.441
		[0.559]	[0.484]		[0.524]	[0.436]
Overseas project promotion policy		0.140	-0.377		1.817***	1.508***
		[0.656]	[0.572]		[0.492]	[0.401]
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,718	3,718	2,982	3,718	3,718	2,637
adj. R-sq	0.218	0.227	0.232	0.267	0.275	0.219
Panel B: PPML	Full Samples		LS>0	Full Samples		CP>0
Log distance population-weighted	-1.686***	-1.674***	-1.634***	-0.441*	-0.377	-0.269
	[0.170]	[0.190]	[0.189]	[0.259]	[0.250]	[0.237]
Log population	0.366***	0.371***	0.324***	0.295***	0.259***	0.180***
	[0.124]	[0.113]	[0.119]	[0.070]	[0.063]	[0.060]
Log GDPPC PPP adjusted	1.086***	1.073***	1.020***	0.169	0.217	0.268**
	[0.216]	[0.216]	[0.207]	[0.131]	[0.138]	[0.125]
Free trade agreement		0.110	-0.005		-0.056	-0.034
		[0.596]	[0.585]		[0.489]	[0.436]
Overseas project promotion policy		-0.506	-0.572		1.252**	1.248***
		[0.539]	[0.529]		[0.516]	[0.481]
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,718	3,718	2,982	3,718	3,718	2,637
pseudo R-sq	0.672	0.672	0.665	0.298	0.329	0.302

Note: Dependent variables are log (number of workers + 1) in Panel A and number of workers in Panel B, respectively. Estimation methods are OLS in Panel A and PPML in Panel B, respectively. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors clustered by destination are in brackets.

Table 6: Alternative explanations

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Number of workers	TITP of Japan		Age and education		Exports and FDI		ODA		Natural resources		Infrastructure	
	LS	CP	LS	CP	LS	CP	LS	CP	LS	CP	LS	CP
Log distance	-1.534***	-0.391*	-1.598***	-0.464**	-1.364***	0.114	-1.533***	-0.270	-1.566***	-0.358	-1.688***	-0.604***
	[0.178]	[0.218]	[0.228]	[0.221]	[0.336]	[0.213]	[0.231]	[0.238]	[0.230]	[0.224]	[0.223]	[0.182]
Log population	0.129	0.270***	0.219**	0.262***	0.208	-0.014	0.328***	0.268***	0.229**	0.305***	0.273**	0.316***
	[0.091]	[0.056]	[0.108]	[0.062]	[0.312]	[0.121]	[0.122]	[0.056]	[0.114]	[0.066]	[0.107]	[0.069]
Log GDPPC	0.578***	0.077	0.685***	0.076	0.670**	-0.108	0.757***	0.078	0.689***	0.131	0.962***	0.734***
	[0.110]	[0.090]	[0.108]	[0.093]	[0.293]	[0.106]	[0.141]	[0.089]	[0.103]	[0.089]	[0.154]	[0.139]
Free trade agreement	0.940**	-0.025	0.665	-0.048	0.362	-0.489	0.953**	0.064	0.745	0.342	0.807*	-0.131
	[0.393]	[0.501]	[0.486]	[0.563]	[0.523]	[0.373]	[0.477]	[0.503]	[0.504]	[0.451]	[0.431]	[0.527]
Overseas project promotion policy	-0.511	1.161**	-0.454	1.303**	-0.302	1.142***	-0.587	1.192**	-0.458	1.039**	-0.505	1.201**
	[0.559]	[0.523]	[0.527]	[0.526]	[0.505]	[0.419]	[0.550]	[0.526]	[0.584]	[0.491]	[0.582]	[0.474]
TITP	1.261***	-2.027***										
	[0.300]	[0.400]										
Share of population aged 15-29 (China)			-0.281***	0.005								
			[0.085]	[0.089]								
Secondary education enrollment ratio (China)			0.000	0.055***								
			[0.014]	[0.010]								
Log exoports					0.106	0.060						
					[0.280]	[0.121]						
Log FDI					0.083**	0.364***						
					[0.041]	[0.063]						
Log ODA							-0.177	1.586***				
							[0.415]	[0.360]				
Total natural resources rents (% of GDP)									-0.007	0.033***		
									[0.012]	[0.006]		
Telephone lines (per 100 people)											-0.021**	-0.074***
											[0.009]	[0.019]
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,849	3,849	3,468	3,468	1,847	1,847	2,221	2,221	3,816	3,816	3,785	3,785
pseudo R-sq	0.678	0.317	0.634	0.306	0.703	0.389	0.669	0.251	0.644	0.425	0.653	0.428

Note: Estimation methods are PPML in all columns. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors clustered by destination are in brackets.

