Can Return Migration Reshape Environmental Preferences? Evidence from the Great Recession in China *

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Abstract

The Great Recession in 2008 induced a large number of migrants to return to their home city in China. This paper studies how return migration in this trade episode reshapes environmental preferences and awareness in the home regions of migrants. We employ a shift-share IV based on exogenous changes in world import demand, which predicts the return migration wave. We show that exposure to return migration from regions featuring stronger environmental awareness increases local people's environmental preferences. In particular, local people express greater awareness of local pollution issues, engage in more environmental protection actions, and acquire more environment-related knowledge. An important mechanism for these results is that return migration leads to the diffusion of environmental beliefs and preferences between regions.

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1 Introduction

Trade, migration, and pollution have been three of the defining features of China's rapid socioeconomic evolution over the last 30 years. The literature has highlighted migration and trade flows as two independent channels facilitating the circulation of knowledge, culture, and attitudes (Daudin et al., 2019; Tang and Zhang, 2021; Spolaore and Wacziarg, 2022). However, little is known about how trade-induced migration shapes social norms and attitudes, especially preferences for environmental quality.

Our study focuses on the diffusion of attitudes and beliefs through return migration in China and takes advantage of the unexpected negative trade shock of the 2008 Great Recession, which induced a large amount of migrants to return home. We evaluate how the return migration wave interacts with heterogeneous environmental awareness between regions (prior to the trade shock) to reshape pro-environmental preferences and behaviors in China. The implication on citizens' environmental awareness is beyond the socioeconomic effects of migration previously documented by economists.

By combining census data and rich micro survey data, we examine whether indirect exposure to environmental awareness and preferences prevailing in other regions-through contacts with return migrants-can change the preferences and behaviors of local people (without any migration experiences) in 2010 and 2013 (in the aftermath of the Great Recession). It builds on the idea that migrants absorb new norms, practices, and information pertaining to environmental preservation while away, which they then transmit to their home communities when they return. In particular, our specification exploits the interaction between the prevalence of return migration (recorded in Census 2010) and the weighted difference in average environmental awareness between the region of origin and the migrants' destination regions in the *baseline* year, the weights of which are based on initial migration networks from home regions to these destinations.

We face two potential identification challenges. First, return migration decisions may be affected by confounders that are associated with people's environmental awareness (say, economic prosperity in home cities). Second, certain migrants may self-select to migrate to or return to regions with greater environmental awareness, causing a reverse causality issue.

To address these empirical concerns, we employ a shift-share IV strategy that is based on the natural experiment of the 2008 Great Recession. Negative world import demand (WID) shocks for the industries that migrants' host regions specialize in can have large effects on return migration from these regions to their home locations. Specifically, we use changes in world-import demand from 2007 to 2009 by industry, and weight them by initial employment shares to derive exposures in each destination province. We next predict plausibly exogenous variation of exposure to return migration in each home city based on proximity from home cities to potential destination provinces and exposure to WID shocks in these destinations. [1] Importantly, in IV construction, we exclude any trade (exports or imports) that involves China. Thus, our shift-share IV is unlikely to be related to local confounders within China, such as environmental awareness or norms in either home location or previous destinations.

Based on detailed survey questions, we construct several "outcome" indexes to measure individual environmental preferences from various perspectives. Our results demonstrate that local people exposed to increased return migration from provinces featuring stronger environmental awareness experience an increase in environmental preferences. Specifically, local people express greater awareness of local pollution problems, take more environmental protection actions, and acquire more environmental knowledge. Increased return migration also affects how locals evaluate government environmental performance. Notably, we estimate these effects *conditional upon* the actual level of pollution exposure by local people.

Moreover, the marginal effects of return migration on preferences and behaviors increase in magnitude and significance level as the regional differences in environmental awareness [2] (between home locations and previous destinations for migrants) become larger. Thus, return migration combines with initial regional differences in environmental awareness to reshape the environmental attitudes and beliefs of Chinese citizens. Taking Leshan and Xiangyang (two medium-sized cities) as an example, the heterogeneous exposure to return migration from different provinces contributes to 6.1 % of the difference of our index for the perceived level of pollution , up to 10.4% of the difference of the index for environmental protection actions, 2 % of the gap in the evaluation of government environmental performance, and 1.4% of the gap in the level of environment-related knowledge

[1] Specifically, for each home city, we calculate the inverse-distance weighted average of exposures to trade shocks across potential destination provinces.

[2] We measure baseline regional environmental awareness as the proportion of population who believe environmental issues are important in the baseline year.

between average local residents in the two cities in 2013. Our estimated effects of return migration lie in the range of the spillover effects of migration (on various social norms) in the literature (Docquier et al., 2016; Barsbai et al., 2017; Karadja and Prawitz, 2019; Diabate and Mesplé-Somps, 2019) and are smaller in magnitude in comparison with the effects of disclosure of real-time PM2.5 information in polluted cities [3] in China.

We conduct a battery of tests to examine potential threats to our indentation strategy and robustness of our results. First, our shift-share IV is well balanced with respect to various potential regional and industry-level confounders, bolstering the confidence of our identification. Second, so as to examine the issue of self-selected migration (driven by environmental preferences), we document that baseline environmental awareness *cannot* predict either out-migration or return migration decisions. Last, our results are robust to controlling for various potential confounders, including economic prosperity, industrial structures, previous and contemporaneous environmental policies, out-migration flows (to regions with both higher and lower environmental awareness), lagged exposure to return migration in the baseline year, and baseline pollution exposure in previous host regions for returnees (which may be associated with their environmental preferences and migration choices).

We provide suggestive evidence that the effect of return migration works through the channel of diffusion of beliefs and attitudes between regions. We document that, holding the regional differences in environmental awareness constant, the effects of return migration would be stronger if people in home regions speak a similar dialect as potential destination regions (for migrants) nearby. This is consistent with the channel of transmission of preference and beliefs. Indeed, smaller linguistic distance is likely to reduce the communication costs between migrants and local residents in destination cities, making it easier for migrants to absorb new information and preferences related to environmental protection. We also show that return migrants have intense social activities and interactions, facilitating the transmission of attitudes and information to other people in their home location. We do not find any evidence to support competing mechanisms for our findings, such as changes in environmental conditions associated with return migration, as well as self-selected return migration based on environmental preferences.

[3] Polluted cities are defined as cities with baseline PM2.5 concentration above the median level.

Our work is related to several strands of literature and sub-disciplines in economics. First, we are the first attempt to study how return migration shapes environmental awareness. There is a notable literature on the role of migrants in the transmission of preferences, ideas and values, which highlights the implications of internal or international migration on fertility preferences (Daudin et al., 2019; Spolaore and Wacziarg, 2022), gender norms (Tuccio and Wahba, 2018; Miho et al., 2024), and political norms and ideology (Chauvet and Mercier, 2014; Giuliano et al., 2020). We complement these by uncovering the association between migration and environmental preferences.

Second, international economists have demonstrated that trade can affect social norms and beliefs through different pathways. For instance, international trade and investment impact gender norms through cultural transmissions between countries (Tang and Zhang, 2021) and changes in gender-specific labor demand (Li, 2021). Historical slave trade undermines the level of trust by creating an environment of insecurity (Nunn and Wantchekon, 2011). Our analysis proposes a new migration channel by which trade impacts norms and beliefs. In particular, return migration induced by trade shocks leads to convergence of environmental beliefs between *sub-national* regions within China.

Third, environmental economists use hedonic valuation to estimate people's preferences for environmental quality (Bayer et al., 2009; Gao et al., 2023a), which is crucial for designing appropriate environmental policies. Moreover, pro-environmental preferences may reduce pollution emissions, stimulate green innovations, and increase social welfare (Aghion et al., 2023; Chander and Muthukrishnan, 2015). But so far, there has been little work analyzing how environmental preferences are formatted and evolved. We attempt to fill this gap in knowledge by analyzing the role of migration in determining environmental preferences.

The remainder of this paper proceeds as follows. Section 2 describes the data and Section 3 shows descriptive patterns of return migration and environmental awareness. Section 4 describes our empirical specification. Section 5 presents the estimates of how trade-induced return migration affects environmental preferences. Section 6 conducts robustness checks and Section 7 discusses the potential mechanisms driving our empirical pattern. Section 8 concludes.

2 Data

2.1 Data on Return Migration

We measure exposure to return migration using the 2010 Population Census of China. China conducts its national population census every ten years [4], and the 2010 Population Census is the most recent decennial census of which individual-level data are available to researchers. Return migrants are defined as people who had been away from their *hukou* provinces five years prior to the census year of 2010 but resided in their *hukou* location in 2010. [5] We count the number of return migrants in each city, and then calculate the share of return migrants among total *hukou* population at the city level. [6] We focus on return migration from other provinces for two reasons. First, the census does not record the migration history of people who previously migrated within their home provinces. Moreover, migrants are more likely to be exposed to different environmental awareness and preferences if they move out of their home provinces.

2.2 Data on Preferences and Behaviors

Data on Preferences after the Great Recession Data on individual preferences for environmental quality come from the Chinese General Social Survey (CGSS) 2010 and 2013.[7] The CGSS is a nationwide, repeated, cross-sectional general survey, covering individuals and households across 105 cities in China. A probability-proportional-to-size sampling (PPS) procedure based on population size and administrative units is adopted to ensure that the survey is nationally representative. The data contain a wide range of environment-related variables, measuring individuals' beliefs about local environmental pollution, behaviors of

[4] China also conducts a mini population survey in the middle year between two censuses, with a much smaller sample size than that of decennial censuses.

[5] We follow recent work on internal migration in China (Liang et al., 2024; Tombe and Zhu, 2019) to use people's *hukou* location as their places of origin. Most people's *hukou* city is their birth city. The China Labor-force Dynamic Survey 2014 shows that only 7% of the respondents' *hukou* city was different from their birth city. Additionally, it usually takes a long time for migrants to obtain local a *hukou*. Some local governments require that migrants must work in the city for more than 3 years before applying for local a *hukou*.

[6] The geographic units of our analysis are Chinese prefecture-level cities. A prefecture-level city comprises both urban and rural areas.

[7] We do not use the CGSS 2011 and 2012, because these waves of the CGSS do not contain any information on beliefs about local pollution, environment-related knowledge or attitudes towards local environmental governance.

environmental protection and energy saving, attitudes towards government environmental performance, as well as knowledge of environmental protection. These variables reflect individual environmental preferences from different perspectives.

Data on Baseline Environmental Preferences Our study analyzes how return migration interacts with baseline regional differences of belief and awareness to affect preferences for environmental quality of local residents. Data on average environmental awareness in the baseline year come from the China Household Income Survey (CHIP) 2002. The CHIP 2002 is the earliest survey in China that provides information on attitudes towards environmental issues at baseline. We thus leverage baseline environmental awareness six years prior to the Great Recession, which is unlikely to be related with exposure to return migration in the aftermath of the trade shock.[8] In particular, the survey asked each respondent whether or not environmental degradation is one of the first two most important issues in modern China. We use the proportion of respondents whose answer is "yes" to measure the average environmental awareness in *hukou* province and each potential destination province (for migrants).

We further use baseline migration networks constructed using the 2000 population census to calculate the weighted average of environmental awareness across various potential destination provinces for people from a particular home province. The weights are based on the proportion of migrants (originating from their home province) who moved to a particular destination province in 2000. The differences between the average awareness in *hukou* province and the weighted average awareness across migrants' potential destination provinces reflect the exposure to preference differences between host regions and places of origin experienced by an average migrant.

Taken together, we measure the fraction of return migrants from other provinces in each home city as well as differences of baseline environmental awareness between home provinces and destination provinces (for an average migrant in the baseline year).

[8]Appendix Table A8 shows that return migration decisions in the aftermath of the Great Recession are significantly associated with exposure to export shocks in previous host regions, but are unrelated with environmental awareness in either destination or home locations.

2.3 Data to Construct Trade Shocks and Control Variables

We leverage exogenous negative shocks to labor demand in migrants' host provinces due to the Great Recession to identify the consequences of large-scale return migration in China. The raw data used to compute import demand in various provinces are drawn from the International Trade Statistics Database of UN Comtrade.

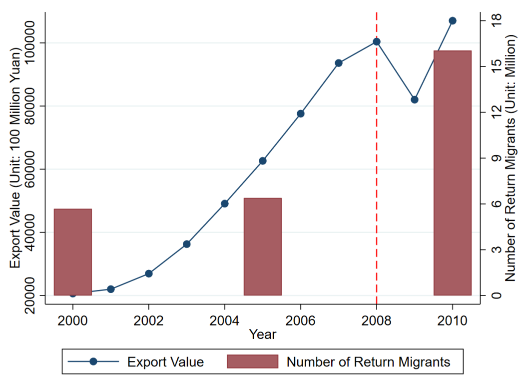
We gather data on control variables from various sources. Data on local water pollution, i.e., Chemical Oxygen Demand (COD) emissions, are collected from the Ministry of Ecology and Environment of China. Data on SO2 concentrations are obtained from the Modern-Era Retrospective Analysis for Research and Applications version 2 (MERRA-2) released by the National Aeronautics and Space Administration (NASA). Data on PM2.5 concentrations are measured using the Global Annual PM2.5 Grids derived from satellite data by Van Donkelaar et al. (2016). Data on regional economic and demographic controls are drawn from the China City Statistical Yearbooks. Appendix Table A1 reports summary statistics of the key variables used in the study.

3 Patterns of Return Migration and Environmental Preferences

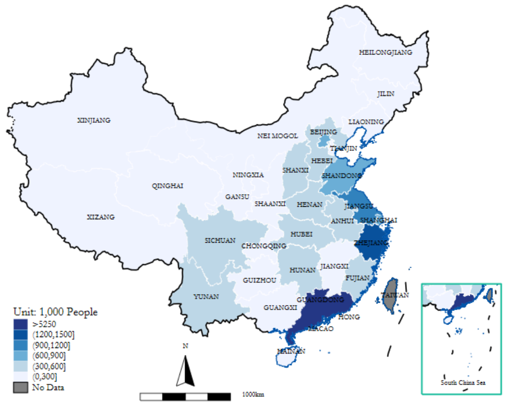
In this section we describe the spatial and temporal patterns of export, return migration and environmental awareness in the raw data. These patterns motivate a more rigorous empirical analysis in subsequent sections.

Figure 1a shows the time trend of China's export to the rest of the world as well as the number of return migrants in population in each census year (2000, 2005 and 2010). Before 2008, China's total export increased rapidly in each year, but the export value suddenly declined by up to 20% in 2009, as a result of the 2008 Great Recession. The negative trade demand shock induced a large amount of migrants to return to their home place. Indeed, the number of return migrants remained stable in 2000 and 2005, but more than doubled in 2010. In 2010, there were over 15 million return migrants in China. Figure 1b shows the geographic patterns of the number of migrants returning home (recorded in the 2010 Census) across different previous destination provinces. These returnees were previously concentrated in coastal provinces, such as Guangdong and Zhejiang, where were greatly hit by the Great Recession.

