The Impacts of Migration and Remittances on Nepali Agricultural Households

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Abstract

Since 2002, Nepal has experienced a rapid rise in labor out-migration and remittance income, which now stands at roughly 25 percent of GDP. This paper estimates the causal effect of expanded migration opportunity on agricultural households. Using a shift-share design that combines district-level baseline migration networks with destination-specific labor-demand shocks, together with household data from the Nepal Living Standards Surveys, I find that greater migration exposure raises households' reliance on exchange labor, i.e., reciprocal, non-monetized labor arrangements, while leaving cash agricultural expenditures unchanged. This pattern suggests that households absorb migration-induced labor shortages by substituting toward reciprocal exchange labor rather than hired labor or capital investment. The findings are consistent with aggregate evidence that agricultural growth has stagnated and that the sector has drawn little investment since remittances became central to the economy.

Keywords: migration, remittances, agriculture, exchange labor, shift-share, Nepal

JEL Codes: O15, Q12, J43, F24

1 Introduction

Work related global emigration has increased significantly in the last few decades. The Migration Report of 2024 reports that there were around 302 million international migrants all over the world. Correspondingly, these emigrants remit money in countries of origin, which can inject liquidity in the economy. The world migration data portal estimates that in the year 2023, around 857 billion dollars have been sent as remittances globally across borders. Cumulatively, emigration and remittance inflow can result in loss of labor and injection of liquidity, that can affect household decision making. Several recent research (for instance Khanna et al. (2022) Yu et al. (2024)) study the impact of remittances on the country of origin. Most of these studies often study the impact of migration and remittances on outcomes related to household welfare or human capital investment - such as consumption, expenditure, poverty, education and health. However, comparatively less is known regarding how migration can affect production decision making within the agriculture sector.

We study the case of Nepal, which is a unique setting to explore this question. Nepal is predominantly an agrarian economy, where 57.3 percent of the population (Central Bureau of Statistics 2021) are still engaged in agriculture, a sector that is largely unproductive and constitutes around a 22 percent of GDP in 2021 (World Bank Development Indicators). The Nepalese economy experienced one of the most drastic increases in remittance income from 2002. In 2001, remittance income was only around 2.44 percent of GDP, but has increased to 11.21 percent in 2002 and subsequently has hovered around 25 percent of GDP. This drastic increase in remittances has the potential to reshape agricultural input use, labor allocation and farm performance.

The macro-data shows that since remittances have gained significance in the economy, the growth rate in agriculture has remained fairly stagnant. The average growth rate in agriculture in the year 2002 to 2012 is around 3.5 percent and is merely around 2.8 percent from 2013 to 2022.[1] This is not a real improvement from the growth rate pre-high remittances, where it was around 2.7 percent from the year 1992 to 2001. A motivation for why I am choosing agricultural outcome is the role that agriculture plays in overall economic growth, especially in an early staged developing country like Nepal. Agricultural outputs act as key inputs for the manufacturing sector, and keeping their prices low is pivotal for long term economic growth since it reduces the put input price and increases manufacturing profit((Basole 2023), (Patnaik 1986)).

Given that most Nepali agriculture is dominated by small-land-holding family farms, very little is known about how such large scale remittance influx and labor loss can affect how households make overall production decisions. With migration being an important diversifying strategy, farmer's priority towards agriculture could decrease if there is a reliable source of income.

This paper studies how migration and remittances affect agricultural production decisions in Nepal. Loss of labor because of migration, would result in a vacuum of labor availability – both at the household as well as at the local level – that would prompt the labor market to react. This could include a transformation in the labor-capital expenditure composition. Moreover, this will be complemented by an influx of liquidity which can result in labor market

[1] Author's calculation using World Bank data

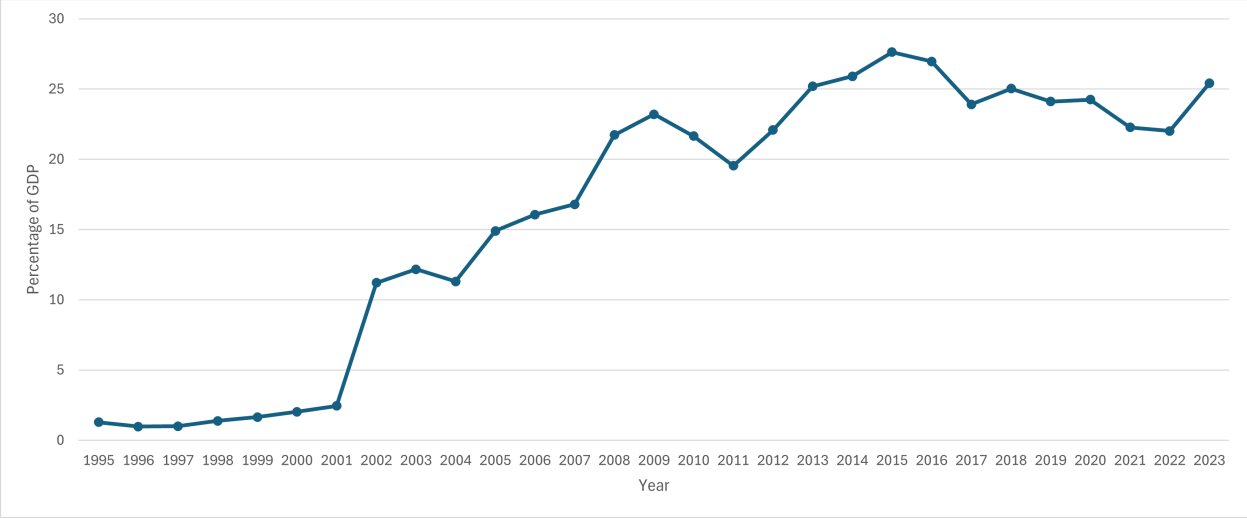


Figure 1: Remittances as a percentage of GDP.
Source: World Bank, World Development Indicators.