Table 7: DD results

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Log (number of workers + 1)	OLS		Fixed-effects		More controls	
	Full samples	CP>0	Full samples	CP>0	Full samples	CP>0
Treatment×Post2009	1.214***	1.010***	1.222***	0.936***	0.961***	0.731***
	[0.356]	[0.237]	[0.365]	[0.264]	[0.359]	[0.260]
Treatment	2.539***	1.390***				
	[0.501]	[0.344]				
Post2009	1.337***	1.061***	2.404***	1.945***	1.277***	0.740**
	[0.135]	[0.119]	[0.210]	[0.201]	[0.322]	[0.292]
Log population					2.420***	2.511***
					[0.641]	[0.597]
Log GDPPC					1.219***	1.369***
					[0.337]	[0.323]
Destination fixed effects	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
Observations	3,849	2,703	3,849	2,703	3,849	2,703
adj. R-sq	0.099	0.118	0.748	0.679	0.755	0.696

Note: Estimation methods are OLS in column (1)-(2) and Fixed-effects in column (3)-(6). Samples with non-zero workers are used in column (2), (4), and (6). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors clustered by destination are in brackets.

Table 8: PSM with DD results

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Log (number of workers + 1)	OLS		Fixed-effects		More controls	
	Full samples	CP>0	Full samples	CP>0	Full samples	CP>0
Treatment×Post2009	1.298***	1.088***	1.245***	1.130***	1.050**	0.931***
	[0.413]	[0.293]	[0.423]	[0.325]	[0.425]	[0.317]
Treatment	-0.005	0.205				
	[0.549]	[0.383]				
Post2009	1.253***	0.983***	1.150***	1.640***	0.661	0.56
	[0.244]	[0.207]	[0.359]	[0.390]	[0.726]	[0.773]
Log population					0.142	1.602
					[2.447]	[1.878]
Log GDPPC					1.444*	1.563***
					[0.735]	[0.474]
Destination fixed effects	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
Observations	745	711	745	711	745	711
adj. R-sq	0.126	0.154	0.689	0.674	0.697	0.692

Note: Estimation methods are OLS in column (1)-(2) and Fixed-effects in column (3)–(6). Samples with non-zero workers are used in column (2), (4) and (6). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors clustered by destination are in brackets.

Appendix

Data sources

Annual data on labor mobility: *China External Economic Statistical Yearbook* (1994–2005), *China Trade and External Economic Statistical Yearbook* (2006–2013), National Bureau of Statistics of China

Distance: The CEPII Gravity Dataset, CEPII,

http://www.cepii.fr/anglaisgraph/bdd/distances.htm

Population, GDP, per capita GDP, per capita GDP (purchasing power parity adjusted), share of population aged 15-29, secondary education enrollment ratio, total natural resources rents (% of GDP), telephone lines (per 100 people):

World Development Indicators, the World Bank,

http://data.worldbank.org/data-catalog/world-development-indicators

GDP, per capita GDP data of Taiwan: Penn World Table, http://pwt.econ.upenn.edu/

Free trade agreement: World Trade Organization,

http://www.wto.org/english/tratop_e/region_e/region_e.htm

Exports and FDI: *China Statistical Yearbook*, 2013, National Bureau of Statistics of China

ODA: *Finance Yearbook of China*, various years, National Bureau of Statistics of China

Table A1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Number of workers undre LS	3,849	1,932	10,053	0	177,560
Number of workers undre CP	3,849	726	2,692	0	46,039
Log distance	3,849	8.999	0.525	6.862	9.868
Log distance population-weighted	3,828	9.023	0.517	7.063	9.858
Log population	3,849	15.398	2.118	9.116	20.936
Log GDPPC	3,849	8.041	1.626	3.912	11.382
Log GDPPC PPP adjusted	3,739	8.904	1.272	4.956	11.804
Free trade agreement	3,849	0.018	0.133	0	1
Overseas project promotion policy	3,849	0.014	0.115	0	1
TITP dummy	3,849	0.005	0.070	0	1
Share of population aged 15-29	3,468	26.234	1.297	25.070	29.439
Secondary education enrollment ratio	3,829	63.368	12.674	43.487	88.978
Log exports	1,847	10.705	2.677	0	17.376
Log FDI	1,847	6.752	3.726	0	17.238
Log ODA	2,221	3.080	0.237	2.760	3.420
Total natural resources rents (% of GDP)	3,816	9.527	14.983	0	100.367
Telephone lines (per 100 people)	3,785	18.694	19.350	0	105.802