Figure 1: China Export and Return Migration



(a) Export Value and Return Migration



(b) Where Return Migrants Lived before 2008

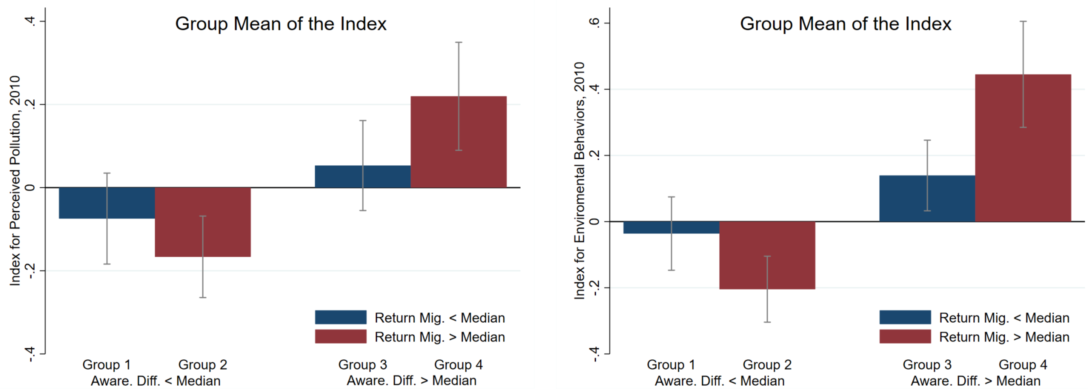
Notes: The left panel plots the number of return migrants in 2000, 2005 and 2015, as well as the China's exports from 2000 to 2010. Here, return migrants are defined as people who came back from other provinces in the past 5 years and have a local *hukou*. Data on return migrants come from the 2000, 2005, and 2010 Censuses. Data on export value come from the National Bureau of Statistics of China. The right panel shows the number of migrants who return home across different previous destination provinces. Data come from 2010 Census. The census records information on previous destination provinces for returnees who used to reside outside their *hukou* province 5 years prior.

Return migration flows in this trade episode were driven by decreased export and have nothing to do with environmental awareness in the previous destination provinces or the home provinces (Appendix Table A8). However, return migrants may transmit information and social norms pertaining to environmental protection to their home locations. Figure 2 summarizes indexes of the perceived level of pollution (Figure 2a) and environmental protection actions (Figure 2b) across cities divided first by the median of return migration and then by the median of regional differences in environmental awareness (average awareness in destinations for previous migrants minus that in home locations) in the baseline year.[9] Within the group of cities with above-median exposure to return migration, the perceived level of pollution and the environmental actions index are both significantly larger in cities where return migrants generally come back from provinces with greater environmental awareness (city group 4, awareness difference > median) than in cities where returnees are likely to be from provinces with lower awareness (city group 2, awareness difference < median). Nevertheless, within the city group with below-median return migration, these indexes are not statistically different based on regional differences in baseline environmental awareness (city groups 1 and 3).

[9]Both the median of return migration and the median of regional awareness differences are based on the full sample.

Taken together, increased return migration may interact with initial differences of environmental awareness between regions to impact local people's environmental preferences. Appendix Figure A1 further illustrates the relationship between return migration and these indexes, conditional on the *actual* exposure to environmental pollution. We limit cities to those with regional awareness differences above the median level; these cities are more likely to be exposed to return migration from provinces with greater environmental preferences. The prevalence of return migration is positively associated with the index of pollution perception (Figure A1a) and the index of environmental actions (Figure A1b).

Figure 2: Return Migration, Awareness Difference, and Environmental Preferences



(a) Individual Perception of Pollution Levels (b) The Behaviors of Environmental Protection

Notes: This figure summarizes the standardized inverse-covariance weighted summary index of individual perception of pollution levels (left panel) and the behaviors of environment protection (right panel) across 4 groups of cities. We divide cities by the median level of return migration and the median level of awareness difference between regions. The awareness difference between regions is defined as the weighted average awareness in destination provinces where previous migrants resided minus the awareness in their *hukou* province. The weights are based on the proportion of migrants (originating from their home province) who moved to a particular destination province in 2000. Environmental awareness is measured as the proportion of population who believe environmental degradation is one of the two most important issues in modern China in the baseline year. The height of each bar in the histogram represents the mean value for the respective group, and the vertical bands represent the 95% confidence intervals. The standardized inverse-covariance weighted summary indexes of individual perception of pollution levels and the behaviors of environmental protection are constructed based on the data of CGSS 2010. Data on return migration come from the 2010 Census, and data on baseline awareness come from CHIP 2002.

4 Empirical Specification

We use the following equation to study how return migration leads to the diffusion of beliefs about and preferences for environmental quality from migrants' previous host provinces (outside their home provinces) to local residents in their city of origin.

$$
\begin{aligned}
f_{ij} = & \psi_0 + \psi_1 Share\_Return_j + \psi_2 \Delta \overline{f}_j + \psi_3 Share\_Return_j \times \Delta \overline{f}_j \\
& + X\beta + \xi_{region} + v_{ij},
\end{aligned} \quad (1)
$$

where f_{ij} represents various outcome variables for individual i who live in *hukou* city j, reflecting the individual's preferences for a clean environment after the Great Recession. Specifically, we employ a battery of environment-related variables recorded in CGSS as outcome variables (f_{ij}), including an individual's beliefs about local environmental pollution, behaviors of environmental protection and energy saving, attitudes towards government environmental performance, as well as knowledge of environmental protection. We employ cross-sectional data from CGSS 2010 and 2013, respectively, to estimate equation 1, allowing us to look at how the effects of return migration evolve over time. We limit the sample of CGSS to local residents who do *not* have any migration experience by the survey year. [10] $Share\_Return_j$ represents the share of return migrants in proportion of local population in city j as measured by Census 2010. Return migrants are defined as those who had been away from their *hukou* provinces five years before 2010 but resided in their *hukou* city in 2010. [11]

The Great Recession of 2008 unexpectedly reduced labor demand in many popular destination provinces for migrant workers, leading to a dramatic increase in return migration. These return migrants are likely to bring in the knowledge and beliefs related to environmental preservation prevalent in previous host locations. $\Delta \overline{f}_j$ represents the difference in environmental awareness between host locations and home locations faced by an average migrant from city j in the baseline year. As our analysis exploits return migration from other provinces, we leverage the difference in environmental beliefs between provinces. [12] Specifically,

[10]Returnees may have a higher environmental preference than other local residents. Thus, even if return migrants do not transmit any information and attitudes to locals, increased return migration may change the average preferences of residents in a city by changing their composition. Restricting to those without any migration experience accounts for the effect of return migration on the composition of local residents.

[11]For return migrants from other cities within *hukou* provinces, the Census 2010 does not record any information on their migration history or previous destination location. Moreover, the within-province variation of the level of environmental awareness tends to be smaller than the cross-province variation. Thus, we only consider exposure to cross-province return migration in our analysis.

[12]Here, we implicitly assume that the difference in environmental awareness (between host locations and home locations) experienced by an average cross-province migrant is the same for migrants from different home cities within the same province.

$\Delta\overline{f}_j = \sum_d \overline{f}_{d,d\neq p} \times \ s_{pd} - \overline{f}_p$. It is defined as the weighted average of environmental awareness in migrants' host provinces ($\sum_d \overline{f}_{d,d\neq p} \times \ s_{pd}$) minus the average awareness in their *hukou* province in the baseline year ($\overline{f}_p$), where the weights are the proportion of migrants coming from their province of origin and moving to a particular destination province in 2000 (s_{pd}). Recall in Section 2.2, we use the fraction of the local population who believed that environmental issues are crucial in modern China (recorded in CHIP 2002) to measure baseline environmental awareness in each province.

The interaction between $\Delta\overline{f}_j$ and $Share\_Return_j$ in equation 1 reflects the horizontal between-group beliefs transmission from migrants-receiving areas to stayers in migrants-sending areas fostered by return migration. Thus, our primary parameter of interest, i.e., ψ_3, captures how return migration interacts with regional differences in beliefs and preferences to reshape preferences for environmental quality. ξ_{region} denotes fixed effects for macro regions [13], controlling for regional differences in economic development and environmental policies in China. X is a vector of controls, such as the level of water and air pollution in the places of origin, and individual demographic characteristics. v_{ijt} is an error term.

Moreover, the specification of equation 1 enables us to estimate how the marginal effect of increased return migration ($\psi_1 + \psi_3\Delta\overline{f}_j$) changes with respect to regional differences in environmental awareness ($\Delta\overline{f}_j$) in the baseline year. For ease of interpretation, we standardize the dependent variable (f_{ij}), exposure to return migration ($Share\_Return_j$) and our measure of regional differences in environmental awareness ($\Delta\overline{f}_j$).

Two empirical concerns regarding the identification of equation 1 naturally arise. First, certain individuals' out-migration or return migration decisions may be affected by the environmental preference of other inhabitants in a region. In other words, they may self-select to migrate to or return to regions with greater environmental awareness, causing a reverse causality issue. Second, confounding factors such as economic activity and environmental quality in home locations may also affect the return decisions of migrants. To deal with these endogeneity concerns, we leverage the unexpected decline in demand for migrant workers in their destination provinces driven by the Great Recession in China, which leads to a sudden increase in return migration. This allows us to identify the ceteris paribus

[13] There are seven macro-regions in China: East China, North China, Central China, South China, Southwest China, Northwest China and Northeast China.

effect of how return migration reshapes the preferences for a clean environment for local residents.

Shift-share IV: World Import Demand (WID) Shock Since China's accession to WTO, the growth in China that induced large-scale internal migration was export-led. Not surprisingly, as a result of the Great Recession in 2008, negative global import demand shocks for the products/industries that migrants' host regions specialize in can have large effects on migrants' return migration propensities from these regions to their *hukou* places. Using UN Comtrade data on imports [14], we construct a shift-share variable called WID_j, which measures migrants' *hukou* city's exposure to a world import demand shock (via their proximity to potential destination provinces for migrants) during the great recession. The import demand shock experienced by each destination province is defined as the changes in import demand for industry k ($\Delta World\ IM_k$)(between 2007 and 2009) weighted by the importance of that industry to destination province d, as measured by that province's pre-period (1990) employment share of that industry ($\frac{EMP_{d,k}}{\sum_n EMP_{d,n}}$). [15]

Khanna et al. (Forthcoming) and Gao et al. (2023b) show that exposure to WID shocks can effectively predict internal migration in China. Every potential destination province experiences these demand shocks, so each original city's exposure is determined by their proximity to every "potential" migration destination. We therefore weight the destination-specific demand shocks by the inverse of the distance ($dist_{jd}$) from the migrant's *hukou* city j to every destination province d, to create a shift-share variable for original city j:

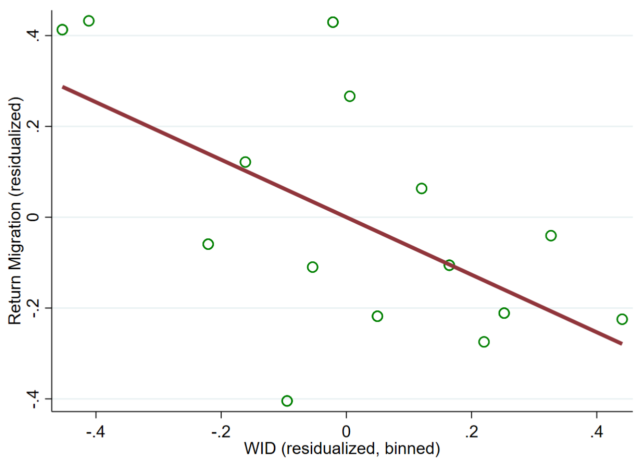
$$WID_j = \sum_d \omega_{jd} \left(\sum_k \Delta World\ IM_k \times \frac{EMP_{d,k}}{\sum_n EMP_{d,n}} \right), \ \omega_{jd} = \frac{\frac{1}{dist_{jd}}}{\left(\sum_m \frac{1}{dist_{jm}}\right)} \tag{2}$$

[14]The International Trade Statistics Database of UN Comtrade contains detailed information on each world trade flow, including the corresponding importer, exporter, the Harmonized System (HS) 6-digit code, and total values. We calculate total imports for each HS 6-digit product at the world level and concord the HS level data to International Standard Industrial Classification (ISIC) industries.

[15]Data on pre-period employment shares come from the 1990 Population Census of China. Erten and Leight (2021) define 26 concordant industry categories to match the ISIC industry categories (for data on world import demand) and the industry categories in the census data. We therefore follow Erten and Leight (2021) to concord both the ISIC industry categories and the industry categories in the census data to the 26 concordant industry categories.

This is a shift-share variable common in the economics literature. The shifter is the changes in the world import demand for industry k. In particular, we firstly create total imports for each industry at the "world" level in each year, netting out any trade (exports or imports) that involves China, and then calculate changes in this "world" level import between 2007 and 2009. Since we exclude any trade flows between China and the rest of the world, our shifter is unrelated to local economic conditions or other confounders of sub-national regions within China. The exposure share of the shift-share variable of equation 2 is the inverse distance weighted average of the baseline employment shares of each potential destination $\sum_d \left(\frac{\frac{1}{dist_{jd}}}{\sum_m \frac{1}{dist_{jm}}}\right) \times \left(\frac{EMP_{d,k}}{\sum_n EMP_{d,n}}\right)$. [16] The sum of the exposure share across industries equals 1. Figure 3 shows a strong correlation between our WID IV and the exposure to return migration in *hukou* city, indicating a strong first stage. Appendix Table A2 presents the first stage results.

Figure 3: WID IV and Return Migration



Notes: We obtain the residuals of WID from the regression of WID on region fixed effects and controls (an overall index for air quality, COD emissions, city tiers, and the minimum distance to Tianjin , Shanghai, and Shenzhen Seaports). We repeat the same regression using city-level exposure to return migration as the dependent variable and predict the residuals of return migration. Cities are divided into 15 groups based on the quantiles of the residuals of the WID. The y-axis denotes the mean of residuals of return migration in each quantile, and the x-axis denotes the mean of residuals of WID in each quantile.

[16] We assign non-zero weights only to potential destinations that are located within a 1750 km radius of *hukou* location j. The 2005 population census shows that the migration distance between the destination location and *hukou* location is below 1750km for more than 95% of migrants in China.

5 Empirical Results

5.1 Baseline Results

This section presents the baseline estimates of the association between the prevalence of return migration and an individual's preferences for a clean environment. We use three different indexes to measure individual preferences from different perspectives: the perception of the severity of local environmental pollution, the behaviors of environmental protection, and the knowledge of environmental protection. These indexes are constructed based on individual responses to various survey questions in CGSS 2010 and 2013. [17] We also evaluate whether exposure to return migration is associated with how individuals evaluate government environmental performance.

Individual Perception of Pollution Levels Table 1 evaluates the effects on an individual's perceived level of local pollution, conditional upon the actual level of pollution exposure. The dependent variable is an standardize overall index constructed based on an individual's perceived levels of three different types of pollution (water, air, and noise pollution). All columns in Table 1 control for macro-region fixed effects and individual demographic attributes. We also add the level of local air pollution and water pollution [18] to account for the confounding effects of actual environmental quality on individual beliefs.

Table 1 columns 1-2 show OLS estimates. Both exposure to return migration and its interaction with the average differences in environmental beliefs (between the province of origin and the previous destination provinces for an average migrant in the baseline year) are statistically insignificant. Return migration decisions may be associated with confounders in places of origin and previous host regions, such as local economic conditions, industrial structure, and the environmental awareness of other inhabitants. Thus, the endogeneity problem is likely to bias the OLS estimates, resulting in statistical insignificance of the coefficient estimates. [19]

[17] For each perspective of environmental preferences, we construct an inverse-covariance weighted summary index based on various independent variables related to environmental preferences and we standardize the index.

[18] Specifically, we control for local Chemical Oxygen Demand (COD) emissions and an overall index for local air quality constructed based on PM2.5 and SO_2 concentrations.