changes – like wages, and hiring patterns of households – as well as how households choose to spend in agriculture, either by spending more or less in the various expenditures related to agriculture. The outcomes that I have considered – like taking credit, expenditure on hiring labor in agriculture, number of hired days in agriculture, expenditure in insecticides/pesticides, expenditure in seeds, expenditure in machines and total agricultural expenditure.

The paper contributes towards the literature on how migration and remittances impact the sending economy in rural settings. (e.g., Lucas and Stark (1985), Lucas (1987)). While some studies find that remittances have a positive impact on farm income since they relieve the credit constraint (Taylor and Wyatt 1996), others find negative impacts on household investment (Ali et al. 2023). These contradictory findings suggest that various channels, including liquidity relaxation and changes in labor market, can affect households differently, resulting in the net effect being ambiguous. Moreover, while there are papers that have studied how remittances have affected agricultural outcomes in Nepal, to my knowledge, no study has explored how the agricultural sector has been transformed.

A key empirical challenge, while regressing agricultural outcomes on migration on remittances, is there are issues of endogeneity. More specifically, there could be issues of the omitted variable bias, or reverse causality, which could result in out coefficient of interest being biased. Following from Goldsmith-Pinkham et al. (2019) and Borusyak et al. (2022), I use a shift-share variable *migration opportunity*. I argue that this variable would try to address issues of endogeneity by exploiting exogenous variation in migrant destination shares in the various districts in Nepal. Under the assumption that these variations in shares (pre remittance spike) are not related to district level agricultural conditions, I argue that these variations are conditionally exogenous. The shift that I use is the per capita income of the various destinations. Combining these two, the *migration opportunity* variable is a predicted migration opportunity, that has high values for districts with high pre-high remittance migrant shares and high per capita GDP. Countries with higher per capita GDP like South Korea, and Japan would result in higher migration opportunity than countries like

Saudi Arabia, or UAE, where the overall per capita GDP is lower.

I use the Nepal Living Standard Survey and Census data (both agricultural and population) to find causal impacts of migration opportunity on agricultural outcomes. I find that a unit Standard Deviation (SD) change in predicted migration opportunity affects household remittance income at the intensive margin and the extensive margin. Moreover, I find that higher predicted remittance income while it does not increase the total hired labor at the district level, it increases total exchange labor used in households. Overall, migration predicted remittance income does not affect any of the agricultural expenditure outcomes.

2 Data and Empirical Framework

2.1 Description of the Data

For my analysis, I used the Nepal Living Standard Survey (NLSS) data for the years 2003/04, 2010/11, and 2022/23 cross-section data. The total number of households in the sample are 4008, 5988 and 9600 households, respectively. However, since most of the analysis is for agricultural households, the sample is lesser, which is 2579, 2315 and 6579 households for the three rounds respectively. For the purposes of this study, I have defined an agricultural household as a household that owns land that has been used for agricultural purposes, or a household that has hired agricultural labor.

The NLSS is a very detailed survey, which is nationally representative and covers a lot of characteristics, including: demographic, housing, access to facilities, literacy and education, health services, family planning, migration, remittances, economic activities, land usage among others. The variables that I will be using would be among these different characteristics to conduct analysis.

In the households, the characteristics that are available are at the individual level (for household members, and absentees (including migrants)). The data set also consists of data on the destination countries of the migrants. When considering agricultural land, the data is available at the plot level, i.e., characteristics of each plot of land (each household can own multiple plots of land).

For the construction of the shares in my methodology I have used the 2001 unit level Census data. To assess the parallel trends, I use the 1991 and 2001 agricultural census data. For various macroeconomic variables, such as GDP per capita and exchange rate, I have used the World Bank data.

Table 1 consists of a summary of descriptive statistics of the exogenous shift share variable, the household level controls, and the 2001 census controls (which are used to control for period effects).