Table A2: Probit estimation

Dependent variable:	Treatment dummy (2008)
Log number of workers under CP (average of 2003 to 2007)	0.328*
	[0.183]
Log number of workers under LS (average of 2003 to 2007)	-0.083
	[0.132]
Log distance	-0.572
	[0.351]
Log population (average of 2003 to 2007)	0.382**
	[0.155]
Log GDPPC (average of 2003 to 2007)	-0.284
	[0.183]
Free trade agreement (2008)	0.183
	[0.615]
Observations	186
pseudo R-sq	0.428
ll	-26.563
chi2	41.123

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

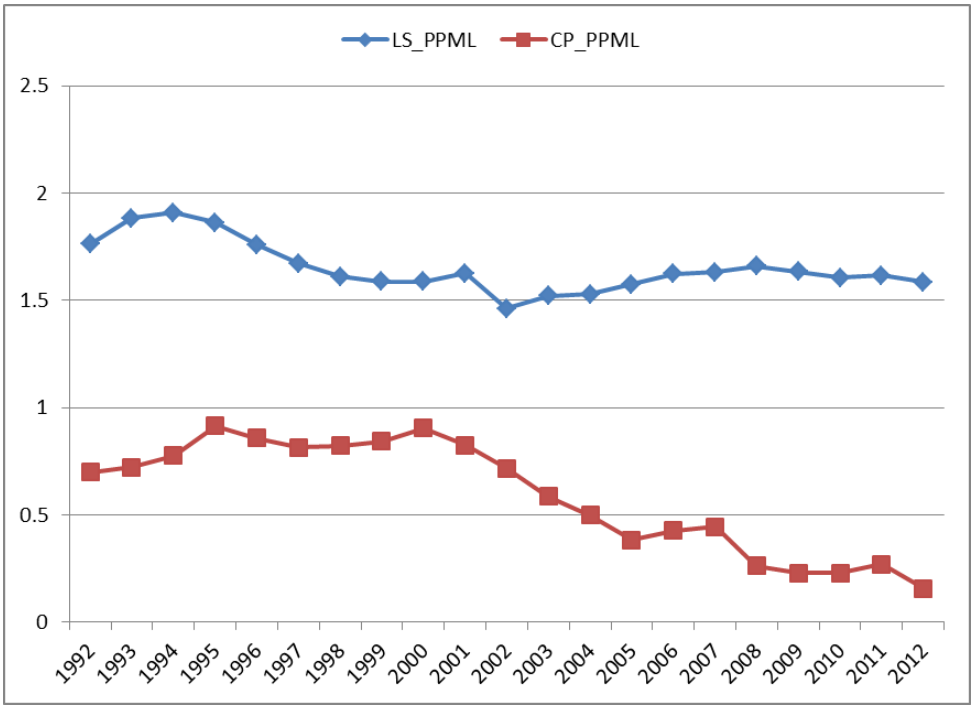
Table A3: Balancing tests

	Destination before matching			Destination after matching		
Covariate	Mean for treatment (1)	Mean for control (0)	(0) - (1) *t* statistics	Mean for treatment (1)	Mean for control (0)	(0) - (1) *t* statistics
Log number of workers under CP	7.028	3.987	-4.209***	7.028	6.642	-0.888
Log distance	8.561	9.031	3.213***	8.561	8.555	0.118
Log population	17.719	15.215	-4.242***	17.719	17.082	-1.805
Log GDPPC	6.787	8.223	3.111**	6.787	6.853	0.144
N	13	177		13	23	

Note: This table uses *t* tests to compare covariates (distance, average of workers, population and relative GDP per capita from 2003 to 2007) between the treatment group and the control group. The common support condition is imposed and the balancing property is satisfied. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

The treatment group includes Algeria, Egypt, Ethiopia, Indonesia, Kazakstan, Nigeria, Pakistan, Philippines, Sri Lanka, Sudan, Tajikistan, Uzbekistan, and Viet Nam. The control group after matching includes Afghanistan, Cambodia, Congo (Democratic Republic of the), Ghana, Iran, Japan, Kenya, Korea, Kyrgyzstan, Lao People's Democratic Republic, Madagascar, Malawi, Malaysia, Mexico, Mongolia, Mozambique, Nepal, Russian Federation, Tanzania (United Rep. of), Thailand, Uganda, Yemen, and Zimbabwe.

Figure A1: Heterogeneous distance effects over time



Note: This figure displays the annual estimates of the distance effects (coefficients on log distance times minus one). I estimate equation (1) on year-by-year basis. Estimation methods are PPML.