[19] For instance, migrants' attitudes towards norms and preferences in destinations may lead

To address this endogeneity concern, we take advantage of the unexpected trade shock driven by the Great Recession in 2008 and 2009 and employ changes in the world import demand (in potential destinations for previous migrants) (defined in equation 2) as the IV for exposure to return migration. Table 1 columns 3-4 show the IV estimates of the effect on individual beliefs in 2010 and 2013, respectively. The point estimates of return migration and its interaction with regional differences in baseline environmental awareness increase in magnitude and statistical significance. [20] [21]

Our empirical specification of equation 1 allows the marginal effects of return migration to change with respect to the differences in initial environmental beliefs between the original and destination provinces (for previous migrants). Table 1 Panel B shows that the marginal effects of return migration increase in magnitude and significance as the level of belief differences becomes larger in both 2010 and 2013, consolidating our hypothesis of the diffusion of information and preferences between regions by return migration. If return migrants come back from provinces with relatively lower environmental awareness (the belief difference is at its bottom 10th and 20th percentile), the marginal effects of return migration are statistically indifferent from zero (Panel B rows 1 and 2). Nevertheless, if returnees come from provinces with greater and distinct environmental awareness (the belief difference is at the 70th and 90th percentile), the marginal effects of return migration are sizable and statistically significant (Panel B rows 3 and 4). For instance, if the belief difference (between original provinces and previous host provinces) is at the 70th percentile of its distribution, a one SD increase in exposure to return

to a downward estimation bias. If a particular group of migrants dislike the social norms and preferences of local people in destination regions, they are more likely to make return migration decisions. They are also unlikely to transmit any beliefs and preferences from their previous destinations to their home locations. Thus, their return migration would not have any effect on the environmental preferences of other residents.

[20] Since we have standardized exposure to return migration and regional awareness difference, the coefficients on the variable of return migration represent the marginal effects of increasing return migration, when the regional awareness difference is at the average level. Although the awareness difference (among all populations in previous host regions versus home regions) is at the mean of the distribution, migrants are likely to interact more with young residents in urban areas (who tend to have stronger environmental preferences than an average resident in destinations) in the host provinces and absorb the environmental knowledge and preferences of these people. This explains the significant effects of return migration when the awareness difference (among all populations) between provinces is at the average level.

[21] Since we have standardized exposure to return migration and regional awareness difference, the coefficients on the variable of awareness difference represent the marginal effects of awareness difference, when exposure to return migration is at the *mean* level.

migration would increase the overall index of perceived local pollution by 0.44 SD in 2010 and 0.48 SD in 2013.

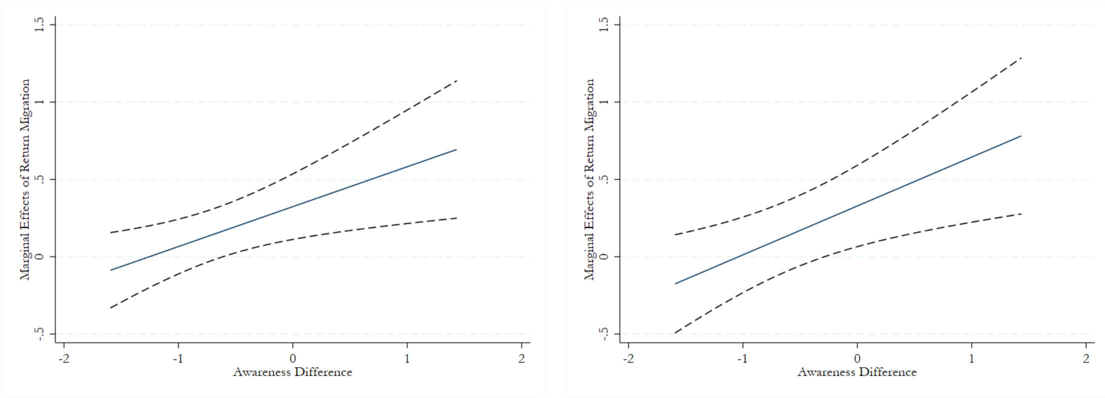
Figure 4 illustrates how the marginal effects of return migration shift with respect to baseline belief differences between regions, showing a slightly larger slope in 2013 than in 2010. Appendix Table A3 repeats our IV estimation and uses local people's perceived level of water pollution, air pollution and noise pollution as outcome variables, respectively.

Table 1: Results on Individual Perception of Pollution Levels

	(1)	(2)	(3)	(4)
	Year 2010	Year 2013	Year 2010	Year 2013
	OLS Estimation		IV Estimation	
Dep. Var.:	Individual Perception of Pollution Levels			
Panel A: Regression Results				
Return Migration (standardized)	0.048	0.069	0.324***	0.328**
	(0.054)	(0.055)	(0.108)	(0.134)
Awareness Difference (standardized)	0.083*	0.101*	0.149***	0.159**
	(0.042)	(0.051)	(0.050)	(0.064)
Return Migration (standardized) ×	0.030	0.067	0.258**	0.316***
Awareness Difference (standardized)	(0.055)	(0.070)	(0.100)	(0.113)
Observations	1,235	3,522	1,235	3,522
Adj R-squared	0.120	0.229		
F-Test of IVs			14.14	11.28
Stock-Yogo Value for 10% IV size			7.03	7.03
Region FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Panel B: Marginal Effects of Return Migration				
P10 of Awareness Difference	0.002	-0.039	-0.079	-0.177
	(0.057)	(0.082)	(0.122)	(0.162)
P20 of Awareness Difference	0.015	-0.008	0.034	-0.033
	(0.041)	(0.056)	(0.095)	(0.132)
P70 of Awareness Difference	0.0613	0.101	0.442***	0.479***
	(0.076)	(0.082)	(0.141)	(0.168)
P90 of Awareness Difference	0.0834	0.152	0.635***	0.721***
	(0.114)	(0.132)	(0.206)	(0.238)

Notes: We standardize return migration and awareness difference. The dependent variable is an individual-level standardized overall index of perceived level of pollution exposure. Columns 1 and 2 report the OLS results, and columns 3 and 4 report the IV results. Panel A presents the coefficient estimates. Panel B estimates the marginal effects of return migration ($\psi_1 + \psi_3 \Delta \overline{f}_j$ in equation 1) when the awareness difference is at the 10th, 20th, 70th, and 90th percentile, respectively. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 4: Marginal Effects: Individual Perception of Pollution Levels



(a) Marginal Effects of Return Migration, 2010 (b) Marginal Effects of Return Migration, 2013

Notes: We plot the marginal effects associated with exposure to return migration on individual perception of pollution levels in 2010 (left panel) and 2013 (right panel), respectively. We standardize awareness difference and use the coefficient estimates in Table 1 Panel A columns 3 and 4 to calculate the marginal effects ($\psi_1 + \psi_3 \Delta \overline{f}_j$ in equation 1) of return migration. Dashed lines represent the 95% confidence intervals.

The Behaviors of Environmental Protection We show the effects of return migration on individual behaviors of environmental protection in Table 2 Panel A, which replicates the empirical specification in Table 1 Panel A. We use a battery of behavior variables to construct a standardized overall index of environmental protection actions, including garbage classification, discussion about environmental issues, recycling of plastic bags, participation in environmental campaigns, saving energy, and among others. We observe a similar pattern of the effects of return migration. The IV estimates of the interaction between return migration and belief differences are statistically significant. Exposure to return migration interacts with baseline awareness differences between regions to reshape the behaviors of environmental protection for local people (who had not been away from their hometown).

Table 2 Panels A and B summarize the marginal effect of return migration on environmental protection actions. For example, if the level of awareness differences is at the 70th percentile of its distribution (Panel B row 3), a one SD increase in return migration would raise the overall index for environment protection behaviors by 0.52 SD and 0.58 SD in 2010 and 2013, respectively. In sum, the marginal effects of return migration on individual behaviors would increase with the level of belief difference (Figure 5). Appendix Table A4 estimates the effects on various independent behavior variables, which are employed to construct our overall behavior index.

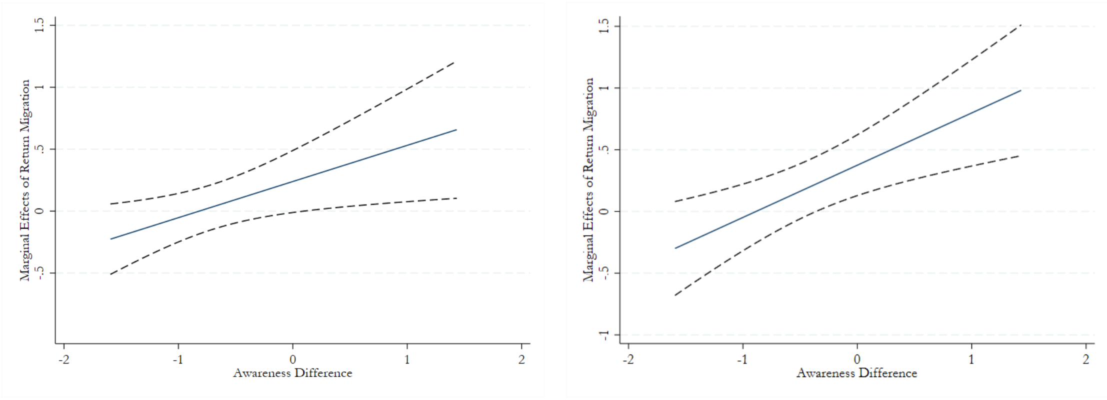
Table 2: Results on the Behaviors of Environmental Protection

	(1)	(2)	(3)	(4)
	Year 2010	Year 2013	Year 2010	Year 2013
	OLS Estimation		IV Estimation	
Dep. Var.:	The Behaviors of Environmental Protection			
Panel A: Regression Results				
Return Migration (standardized)	0.013	0.140*	0.239*	0.375***
	(0.049)	(0.072)	(0.128)	(0.126)
Awareness Difference (standardized)	0.136**	0.125**	0.178***	0.172**
	(0.059)	(0.054)	(0.062)	(0.074)
Return Migration (standardized) ×	0.041	0.112*	0.292**	0.423***
Awareness Difference (standardized)	(0.063)	(0.065)	(0.125)	(0.133)
Observations	1,128	3,775	1,128	3,775
Adj R-squared	0.119	0.264		
F-Test of IVs			9.103	12.02
Stock-Yogo Value for 10% IV size			7.03	7.03
Region FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Panel B: Marginal Effects of Return Migration				
P10 of Awareness Difference	-0.054	-0.039	-0.245	-0.300
	(0.106)	(0.079)	(0.151)	(0.194)
P20 of Awareness Difference	-0.036	0.012	-0.112	-0.108
	(0.081)	(0.061)	(0.112)	(0.149)
P70 of Awareness Difference	0.053	0.193**	0.523**	0.575***
	(0.086)	(0.095)	(0.229)	(0.163)
P90 of Awareness Difference	0.062	0.279*	0.588**	0.898***
	(0.098)	(0.139)	(0.255)	(0.247)

Notes: We standardize return migration and awareness difference. The dependent variable is an individual-level standardized overall index of environmental protection behaviors. Columns 1 and 2 report the OLS results, and columns 3 and 4 report the IV results. Panel A presents the coefficient estimates. Panel B estimates the marginal effects of return migration ($\psi_1 + \psi_3 \Delta \overline{f}_j$ in equation 1) when the awareness difference is at the 10th, 20th, 70th, and 90th percentile, respectively. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Knowledge of Environmental Protection CGSS 2010 and CGSS 2013 have various survey questions related to individuals' knowledge of environmental contamination and protection. For example, each respondent was asked whether automobile exhaust is harmful to human health, whether level-3 air quality is better than level 1 in China's air quality report, and among others. We construct a standardized overall index for environmental knowledge on the basis of individual responses to these survey questions. Table 3 Panel A uses this index as the outcome variable and demonstrates the heterogeneous effects of return migration on

Figure 5: Marginal Effects: The Behaviors of Environmental Protection



(a) Marginal Effects of Return Migration, 2010 (b) Marginal Effects of Return Migration, 2013

Notes: We plot the marginal effects associated with exposure to return migration on individual behaviors of environmental protection in 2010 (left panel) and 2013 (right panel), respectively. We standardize awareness difference and use the coefficient estimates in Table 2 Panel A columns 3 and 4 to calculate the marginal effects ($\psi_1 + \psi_3 \Delta \overline{f}_j$ in equation 1) of return migration. Dashed lines represent the 95% confidence intervals.

individual environmental knowledge based on baseline awareness differences between the original province and the previous destination province (for an average migrant in the baseline year).

Once again, the IV estimates imply that the marginal effects of return migration on environmental knowledge increase as the baseline awareness gaps become larger (Panel B columns 3 and 4). Figure 6 further visualizes how the marginal effects change with respect to belief differences. Appendix Table A5 uses various individual variables of environmental knowledge (defined based on the survey questions in CGSS 2010 and CGSS 2013) as dependent variables and repeats our IV estimation.

Government Environmental Performance We next turn our attention to how individuals evaluate the environmental performance of local government (in their residential city) in Table 4. Based on survey questions in CGSS, we create an indicator for whether an individual believes that local government has made achievements in environmental protection. [22] The IV estimates in Table 4 Panel

[22]Based on the question "regarding the addressing of local environmental issues, how do you evaluate the performance of local government in the last five years?" recorded in CGSS 2010 and 2013, we define a dummy variable to indicate whether an individual believes that the local government has made achievements in environmental protection. The responses coded as 4 ("made a significant effort with certain achievements") and 5 ("achieved great success") are assigned a value of one. Responses coded as 1 ("prioritized economic development, and neglected environmental protection"), 2 ("insufficient attention to and investment in environmental protection"),

Table 3: Results on Knowledge of Environmental Protection

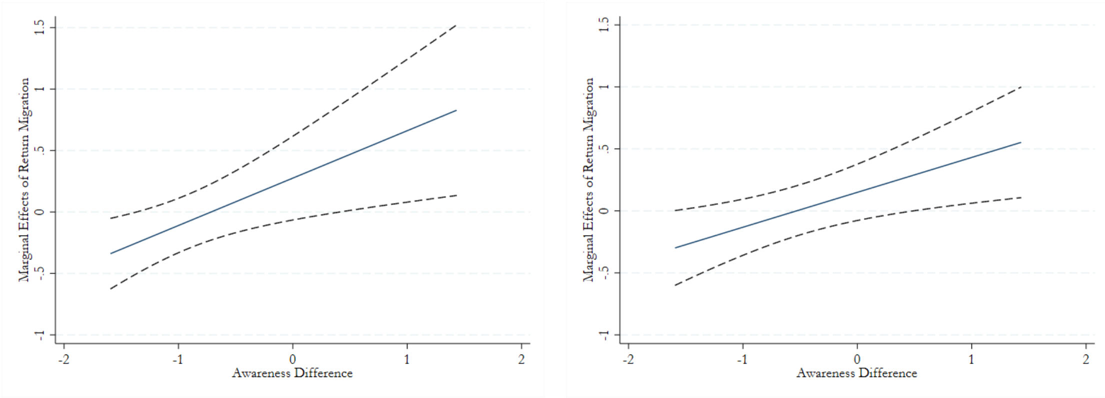
	(1)	(2)	(3)	(4)
	Year 2010	Year 2013	Year 2010	Year 2013
	OLS Estimation		IV Estimation	
Dep. Var.:	Knowledge of Environmental Protection			
Panel A: Regression Results				
Return Migration (standardized)	-0.059	-0.056	0.276	0.150
	(0.055)	(0.051)	(0.174)	(0.116)
Awareness Difference (standardized)	-0.067	0.016	0.006	0.056
	(0.056)	(0.056)	(0.064)	(0.059)
Return Migration (standardized) ×	0.103*	0.006	0.386***	0.281**
Awareness Difference (standardized)	(0.059)	(0.070)	(0.142)	(0.105)
Observations	1,128	3,782	1,128	3,782
Adj R-squared	0.206	0.244		
F-Test of IVs			9.103	11.89
Stock-Yogo Value for 10% IV size			7.03	7.03
Region FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Panel B: Marginal Effects of Return Migration				
P10 of Awareness Difference	-0.229***	-0.066	-0.364**	-0.299*
	(0.081)	(0.094)	(0.152)	(0.154)
P20 of Awareness Difference	-0.182***	-0.063	-0.188	-0.172
	(0.061)	(0.067)	(0.119)	(0.123)
P70 of Awareness Difference	0.041	-0.053	0.650**	0.282*
	(0.099)	(0.074)	(0.293)	(0.145)
P90 of Awareness Difference	0.065	-0.048	0.737**	0.496**
	(0.111)	(0.122)	(0.323)	(0.209)

Notes: We standardize return migration and awareness difference. The dependent variable is an individual-level standardized overall index of environmental protection knowledge. Columns 1 and 2 report the OLS results, and columns 3 and 4 report the IV results. Panel A presents the coefficient estimates . Panel B estimates the marginal effects of return migration ($\psi_1 + \psi_3 \Delta \overline{f}_j$ in equation 1) when the awareness difference is at the 10th, 20th, 70th, and 90th percentile, respectively. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

A show that the interaction between return migration and baseline belief differences between regions is significantly negative. Increased return migration from provinces with greater environmental awareness raises local people's environmental preferences, which may increase their demand for efficient environmental governance and in turn lower their evaluation of government performance. Appendix Table A6 additionally controls for public expenditures on environmental protec-

and 3 ("made efforts, but the results are unsatisfactory") are assigned a value of zero.