2.2 Construction of the Shift-Share (Migration Opportunity)

Below I construct an Opportunity variable that identifies the causal relationship between migration opportunities and various outcome variables by exploiting exogenous variation in share of migrants of migrant that is independent of household characteristics. The "shift" component ($\tilde{I}_{kt}$) is the per capita GDP, and refers to changes in the economic conditions

Table 1: Descriptive Statistics

Variable	N	Mean	SD
Panel A: Dependent variable			
Exogenous shift-share exposure	10,348	23,036.36	31,752.33
Panel B: Household characteristics (NLSS)			
Dependency ratio	10,484	0.354	0.244
Age of household head	10,484	47.63	14.46
Household size	10,484	5.21	2.39
Panel C: District characteristics (2001 Census)			
Average landholding size (ha)	10,487	0.779	0.223
Education (years)	10,487	5.764	0.785
Total population	10,487	44,491.53	26,639.48
Share w/ electric lighting	10,487	0.366	0.224

Notes: The unit of observation is the household-year. Panel A reports the exogenous (Gulf/Malaysia) shift-share exposure measure. Panel B reports household characteristics from the NLSS. Panel C reports district-level characteristics from the 2001 Nepal Population Census. Sample sizes differ across variables owing to missing values; the shift-share measure is missing for 139 household-years.

of destination countries where migrants reside. The $share_{dk,2001}$ component represents the predetermined distribution of migrants from the home country across these destinations. The term e_{kt} is the exchange rate between Nepal and the destination country k in year t. I used share of migrants before the high remittance period — that is before 2002, where I have used the census data for 2001 to construct these shares. The k-countries here refer to the countries where I can argue for exogenous district level, Qatar, UAE, Saudi Arabia, Malaysia, South Korea and Japan.

$$Opportunity_{d(h)t} = \sum_{k \in K} share_{dk,2001} \times \tilde{I}_{kt} \times e_{kt} \tag{1}$$

The shift-share variable $Opportunity_{d(h)t}$ is a district level pull shock. The intepretation of its coefficient is how changes in opportunity to migrate, affects the various outcome variables. This is an Intent-To-Treatment (ITT) framework and not an Average-Treatment on the Treated (ATT). The subscripts d denotes district, (h) denotes household and t denotes time. The unit of analysis are individual households. However, the treatment of the Opportunity variable would be at the district level. Therefore, all the households in a district will have the same $Opportunity_{d(h)t}$ treatment.

Since the variable of interest is ITT, we will also need to consider how migration opportunity has general equilibrium effects at the local level, including how it affects the labor market – more specifically wages, and hiring practices. Higher migration opportunity can also affect access to credit, since there is influx of liquidity in the economy. These would be discussed and empirically verified in Section 3.2.

Each district has a pre-determined migrant share (for the year 2001), denoted by $share_{dk,2001}$. I try to argue that the difference in the share of migrants between the various

districts is (conditionally) exogenous to local economic conditions, both a priori and by pre-trends. The reason that I argue that the shares are exogenous in the case of Nepali migration towards these gulf countries, since the demand for labor comes from abroad and this is not related to any district level characteristics conditional on observables and district and time fixed effects. I will show the pre trends later in Section 2.4 in the paper.

I have used a combination of per capita GDP and exchange rate in the destination countries as the shifts. A country would have a higher migration opportunity if it has a higher per capita GDP, compared to a lower per capita GDP. South Korea, which has a relatively high per capita GDP of 32,395 USD compared to a country like Malaysia, which has a relatively low per capita GDP of 11,748. These per capita GDP figures will be multiplied by the average exchange rate to get an estimate of the shifts in Nepali rupees. The economic levels at the destinations across time are not correlated with characteristics of the origin. The countries and their per capita GDP in Table 2.

Table 2: GDP per capita by Country (current USD)

Country Name	2003	2010	2022
United Arab Emirates	29,660	43,697	49,899
Malaysia	4,465	8,899	11,748
Qatar	31,602	77,387	88,701
Saudi Arabia	11,487	22,028	34,454
Japan	35,387	44,968	34,017
Korea, Rep.	14,673	23,079	32,395

Source: World Bank, World Development Indicators (2023).

By exploiting these three elements, I construct a *Migration Opportunity* variable, which is a combination of these two elements, to isolate exogenous differences in migration related income opportunities. Because the migrant shares predate the outcome period and the destination GDP changes are external to origin districts, their interaction is not driven by endogenous household characteristics.

It is important to note that one could consider constructing a share by taking the total number of migrants in district d from destination k and divide it by the total number of migrants. In that case, the migration opportunity variable would be a weighted average. A drawback of doing this would be that it could falsely have a high opportunity, when in reality the denominator could just be small. For instance, migration opportunity out 10 migrants in district d to destination k and total migrants of 100 could have the same opportunity value of 0.1, but the opportunity from having 100 migrants in district d to destination k and total migrants of 1000, would have much more migration opportunity but the opportunity variable would have the same value of 0.1.

To deal with this issue, the shares is the total number of migrants in district d in destination k, divided by total population in k. An issue of constructing such a share could be that which Borusyak et al. (2022) refers to as "incomplete shares". The opportunity variable would not be a weighted average, but we can deal with this by controlling for the total

number of migrants divided by total population in a district. This term can be absorbed by the district level fixed effects (since it is a constant).

2.3 Specification

In this section we discuss the specification of the regression. The variable y_{ht} is the outcome variable, which in this case would be expenditure on hired agricultural labor, the number of hired agricultural days, expenditure on fertilizers/pesticides, expenditure on seeds, crop sales income, total expenditure on agriculture and profit. The subscript h is household and t is time (which is either 2003, 2010 or 2022).

$$y_{ht} \;=\; \alpha_d \;+\; \alpha_t \;+\; \beta\, Opportunity_{d(h)t} + \gamma\, B_{dt}^{endo} \;+\; \gamma \mathbf{X}_{ht} \;+\; \mathbf{Z}_d' \lambda_t \;+\; \mu_{ht} \tag{2}$$

As we have discussed above, the $Opportunity_{d(h)t}$ variable is a shift-share pull shock. It is a measure of migration opportunities in the destination country. This can be interpreted as the average change in the household outcome y_{ht} associated with a one-unit increase in the district's migration pull-shock.