Figure 6: Marginal Effects: Knowledge of Environmental Protection



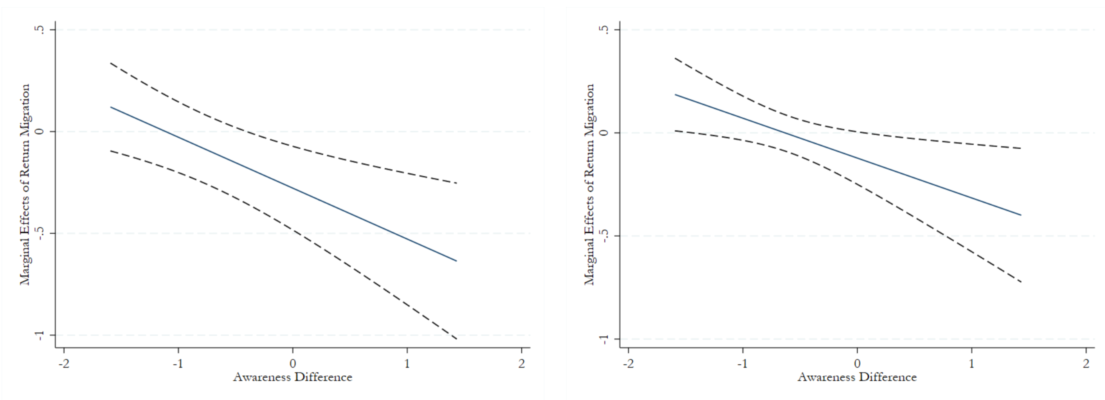
(a) Marginal Effects of Return Migration, 2010 (b) Marginal Effects of Return Migration, 2013

Notes: We plot the marginal effects associated with exposure to return migration on individual knowledge of environmental protection in 2010 (left panel) and 2013 (right panel), respectively. We standardize awareness difference and use the coefficient estimates in Table 3 Panel A columns 3 and 4 to calculate the marginal effects ($\psi_1 + \psi_3 \Delta \overline{f}_j$ in equation 1) of return migration. Dashed lines represent the 95% confidence intervals.

tion to account for the potential confounding effects of government environmental efforts. The results are similar to our baseline estimates reported in Table 4.

Based on Table 4 Panel B and Figure 7, it is clear that the marginal effects of return migration on the public valuation of environmental governance would increase as awareness differences become larger.

Figure 7: Marginal Effect: The Evaluation of Environmental Governance



(a) Marginal Effects of Return Migration, 2010 (b) Marginal Effects of Return Migration, 2013

Notes: We plot the marginal effects associated with exposure to return migration on how individuals evaluate government environmental performance in 2010 (left panel) and 2013 (right panel), respectively. We standardize awareness difference and use the coefficient estimates in Table 4 Panel A columns 3 and 4 to calculate the marginal effects ($\psi_1 + \psi_3 \Delta \overline{f}_j$ in equation 1) of return migration. Dashed lines represent the 95% confidence intervals.

Table 4: Results on Government Environmental Performance

	(1)	(2)	(3)	(4)
	Year 2010	Year 2013	Year 2010	Year 2013
	OLS Estimation		IV Estimation	
Dep. Var.:	Perceived Good Environmental Performance (=1)			
Panel A: Regression Results				
Return Migration (standardized)	-0.048	-0.033	-0.278**	-0.122*
	(0.029)	(0.034)	(0.105)	(0.065)
Awareness Difference (standardized)	0.117***	0.059**	0.077	0.043
	(0.028)	(0.028)	(0.050)	(0.032)
Return Migration (standardized) ×	-0.050	-0.071**	-0.250***	-0.193**
Awareness Difference (standardized)	(0.035)	(0.033)	(0.081)	(0.078)
Observations	987	3,147	987	3,147
Adj R-squared	0.108	0.070		
F-Test of IVs			7.605	8.386
Stock-Yogo Value for 10% IV size			7.03	7.03
Region FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Panel B: Marginal Effects of Return Migration				
P10 of Awareness Difference	0.034	0.085**	0.132	0.198**
	(0.048)	(0.039)	(0.113)	(0.094)
P20 of Awareness Difference	0.011	0.053*	0.020	0.110*
	(0.035)	(0.028)	(0.093)	(0.065)
P70 of Awareness Difference	-0.100*	-0.102	-0.517***	-0.312**
	(0.056)	(0.061)	(0.162)	(0.132)
P90 of Awareness Difference	-0.107*	-0.118*	-0.573***	-0.356**
	(0.063)	(0.068)	(0.177)	(0.149)

Notes: We standardize return migration and awareness difference. The dependent variable is an indicator for whether an individual believes that local government has made achievements in environmental protection. Columns 1 and 2 report the OLS results, and columns 3 and 4 report the IV results. Panel A presents the coefficient estimates . Panel B estimates the marginal effects of return migration ($\psi_1 + \psi_3 \Delta \overline{f}_j$ in equation 1) when the awareness difference is at the 10th, 20th, 70th, and 90th percentile, respectively. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

5.2 How Much of the Inter-city Preference Gap is Due to Return Migration?

In this section, we use our estimated results to explore: how much of the cross-city gaps of average environmental preferences is explained by exposure to return migration? We used Leshan and Xiangyang, two comparable representative medium-sized cities, to illustrate. In the aftermath of the Great Recession, these two cities are exposed to different levels of return migration; returnees in the two cities are likely to come from different provinces with different levels of environmental awareness in the baseline year.

Table 5 shows that, on the basis of our coefficient estimates, heterogeneous exposure to return migration combines with its interaction with baseline awareness differences can explain 6.10% of the difference of the index for perceived level of pollution , up to 10.41% of the difference of the index for environmental protection behaviors, 1.36% of the gap of the level of environment-related knowledge, and 1.98% of the gap of the evaluation of government environmental performance between average local inhabitants in these cities in 2013.

Table 5: Contribution of Return Migration in 2013: Leshan v.s. Xiangyang

Differences in Specific Index	Differences in the Effects of Return Migration	Contribution
(1)	(2)	(3)
Panel A: Perceived Level of Local Pollution		
0.714	0.044	6.10%
Panel B: Behaviors of Environmental Protection		
0.426	0.044	10.41%
Panel C: Knowledge of Environmental Protection		
0.317	0.004	1.36%
Panel D: Government Environmental Performance		
-0.161	-0.003	1.98%

Notes: This table presents the contribution of return migration to gaps in average environmental preferences between Leshan and Xiangyang using CGSS 2013. The panel headings report the specific index used to measure preferences. We first calculate the mean value of each index of environmental preferences for Leshan and Xiangyang, respectively, and define the difference in the index as the mean value for Leshan minus that for Xiangyang (column 1). Next, we calculate the effects of return migration on indexes for environmental preferences in each city based on the IV estimates in Tables 1-4. Specifically, the effect of return migration on each city is calculated as $\psi_1 Share\_Return_{jt} + \psi_3 Share\_Return_{jt} \times \Delta\overline{f}_j$ (parameters are defined in equation 1), relying on the information of exposure to return migration and baseline awareness difference. The difference in the effects of return migration is defined as the effect on Leshan minus that on Xiangyang (column 2). Finally, the contribution of return migration is calculated as the difference in the effect of return migration (between the two cities) divided by the difference of a particular index for preferences (between the two cities) (column 3).

5.3 How to Interpret the Magnitude of the Effect of Return Migration ?

Our findings demonstrate that the spillover effects of return migration are meaningful. So as to interpret the magnitude of these effects, we compare the effects of return migration with the effects of other contemporaneous policies as well as the consequences of international migration on social norms and beliefs documented in other studies.

A Contemporaneous Policy. We first compare the effects of return migration with the effects of the disclosure of real-time PM2.5 information in China. Chinese citizens used to have no access to information about local PM2.5 concentration. While China started to publish an Air Pollution Index (API) based on PM10, SO_2 and NO_2 in 2000, fine particulate pollution (PM2.5) has been the most important source of air pollution in China. [23] Due to the information constraints, Chinese people used to regularly understate the level of atmospheric contamination (Barwick et al., 2024). In 2012, China launched a nation-wide air quality monitoring and disclosure program, publishing real-time PM2.5 information for the first time. [24] The sudden disclosure and dissemination of PM2.5 data dramatically increased public awareness of pollution exposure (Gao et al., 2023a; Barwick et al., 2024).[25]

The nation-wide program was conducted in three waves. We thus created an indicator for whether real-time PM2.5 data have been published in a particular city by 2013 and interact it with another indicator for polluted cities (baseline PM2.5 $>$ median level). Table A7 uses CGSS 2013 to repeat our regressions, incorporating the effect of the disclosure of the PM2.5 information. In those polluted cities, the release of local PM.5 data increases the index for perceived level of pollution by 1.4 SD, the index for environmental actions by 1.5 SD, and the index for environmental knowledge by 1.2 SD. The effects associated with the policy shock of information disclosure are about twice as large as the effects of return mitigation (when the baseline awareness difference is at the 70th percentile level).

The Migration Effects in Other Studies. We next compare our estimates with the consequences of international migration documented in the literature. Table 6 summarizes the findings in related works. Docquier et al. (2016) and Barsbai et al. (2017) show that a one SD increase in emigration to Western countries is associated with a 1.2 SD increase in the democracy index [26] in developing coun-

[23] Fine particles (PM2.5, diameter $< 2.5\ \mu$g) are much more hazardous than larger particles with respect to mortality, cardiovascular and respiratory endpoints.

[24] The program published both hourly and daily PM2.5 data in real time on official government websites, and mass media was encouraged to disseminate the data.

[25] The disclosure of pollution information had an important effect on household avoidance behavior. Figure A2 shows how the sales of indoor air filtration increased sharply in response to the PM2.5 data disclosure in 2012.

[26] Docquier et al. (2016) use the Political Rights Index from the Freedom House Database to measure the level of democracy.

tries and reduces the vote share of the communist party by 0.1 SD in Moldova. In 19th century Sweden, a one SD increase in out-migration rates would lead to a 0.75 SD increase in the labor organization rate [27] and up to a one SD increase in strick participants per capita (Karadja and Prawitz, 2019). Diabate and Mesplé-Somps (2019) analyze international return migration, showing that a one SD increase in return migration from countries that have banned Female Genital Mutilation(FGM) would reduce the risk of FGM in home countries by 0.27 SD. Our estimated effect of return migration (from other provinces within China) lies in the range of estimates of the spillover effects of international migration in the literature.

Table 6: The Spillover Effect of Migration Documented by the Literature

Related Papers	Social Norms and Countries	Marginal Effects
Docquier et al. (2016)	Political norms in developing countries	1 SD increase in emigration to western countries raises the democracy index by 1.21 SD.
Barsbai et al. (2017)	Political norms in Moldova	1 SD increase in emigration to western countries reduces the vote share of communist party by 0.1 SD.
Diabate and Mesplé-Somps (2019)	Female Genital Mutilation (FGM) in Mali	1 SD increase in return migration from countries that ban FGM reduces the risk of FGM by 0.28 SD.
Karadja and Prawitz (2019)	Participation in labor organizations and strikes in Sweden in 19th century	1 SD increase in emigration to U.S. raises labor organization participation rate by 0.75 SD and strike participants per capita by 1 SD.

6 Robustness Checks

We conduct various meaningful robustness checks to evaluate the concreteness of the empirical relationship between return migration and individual environmental preferences. We first show that environmental awareness and preferences can not predict migration decisions in our context and then demonstrate our shift-share IV is well-balanced with respect to a variety of regional and industry-level confounding factors. We also demonstrate that our results are robust to additional control variables.

6.1 Can Belief and Preferences Predict Migration Decisions?

An important concern with our identification is that migrants may be self-selected to destinations based on their environmental beliefs. Specifically, migrants to

[27] Karadja and Prawitz (2019) define the labor organization rate as the number of members in labor unions and the Social Democratic Party per capita

regions with greater environmental awareness may have stronger environmental preferences than migrants to other regions. Consequently, they may transmit their own beliefs (rather than the beliefs of people in host regions) to stayers in their original places when they return. Or they may be more willing to return home if their original places also have higher environmental awareness, leading to a reverse causality issue.

Nevertheless, this is not the case in our research context. First, our shift-share IV leverages the exogenous changes in world import demand that are unrelated to local confounders (say, environmental awareness in either destination or home locations). Thus, our results are unlikely to be driven by self-selected migration based on environmental awareness. Second, in early 2000, emigration from the hometown was typically motivated by economic opportunities [28], not environmental considerations (Gao et al., 2023b). Consequently, their return migration decisions in response to negative trade shocks are unlikely to be related to beliefs or social norms of environmental protection in either their region of origin or host regions. Third, in early 2000, regions with higher environmental awareness tended to be richer and more polluted, say those industrialized coastal cities (Zheng and Kahn, 2013). In this case, if migration choices were driven by environmental awareness, individuals with higher environmental preferences would move to regions with less pollution but *lower* (not higher) environmental awareness. However, we estimate the opposite: exposure to return migration from regions with greater environmental awareness would enhance people's environmental preferences. Therefore, self-selected migration (based on environmental awareness) cannot explain our empirical pattern. Finally, we show that return migrants in home locations where the regional differences in environmental awareness at baseline are positive (i.e., previous migrants generally moved to regions with greater environmental awareness than home regions) share the demographic profile of their counterparts in home locations with negative awareness differences (Appendix Table A9).

Indeed, as shown in Appendix Table A8, return migration decisions in the aftermath of the 2008 Great Recession are significantly associated with exposure to export shocks in previous host regions but have nothing to do with environmental awareness in either destination or home locations (Columns 1-3). Moreover, out-migration flows prior to the Great Recession are also unrelated to environmental

[28]China's accession to WTO created new economic opportunities, inducing people to migrate to provinces with greater trade exposure.

beliefs in destination or home regions (Columns 4-6).

Additionally, Appendix Table A9 compares demographic attributes between two groups of returnees: those in home locations with positive regional awareness differences at baseline versus those in home locations with negative awareness differences. Demographic characteristics which seem to be related to socioeconomic status and environmental preferences, including gender, home ownership, education achievements, ethnicity, *hukou* type (rural/urban), employment status, are statistically indistinguishable between the two groups of returnees. Only average age is significantly different between the two groups. However, the age difference is only one year.

6.2 WID IV: Threats to Identification

Recent literature demonstrates that identification based on shift-share variables either relies on the orthogonality of shifters or of exposure shares (Borusyak et al., 2022; Goldsmith-Pinkham et al., 2020). In our context, the validity of identification depends on the exogeneity of shifters, i.e., industry-level changes in world import demand between 2007-2009. Our key identification assumption is that industry-level trade shocks are orthogonal to regional confounding unobservables within China. This assumption is reasonable, since we exclude any trade flows between China and the rest of the world (exports or imports) in the calculation of changes in world import demand in each industry.

In this section, we conduct a battery of tests to examine the validity of our identification strategy, following the guidance from a recent applied econometrics literature on shift-share strategies.

The Distribution of Shocks and Exposure Weights Appendix Table A10 summarizes the distribution of industry-specific shifters as well as the industry-level exposure weights (i.e., average exposure shares across locations for each industry S_k). The distribution of shocks has a mean of -49.6 (which implies that, on average, sector-level world import decreased by -49.6 billion USD), a standard deviation of 79.1, and an inter-quartile range of 41.1. The inverse of its Herfindahl index (HHI) $1/\sum_k S_k^2$ is 13.8 (across 26 industries), which is close to two recent papers that study economic shocks in China and the UK (Erten and Leight, 2021;

McNeil et al., 2023). [29]

Falsification Tests We next implement falsification tests. Table A11 conducts industry balance tests. We examine the potential association between industry-level WID shocks and a set of potential confounders that may affect international trade between China and other countries. These industry-level factors do not have any significant relationship with our shifters. In particular, baseline contract intensity [30] , NTR gaps [31], export tariffs, and measures of performance (input, output, value-added, average return on assets, and average return on equity) do not predict sector-level changes in world import demand driven by the Great Recession.

Table A12 reports our results of regional balance tests. We assess balance with respect to baseline city-level characteristics. We again find no statistically significant relationships between our shift-share variable and the size of the financial sector, GDP, average wages, and industrial structure (share of secondary industry in GDP) in the baseline year. We then examine pre-trends in regional economic factors, including changes in employment shares in first, secondary, and tertiary sectors, respectively, and changes in GDP and GDP per capita. Changes in these factors cannot predict the exposure to negative shocks (i.e., our measure of WID) driven by the Great Recession.

Tests Based on Rotemberg Weights As in Goldsmith-Pinkham et al. (2020), we calculate Rotemberg weights to measure the "importance" of each sector in driving the variation of shift-share variables. In our context, industries with higher Rotemberg weights drive the variations of exposure to trade shocks across space.

[29] As in Erten and Leight (2021), we exploit economic shocks in 26 industries. We follow Borusyak et al. (2022) to use the inverse of its Herfindahl index (HHI) $1/\sum_k S_k^2$ to examine whether there is a high concentration of industry exposure. If $1/\sum_k S_k^2$ is low, exposure weights would be so concentrated that only shocks in a few industries drive the variation of shift-share variables.

[30] As in Nunn (2007), we measure the contract intensity as the fraction of intermediate inputs used by firms that require relationship-specific investments by the supplier. It had been difficult for foreign firms to deal with imperfect contract enforcement before 2001. Driven by China's accession to the WTO, these barriers were gradually removed, and industries with a higher contract intensity may experience a greater increase in labor demand.

[31] Prior to joining the WTO, the US Congress needed to continually renew the preferential Normal Trade Relations(NTR) tariffs bestowed upon China. Joining the WTO reduced the renewal uncertainty, which is defined as the difference between the non-NTR tariff and the NTR tariff. NTR gaps are defined as the sector-level average gap between the two tariffs.

Table A13 lists the top 10 industries regarding Rotemberg weights.

Goldsmith-Pinkham et al. (2020) suggest examining whether the results are robust to using alternative shift-share IVs that rely on sources of variation unrelated to the top 5 industries (in terms of Rotemberg weights). We therefore exclude these industries one at a time in the construction of the WID IV and re-estimate the effect of return migration in Table A14. Removing any of these top 5 industries from our measure of WID IV does not affect our findings. The coefficient estimates of the interaction between return migration and awareness differences are similar as before.

6.3 Additional Controls and Alternative Samples

Control for Out-migration Flows Out-migrants may send information and knowledge back to their region of origin, affecting the beliefs and preferences of stayers (Barsbai et al., 2017; Daudin et al., 2019). The widespread use of internet and smartphones in recent years also facilitates inter-regional information transmission.

We examine the potential role played by out-migration in Appendix Table A15. We control for differential out-migration rates (in one's *hukou* city) to provinces with higher baseline environmental awareness (relative to *hukou* provinces) as well as emigration rates to provinces with lower awareness (as in Barsbai et al. (2017)). Adding out-migration controls does little to affect the estimated effect of return migration. Thus, our empirical pattern is unlikely to be driven by emigration.

Control for Lagged Return Migration Appendix Table A16 additionally controls for baseline exposure to return migration in 2005 and its interaction with baseline differences in environmental awareness (between host and original regions). By doing so, we effectively analyze the change in return migration and how this change interacts with awareness differences. As such, we account for the underlying effects of time-invariant confounders that may be associated with return migration decisions and how these decisions are related to environmental awareness. [32] We find a similar pattern and magnitude as our baseline estimates. This further demonstrates that our WID IV does a good job of isolating the causal

[32] If our empirical pattern were driven by time-invariant confounders (such as distance to big cities), which predict return migration decisions in both 2005 and 2010, controlling for baseline return migration would systematically change our results.

effect of return migration driven by the unexpected Great Recession in 2008.

Control for Trade Shocks in Home City Exposure to trade shocks in migrants' destinations may be associated with that exposure in their hometown, if these two regions have similar industrial structures. If that were the case, our WID IV would not satisfy the exclusion restriction. In particular, beyond the return migration channel, spatially correlated negative trade shocks may affect the economic prosperity in region of origin, which in turn alter people's environmental preferences there. [33] So as to address this concern, Appendix Table A17 controls for how trade shocks hit *hukou* location during the Great Recession, which may affect local labor demand and economic prosperity. [34] Our empirical pattern is quantitatively and qualitatively similar.

Control for Local Environmental Policies The Chinese government has implemented various spatially differentiated policies to mitigate environmental degradation. These policies may attract migrants to return to their home city and also alter stayers' environmental beliefs and awareness, confounding our baseline estimates. In Appendix Table A18 , we control for a wide range of environmental policies implemented during or prior to the period of our analysis. We include air pollution policies, such as the two-control zone policy, the release of data on the Air Pollution Index (prior to 2012), water pollution regulations, such as the river chief policy, and general policies say the promulgation and implementation of local environmental laws, and pollution abatement mandates in China's 11th Five-Year Plan. Controlling for these policies hardly changes our empirical pattern. Our primary interest–the interaction between return migration and baseline awareness gaps–is always statistically significant.

Additional Environmental and Economic Controls Recent evidence shows that environmental pollution may affect Chinese people's migration choices (Gao et al., 2023a; Khanna et al., Forthcoming). Our baseline results of Tables 1-4 control for the actual exposure to pollution at baseline in one's *hukou* city. Appendix

[33]People's environmental preferences tend to be related to their economic status (Khanna et al., Forthcoming).

[34]In particular, we control for another shift-share variable defined as $\sum_k \Delta World\ IM_k \times \frac{EMP_{j,k}}{\sum_n EMP_{j,n}}$, where $\frac{EMP_{j,k}}{\sum_n EMP_{j,n}}$ is the baseline employment share across industries in one's *hukou* city.

Table A19 further shows that our results are robust to controlling for baseline pollution exposure in previous destination provinces of return migrants. [35] Therefore, even after controlling for baseline pollution exposure in both the destination and the home location, return migration still combines with the awareness difference (between destination and home locations) to generate meaningful spillover effects. Our empirical pattern is unlikely to be driven by the potential migration responses to pollution exposure.

In Appendix Table A20, we further examine the robustness of our results to additional economic controls in one's *hukou* city. These controls include GDP per capita and GDP growth rate in the baseline year. Our results remain similar as before.

Heterogeneity by *Hukou* Type According to the 2010 Census, approximately 30% of return migrants have an urban *hukou*, while the remaining 70% have a rural *hukou*. The census does not record whether these returnees reside in urban or rural areas within their registered *hukou* cities. [36] However, data from the China Labor-force Dynamic Survey (CLDS) show that about 30% of returnees with a rural *hukou* live in urban areas upon returning, whereas those with an urban *hukou* typically reside in urban areas. Based on a simple calculation, this suggests that approximately 50% of return migrants live in urban areas of their home cities after returning. Additionally, some returnees with a rural *hukou* may later settle in urban areas and obtain urban *hukou* status over time. Taken together, these suggest that urban residents are exposed to return migrants with both urban and rural *hukou* backgrounds.

We next break our individual sample of stayers based on their *hukou* type (rural or urban). Table A21 examines whether the effect of return migration on environmental preferences differs between individuals with rural and urban *hukou*. The results suggest that the impact of exposure to return migration is more pro-

[35] Specifically, we control for PM2.5 concentration, SO2 emissions, and COD emissions in 2005 in previous destination provinces for return migrants.

[36] The geographic units of our analysis are Chinese prefecture-level cities. In China, there are three layers of administrative units: provinces, followed by prefecture-level cities, and then by county-level units. A prefecture city represents an entire prefecture area, comprising both urban and rural areas. Moreover, a prefectural level city is not a "city" in the usual sense of the term (a large continuous urban settlement), but instead an administrative unit comprising a main central urban area surrounded by rural areas (which together are divided into districts), and some surrounding county-level units (which also have their own urban areas surrounded by their own rural areas).

nounced among urban *hukou* holders. One possible explanation is that information and preference diffusion tend to be stronger in urban areas. In particular, return migrants residing in urban areas are, on average, more educated and younger than those in rural areas, making them more likely to absorb environmental beliefs and attitudes from their previous host regions and transmit these perspectives to stayers in urban areas.

7 Mechanisms

At least three potential mechanisms may explain the effects of return migration on individuals' pro-environmental preferences. First, return migration leads to the diffusion of environmental knowledge and beliefs from other places to the home city. Second, self-selected migrants transmit their own beliefs (not beliefs prevalent in host regions) to stayers when they return home. Third, increased return migration may change local environmental quality and economic prosperity, affecting the environmental attitudes of stayers. In this section, we empirically examine the three mechanisms and find the most consistency with the mechanism of diffusion of knowledge and preferences.

7.1 The Diffusion of Knowledge and Information

If spillovers associated with return migration operate through the transfer of information and norms, they would increase if returnees have lower communications costs with other inhabitants in previous destinations, which makes it easier for migrants to understand and absorb new information and knowledge (related to environmental preservation). In this section, we show that the effects of return migration are stronger if similar dialects are spoken in migrants' original and destination regions. We also present suggestive evidence that return migrants have intense social activities and interactions, facilitating the diffusion of attitudes and information between groups.

The Role Played by Dialect Distance. Due to geographical and historical reasons, there are up to ten major dialects in China. Although most people can speak the official language Mandarin, various local dialects are still widely used in daily work and life, creating communication barriers between migrants and locals. Additionally, many Chinese citizens view dialect as a critical aspect of social identity, and consequently interact more with people speaking a similar dialect. As a result, linguistic proximity may increase social integration between migrants and locals, facilitating the between-group transfer of environmental preferences.

We therefore assess whether the effects of return migration are different based on the dialect distance between migrants' home cities and destinations. Specifically, we calculate the average dialect distance between a home city (for migrants) to various potential destination locations in the baseline year, and divide home cities into two groups based on the median level of the dialect distance. [37] Table 7 shows that the effects of return migration are driven by home cities of which previous migrants were typically residing in regions speaking a similar dialect. In particular, the estimates of the interaction between return migration and regional differences in baseline environmental awareness are only statistically significant for home cities with a below-median dialect distance (to previous destinations) and shrink in significance level and magnitude for the above-median city group. The results provide important evidence to support the inter-regional transfer of environmental knowledge and beliefs.

[37] We first measure the dialect distance at baseline between a home city and all potential destination cities in China based on the data from the Chinese Dialect Dictionary and the Language Atlas of China. For each particular home city, we then calculate the inverse geographic distance weighted average of its dialect distance to every potential destination. This measures how one's home city is "isolated" from nearby areas in terms of the dialect spoken; migrants from this city are likely to be concentrated in these nearby areas. Here, we do not rely on migration networks (the fraction of migrants from a home city to different destinations) to construct the weights, because the dialect distance itself may affect migration choices at baseline.

Table 7: Mechanism: The Diffusion of Knowledge and Information

	(1)	(2)	(3)	(4)	(5)	(6)
	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013
Dep. Var.:	Perceived Level of Local Pollution		Behaviors of Environmental Protection		Knowledge of Environmental Protection	
Return Migration (standardized)	0.272***	0.318**	0.233*	0.364**	0.200	0.145
	(0.074)	(0.128)	(0.137)	(0.134)	(0.127)	(0.118)
Awareness Difference (standardized)	0.119***	0.142**	0.177***	0.152*	-0.029	0.054
	(0.036)	(0.064)	(0.065)	(0.082)	(0.052)	(0.065)
Return Migration (std.) × Awareness Difference (std.)	0.251***	0.333***	0.291**	0.442***	0.388***	0.280***
× Dialect Distance<Median (=1)	(0.071)	(0.101)	(0.122)	(0.135)	(0.091)	(0.103)
Return Migration (std.) × Awareness Difference (std.)	-0.140	-0.006	0.247	0.061	-0.132	0.173
× Dialect Distance>Median (=1)	(0.207)	(0.294)	(0.276)	(0.302)	(0.247)	(0.273)
Observations	1,235	3,522	1,128	3,775	1,128	3,782
Region FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES

Notes: We standardize return migration and awareness difference. In columns 1-6, the dependent variables are standardized overall indexes for preferences. Control variables include gender, age, education level, an index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from the *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), and city tiers. We categorize regions as north, central, east, south, southwest, northwest, and northeast China. We further control for a dummy variable for whether the weighted average dialect distance (between home cities and potential destinations) is below the median level. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Returnees have Intensive Social Interactions. Information frictions are important potential constraints to the diffusion of new social norms and beliefs, and social relationships can serve as important vectors through which individuals learn about and then change their beliefs and preferences (Beaman et al., 2021). In our contexts, those return migrants act as entry points of information into a social network and introduce a new belief and knowledge (from regions where they migrated to).

Table 8 shows that, compared to those without migration experience, return migrants have significantly more social interactions with others. In particular, they are more likely to do outdoor activities (shopping, watching sports events in person) and gather with friends. They are also significantly more likely to use the internet, where they can post their voices of environmental protection online.

These evidences suggest that returnees seem to be more connected to local social networks. Since they have intense social interactions with others, beliefs (related to environmental preservation) will spread through their connections and quickly reach other people in their home city.

Table 8: Returnees Have More Social Activities than Others

Dep. Var.:	(1) Internet	(2) Outdoor Shopping	(3) Gather with Friends	(4) Watch Sports Events in Person	(5) Overall Index_Social Activities
Migration Experience (=1)	0.0309**	0.0405***	0.0267**	0.0226**	0.133***
	(0.0121)	(0.0147)	(0.0112)	(0.0101)	(0.0312)
Observations	5,110	5,102	5,104	5,101	5,112
Region FE	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES

Notes: We control for gender, age, education level, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. We define the dummy variable internet based on the survey question "How often did you use internet last year?" The dummy internet equals one if the response is "always" and "usually", and equals zero if the response is "sometimes", "rarely" and "never". We define the dummy variable - outdoor shopping - based on the survey question "How often did you do outdoor shopping last year?" The dummy equals one if the response is "several times a day", "several times a week", and "several times a month", and equals zero if the response is "several times a year or less" and "never". We define the dummy variable - gather with friends - based on the survey question "How often did you gather with your friends last year?" The dummy equals one if the response is "several times a day", "several times a week", and "several times a month", and equals zero if the response is "several times a year or less" and "never". We define the dummy variable - watch sports events in person - based on the survey question "How often did you watch live sports events in person last year?" The dummy equals one if the response is "several times a day", "several times a week", and "several times a month", and equals zero if the response is "several times a year or less" and "never". The dependent variable in column 5 is an overall index for social activities (constructed based on the frequency of outdoor shopping, gathering with friends, and watching sports events in person last year). Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

7.2 Other Competing Mechanisms

Selected Migration Based on Preferences A competing mechanism is self-selected migration based on environmental beliefs. If migrants to regions with higher environmental awareness also have higher individual environmental preferences (prior to their migration), they may transmit their own beliefs (not beliefs of residents in host regions) to stayers when coming back.