I also control for the shift share for endogenous countries – B_{dt}^{endo}, like USA, UK, Australia, China and others. This is because controlling for this could address potential district level confounders given that the processes of migration in these countries are by direct application rather than being pre-determined by the destination countries. Why these countries differ than the other countries where the shares are exogenous is discussed in Section 2.4.1.

α_d is the district level fixed effects and α_t are time fixed effects capturing common shocks (e.g. national policies, aggregate price changes). X_{ht} is a set of household level characteristics that are controlled. $Z_d' \lambda_t$ is the period effects of some 2001 district level characteristics. μ_{ht} is an idiosyncratic error term.

2.4 Identifying Assumption

In the context of my research, the following equation is the identifying assumption.

$$\text{Cov}(s_{d,k}^{(2001)},\, \varepsilon_{ht}) = 0 \tag{3}$$

Here, $s_{d,k}^{(2001)}$ is the share of migrants. The superscript 2001 is the pre high remittance census year. The subscript d is district and k is the migration destination. In the exogenous error term ε_{ht}, h is the household and t is the different waves of NLSS, that is 2003, 2010 and 2022.

I argue that the share of migrants $s_{d,k}^{(2001)}$ is exogenous to post-high remittance outcome changes. More specifically, the identifying assumption requires that the migrant share is exogenous with respect to unobserved determinants of household outcomes. One argument in the migration literature is that households that receive migrants have unobserved characteristics — say these households might have more drive which cannot be adequately captured — that affect both the variable of interest and the outcomes. If this is the case, then the coefficient of interest can be biased. However, if $s_{d,k}^{(2001)}$ is exogenous, then we can make a case for the regression with the shift-share coefficient as being unbiased. The identifying variation

comes from the interaction between the 2001 district migrant share of a destination and the year per capita GDP and exchange rates of the destination countries.

It should be noted that this assumption cannot be directly tested, since we do not observe ε_{ht}. According to Borusyak et al. (2022), one of the common ways to validate the identifying assumption is to test the following:

$$E[\Delta Y_i \mid s_{i,k},\, X_i] = E[\Delta Y_i \mid X_i]. \tag{4}$$

In words, *trends* (not levels) in outcome Y_i (in household i) should be equal whatever the value of share ($s_{i,k}$) (where i is the household and k is the country), given X_i. This would entail that the shares are 'as-good-as-randomly assigned'. In table 3, we assess the pre trends using trends between 1991 and 2001 at the district level.

Please note that there weren't two waves before remittances got significant in in 2001. Therefore, I have used the 1991 and 2001 agricultural census to calculate pre-trends. Since the 1991 agricultural census do not have data at the household level data I have used district level data for this.

Since I am not using the NLSS for pre-trends, I have chosen outcome variables most similar to the agricultural outcomes in my main regression. The outcomes that I have considered are the share of agricultural land that is irrigated, the average size of agricultural land holding, the share (and total area) of land that is used for cultivation of rice, the share (and total area) of land used for cultivation of maize and share (and total area) of land used for cultivation of wheat.

This is the regression for Table 3.

$$\Delta y_{dk}^{2001-1991} = \alpha + \beta^k \,\text{share}_{d,k} + \theta_1 Dist_d + \theta_2 Dist_d^2 + geobeltdummies + \varepsilon_d \tag{5}$$

As can be observed in Table 3 only 4 out of 48 outcomes show significant pre-trends at the 10 percent level and only two of the coefficients are significant a the 5 percent level (share of maize cultivated for south Korea and Japan). We also observe a weak relationship for average holding size for Malaysia and total area of land cultivating rice for Qatar. Overall, by considering the results from Table 3, we can say that there are no significant pre-trends and the variables that are significant can be controlled for, addressing the concern for confounders.

As a further robustness check, I regress the trend in the bartik variable (that is the shift-share variable in 2022 minus 2003) to the same variables as in Table 3. The following is the regression for this

$$\Delta B_d^{2022-2003} = \alpha + \delta^m \,\Delta y_d^{2001-1991} + \theta_1 Dist_d + \theta_2 Dist_d^2 + \underbrace{\gamma_{b(d)}}_{column(2)} + \varepsilon_d \tag{6}$$

As can be observed, while there is some variables where there are pre-trends (in the case of share of rice cultivated, total area of rice cultivated, and total of wheat cultivated, non of the pre-trend remain once I control for geo-belt fixed effects.

2.4.1 A case for conditional exogeneity of shares in Nepal

Exogeneity in the different share of migrants in the various destination is an important assumption to make causal claims. In this section, I will argue why variation between districts

Table 3: Pre-trend balance across destinations (fully-controlled specification)

	Coefficient on migrant share, column (3)					
Pre-trend outcome	Malaysia	Saudi	Qatar	UAE	S. Korea	Japan
Share irrigated	-1.089	0.598	1.371	-5.716	-6.000	-6.861
	(23.33)	(3.122)	(8.256)	(15.40)	(12.43)	(8.492)
Avg. holding size	-96.09*	-9.377	-27.17	-39.35	-36.60	-5.947
	(49.77)	(6.750)	(17.80)	(33.46)	(31.12)	(21.52)
Share rice	-24.92	-8.289	-31.82	-58.66	-113.7	-119.6
	(61.31)	(7.972)	(20.95)	(38.81)	(151.2)	(105.6)
Share maize	15,892	2,534	8,848	4,231	64,096***	38,654**
	(41,054)	(5,492)	(14,508)	(27,153)	(23,438)	(15,671)
Share wheat	4.340	0.125	1.431	2.228	11.84	13.47
	(21.47)	(2.874)	(7.600)	(14.19)	(12.85)	(8.399)
Area rice	-2,524	-659.5	-2,224*	-2,722	-4,625	-511.3
	(3,606)	(466.9)	(1,226)	(2,304)	(8,938)	(6,291)
Area wheat	-298.5	-64.73	-168.2	-27.40	84.97	2.704
	(1,130)	(151.1)	(399.7)	(747.2)	(680.8)	(450.9)
Area maize	-753.4	-95.87	-319.9	-558.5	-324.6	-166.9
	(786.2)	(105.3)	(277.4)	(518.6)	(475.1)	(315.0)

Notes. Each cell reports the coefficient (standard error in parentheses) on the district migrant share from a separate OLS regression of the pre-period agricultural trend on migrant share, corresponding to column (3) of the destination-specific balance tables. All regressions include a quadratic in distance to Kathmandu and geo-belt fixed effects. For South Korea and Japan, *Share irrigated* and *Avg. holding size* include geo-belt fixed effects only. Standard errors are homoskedastic (default). $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 4: Balance of the Bartik exposure trend on pre-period agricultural trends

	Dependent variable: trend in Bartik exposure	
Pre-period trend	(1)	(2)
Panel A. Land and holdings		
Share irrigated	$-43,740$	$3,174$
	$(37,573)$	$(39,539)$
Avg. holding size	$2,596$	$-24,999$
	$(17,995)$	$(18,641)$
Panel B. Cropping intensity (output shares)		
Share rice	$14,300^{*}$	$-20,234$
	$(7,433)$	$(14,968)$
Share maize	-21.81	18.52
	(15.33)	(21.31)
Share wheat	$-27,580$	$8,360$
	$(41,233)$	$(41,424)$
Panel C. Cultivated area		
Area rice	225.1^{*}	-393.8
	(123.4)	(252.3)
Area wheat	$-1,249^{*}$	-288.1
	(698.7)	(777.8)
Area maize	-837.3	$-1,224$
	$(1,155)$	$(1,103)$
Distance polynomial	Yes	Yes
Geo-belt dummies	No	Yes
Observations	67–69	67–69
R^2 range	0.15–0.18	0.25–0.27

Notes. Each cell reports a separate OLS regression of the trend in assembled Bartik exposure on the indicated pre-period agricultural trend. Column (1) conditions on distance to Kathmandu and its square; column (2) adds geo-belt dummies. The entry is the coefficient on the pre-trend regressor, with the standard error in parentheses below; distance terms and belt effects are included but not shown. A coefficient statistically indistinguishable from zero indicates the pre-trend does not predict exposure, consistent with share exogeneity. Observation counts are 67 for the rice rows and 69 otherwise. Standard errors are homoskedastic (default). $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

are not related to any district level characteristics and how they are exogenous conditional on its distance from Kathmandu.

To make a case for why I think the shares are conditionally exogenous, it is important to understand the process through which migrants are hired. Most of the hiring occurs through recruitment agencies. Based on Government of Nepal, Ministry of Labour and Employment, Department of Foreign Employment (2014), in 2008/09, around 75 percent of the labor permits that were issued were through recruitment agencies, while the rest (25 percent) were done individually. Moreover, in 2001 there were 301 recruitment agencies and all of them were based in Kathmandu (Kern and Müller-Böker 2015). This is because for a person who is not in Kathmandu, there are costs involved to go through the process of migration — such as traveling, accommodation, and others — which make distance quite an important factor for migrants.

It is also important to note that the process of migration as explained by Kern and Müller-Böker (2015) is the following. Firstly, the demand for labor comes from the destination countries, where companies approach the recruiting agencies. Secondly, after performing necessary paper work, the recruitment agencies have to get approval from the government of Nepal. Thirdly, the hiring process starts, and after recruiting sufficient number of workers, they can leave for the destination for work. What is important to note for identification is that the *demand comes from the destination countries themselves*. This is exogenous and not related to any district level characteristics. Therefore, any variation in share of migrants in the districts from across various destinations conditional on distance to Kathmandu and other characteristics, should be largely exogenous.

Why is distance to Kathmandu a key control for exogenous shares? The key destinations Nepalis emigrate can be broadly classified into two groups: a) destinations that require low skilled work — such as UAE (Dubai), Qatar, Bahrain, Malaysia, Saudi Arabia, b) medium skilled work like Japan and South Korea and c) destinations where people move initially for educational purposes, but then end up moving there permanently — such as US, UK and Australia. I will argue why in the former two case, destination shares are exogenous conditional on distance to Kathmandu by giving a brief historical overview of migration in Nepal.