As documented by Section 6.1, out-migration decisions are typically motivated by economic (not environmental considerations) before the Great Recession. Hence, return migration flows driven by the trade shock in 2008-2009 are unlikely to be related to individual environmental concerns. Moreover, Table A8 demonstrates that baseline environmental awareness (in home locations or destination locations) cannot predict either out-migration or return migration decisions. These evidences do not support the mechanism of self-selected migration.

Economic Effects of Return Migration Trade-induced return migration may impact local economic development, in turn affecting the demand for environmental quality of local residents. For example, returnees may bring in new technologies and business opportunities, boosting the local economy. Nevertheless, Table A22 demonstrates that our results are robust to controlling for local economic prosperity in the aftermath of the Great Recession as measured by GDP per capita and industrial structure in 2010 and 2013. [38]

Environmental Effects of Return Migration Migrant workers tend to work in manufacturing industries in coastal cities before the Great Recession. Increased return migration may in turn raise the supply of manufacturing workers in their home city and in turn expand manufacturing productions there (Imbert et al., 2022). This may lead to environmental degradation and change stayers' environmental awareness. Table A23 examines this alternative mechanism, showing no systematic relationship between return migration and local industrial emissions or industrial production in the short run.

In sum, these evidences suggest that inter-regional diffusion of knowledge and information is at least an important mechanism driving the effects of return migration on the environmental preferences of local people. However, we acknowledge that the effects of return migration on economic prosperity and environmental quality may also be a potential pathway, since we do not find strong evidence to rule out these alternative underlying mechanisms. Self-selected migration is unlikely to be a mechanism in our context.

8 Conclusion

The Great Recession in 2008-2009 led to large-scale return migration flows in China. We document a surprising unintended consequence: increased return migration in this trade episode resulted in the convergence of environmental awareness and preferences between different geographical regions within China. We demonstrate that exposure to increased return migration from regions with greater environmental awareness increases local people's environmental preferences, and vice versa. This is due to the fact that return migration promotes inter-regional diffusion of environmental awareness and attitudes. Our shift-share strategy based on exogenous changes in world import demand by industries allows us to estimate the causal effects of return migration. We further show that our empirical pattern cannot be explained by selected migration based on environmental preferences and the potential effects of return migration on environmental quality and economic prosperity.

[38] Industrial structure is defined as the share of secondary industry in GDP.

The implication on citizens' environmental awareness is beyond the socioeconomic effects of migration that development economists had previously documented. This is important, because understanding how environmental preferences are formatted and evolved is crucial to designing appropriate environmental policies. Additionally, we propose a new migration channel by why international trade can impact the beliefs and preferences of sub-national regions within a country. Our analysis may have general implications beyond China because trade-induced internal migration is ubiquitous in both the developing and developed world.

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Supplemental Appendix

Table of Contents

A1 Additional Tables and Figures

Table A1: Summary Statistics of Key Variables

Variables	Obs	Mean	Std. dev.	Min	Max
Panel A: Return Migration					
Return Migration (%)	3,775	0.788	0.510	0.066	1.943
Standardized Return Migration	3,775	0.000	1.000	-1.417	2.267
Panel B: Awareness Difference					
Awareness Difference (%)	3,775	-1.808	5.689	-10.875	6.408
Standardized Awareness Difference	3,775	0.000	1.000	-1.594	1.444
Panel C: CGSS Adults, 2010					
Overall Index of Perception of Pollution Level	1,235	0.000	1.000	-0.768	2.090
Overall Index of Behaviors of Environmental Protection	1,128	0.000	1.000	-1.719	3.883
Overall Index of Knowledge of Environmental Protection	1,128	0.000	1.000	-2.994	2.087
Government Environmental Performance (=1)	987	0.305	0.461	0.000	1.000
Panel D: CGSS Adults, 2013					
Overall Index of Perception of Pollution Level	3,522	0.000	1.000	-0.899	1.979
Overall Index of Behaviors of Environmental Protection	3,775	0.000	1.000	-1.593	3.049
Overall Index of Knowledge of Environmental Protection	3,782	0.000	1.000	-1.521	2.052
Government Environmental Performance (=1)	3,147	0.394	0.489	0.000	1.000

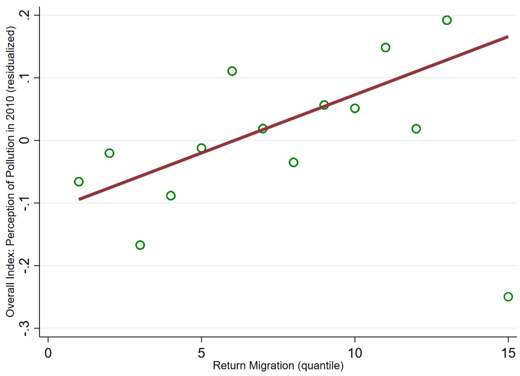
Notes: This table presents summary statistics for key variables. Data on return migration (Panel A) come from the 2010 Census, and data on awareness difference (Panel B) come from the CHIP 2002. Data on variables related to environmental preferences (Panel C and Panel D) come from the CGSS 2010 and 2013.

Table A2: First Stage Results of WID IV

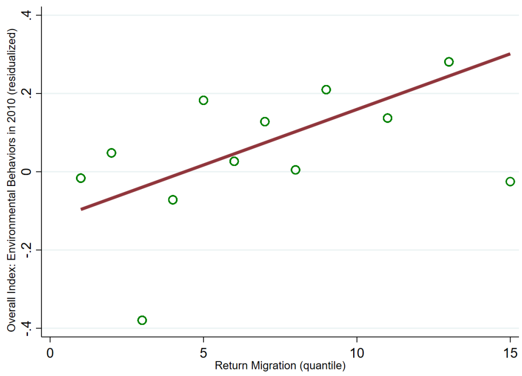
	(1)	(2)
	Year 2010	Year 2013
Dep. Var.:	Exposure to Return Migration	
WID	-0.518***	-0.593***
	(0.186)	(0.211)
Observations	1,235	3,522
Region FE	YES	YES
Controls	YES	YES

Notes: We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. We merge the WID IV with the individual sample from the CGSS based on the *hukou* city. Column 1 uses the individual sample drawn from CGSS 2010, and column 2 uses the individual sample drawn from CGSS 2013. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure A1: The Correlation between Return Migration and Preferences



(a) Individual Perception of Pollution Levels



(b) The Behaviors of Environmental Protection

Notes: This figure plots exposure to return migration against the standardized inverse-covariance weighted summary index of the perception of pollution levels (left panel) and the standardized inverse-covariance weighted summary index of environmental protection behaviors (right panel). We limit the sample to cities with regional awareness difference above the median level. We obtain the residuals from the regression of standardized inverse-covariance weighted summary index on region fixed effects and controls (an overall index for air quality, COD emissions, the minimum distance to Tianjin, Shanghai, and Shenzhen Seaports, and city tiers). The samples are divided into 15 groups based on the return migration. The x-axis denotes the quantiles of return migration. The y-axis denotes the mean value of residuals of standardized inverse-covariance weighted summary index in each quantile.

A2 Additional Results on Environmental Preferences

Table A3: Individual Measures of Perceived Level of Local Pollution

	(1)	(2)	(3)	(4)	(5)	(6)
	Year 2010			Year 2013		
Dep. Var.:	Air Pollution	Water Pollution	Noise Pollution	Air Pollution	Water Pollution	Noise Pollution
Return Migration (standardized)	0.117**	0.132***	0.0950**	0.131*	0.178**	0.0790**
	(0.0530)	(0.0477)	(0.0466)	(0.0725)	(0.0664)	(0.0390)
Awareness Difference (standardized)	0.0270	0.0550***	0.0659***	0.0801**	0.0728**	0.0380*
	(0.0247)	(0.0202)	(0.0194)	(0.0330)	(0.0338)	(0.0206)
Return Migration (std.) × Awareness Difference (std.)	0.0752	0.107**	0.0865**	0.0947	0.172***	0.0864**
	(0.0539)	(0.0468)	(0.0384)	(0.0788)	(0.0550)	(0.0420)
Observations	1,234	1,234	1,233	3,420	3,444	2,957
Region FE	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES

Notes: We standardize return migration and awareness difference. Columns 1-3 report the IV results using CGSS 2010. Columns 4-6 report the IV results using CGSS 2013. We construct three dummy variables *Air Pollution*, *Water Pollution* and *Noise Pollution* based on the CGSS survey questions: *"Do you think local air/water/noise pollution is a serious problem?"*. The dummy variable *Air/Water/Noise Pollution* equals one if the response is "Very serious" or " serious", and 0 if the response is "Not too serious" or "Not serious at all". We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A4: Individual Measures of Environmental Protection Actions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year 2010			Year 2013				
Dep. Var.:	Less Driving	Less Consuming	Green Groups	Waste Sorting	Shopping Bags	Environmental Activity1	Environmental Activity2	Complaints
Return Migration (standardized)	0.526	0.110*	0.00127	0.177**	0.129***	0.0396	0.0503	0.0565*
	(0.368)	(0.0625)	(0.00860)	(0.0710)	(0.0429)	(0.0337)	(0.0398)	(0.0333)
Awareness Difference (standardized)	0.200*	0.0858***	0.00490	0.0286	0.101***	0.0162	0.0152	0.0157
	(0.115)	(0.0275)	(0.00583)	(0.0408)	(0.0222)	(0.0141)	(0.0189)	(0.0144)
Return Migration (std.) × Awareness Difference (std.)	0.372	0.133**	0.00808	0.217***	0.115**	0.0568	0.0720	0.0688*
	(0.318)	(0.0631)	(0.00805)	(0.0710)	(0.0496)	(0.0410)	(0.0451)	(0.0383)
Observations	212	1,115	1,127	3,768	3,772	3,766	3,766	3,767
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: We standardize return migration and awareness difference. Columns 1-3 report the IV results using CGSS 2010. Columns 4-8 report the IV results using CGSS 2013. We construct dummy variables *Less Driving* based on the CGSS survey question: *"Do you often avoid driving vehicles to protect the environment?" Less Driving* equals one if the response is "Always", "Often", or "Sometimes", and 0 if the response is "Never". We construct dummy variables *Less Consuming* based on the CGSS survey question: *"Do you often avoid buying certain products to protect the environment?" Less Consuming* equals one if the response is "Always", "Often", or "Sometimes", and 0 if the response is "Never". We construct dummy variables *Green Groups* based on the CGSS survey question: *"Are you a member of certain groups/associations aiming to protect the environment?" Green Groups* equals one if the response is "Yes", and 0 if the response is "No". We construct dummy variables *Waste Sorting* based on the CGSS survey question: *"Did you engage in waste sorting and distributing last year?" Waste Sorting* equals one if the response is "Often" or "Sometimes", and 0 if the response is "Never". We construct dummy variables *Shopping Bags* based on the CGSS survey question: *"Did you use your own shopping basket/ bag when purchasing daily necessities last year?" Shopping Bags* equal one if the response is "Often" or "Sometimes", and 0 if the response is "Never". We construct dummy variables *Environmental Activity1* based on the CGSS survey question: *"Did you actively participate in environmental publicity and education activities organized by the government last year?" Environmental Activity1* equals one if the response is "Often" or "Sometimes", and 0 if the response is "Never". We construct dummy variables *Environmental Activity2* based on the CGSS survey question: *"Did you participate in environmental protection activities organized by non-governmental groups in the past year?" Environmental Activity2* equals one if the response is "Often" or "Sometimes", and 0 if the response is "Never". We construct dummy variables *Complaints* based on the CGSS survey question: *"Did you actively participate in complaints and appeals to resolve environmental issues?" Complaints* equals one if the response is "Often" or "Sometimes", and 0 if the response is "Never". We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A5: Individual Measures of Environmental Knowledge

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year 2010				Year 2013			
Dep. Var.:	Knowledge1	Knowledge2	Knowledge3	Knowledge4	Knowledge1	Knowledge2	Knowledge3	Knowledge4
Return Migration (standardized)	0.0650	0.135**	0.165*	0.00462	0.0790*	0.0455	0.0130	0.0145
	(0.0567)	(0.0665)	(0.0868)	(0.0332)	(0.0457)	(0.0570)	(0.0310)	(0.0256)
Awareness Difference (standardized)	0.0146	0.0199	0.0180	-0.0326*	0.0456*	0.00633	0.00191	-0.00246
	(0.0227)	(0.0272)	(0.0338)	(0.0190)	(0.0251)	(0.0297)	(0.0183)	(0.0109)
Return Migration (std.) $\times$ Awareness Difference (std.)	0.101**	0.182***	0.169**	0.0179	0.0959**	0.134**	0.0664**	0.0280
	(0.0457)	(0.0615)	(0.0757)	(0.0356)	(0.0443)	(0.0611)	(0.0316)	(0.0268)
Observations	1,127	1,121	1,122	1,121	3,782	3,778	3,781	3,780
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: We standardize return migration and awareness difference. Columns 1-4 report the IV results using CGSS 2010 samples. Columns 5-8 report the IV results using CGSS 2013 samples. We construct dummy variables *Knowledge1* based on the CGSS survey question: *"Car exhaust does not pose a threat to human health."* *Knowledge1* equals one if the response is "Wrong", and 0 if the response is "Right" or "Don't know". We construct dummy variables *Knowledge2* based on the CGSS survey question: *"Species are interdependent, and the extinction of one species will have a chain reaction."* *Knowledge2* equals one if the response is "Right", and 0 if the response is "Wrong" or "Don't know". We construct dummy variables *Knowledge3* based on the CGSS survey question: *"In China's air quality report, Level 3 air quality is better than Level 1."* *Knowledge3* equals one if the response is "Wrong", and 0 if the response is "Right" or "Don't know". We construct dummy variables *Knowledge4* based on the CGSS survey question: *"In China's water pollution report, Level 5 water quality is better than Level 1."* *Knowledge4* equals one if the response is "Wrong", and 0 if the response is "Right" or "Don't know". We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A6: Control for Public Expenditures on Environmental Protection

	(1)	(2)
	Year 2010	Year 2013
Dep. Var.: Perceived Good Environmental Performance (=1)		
Return Migration (standardized)	-0.382**	-0.201**
	(0.167)	(0.0986)
Awareness Difference (standardized)	-0.0159	-0.0229
	(0.0819)	(0.0469)
Return Migration (std.) × Awareness Difference (std.)	-0.280**	-0.287*
	(0.117)	(0.154)
Observations	987	3,147
Region FE	YES	YES
Controls	YES	YES

Notes: We standardize return migration and awareness difference. The dependent variable is an indicator for whether an individual believes that local government has made achievements in environmental protection. Column 1 reports the IV results using CGSS 2010 samples. Column 2 reports the IV results using CGSS 2013 samples. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. We additionally control for government expenditures on environmental protection in 2009 (column 1) and in 2012 (column 2). Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

A3 The Disclosure of PM2.5 Information in China

Figure A2: The Number of Air Purifier Sales from 2006 to 2014

Notes: Air purifier sales transaction data collected by a marketing firm in China from January 2006 through December 2014 for 85 major Chinese cities. China started to disclose real-time PM2.5 information in 2012.

Table A7: The Effect of PM2.5 Information Disclosure

Dep. Var.:	(1) Perceived Level of Local Pollution	(2) Behaviors of Environmental Performance	(3) Government Environmental Performance	(4) Knowledge of Environmental Protection
Panel A: Regression Results				
Return Migration(standardized)	0.483**	0.493**	-0.218*	0.287
	(0.204)	(0.184)	(0.116)	(0.173)
Awareness Difference (standardized)	-0.0124	-0.0724	0.125**	-0.108
	(0.0790)	(0.104)	(0.0614)	(0.0980)
Return Migration (std.) × Awareness Difference (std.)	0.537**	0.616***	-0.329**	0.475**
	(0.203)	(0.221)	(0.160)	(0.179)
PM2.5 Data Disclosure (=1)	0.917*	0.816*	-0.499*	0.813**
	(0.501)	(0.423)	(0.271)	(0.373)
PM2.5 Data Disclosure (=1) × Polluted City (=1)	0.441*	0.726**	-0.205	0.416
	(0.261)	(0.309)	(0.163)	(0.259)
Polluted City (=1)	0.135	0.130	0.0261	0.191
	(0.226)	(0.206)	(0.136)	(0.256)
Panel B: Marginal Effects of Return Migration				
P10 of Awareness Difference	-0.375*	-0.489**	0.327*	-0.471**
	(0.215)	(0.238)	(0.164)	(0.192)
P20 of Awareness Difference	-0.131	-0.21	0.177*	-0.256*
	(0.153)	(0.158)	(0.0947)	(0.135)
P70 of Awareness Difference	0.739**	0.784***	-0.542*	0.509**
	(0.285)	(0.273)	(0.268)	(0.243)
P90 of Awareness Difference	1.151**	1.254***	-0.616**	0.871**
	(0.428)	(0.432)	(0.304)	(0.369)
Observations	3,522	3,775	3,147	3,782
Region FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES

Notes: We standardize return migration and awareness difference. In columns 1, 2, and 4, the dependent variables are standardized indexes for preferences. In column 3, the dependent variable is an indicator for whether an individual believes that local government has made achievements in environmental protection. Panel A presents the IV estimates using CGSS 2013. We add an indicator for whether real-time PM2.5 data have been published in a particular city by 2013 and interact it with another indicator for polluted cities (baseline PM2.5 > median level). Panel B estimates the marginal effects of return migration ($\psi_1 + \psi_3 \Delta \overline{f}_j$ in equation 1) when the awareness difference is at 10th, 20th, 70th, and 90th percentile, respectively. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

A4 Tests for Self-selected Migration

Table A8: Environmental Awareness Cannot Predict Migration Decisions

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.:	Return Migration Flows Recorded in Census 2010			Out-migration Flows Recorded in Census 2005		
Baseline Awareness: Destination Province	-0.0875		-0.0870	-5.150		-4.960
	(0.0629)		(0.0800)	(3.364)		(3.179)
Baseline Awareness: *Hukou* Province	-0.0894	-0.143		1.522	1.083	
	(0.247)	(0.251)		(1.671)	(1.643)	
Δ Export: Destination Province	-0.372**		-0.369**			
	(0.129)		(0.139)			
Δ Export: *Hukou* Province	0.0593	0.0648				
	(0.0397)	(0.0504)				
Observations	132	132	132	132	132	132
R-squared	0.288	0.372	0.394	0.066	0.420	0.144
Destination Province FE		YES			YES	
Hukou Province FE			YES			YES

Notes: We drop observations if data on provincial-level baseline awareness are missing. In columns 1-3, we use data on return migration flows from 11 previous destination provinces to 12 *hukou* provinces (recorded in Census 2010). The dependent variable is the return migration rate (at the destination by *hukou* province level), which is calculated as the proportion of return migrants from a particular destination province to the *hukou* population in their *hukou* province. In columns 4-6, we use data on out-migration flows from 11 *hukou* provinces to 12 destination provinces (recorded in Census 2005). The dependent variable is the out-migration rate (at the *hukou* by destination province level), which is calculated as the proportion of migrants moving to a particular destination province to the *hukou* population of their *hukou* province. Δ *Export* is defined as the change in provincial level export value between 2008 and 2009. We also control the distance between the provincial capitals of any two provinces and a dummy variable for whether the destination province and the *hukou* province are located within the same macro region. Two-way robust standard errors clustered at the level of destination province and the level of *hukou* province are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A9: Demographic Attributes of Return Migrants

	Awareness Difference >0	Awareness Difference <0	Diff.	P-value of Diff
Average Education Level	3.529	3.588	-0.059	0.583
	(0.065)	(0.089)	(0.108)	
Share of Han Ethnicity	0.902	0.909	-0.007	0.791
	(0.0157)	(0.022)	(0.0264)	
Mean Age	33.309	32.363	0.946	0.029
	(0.270)	(0.344)	(0.431)	
Share of Female	0.518	0.494	0.024	0.298
	(0.0119)	(0.021)	(0.023)	
Share of Rural *Hukou* Holders (=1)	0.695	0.678	0.017	0.633
	(0.021)	(0.030)	(0.036)	
Share of employed	0.791	0.820	-0.029	0.211
	(0.014)	(0.019)	(0.023)	
Share of Homeowners	0.909	0.910	-0.001	0.948
	(0.011)	(0.016)	(0.019)	

Notes: We divide cities into two groups by whether a city has positive or negative awareness difference in the baseline year. A positive awareness difference indicates that an average migrant moved to a province with greater environmental awareness (than *hukou* province) in the baseline year, and vice versa. The awareness difference is defined as the weighted average awareness of the destination province minus the awareness of the *hukou* province in the baseline year. The weights are constructed based on baseline migration networks from *hukou* provinces to destination provinces. We first calculate the mean of demographic variables for return migrants in each city and then compare the city mean of these variables between the two city groups. Education levels are categorized into seven groups: no formal schooling (=1), primary school(=2), secondary school(=3), high school(=4), pre-college(=5), college (=6), and graduate school(=7).

A5 Tests for Shift-share IV

Table A10: Shock-level (World Import Demand) Summary Statistics

	(1)
Mean	-49.578
Standard Deviation	79.067
Interquartile range	41.130
1/HHI for exposure weight	13.833
Largest exposure weight	0.132
Number of Industries	26

Notes: This table summarizes the distribution of World Import Demand at the industry level and the industry-level exposure weights S_k. As in Borusyak et al. (2022), statistics are weighted by the average industry exposure shares S_k.

Table A11: Industry Balance Test

Dep. Var.	Coef. on Shocks
Contract intensity, 1997	-0.0262
	(0.0320)
NTR gap,1997	0.0156
	(0.0211)
Export tariffs, 2000	1.903
	(1.318)
Industry input, 2000	-40.38
	(44.86)
Industry output, 2000	-51.06
	(56.87)
Value-added, 2000	-13.39
	(15.40)
Return on assets, 2000	-0.00126
	(0.00285)
Return on equity, 2000	0.0473
	(0.0389)
Number of Industries	26

Notes: We regress baseline industry attributes on standardized industry-level world import demand shocks. Each row represents a separate regression, and column 1 shows the dependent variable for each regression. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A12: Regional Balance Test

Dep. Var.	Coef. on WID IV	Num of Cities
Number of employees in financial ind, 2000	-0.00129	260
	(0.0723)	
ln(GDP), 2000	0.0258	260
	(0.0748)	
ln(Wage), 2000	-0.0629	260
	(0.0747)	
Industrial structure, 2000	-0.705	251
	(0.926)	
Δ Industrial structure, 2000-1995	-0.170	251
	(0.478)	
Δ First sector employment share, 2000-1995	-1.226	251
	(1.454)	
Δ Second sector employment share, 2000-1995	-0.338	251
	(0.803)	
Δ Third sector employment share, 2000-1995	1.468	251
	(1.066)	
ln(GDP), 2000-1995	-0.00624	250
	(0.0200)	
ln(GDP per Capita), 2000-1995	-0.0280	250
	(0.0174)	

Notes: We regress baseline city attributes and their changes on city-level exposure to world import demand shocks. Each row represents a separate regression, and column 1 shows the dependent variable for each regression. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A13: Rotemberg Weights

Industry Code	Description	Weight
33	Ordinary Machinery	0.535
34	Transport Equipment	0.276
35	Electric Equipment and Machinery	0.162
24	Raw Chemical Materials and Chemical Products	0.136
31	Smelting and Pressing of Nonferrous Metals	0.057
37	Instruments, Meters, Cultural,and Office Machinery	0.05
13	Food Processing	0.013
27	Rubber Products	0.007
25	Medical and Pharmaceutical Products	0.004
29	Nonmetal Mineral Products	0.002

Table A14: Tests Based on Rotemberg Weights

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013
	Perceived Level of		Behaviors of		Good Government		Knowledge of	
Dep. Var.:	Local Pollution		Environmental Protection		Environmental Performance		Environmental Protection	
	Panel A: Exclude the Industry 33							
Return Migration (std.) × Awareness Difference (std.)	0.274**	0.337**	0.339**	0.441***	-0.273**	-0.210**	0.439**	0.346***
	(0.112)	(0.127)	(0.162)	(0.146)	(0.103)	(0.0863)	(0.171)	(0.123)
	Panel B: Exclude the Industry 34							
Return Migration (std.) × Awareness Difference (std.)	0.259***	0.283***	0.280**	0.354***	-0.249***	-0.160**	0.313**	0.194*
	(0.0821)	(0.0979)	(0.122)	(0.117)	(0.0644)	(0.0670)	(0.127)	(0.112)
	Panel C: Exclude the Industry 35							
Return Migration (std.) × Awareness Difference (std.)	0.258**	0.317***	0.291**	0.421***	-0.252***	-0.192**	0.385***	0.281**
	(0.0992)	(0.112)	(0.124)	(0.131)	(0.0809)	(0.0771)	(0.142)	(0.104)
	Panel D: Exclude the Industry 24							
Return Migration (std.) × Awareness Difference (std.)	0.248**	0.306***	0.290**	0.413***	-0.241***	-0.191**	0.375***	0.274**
	(0.0958)	(0.110)	(0.120)	(0.133)	(0.0762)	(0.0767)	(0.135)	(0.104)
	Panel E: Exclude the Industry 31							
Return Migration (std.) × Awareness Difference (std.)	0.258**	0.316***	0.300**	0.425***	-0.247***	-0.197**	0.390***	0.285**
	(0.0999)	(0.113)	(0.125)	(0.136)	(0.0799)	(0.0794)	(0.142)	(0.105)
Observations	1,235	3,522	1,128	3,775	987	3,147	1,128	3,782
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Each cell represents a separate IV regression and repeats the specification of Tables 1-4. In columns 1, 2, 3, 4, 7, and 8, the dependent variables are standardized indexes for preferences. In columns 5-6, the dependent variable is an indicator for whether an individual believes that local government has made achievements in environmental protection. In each panel, we exclude one of the top five industries in terms of Rotemberg weights and re-construct the WID IV. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

A6 Additional Controls and Alternative Samples

Table A15: Control for Out-migration Flows

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013
Dep. Var.:	Perceived Level of Local Pollution		Behaviors of Environmental Protection		Good Government Environmental Performance		Knowledge of Environmental Protection	
Return Migration (standardized)	0.303***	0.307**	0.222*	0.368***	-0.246***	-0.108*	0.223	0.135
	(0.0892)	(0.124)	(0.112)	(0.123)	(0.0868)	(0.0537)	(0.135)	(0.112)
Awareness Difference (standardized)	0.265**	0.267***	0.342***	0.220*	-0.0658	-0.0535	0.239*	0.162*
	(0.1000)	(0.0955)	(0.0895)	(0.124)	(0.0861)	(0.0389)	(0.131)	(0.0935)
Return Migration (std.) × Awareness Difference (std.)	0.230***	0.294***	0.302***	0.416***	-0.220***	-0.176***	0.336***	0.268**
	(0.0836)	(0.107)	(0.103)	(0.131)	(0.0730)	(0.0597)	(0.115)	(0.114)
Observations	1,235	3,522	1,128	3,775	987	3,147	1,128	3,782
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: We repeat the specification of Tables 1-4. In columns 1, 2, 3, 4, 7, and 8, the dependent variables are standardized indexes for preferences. In columns 5-6, the dependent variable is an indicator for whether an individual believes that local government has made achievements in environmental protection. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. We additionally control for baseline out-migration flows to provinces with greater environmental awareness and to provinces with lower awareness (in comparison with the awareness in *hukou* province). Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A16: Control for Lagged Return Migration

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013
Dep. Var.:	Perceived Level of Local Pollution		Behaviors of Environmental Protection		Good Government Environmental Performance		Knowledge of Environmental Protection	
Return Migration (standardized)	0.455*	0.716*	0.175	0.557*	-0.292	-0.0585	0.366	0.201
	(0.237)	(0.398)	(0.208)	(0.322)	(0.176)	(0.128)	(0.288)	(0.259)
Awareness Difference (standardized)	0.0766	0.189	0.0253	0.0437	0.180*	0.157*	-0.138	-0.0866
	(0.127)	(0.221)	(0.163)	(0.237)	(0.0937)	(0.0921)	(0.153)	(0.187)
Return Migration (std.) × Awareness Difference (std.)	0.365**	0.411*	0.420**	0.582**	-0.354***	-0.259**	0.545**	0.397**
	(0.152)	(0.222)	(0.180)	(0.246)	(0.0898)	(0.103)	(0.204)	(0.186)
Observations	1,165	3,364	1,091	3,603	951	3,008	1,091	3,610
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: We repeat the specification of Tables 1-4. In columns 1, 2, 3, 4, 7, and 8, the dependent variables are standardized indexes for preferences. In columns 5-6, the dependent variable is an indicator for whether an individual believes that local government has made achievements in environmental protection. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. We additionally control for baseline exposure to return migration in 2005 and its interaction with baseline awareness difference. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A17: Control for Exposure to Trade Shocks in Home City

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013
Dep. Var.:	Perceived Level of Local Pollution		Behaviors of Environmental Protection		Good Government Environmental Performance		Knowledge of Environmental Protection	
Return Migration (standardized)	0.370**	0.393*	0.216	0.453**	-0.344*	-0.182*	0.359	0.142
	(0.168)	(0.208)	(0.172)	(0.198)	(0.181)	(0.0952)	(0.278)	(0.171)
Awareness Difference (standardized)	0.166**	0.189*	0.170**	0.209**	0.0549	0.0175	0.0353	0.0524
	(0.0705)	(0.0977)	(0.0747)	(0.0961)	(0.0710)	(0.0474)	(0.0998)	(0.0742)
Return Migration (std.) × Awareness Difference (std.)	0.279**	0.362**	0.282**	0.478***	-0.281**	-0.233**	0.422**	0.276**
	(0.124)	(0.156)	(0.139)	(0.170)	(0.115)	(0.0932)	(0.185)	(0.132)
Observations	1,235	3,522	1,128	3,775	987	3,147	1,128	3,782
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: We repeat the specification of Tables 1-4. In columns 1, 2, 3, 4, 7, and 8, the dependent variables are standardized indexes for preferences. In columns 5-6, the dependent variable is an indicator for whether an individual believes that local government has made achievements in environmental protection. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. We additionally control for local exposure to trade shocks (in hukou city), which is another shift-share variable defined as $\sum_k \Delta World\ IM_k \times \frac{EMP_{k,c}}{\sum_j EMP_{j,c}}$. Here, $\frac{EMP_{k,c}}{\sum_j EMP_{j,c}}$ is the baseline employment share across industries in one's *hukou* city. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A18: Control for Local Environmental Policies