Internal migration and migration towards India were pretty high during the 1980s and 1990s. In addition to emigration to India for work, during the 1990s there was a boom in the carpet industry (located in Kathmandu) in Nepal and because of which there was substantial migration from regions around Kathmandu towards these factories (Graner 2010). The carpet industry was booming in the 90s and in 1995 constituted around 50 percent of overall exports of Nepal. It is important to point out that the demand for work for Nepalis was always high since the 80s and 90s. However, in the late 90s or early 2000s, the carpet industry experienced a slump, and could not absorb labor like during its boom periods.

Simultaneously during the 90s, there was also growing demand for labor in the gulf countries and Malaysia. While there were migrants towards these countries prior to 2002, the huge jump in migrants took place during that year (Graner 2010). While there was always demand for work by workers and households (something that is evidenced by migration towards India and Kathmandu (carpet factories)), the destinations started to shift towards the gulf countries.

To illustrate this point, let us consider Figure 2 and Figure 3. In Figure 2, we observe that

most migrants that went to the Kathmandu carpet factories, come from locations around Kathmandu valley, and therefore distance to Kathmandu becomes an important variable to control. Furthermore, one can also observe that between 1985 and 1997, there were not many migrants toward Kathmandu from districts in the Western parts of Nepal. Correspondingly, in Figure 3, one can also observe that most of the migrants originate from the districts around Kathmandu. This shows that migrant worker demands only shifted from carpet factories to Gulf and other regions outside of Nepal. By observing these graphs, we can observe that distance to Kathmandu is an important variable to control for, and therefore can make a stronger case for conditional exogeneity.

It is also important to note that most migrant workers go through recruiting agencies, and all of them are located in Kathmandu.

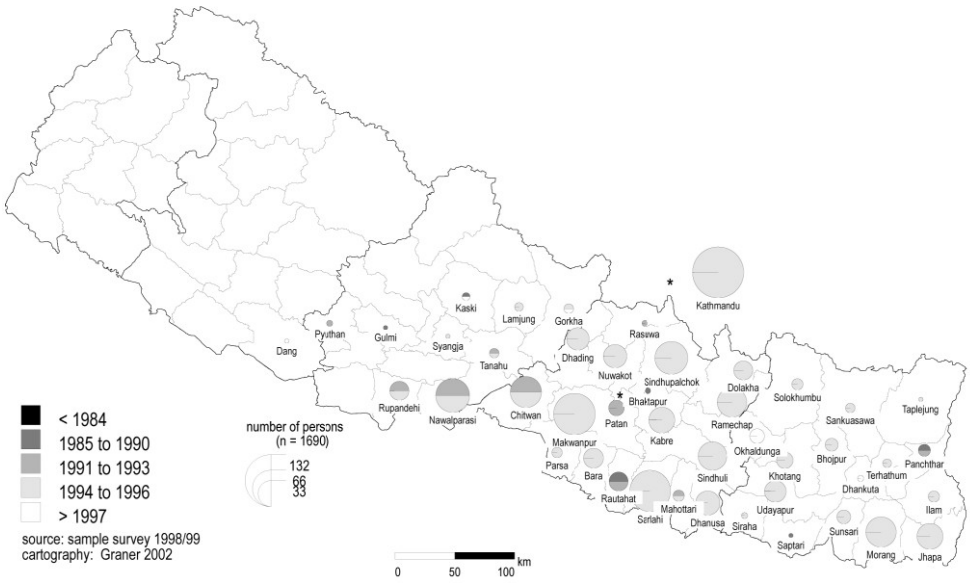


Figure 2: Origin of labor migrants carpet manufactories in the Kathmandu valley during the 1990s.
Source: Graner (2010)

To empirically make this case consider Table 5. I conduct the following regression

$$s_{d,k}^{2001} = \alpha + X_{d,k}^{1991}\gamma + u_{d,k} \tag{7}$$

In this regression, it can be observed that distance from Kathmandu is significant in all the destinations where I can argue for exogenous shares, namely, Saudi Arabia, UAE, Qatar and Malaysia. All other destinations, where I can't argue for exogenous shares, the distance to Kathmandu is not significant.

Additionally, it should be noted that according to Kern and Müller-Böker (2015), all of the 301 recruiting agencies are based in Kathmandu, which could mean that the cost of traveling to Kathmandu can be an important deterent to migrant. Therefore this is an additional reason why distance from Kathmandu for these destinations is a significant variable, after controlling for which (and other controls) the shares are exogenous.