Dep. Var.:	(1) Year 2010 Perceived Level of Local Pollution	(2) Year 2013	(3) Year 2010 Behaviors of Environmental Protection	(4) Year 2013	(5) Year 2010 Good Government Environmental Performance	(6) Year 2013	(7) Year 2010 Knowledge of Environmental Protection	(8) Year 2013
Panel A: Control for Two Control Zone Policy								
Return Migration (std.) × Awareness Difference (std.)	0.262***	0.329***	0.292**	0.417***	-0.249***	-0.196**	0.404***	0.269***
	(0.0953)	(0.109)	(0.120)	(0.131)	(0.0829)	(0.0763)	(0.135)	(0.0928)
Panel B: Control for River Chief Policy								
Return Migration (std.) × Awareness Difference (std.)	0.283***	0.355*	0.269*	0.561***	-0.241**	-0.207*	0.513***	0.432***
	(0.103)	(0.188)	(0.134)	(0.202)	(0.0905)	(0.120)	(0.190)	(0.158)
Panel C: Control for Access to Air pollution Index (Prior to 2012)								
Return Migration (std.) × Awareness Difference (std.)	0.263**	0.314***	0.299**	0.396***	-0.255**	-0.186**	0.379**	0.273**
	(0.112)	(0.110)	(0.140)	(0.133)	(0.0980)	(0.0725)	(0.152)	(0.103)
Panel D: Control for Local Environmental Laws and Regulations								
Return Migration (std.) × Awareness Difference (std.)	0.248**	0.272**	0.291**	0.393***	-0.226***	-0.173**	0.371***	0.285***
	(0.102)	(0.115)	(0.120)	(0.125)	(0.0742)	(0.0742)	(0.137)	(0.0993)
Panel E: Control for China's 11th Five-year Plan								
Return Migration (std.) × Awareness Difference (std.)	0.342**	0.463**	0.337*	0.632***	-0.300**	-0.257**	0.463**	0.355**
	(0.132)	(0.178)	(0.178)	(0.188)	(0.112)	(0.118)	(0.191)	(0.146)
Observations	1,235	3,522	1,128	3,775	987	3,147	1,128	3,782
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Each cell represents a separate IV regression and repeats the specification of Tables 1-4. In columns 1, 2, 3, 4, 7, and 8, the dependent variables are standardized indexes for preferences. In columns 5-6, the dependent variable is an indicator for whether an individual believes that local government has made achievements in environmental protection. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. In each panel, we additionally control for different environmental policies. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A19: Control for Baseline Pollution Exposure in Previous Destinations of Return Migrants

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013
Dep. Var.:	Perceived Level of Local Pollution		Behaviors of Environmental Protection		Government Environmental Performance		Knowledge of Environmental Protection	
Return Migration (standardized)	0.333***	0.346**	0.234*	0.397***	-0.283***	-0.127*	0.288*	0.141
	(0.105)	(0.149)	(0.133)	(0.138)	(0.0983)	(0.0687)	(0.166)	(0.128)
Awareness Difference (standardized)	0.142***	0.161**	0.179***	0.172**	0.0769	0.0431	0.00208	0.0559
	(0.0430)	(0.0632)	(0.0599)	(0.0748)	(0.0478)	(0.0320)	(0.0580)	(0.0579)
Return Migration (std.) × Awareness Difference (std.)	0.251***	0.308***	0.299**	0.417***	-0.238***	-0.190**	0.367***	0.284**
	(0.0892)	(0.106)	(0.122)	(0.127)	(0.0678)	(0.0796)	(0.125)	(0.109)
Observations	1,235	3,522	1,128	3,775	987	3,147	1,128	3,782
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: We repeat the specification of Tables 1-4. In columns 1, 2, 3, 4, 7, and 8, the dependent variables are standardized indexes for preferences. In columns 5-6, the dependent variable is an indicator for whether an individual believes that local government has made achievements in environmental protection. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. We additionally control for a pollution index (constructed based on PM2.5, SO_2 emissions and COD emissions in the baseline year of 2005) in previous destination provinces. Specifically, we control for the weighted average of the index across potential destination provinces, the weight of which is the proportion of return migrants from each previous destination province to the total number of returnees in their *hukou* city in 2010. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A20: Add Additional Economic Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013
Dep. Var.:	Perceived Level of Local Pollution		Behaviors of Environmental Protection		Government Environmental Performance		Knowledge of Environmental Protection	
Return Migration (standardized)	0.455***	0.515***	0.341**	0.428**	-0.331**	-0.166*	0.468*	0.253
	(0.150)	(0.174)	(0.163)	(0.167)	(0.141)	(0.0860)	(0.238)	(0.159)
Awareness Difference (standardized)	0.188***	0.152*	0.201**	0.154*	0.0666	0.0578	0.0228	0.0748
	(0.0654)	(0.0860)	(0.0745)	(0.0891)	(0.0745)	(0.0404)	(0.0865)	(0.0776)
Return Migration (std.) × Awareness Difference (std.)	0.290***	0.354***	0.290**	0.394***	-0.274***	-0.191**	0.428**	0.298**
	(0.107)	(0.119)	(0.136)	(0.128)	(0.0965)	(0.0856)	(0.163)	(0.116)
Observations	1,235	3,522	1,128	3,775	987	3,147	1,128	3,782
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: We repeat the specification of Tables 1-4. In columns 1, 2, 3, 4, 7, and 8, the dependent variables are standardized indexes for preferences. In columns 5-6, the dependent variable is an indicator for whether an individual believes that local government has made achievements in environmental protection. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. We additionally control for Log (GDP per capita) and GDP growth rate in 2005. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A21: Heterogeneity between Rural and Urban *Hukou* Holders

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013
Dep. Var.:	Perceived Level of Local Pollution		Behaviors of Environmental Protection		Perceived Level of Local Pollution		Behaviors of Environmental Protection	
	Sample of Rural *Hukou* Holders				Sample of *Urban Hukou* Holders			
	Panel A: Regression Results							
Return Migration (standardized)	0.151**	0.0811	0.184	0.129	0.761**	1.066*	0.670*	0.786**
	(0.0691)	(0.0979)	(0.151)	(0.148)	(0.313)	(0.564)	(0.336)	(0.302)
Awareness Difference (standardized)	0.174***	0.0556	0.166**	0.0108	0.0688	0.211	0.392***	0.237*
	(0.0534)	(0.0708)	(0.0815)	(0.103)	(0.0935)	(0.184)	(0.112)	(0.117)
Return Migration (std.) $\times$ Awareness Difference (std.)	0.235**	0.152	0.314*	0.370*	0.469**	0.654	0.639**	0.461
	(0.0996)	(0.123)	(0.184)	(0.207)	(0.222)	(0.469)	(0.297)	(0.281)
Observations	784	2,137	671	2,335	391	1,153	394	1,177
	Panel B: Marginal Effects of Return Migration							
P10 of Awareness Difference	-0.191	-0.139	-0.272	-0.404**	-0.00841	0.125	-0.273	0.116
	(0.137)	(0.120)	(0.177)	(0.197)	(0.315)	(0.482)	(0.542)	(0.397)
P20 of Awareness Difference	-0.0860	-0.0696	-0.132	-0.237*	0.195	0.489	0.100	0.374
	(0.100)	(0.0786)	(0.116)	(0.119)	(0.271)	(0.397)	(0.420)	(0.304)
P70 of Awareness Difference	0.413***	0.258	0.533	0.558	1.241**	1.587*	1.341***	1.153**
	(0.150)	(0.227)	(0.336)	(0.371)	(0.481)	(0.871)	(0.466)	(0.443)
P90 of Awareness Difference	0.465***	0.292	0.602	0.641	1.360**	1.880*	1.525***	1.361**
	(0.170)	(0.254)	(0.375)	(0.416)	(0.530)	(1.062)	(0.529)	(0.548)

Notes: We repeat the specification of Tables 1-4. We drop the observations that lack information on on their *hukou* type. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. We additionally control for baseline out-migration flows to provinces with greater environmental awareness and to provinces with lower awareness (in comparison with the awareness in *hukou* province). Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

A7 Results on Competing Mechanisms

Table A22: Control for Contemporaneous Economic Prosperity in Home City

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013	Year 2010	Year 2013
Dep. Var.:	Perceived Level of Local Pollution		Behaviors of Environmental Protection		Government Environmental Performance		Knowledge of Environmental Protection	
Return Migration (standardized)	0.440**	0.370***	0.332	0.318**	-0.304**	-0.109*	0.290*	0.172
	(0.167)	(0.106)	(0.203)	(0.131)	(0.122)	(0.0584)	(0.170)	(0.127)
Awareness Difference (standardized)	0.146**	-0.00481	0.168	0.0574	0.0919	0.109***	-0.0890	-0.0567
	(0.0723)	(0.0681)	(0.104)	(0.0814)	(0.0645)	(0.0386)	(0.0691)	(0.0874)
Return Migration (std.) $\times$ Awareness Difference (std.)	0.329**	0.281***	0.344*	0.321**	-0.245**	-0.151**	0.298**	0.246*
	(0.138)	(0.100)	(0.182)	(0.137)	(0.0970)	(0.0741)	(0.134)	(0.132)
Observations	1,235	3,522	1,128	3,775	987	3,147	1,128	3,782
Region FE	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Notes: We repeat the specification of Tables 1-4. In columns 1, 2, 3, 4, 7, and 8, the dependent variables are standardized indexes for preferences. In columns 5-6, the dependent variable is an indicator for whether an individual believes that local government has made achievements in environmental protection. We control for gender, age, education level, an overall index for air quality (constructed based on PM2.5 and SO_2 concentrations), COD emissions, the minimum distance from one's *hukou* city to the three large seaports (Tianjin, Shanghai, and Shenzhen seaports), city tiers and region fixed effects. We additionally control for GDP per capita and industrial structure (share of secondary industry in GDP) in 2010 or in 2013. Robust standard errors clustered at the level of *hukou* city are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A23: The Effects on Pollution Emissions in Home City

	(1)	(2)	(3)	(4)
Dep. Var.:	ln(SO2)	ln(Dust)	ln(Waste Water)	ln(Industrial Output)
Return Migration (standardized)	-0.000407	-0.0548	-0.0470	-0.0646
	(0.0873)	(0.101)	(0.0804)	(0.0640)
Observations	142	142	143	143
Region FE	YES	YES	YES	YES

Notes: We standardize exposure to return migration. This table reports the effects of return migration on industrial emissions (SO2 emissions, dust emissions, waste water emissions) and industrial output in 2010. We control for the minimum distance to Tianjin, Shanghai, and Shenzhen Seaports, city tiers and region fixed effects. Robust standard errors clustered at the city level are reported in parentheses.

A8 Data Appendix

Migration Data Data on return migration come from the 2010 Population Census of China. China conducts a national population census every ten years, and the 2010 census is the most recent decennial census with individual-level data available to researchers. The census records individuals' residential provinces one year and five years prior to 2010 for those who had been away from their hukou provinces at the time. Our analysis leverages the return migration wave triggered by the 2008 Great Recession. Therefore, we focus on return migrants who had been away five years prior to 2010. Specifically, we define return migrants as individuals who were living outside their hukou provinces five years before the 2010 census but had returned to their hukou locations by 2010. We restrict our sample to individuals who were aged between 16 and 60 five years before the census, meaning they were between 21 and 65 years old in 2010. To measure exposure to return migration, we count the number of return migrants in each city and calculate their share of the hukou population at the city level.

Our analysis leverages return migration from other provinces for two reasons. First, the census does not record the migration history of people who previously migrated within their home provinces. Moreover, migrants are more likely to be exposed to different environmental awareness and preferences if they move out of their home provinces.

Data on Preferences after the Great Recession Data on individual preferences for environmental quality are drawn from the 2010 and 2013 waves of the Chinese General Social Survey (CGSS). We exclude the 2011 and 2012 waves, as they do not contain information on beliefs about local pollution, environment-related knowledge, or attitudes toward local environmental governance.

The CGSS is a is a nationwide, repeated, cross-sectional survey designed to systematically monitor the evolving relationship between social structure and quality of life in both urban and rural China. Since 2010, the survey has been conducted by the National Survey Research Center (NSRC) at Renmin University of China (RUC), with funding from the RUC 985 Grant and the RUC Scientific Research Grant. The sampling design of the CGSS, implemented since 2010, is based on the 2009 national population data as the sampling frame. Specifically, the survey employs a stratified multi-stage probability proportional to size (PPS) sampling design. In this framework, residential districts and counties serve as primary sampling units (PSUs), villages and urban neighborhood communities as secondary sampling units, and households as tertiary sampling units. The sampling units are stratified by socioeconomic and demographic indicators and sampled with probability proportional to their size.

A key objective of the CGSS is to track behavioral and attitudinal changes among the Chinese population amid radical social transformations. As a result, the dataset includes a wide range of environment-related variables, capturing individuals' perceptions of local environmental pollution, engagement in environmental protection and energy-saving behaviors, attitudes toward government environmental performance, and knowledge of environmental protection. These variables collectively offer a comprehensive view of individual environmental preferences from multiple perspectives.

Data on Baseline Environmental Preferences To measure regional average environmental awareness in the baseline year, we use data from the 2002 China Household Income Survey (CHIP). The CHIP 2002 was jointly conducted by the Institute of Economics at the Chinese Academy of Sciences, the Asian Development Bank, the Ford Foundation, and the East Asian Institute at Columbia University. As a geographically and economically representative survey, CHIP provides researchers with the opportunity to generate nationally representative estimates.

The CHIP dataset consists of repeated cross-sections of randomly selected Chinese households and individuals and is widely used by economists studying the Chinese economy. The 2002 wave of CHIP is among the earliest surveys in China to include information on attitudes toward environmental issues at baseline. We leverage this baseline measure of environmental awareness—six years before the Great Recession—which is unlikely to be influenced by exposure to return migration following the trade shock. Specifically, the survey asked each respondent whether they considered environmental degradation to be one of the two most important issues in modern China. We measure average environmental awareness using the proportion of respondents who answered "yes" at both the hukou province level and across potential destination provinces for migrants.

We further construct baseline migration networks using data from the 2000 population census. These networks allow us to calculate a weighted average of environmental awareness across potential destination provinces for individuals from a given home province. The weights are based on the proportion of migrants from each home province who moved to a particular destination province in 2000. The difference between the average awareness in the hukou province and the weighted average awareness across migrants' potential destination provinces captures the extent to which migrants are exposed to differences in environmental preferences between their home and host regions in the baseline year.

Data on Shift-share IV We employ a shift-share IV based on exogenous changes in world import demand (WID) to predict the return migration wave triggered by the 2008 Great Recession. The shifter is the change in import demand for each industry between 2007 and 2009. To construct world import demand, we use trade flow data from the International Trade Statistics Database of UN Comtrade, which provides detailed information on each transaction, including importer, exporter, HS 6-digit code, and total values. We aggregate import values for each HS 6-digit product at the global level, excluding any transactions (exports or imports) involving China. Finally, we concord the HS-level data to International Standard Industrial Classification (ISIC) industries.

The exposure share of the WID IV is constructed based on each destination province's pre-period (1990) employment share of that industry and the proximity of one's hukou city to each destination province (as in equation 2). Data on baseline employment shares come from the 1990 Population Census of China. Erten and Leight (2021) define 26 concordant industry categories to align the ISIC industry categories (for data on world import demand) and the industry categories in the census data. Following their approach, we concord both the ISIC industry categories and the industry categories in the census data to the 26 concordant industry categories.

Data on Controls Following He et al. (2020), we measure local water contamination levels using Chemical Oxygen Demand (COD) emissions. The COD data are obtained from the Ministry of Ecology and Environment of China. COD is a key pollutant monitored and prioritized by the Chinese government. Moreover, the level of COD emissions has been widely used as a comprehensive indicator of water pollution in both China and worldwide.

As in Khanna et al. (Forthcoming), we assess local air quality using satellite data. Specifically, we obtain SO2 concentration data from the Modern-Era Retrospective Analysis for Research and Applications version 2 (MERRA-2) provided by the National Aeronautics and Space Administration (NASA). We measure PM2.5 concentrations using the Global Annual PM2.5 Grids, derived from satellite data by Van Donkelaar et al. (2016). Based on the local concentrations of PM2.5 and SO2, we construct an overall air quality index..

We collect data on regional economic and demographic controls from the China City Statistical Yearbooks, which are compiled by the National Bureau of Statistics of China. These yearbooks are extensively used for analyzing social and economic development at the prefecture-level city and higher levels in China.