Table 5: **Standardized (Beta) Coefficients of District-Level Determinants of Migrant Share**

	Saudi Arabia		**Qatar**		**UAE**		**Malaysia**	
	No Dist.	With	No Dist.	With	No Dist.	With	No Dist.	With
Distance from KTM	–	1.024*	–	1.337**	–	1.364**	–	1.184**
Distance^2	–	−1.247**	–	−1.168**	–	−1.469**	–	−1.222**
1991 controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	66	63	58	55	61	59	56	54
R^2	0.109	0.181	0.097	0.159	0.108	0.205	0.151	0.241

	South Korea		**Japan**	
	No Dist.	With	No Dist.	With
Distance from KTM	–	2.594***	–	1.258*
Distance^2	–	−2.306***	–	−1.252**
1991 controls	Yes	Yes	Yes	Yes
N	35	35	39	39
R^2	0.05	0.40	0.28	0.40

	UK		**US**		**Australia**		**India**	
	No Dist.	With	No Dist.	With	No Dist.	With	No Dist.	With
Distance from KTM	–	0.727	–	0.340	–	−0.204	–	0.802
Distance^2	–	−0.891*	–	−0.362	–	0.074	–	−0.580
1991 controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	57	55	58	54	42	40	73	69
R^2	0.184	0.251	0.523	0.663	0.321	0.414	0.126	0.210

Notes: Standardized (beta) coefficients from OLS regressions of the 2001 district migrant share on the distance terms and 1991 baseline district characteristics. Controls: 1991 Census variables include population, share of farm population, landholding characteristics, irrigation variables, and paddy share. ***, **, * denote significance at the 1%, 5%, and 10% levels.

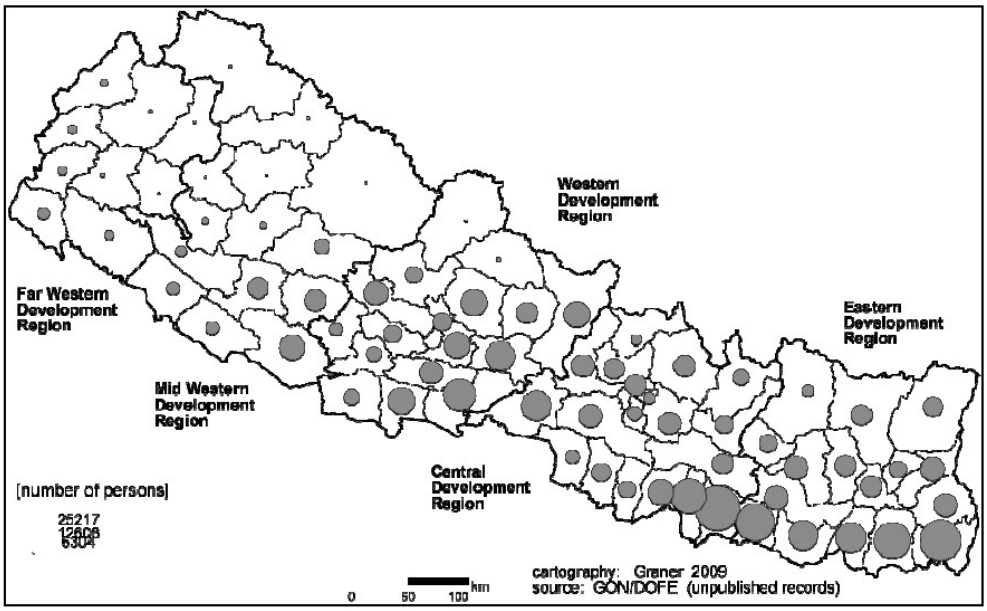


Figure 3: Districts of origin of labor migrants to the Gulf countries or Malaysia Districts of origin of labor migrants to the Gulf countries or Malaysia (2006-08)
Source: Graner (2010)

3 Main Result

3.1 Mechanism: Migration Opportunity and household remittance receipt

I will initially show results on whether the exogenous *Opportunity* variable positively affects household remittances. This is the following equation for Table 6.

$$R_{idt} = \beta\, Opp_{dt} + \gamma\, B_{dt}^{endo} + \underbrace{\mathbf{X}'_{idt}\,\delta}_{cols.(2),(3)} + \underbrace{\mathbf{Z}'_{d}\lambda_t}_{col.(3)only} + \alpha_d + \tau_t + \varepsilon_{idt} \tag{8}$$

The variable of interest is *Migration Opportunity*. I also control for the shift share for endogenous countries as in Equation 2.

As can be observed in Table 6 Panel A, we observe that at the intensive margin there is a strong positive relationship between the Opportunity variable and household remittances (across all three specifications). Moreover, in Panel B, we run a regression where the unconditional remittance receipt, where households that do not receive remittances have values 0, whereas households that receive remittances have the total remittance value. Here as well we observe a positive relationship (although only significant at the 10 percent level) across all specifications.

Table 6: Exogenous migration exposure and per-household remittances

	(1) Sparse	(2) + Demographic	(3) + Full trends
Panel A. Remittance-receiving households (intensive margin)			
Exogenous shift-share	44160.9***	41878.7***	40248.6***
	(13303.0)	(12866.5)	(14536.6)
p-value	0.001	0.002	0.007
Observations	1,599	1,599	1,599
Clusters	66	66	66
Panel B. Full sample			
Exogenous shift-share	5929.4*	5814.0*	5227.5*
	(3077.3)	(3044.1)	(3052.1)
p-value	0.058	0.060	0.091
Observations	10,179	10,179	10,179
Clusters	69	69	69
Endogenous shift-share (control)	Yes	Yes	Yes
Demographic controls	No	Yes	Yes
Baseline-characteristic × year trends	No	No	Yes
District FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes: All regressions include district and year fixed effects; standard errors clustered by district (69 clusters) in parentheses. Panel A includes no additional controls; Panel B adds the household dependency ratio, age of the household head, and household size; Panel C additionally interacts baseline district characteristics (average holding size, years of education, total population, and share of households with electric lighting) with year dummies. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

3.2 Mechanism: Migration Opportunity and labor market and credit channels

A mechanism through which households can be affected is how migration and remittances can affect the labor market. Because of the huge outflow of labor, there is a vacuum in supply of workers in the household, which could be replaced by hiring of outside labor. Additionally, there could also be an increase in Exchange Labor adoption, which is a labor practice very prevalent in Nepal. This is a practice where there is no exchange of money for one's labor services but rather household compensate for someone's labor service by helping them out in their land in exchange (Fortier 1993).

As can be observed from Table 8, we observe that there is no increase in hired labor nor an increase in wages. On the contrary, we observe that migration opportunity positively affects exchange labor practices. More specifically, a SD increase in migration opportunity increases exchange labor by around 0.1 SD. This is consistent across all three specifications. Moreover, the fact that migration opportunity is not increasing both total hired days and wages, could be the result of the shift towards exchange labor practices.

When considering how migration opportunity affects credit channels, it did not affect the both formal and informal credit channels.

3.3 Agricultural outcomes

We now show the results of our main specification, namely from Equation 2. We regress the migration opportunity variable with agricultural outcomes. As can be observed in Table 7, we see that migration opportunity does not affect total expenditure to hire labor – which follows from the results in the previous section. Moreover, migration opportunity does not affect expenditure in other important agricultural outcomes like expenditure for fertilizers and persticides, expenditure for seeds, total expenditure in agriculture and expenditure for machineries in agriculture. These results are consistent across specifications.

From this, we can conclude that despite there being very high inflow of remittances, we observe that this does not have significant agricultural outcomes. Therefore, there has been no real significant change in prioritizing agriculture since remittance income has gained significance in the economy.

4 Conclusion

From the results, we observe that despite there being such a huge influx of remittance inflow in Nepal, there seem to be limited effect on agricultural outcomes. While migration opportunity has positively affected the adoption of exchange labor practices, there has been no real change in other agricultural outcomes. Given that my results show that there are null results, this complements the fact that agricultural growth has stagnated since remittance income has gained significance in the economy. Subsequently, remittance income has not improved the prospects of economic growth by improving the state of the agricultural sector.

Table 7: Reduced-form effects of migration shift-share exposure on agricultural outcomes

	(1) Hired labor days	(2) Agri. wages	(3) Male agri. wages	(4) Exchange labor
Panel A: No controls				
Exogenous shift-share	0.037	−0.015	0.011	0.108**
	(0.027)	(0.052)	(0.059)	(0.045)
Panel B: + Household controls				
Exogenous shift-share	0.030	−0.015	0.011	0.096**
	(0.027)	(0.052)	(0.060)	(0.044)
Panel C: + Baseline characteristics × Year				
Exogenous shift-share	0.001	−0.017	0.021	0.101**
	(0.025)	(0.039)	0.045	(0.047)
Endogenous shift-share	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	9,738	5,377	4,543	8,026

Notes: Outcomes are standardized (z-scored). Each cell reports the coefficient on the exogenous migration shift-share exposure measure from a separate `reghdfe` regression; the endogenous shift-share measure is included as a control in every specification (coefficients suppressed). All regressions include district and year fixed effects; standard errors clustered by district (69 clusters) in parentheses. Panel A includes no additional controls; Panel B adds the household dependency ratio, age of the household head, and household size; Panel C additionally interacts baseline district characteristics (average holding size, years of education, total population, and share of households with electric lighting) with year dummies. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 8: Reduced-form effects of migration shift-share exposure on agricultural input and household expenditure

	(1) Total labor exp.	(2) Fertilizer/pesticide exp.	(3) Seed exp.	(4) Total expenditure	(5) Machinery exp.
Panel A: No controls					
Exogenous shift-share	0.046	0.010	−0.015	−0.018	−0.036
	(0.028)	(0.028)	(0.045)	(0.046)	(0.041)
Panel B: + Household controls					
Exogenous shift-share	0.035	−0.004	−0.025	−0.029	−0.050
	(0.029)	(0.030)	(0.046)	(0.047)	(0.042)
Panel C: + Baseline characteristics × Year					
Exogenous shift-share	0.048	0.020	0.005	0.047	0.018
	(0.029)	(0.030)	(0.041)	(0.036)	(0.034)
Endogenous shift-share	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	9,454	9,078	9,077	9,078	9,908

Notes: Outcomes are standardized (z-scored). Each cell reports the coefficient on the exogenous migration shift-share exposure measure from a separate `reghdfe` regression; the endogenous shift-share measure is included as a control in every specification (coefficients suppressed). All regressions include district and year fixed effects; standard errors clustered by district (69 clusters) in parentheses. Panel A includes no additional controls; Panel B adds the household dependency ratio, age of the household head, and household size; Panel C additionally interacts baseline district characteristics (average holding size, years of education, total population, and share of households with electric lighting) with year dummies. $^{***}\,p < 0.01$, $^{**}\,p < 0.05$, $^{*}\,p < 0.10$.

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